DEVELOPMENTS IN LONG DISTANCE COMMUTING TO LONDON

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The candidate confirms that the work submitted is his own and that appropriate credit has been given where reference has been made to the work of others.

ABSTRACT

The stimulus for this work is the development in long distance commuting to Greater London, from areas beyond the South East Region, which has been increasing since the early nineteen fifties. Evidence of this is reported in the five censal periods dating back to 1966. Arising from this factor, the key objective, in this thesis has been to identify and understand the factors, which are generating the increase in the above movement.

The methodology developed, in response to the above objective, had two interdependent stages. The first was a general descriptive analysis, undertaken at the aggregate level, which aimed to identify the contributory factors behind the increasing trend of LDC to London. The second was the undertaking of a new survey to identify and explain, at the disaggregate level, factors which are contributing to the general increase in LDC earlier described.

Stated preference methods were used to test LDCs' sensitivity to journey time and price elasticity, which by industry's evidence are known to affect commuting behaviour. A logit formula was then applied to explain the latter. Other issues (economic activity, demography, location of residence relative to employment), which affect commuting behaviour were also investigated. The framework developed proved powerful enough to shed light on some of the key factors affecting LDC to London.

Our findings indicate that, within the increasing trend of LDC to London, the traditional form of commuting from a fixed rural residence to a fixed workplace in London is still maintained. But advances in technology and communication (including transport) and the hub of commercial enterprise are creating a new type of LDC, who like their traditional counterparts, are commuting from fixed rural residences but to 'multi-work destinations', including London, during the working week.

LDCs are also responding to opportunities that exist in the London labour market – rather than the local market. This is not unusual. LDCs are highly skilled (SOC 1-3) and there may not be opportunities locally to suit inclination, training and skills. What is unusual is that many of those involved in this type of movement were formerly SDCs, who have chosen to retain rural residence and commute long distance to employment in London. This was contra to the conventional concept of LDC. LDCs are therefore far more mobile than was previously considered and it is these factors (not seen elsewhere in published literature), which are contributing to the increasing trend in LDC to London.

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It is to my dear wife, Mavis, that I dedicate this work.

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NOTATION

Used in connection with tests conducted in Chapter Eight.

H_o	Null hypothesis
H_1	Alternative hypothesis
μ	Population mean
n	Sample size
$<$	is less than
$>$	is greater than
α	alpha
$\pm$	plus or minus
$(p > .05)$	probability p is significant at the 95 percent level of confidence
$(p < .05)$	probability p is not significant at the 95 percent level of confidence
$\mid Z \mid$	absolute value of Z
$\mid Z\alpha/2 \mid$	critical value of Z - 2-tailed test of significance
S.E.	Standard error of the mean
$\overline{X}$	Mean value of x
ANOVA	Analysis of Variance

Z	Standard value
	Test statistic for tests using the Normal distribution

Used in connection with tests conducted in Chapter Nine

R^2	Indicator of the model's level of
Adj R^2	explanation
ε	Unexplained random component
$\beta_1, \beta_2, \beta_n$	represent the parameter estimates for the independent variables
df	degree of freedom
D	journey distance
P( )	probability that demand (expressed by the dependent variable) would be retained if IVT or IVJF increases by 'x' %.
1-P	is the probability of this not happening
ln	natural log
% Δ JT	represents % change in journey time – relative to current journey time
% Δ JF	% change in journey fare – relative to current fare

GLOSSARY OF TERMS USED

ANOVA	Analysis of Variance
BHPS	British Household Panel Survey
Comm	Commuting Trips
DETR	Department for the Environment, Transport and Regions
DoT	Department of Transport
EB	Employers business travel
ESRC	Economic and Social Research Council (UK)
FGW	First Great Western
GDP	Gross Domestic Product
HMSO	Her Majesty's Stationery Office
IU	Inter – Urban journey in excess of 30 miles
IVJ	In-vehicle Journey
IVT	In-vehicle journey time
Km	Kilometre
LDC	Long distance commuter or Long distance commuting

LDCs	Long distance commuters
LFS	Labour Force Survey
LLM	London's Labour Market
LSE	Trips within London and South-East Area
LUL	London Underground Limited
MDCs	Middle distance commuters
NATS	National Air Traffic Services
NTS	National Travel Survey
NSE	Network South East
ONS	Office for National Statistics
PAYE	Pay as you earn
PDFH	Passenger Demand Forecasting Handbook
PPSJ	Pence per mile single journey
SDCs	Short distance commuter
SOC 2000	Standard Occupation of Classification 2000
SPSS	Software Package for the analysis of Statistical Data
SRA	Strategic Rail Authority

SWT	South West Trains
VoT	Value of Time

CHAPTER ONE

INTRODUCTION AND RESEARCH OBJECTIVES

1.0 Introduction

This study examines the changes which have occurred, since 1950, within trends in contemporary long distance commuting centred on Greater London and their causes.

It draws initially on evidence obtained from a review of long distance commuting, which detected:

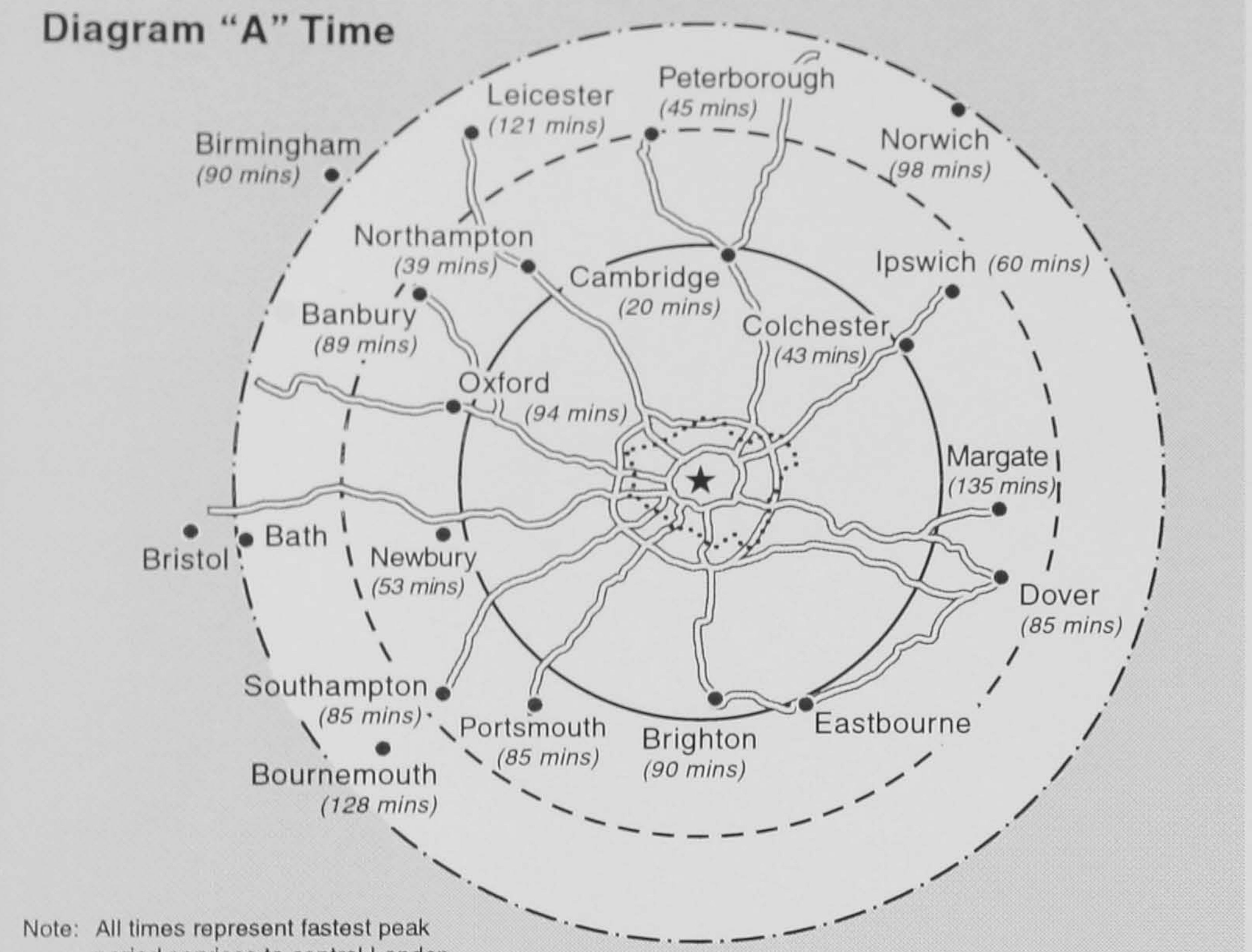
* a growing trend towards long distance commuter journeys, in excess of 200 km – particularly to the North of London (Map 1).

* changes in the job and housing markets, planning and land-use policies, rising income and the lifestyle of commuters, which are generating changes in contemporary long distance commuting.

These changes have not been fully studied. Howe (1997), for example, looked at the statistical trends, in the two decades between 1971-91, which were leading to long distance journeys-to-work. But did not specifically seek to explain such trends.

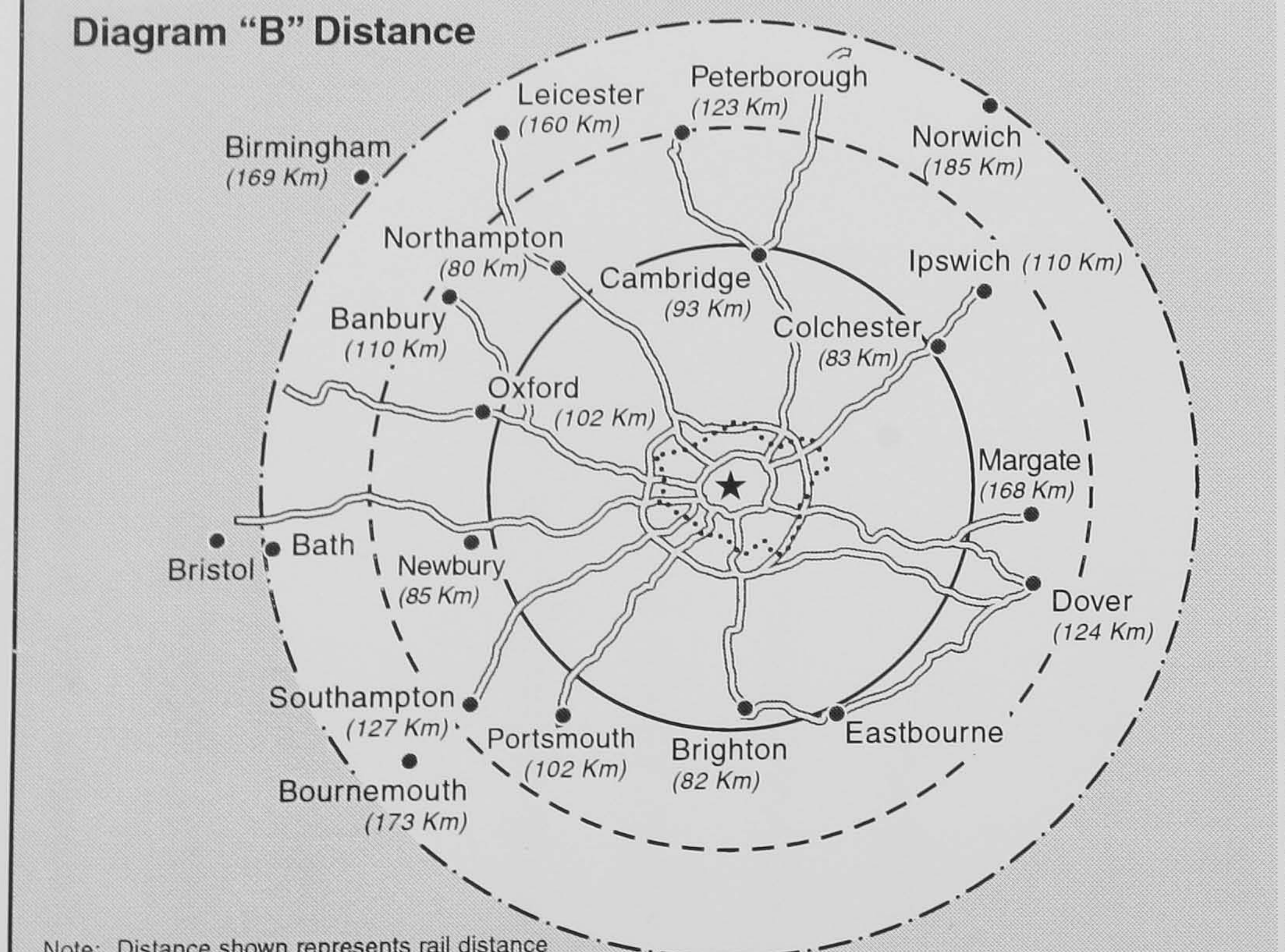
Green et al (1999) examined the sociological aspects of long distance living. Wherein, workers were involved in long distance weekly commuting, as opposed to the emphasis of this study on regular long distance commuting.

Diagram "A" Time

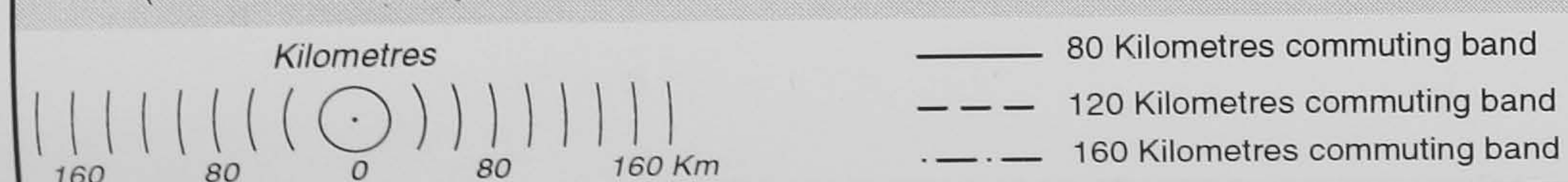


Note: All times represent fastest peak period services to central London

Diagram "B" Distance



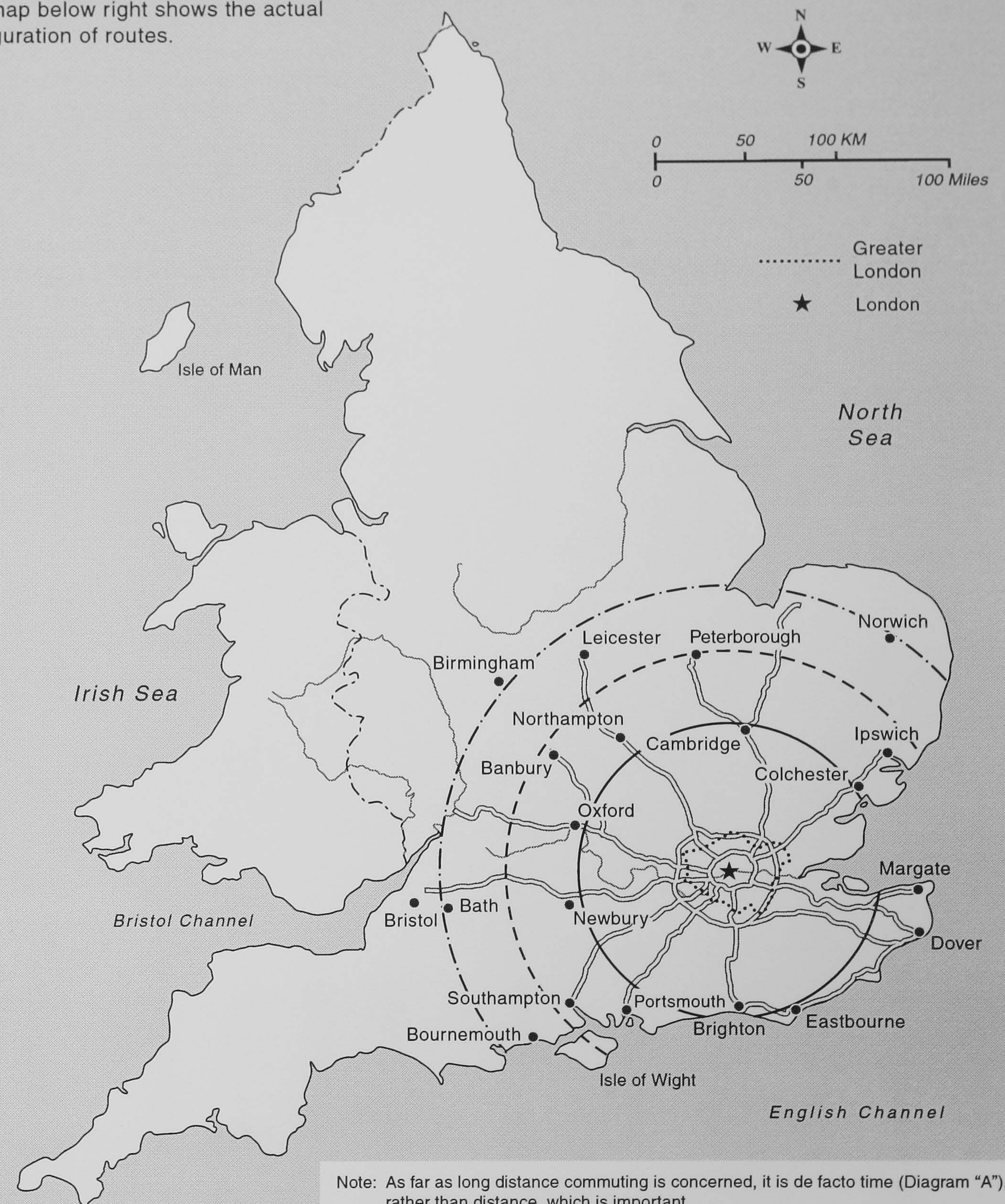
Note: Distance shown represents rail distance (from stations indicated) to central London



Map 1:

Long Distance Commuter Routes into Greater London from beyond the South East Region

Drawn on "A" time and "B" rail-distance scales. The map below right shows the actual configuration of routes.



Note: As far as long distance commuting is concerned, it is de facto time (Diagram "A"), rather than distance, which is important.

Diagram "A" and map (on the right) show some of the areas which are within $1\frac{1}{2}$ – 2 hours commuting of Central London and which, at present, represent the outer limits of centripetal commuter journeys to London.

Cameron and Muellbauer (1998) examined inter-regional commuting, during the censal periods, 1981-91, - as an alternative to migration – with the emphasis on the latter.

It remains clear from the above factors that while the studies will have provided some useful insight into the subject of enquiry, they did not specifically examine the trends and underlying causes associated with long distance daily commuting to Greater London.

Yet it is not only the increase in long distance commuting, both in volume and length, which are of concern to this study. Of equal importance, if an explanation is to be found, are the underlying and/or external factors, which have given rise to the increase in long distance commuting.

In this work an attempt is made to fill the gap by identifying the important factors, which are generating the increase in long distance commuting to Greater London. A methodology is also developed in support of the above analysis. This is explained in the ensuing text.

1.1: Research Objectives

The key objective of this thesis is to identify and understand the key factors, which are generating the increase in long distance commuting to Greater London.

In this process, the study uses a two prong approach. First it addresses, in the descriptive analysis of the study (Chapter Four), long distance commuting to Greater London at the aggregate level. In this section, a combination of data taken from the

National Census (1981-2001), National Travel Survey (1985/97) and other published sources are used to illustrate broad trends in the development of long distance commuting to Greater London and to find an explanation for the latter development.

Secondly the study addresses, at the disaggregate level, the undercurrents which are fuelling long distance commuting to Greater London – using primary data obtained from a survey of long distance commuting to London. In order to put the study's findings into context, the results are compared with the findings of other pertinent studies.

1.2: Methodology

In the present work, we have adopted a major LDC route (Bristol to Paddington) for detailed analysis and study. It is one of ten national rail commuter routes, through which workers commute long distance to Greater London, from beyond the South East Region. It also fits the criterion, adopted by the study, for long distance commuting. Namely, commuting to Greater London, which originates in areas that are beyond the South East Region – as defined by the 1964 South East Study (Map 1).

In the case of the study route, it is the only fast and direct rail link (operated by First Great Western) between the South West of England and Greater London. This makes it a captive route for long distance commuters, who live in South Wales, Bristol, Bath, Chippenham, Didcot, Swindon or other areas within the catchment area of the above route.

In terms of analysis, stated preference (SP) methods, seen as the most appropriate, are used in the LDC survey to obtain data for the estimation of LDC time and price elasticity as well as the value of time. A logit formula, of the ordered type, is then applied to identify the factors, which influence LDCs' sensitivity to time and price elasticity, which by industry's evidence (PDFH, 2005) are known to affect commuting behaviour. Other issues (such as economic activity, demography, location of residence relative to employment), which affect commuting behaviour are also examined. As they can provide an explanation for some of the underlying developments, which are taking place within the general trend of long distance commuting to Greater London.

It is envisaged that the methodology, adopted in this study, can be applied to the eleven other national rail routes (Map 1), through which workers commute long distance to Greater London – to obtain corresponding results.

1.3: Structure of Thesis

The framework for the study will be constituted on ten chapters:

Chapter One has identified the research objectives

Chapter Two reviews the state of existing knowledge on the subject. The gap(s) that exist in the LDC literature and identifies the need and/or opportunities for further research – thereby providing a link to the later chapters.

Chapter Three describes the methodology adopted in pursuing the study's objectives, stated in Chapter One, and the data needed to support it. In particular, the Chapter will define the methodology adopted and show how it is applied. The data sources will also be identified – along with reasons for their inclusion. For comparative purposes and in order to place the study's findings in context, data from the National Travel Survey 1995/97; Adcock et al's 1995 study; South West (SWT) Trains Study; the Passenger Demand Forecasting Handbook (PDFH), and from related studies (which will be identified in the appropriate text) are also incorporated. Overall, the chapter is fundamental in identifying the basis (both in terms of the data adopted and their respective uses) for the analyses, which will be undertaken in the succeeding chapters.

Chapter Four sets the wider context in which the study is based. It examines the historical influences, which provided the nucleus for the present structure (in terms of workflow and direction) of LDC to London. The chapter also examines the external factors (principally economic, demographic and the advent of twentieth century technology), which aided the early development of LDC to London and still continue to have effect.

Chapter Five describes the survey methodology adopted for the collection of the primary data, used in the study. It is the first of a two-stage process, continued in Chapter Six, which is aimed at collecting the primary data – needed to pursue the study's objectives at the sub-level of LDC to London. The chapter further describes the results of the pilot survey and the changes, made to the survey questionnaire – prior to the conduct of the main survey. Also taken into consideration are the supplementary tests that are carried out to ensure that the survey questionnaire is efficiently designed to capture the required data. Given that, during the field survey, the researcher will have only one opportunity of achieving this.

Chapter Six. The efficient management and conduct of a survey requires careful planning, if it is to progress smoothly and achieve the objectives for which it is designed. The consideration given to the planning and execution of the main survey are discussed in this chapter. This includes an examination of the operational and other factors, which are likely to impact on the survey; the sample size; the on-train pilot survey and the conduct of the main survey itself. So that some insight is gained as to the conditions under which the primary data was collected.

Chapter Seven describes the nature and characteristics of the data collected from the LDC survey. The chapter further examines each of the fifty four questions, incorporated in the survey questionnaire, and the key features revealed by the data. The chapter is crucial, in that it draws out observations or hypotheses, which give insight into the nature and characteristics of the LDCs surveyed. The latter is a primary focus of the thesis.

Chapter Eight reports on the tests carried out to test the hypotheses, unearthed by Chapter Six, to determine whether they are statistically significant.

Chapter Nine specifically examines the journey time and cost elasticities for the study's long distance commuters. Given that LDC is a matter of time and cost rather than distance. But most importantly, both journey time and cost elasticity may be a function of age, gender, cost, frequency of travel, income or external factors, such as the strength of competition from other modes. The 'value of time' is also taken into consideration. These factors are examined, as part of the overall objective of the study, to investigate factors which may explain developments in long distance commuting to London.

Finally in Chapter Ten, a summary of the results of this work is stated – along with the conclusions reached. Some suggestions for further work are also presented.

These are the factors which are incorporated into the conceptual framework of this study. Allowance is made for the fact that the investigation may well unearth other factors of significance, not previously detected. These will be incorporated into the study's architecture.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The aim of this chapter is to selectively review the existing literature on long distance commuting (LDC). Its scope and objective is to: establish the state of current knowledge that exist on the subject; identify the gap(s) which exist and, arising from the review, to state what contribution the present study will make to the current body of knowledge.

2.1 Structure

Within the above context, a basic principle underlining the scope and objective of the literature review is stated in Section 2.2. This leads to an examination in Section 2.3 of the LDC studies, which are undertaken at the aggregate level of detail, as opposed to those undertaken at the disaggregate level of detail in Section 2.6. This helps to determine the advantages or disadvantages of the approach adopted by the two sets of studies and where the gaps in the journey-to-work literature exist. By contrast, Section 2.4 will focus on studies with specialist or technical issues pertaining to LDC and the insights gained from such work, which have bearing on the present research. A similar analysis is undertaken in Section 2.5, but with respect to the core issues of commuting – namely distance, transport and exogenous factors, such as the state of the economy. Section 2.7 states the contribution, which the present study will make, in the light of the gaps unearthed by the literature review.

2.2 Scope and Objective of the Review

Historically, it was not until the publication of the journey-to-work tabulations, published by the Registrar General, in the 1966 National Census that studies of commuting in the United Kingdom began to appear. Lawton (1976), at the time remarked: that the journey-to-work has increased, but our knowledge of the subject has barely kept pace.

2.3 Studies of LDC Undertaken at the Aggregate Level of Analysis

Almost four decades later (1966-2005), long distance commuting, particularly to London, continues to increase in volume and length, but by contrast there is now a substantial body of work available on long distance commuting – at the aggregate level of reporting.

Most of the studies used censal data supplied by the Office of National Statistics (previously the Office for Population Censuses and Surveys) or data from other centralised published sources (e.g. Economic Trends), which are in aggregated form.

Studies in this mould include:

Howe's (1997) study of '*London's Workers*', which draws its evidence from the Journey-to-Work Tabulations of the 1971-91 National Censuses. It is a study of workers, who reside in the South Eastern Counties (e.g. Hertfordshire, Kent, Surrey etc.) and beyond (e.g. East Anglia, East and West Midlands, etc.), who commute long distance to jobs mostly to inner London and to a lesser extent to outer London.

Howe does not provide the reasons for such commuting, for the aggregated nature of the 1971-91 censal data does not permit such an analysis. But Howe exploits the data to give some idea of the volume of workers, identified in work-oriented long distance journeys to London and the statistical trend over the censal period, 1971-91.

In a separate study, Cameron and Muellbauer (1998) compiled evidence from four data sets (i.e. Labour Force Survey, 1994; Census of Employment Data, 1991; National Health Service Central Register; Central Journey to Work Tabulations, 1981 and 1991), to carry out an appraisal of the economic conditions, found in the labour and housing markets, which foster inter and intra long distance commuting in Great Britain.

Some interesting results have emerged from this study, pertaining to the part that economic conditions played, in the development of long distance commuting to the Capital. A brief report of the main findings is presented.

* Cameron and Muellbauer observed that the regions, such as the South East, with relatively high employment and associated high earnings tend to attract workers from regions, such as East Anglia, East and West Midlands that have relatively low employment opportunities and earnings.

The evidence is borne out by Table 2.1, which showed, between 1981 and 1991, that the above regions had the highest rate of out-commuting.

It is however observed that the authors did not state that these out- movements were easily facilitated by the provision of good transport routes and public transport services, which exist between the said regions and the impact that the transport infrastructure had on fostering such development.

Table 2.1: Intra and Inter-Regional Commuting in Britain, 1981-91

		1981 Census			1991 Census			1994 LFS
Region	1991 Employed Residents (000's)	In Rate %	Out Rate %	Net Rate %	In Rate %	Out Rate %	Net Rate %	Net Rate %
Great Britain	23452	2.2	2.2	0.0	2.8	2.8	0.0	0.0
Northern	1192	1.5	2.1	- 0.6	1.9	2.6	- 0.7	0.3
Yorkshire	2009	2.4	2.5	- 0.1	3.1	3.2	0.0	0.1
East Midlands	1747	3.1	6.3	- 3.2	4.2	7.8	- 3.6	- 4.0
East Anglia	912	3.5	3.9	- 0.4	4.5	5.3	- 0.8	0.5
South East	7682	1.8	0.7	1.1	2.3	1.1	1.2	0.9
South West	2006	1.9	2.7	- 0.7	2.3	3.1	- 0.8	- 0.5
West Midlands	2209	2.6	2.5	0.0	3.3	3.4	0.0	0.2
North West	2534	2.3	1.9	0.5	2.9	2.6	0.3	0.5
Wales	1087	1.7	3.3	- 1.6	2.3	4.0	- 1.7	- 1.7
Scotland	2074	n/a	n/a	n/a	0.7	1.6	- 1.0	- 0.2

Source: Workplace and Travel to Work Survey (Censuses 1981, 1991
Labour Force survey 1994
Cameron and Muellbauer (1998)

Notes:

1. Data for the 1980s and 1990s on net commuting are derived from the ratios of the numbers of employees resident in a region to the number employed in that region, using Labour Force Survey and Census of Employment Data

* The authors further indicated that the mobility of labour, in response to regional job opportunities, is inhibited by high house prices in regions, where job opportunities exist. A concept, which is also shared by Bover et al (1989), Hughes

and Mc Cormick (1981, 1987), Minford et al (1987), Muellbauer and Murphy (1991) and Mc Cormick (1997).

It is however accepted that the stark choice, facing workers caught up in such conditions, is either to migrate nearer the job, thus incurring huge up front costs, derived from the residential transfer. Or, for those who cannot afford it, to opt for the relatively cheaper form of long distance commuting or what is termed the commuting/migration trade-off – which represents a focus of the study.

The above view, is also shared by Gordon (1975), Molho (1982) and Jackman and Savouri (1992a).

2.3.1 Effect on the Disaggregate Level of Long Distance Commuting

The report also showed that house prices in the South East was another factor, which generated the development of long distance commuting in the 1980s.

Typically, house prices to income ratios in London and the rest of the South East exceed those in other regions. Mortgage lenders apply ceilings both on loan-to-value and loan-to-income ratios in allocating mortgage loans. Therefore, first time buyers in the South East, or those considering a move to the South East, are more likely to be constrained by low-to-income ceilings and more likely to face cash flow problems, if mortgage interest rates rise.

Also when house prices have risen more sharply in the South East, owner-occupiers in other regions have to borrow relatively more to move to the South East. In contrast, South East residents have an equity cushion that they can use to reduce borrowing or spend on more luxurious housing by moving to other regions. In so doing, the worker retains the job in London and commute long distance as a cheaper alternative to living in London. This is a factor, which this study will need to investigate in order to study its continuing effects, beyond Cameron and Muellbauer's study, on the development of long distance commuting to London

2.3.2 Effect on the Aggregate Level of Long Distance Commuting

Regional house prices also had an effect on the aggregate level of long distance commuting. Cameron and Muellbauer also cite, as example, the 1980s house price boom. When the increased portfolio demand for housing crowded out part of the demand by employers for living space.

This was clearly seen in the South East, which by 1987-88 was showing symptoms of speculative frenzy. Thus in 1987-89, relative unemployment rates in the South East had fallen sharply, and relative earnings had experienced strong rises, net regional in-migration into the South East reached record lows of -55,000 individuals per annum – despite the labour market pressures for higher in-migration.

* Finally, the high job demand in the South East was not entirely filled by South East residents. It could only be filled by workers, who commuted long distance to jobs in the South East from outside the region.

The above helps to explain the increase in long distance commuting, detected by Howe (1997). But more specifically, the economic factors which triggered the increase in long distance commuting to London.

Another study, which gave important insight into the development of long distance commuting to London was Fae's (1992) study, which stressed the importance of public transport in the said development.

In contrast to Cameron and Muellbauer (1998), Fae's study of 'Developments in Commuting Patterns to Central London During the 1980s', draws its evidence from the 1971 and 1981 National Censuses.

The study examines the historical patterns and trends of intra-regional long distance commuting between the South Eastern County of Kent and Central London. It is different from the present research, which examines long distance commuting into Greater London from areas beyond the South East County, examined by Fae.

Somewhat like Cameron et al, Fae uses the influence of the London labour market and developments in the remote residential housing markets, in the 1980s to explain developments in long distance commuting, between the said areas. But, unlike Cameron et al, realises that transport provides the important link.

2.4 Studies on Specialist or Technical Issues Pertaining to Long Distance Commuting

The review also took in studies, which dealt with specialist or technical topics pertaining to commuting in general. But the review also found that they incorporated evidence, which could be applied to long distance commuting.

Studies in this mould included Adcock and Lampkin (1995); Shilton et al (1999); Wardman and Shires (2003); Wardman and Tyler (2000); Wardman and Whelan (2004) and Wardman (1997a, 1997b, 1997c, 2005).

Adcock and Lampkin, for example, in an *'Analysis of Railheading and Station Switching'* investigated whether different groups of passengers (peak and off peak) had different propensities to railhead. The latter incorporated rail passengers who, for whatever reason (commuting, business, leisure) had to travel beyond their station of immediate access, because it was not appropriate for their intended journey – to access a station that was appropriate, albeit within the following limits:

* where, for example, the distance from the start address to the access station was over twenty percent to the nearest station and

* the access station was over four km from the start address.

Adcock and Lampkin's work is relatively important to this study, because it incorporates areas along the study route such as Bristol, Bath, Chippenham, Swindon and Reading. In terms of access to railhead, the study will serve as a useful source against which the findings of this study (in Chapters Seven and Eight) on 'access to railhead' can be compared or placed in context.

From a commuting perspective, 'access to railhead' forms part of the total concept of commuting, which also includes the in-vehicle journey time (IVT) as well as the egress time from the station at the destination end.

Adcock and Lampkin, in common with Benito and Oswald (1999), found that LDCs tended to live further from their station of rail access than SDC and MDC. This might give the impression of a work journey made even longer (taking access time into account), for workers who are already involved in long distance commuting.

Or is it a case of the speed of travel, which have liberated the distance that a worker is able to reside from the place of employment. So that the journey to work is no longer a question of distance but of time? Neither Adcock and Lampkin, nor Benito and Oswald, examine this connection, possibly because it was not within the ambit of their study. But in LDC, the two issues are related. At least, the evidence indicates the need for research into this aspect of long distance commuting. It is a factor, which this study can exploit – given the objective stated in Section 2.0.

2.4.1 Studies on Journey Time and Fare Elasticities

By contrast, the conventional theory pertaining to journey time and fare elasticities is that they represent important determinants of commuting (PDFH, 2005).

Wardman et al, for example, are foremost amongst the studies (these are cited at Section 2.4, paragraph 2), which for the better part of the past decade (1997 – 2005) have reported consistently on commuter's sensitivity to journey time and price elasticities. The latter are seen by the (travel) industry as factors, which explain commuting behaviour. A review of the said studies would therefore be in line with the objective stated at Section 2.0.

Wardman (1997), for example, undertook a detailed analysis of the effects of exogenous factors on Great Western's revenue – raised through season ticket purchases (and hence commuter fares). This was in respect of both long distance London flows (LDLF) and non-London long distance flows. The exogenous factors, taken into consideration, were the population or the size of the commuter market, which represented the demand for Great Western's services; the level of car ownership or market competition particularly in non-London flows; retail sales; unemployment and consumer expenditure.

In accordance with PDFH's convention, a GDP elasticity of 1.5 and a negative trend of 2.5 percent per annum – representing the change in demand per annum - were used to forecast the effects of the exogenous factors on Great Western's revenue.

Findings

For purposes of the review, it is Great Western's long distance London flows which are of main interest, because they equate to the LDC element of this study. Such flows incorporated long distance London commuter journeys, which originated in areas such as Cardiff, Bristol and Reading.

Table 2.2: Elasticity of Journey Time, Fares and Central London Employment on LDC to London

Journey Time (GT)	- 0.833
Fare	- 1.049
Central London Employment (CLEMP)	- 0.983

Source: Wardman (1997)

Also of interest are the elasticity effect (an indicator of LDCs' sensitivity) of journey time (GT), fares and central London employment, which are related to the above flows. The revenue raised by Great Western, for example, would be derived largely from purchases of season tickets. Taking the latter into consideration, the study found that the fare elasticity, relative to Great Western's long distance London flows was -1.049 (Table 2.2). This was considered quite high. The explanation given was that British Rail (at the time) had consistently priced up the commuter market, so that one would expect the fare elasticity to be higher than the actual figure of around – 0.3 percent – then in use for commuters.

Also, whilst other studies (Mackett, Madden and Nash (1985); Fae, 1992) have shown in a non technical way, the effect of central London employment on long distance commuting flows to London, Wardman (1997) takes it a stage further by showing the elasticity effect (- 0.983) of Central London employment on such journeys (Table 2.2).

Overall the above findings would serve as a useful reference, against which the findings of this work (undertaken in Chapter Nine) can be compared.

Yet viewed over the longer term (1951-2002) Wardman and Shires (2003) found that the elasticity of long distance London flows in general tended to be inversed (-1.00) to increases in ticket prices.

It needs to be noted that Wardman and Shires' (2003) review evidence (updated by Wardman, 2005) was based on a larger dataset (namely an analysis of public transport fare elasticities across 104 studies) than Great Western's and incorporated time series data, which extended 51 years (1951-2002), compared to Great Western's 9 years. But this is the advantage of taking a longer term view.

Reasons

Wardman and Shires cite, as contributory factors:

* journey purpose, which represented a key driver of variation in rail fare elasticiticies in the case of season tickets and

* distance travelled (i.e. 75 miles) – in the case of long distance London-oriented flows.

Even so, in respect of LDC, other socio-economic drivers or characteristics may also have effect. LDCs, for example, are also known to have higher occupational skills (SOC 1-3) (Howe 1997). They are also wealthier and fare discounts could mean lower fare elasticities (Wardman, 2005). Being on high incomes, LDCs would also be less sensitive (than those on lower incomes) to fare increases. Also, opportunities for suitable employment, to satisfy inclination, training, skill and earnings' expectation may not all be available in the local labour market. So that some amount of commuting – possibly to the London labour market – is inevitable.

These factors are not mentioned in the 'Elasticity Review' – possibly because of the use of aggregated data pertaining to season tickets, which do not permit such an analysis. But the above factors are also likely to have bearing on the subject of review.

In terms of the development of LDC to London, these issues are not known to have been investigated. From the latter viewpoint, this would represent a fertile area of research – given the objective stated at Section 2.0.

2.5 Studies on Core Issues of Journey to Work

The classic theory applicable to commuting is that, in general, it is based on the core factors of distance (the separation between home and workplace); transport (through which the home/workplace separation is bridged); and external factors, such as the state of the economy; the availability of job opportunities or the commuting characteristics of workers, which combine together to produce the journey to work.

It is another perspective, through which the studies listed in Table 2.3 (and others reviewed) can be examined. In most cases, the factors would have formed the basis of studies published in the journey to work literature. Howe (1997), for example, is a study of LDC and the UK censal evidence (1981 -1991), which supports it. Cameron and Muellbauer (1998) is a study of the exogenous factors (e.g. housing, employment and government policies), which prompted the migration of workers or LDCs during the 1980s.

In terms of journey distance, Bannister and Gallent (1998), Keane (1999), Lawton (1959, 1963) and Warnes (1972) were among those, for example, who concentrated on the increase, both in numbers and distance of the work commutes undertaken in

London – during the three inter-censal periods, between 1961-1981. This was at a time, when London was expanding rurally, in contrast to employment which remained centrally rooted in the City and in the West and East Ends of London – thus giving rise to a greater separation between homes and workplaces.

Madden and Chiu (1990), who studied the '*The Wage Effects of Residential Location and Commuting Constraints on Employed Married Women*' used the themes of distance and wage effects to explain why women in the 1980s commuted shorter distances than men. A view, which was broadly supported by Gordon et al (1989).

Yet most of the studies of this genre are based on aggregated data (Section 2.3 refers). This would have precluded explanations pertaining to the development of LDC to London – both within the core concepts of LDC and at the disaggregate level of detail. The latter may well contain salient clues on the subject, which may be concealed within the aggregated data.

The studies reviewed above have their importance in long distance commuting literature. Particularly, in explaining the choice made by workers to commute long distance, in response to labour market and housing conditions; the development of public transport for long distance commuting to London and the maintenance of what Green et al (1999) terms a new twenty first century lifestyle – as seen in the case of workers, who choose to live rurally and commute long distance to jobs, which they have retained in the Capital.

Also, there have been studies, which have dealt with the specialist or technical aspects of commuting. Their contribution to the journey to work literature and the opportunities provided for further research, by this work, have been highlighted.

2.6 Studies of LDC Undertaken at the Disaggregate Level of Analysis

However, there has been very little work, which amounts to an under reporting of developments in long distance commuting – at the disaggregate level of detail. A review of the literature revealed only two studies (Green et al, 1999; Goodwin et al, 1999), which investigated the subject at this level (Table 2.3).

One factor, which may be responsible for the dearth of such studies in the LDC literature may be the cost, in terms of human and financial resources as well as the time required to undertake large scale surveys. Both factors can be prohibitive (Illersic, 1964).

But there are advantages to be gained, over the aggregate approach, from research conducted into long distance commuting at the disaggregate level. The latter will often involve the use of sample surveys, which often target the individual decision maker – in this case the long distance commuter. Through this process, it is possible to target the individual's preferences amongst travel alternatives, such as work destinations, modes, routes and economic options facing the decision to commute long distance. Variations in these choices, across individuals, are explained by reference to their different personal and travel characteristics. They are features of analysis, which cannot be undertaken at the aggregate level of approach.

Table 2.3: Studies of LDC Undertaken at Aggregated or Disaggregated Level and Themes Covered

Year	Key Topic/Central Theme Examined in the Literature	Title of Study	No of 105 Studies Reviewed Covering Subject
	Studies Undertaken at the Aggregated Level		
	Dominant Themes		
1996	Job - Housing Balance	Jobs-Housing Balance Revisited - Trends & Impacts in the San Francisco Bay Area	
1996	(some example of studies)	Commuting: In Search of Jobs and Residences Housing, Family and Working Lives	5
1997		The ``Blurring of Boundaries'' Between ``Work'' and ``Home'': Perspectives from Case Studies in the East Midlands	
1992	Labour Market	The Economics of Commuting and the Urban Labour Market	
1998	(some examples)	Review of the Economy and Employment 1997/98: labour Market Assessment, Coventry	7
1999		Commuting Distances and Labour market Areas: Some Preliminary Insights from a Spatial Model of Job Search	
1983	Long Distance Commuting (some examples)	A European Study of Commuting and its Consequences, A Report to the European Foundation for the Improvement of Living and Working Conditions	
1996		Commuting Patterns and Labour Market Trends in the South East 1981-1991, (SERPLAN)	7
1997		London's Workers from 1991 Census	
1999		Long Distance Commuting as a Substitute for Migration	
1984	Migration	Urban & Regional Change, Migration & Commuting - the Dynamics of Workplace, Residence & Transport Choice	6
1998	Trends In Commuting	Trends In Commuting in England and Wales - Becoming Less Sustainable	5
2003		Review of Fares Elasticities in Great Britain	
2004	Time and Price Elasticity (some examples)	Generalised Journey Time Reformulation, Final Report, Submitted to Passenger Demand Forecasting Council	7
2005		Review of Fare Elasticity Evidence for PDFH	
	Studies Undertaken at the Disaggregated Level		
1995	LD Car Commuting	Car Dependence Oxford	2
1999	LD Weekly Commuting	Long Distance Living	

Source: Study's Data Bank
Table 2.3 only lists some of the studies attached to the themes identified. A full list of the studies and associated topics/themes is presented in the Bibliography.

In addition data required for investigation, may not be available from published sources. In such circumstances, the relevant data can be collected through sample surveys.

It is also the case, that where disaggregate analysis is adopted (often with the use of disaggregate models, e.g. logit and regression), they provide a firmer behavioural basis, in the sense that the models are based on an explicit theory of consumer behaviour, which aim to reveal causality, rather than simply capture correlation.

A case in point is Green et al's (1999) study of 'Long Distance Living', which was conducted on a sample of 126 workers, whose permanent residence is remotely located from the job. Green et al indicated that the above reflected a lifestyle, where for most of the working week the said workers would reside nearer the job. But at week-ends would travel back to the permanent residence. The study is an example of what can be achieved by research undertaken at the disaggregate level of detail.
Another example, testifying to the above is Goodwin et al's (1995) study of long distance car commuting.

2.7 Filling the Gap

In this work, an attempt is made to fill this gap by:

a) developing research methodology to identify and analyse the underlying factors, which could explain recent developments in long distance commuting.

b) However the process, undertaken at (a), may not be entirely sufficient to explain developments in long distance commuting. To overcome this, the findings of this study will be compared with the findings of pertinent studies, undertaken earlier, to determine whether in the interim there has been any development within the said area of LDC, being investigated.

c) It is also possible, during the course of the research, that new findings pertaining to the development of LDC, may come to light. These will be reported on.

In the present study, we have taken a major long distance commuting route on which to conduct the research. Namely, the LDC rail route between Bristol, in South West England and Paddington in Central London.

Almost 4,700 workers (more than any county outside the South East region) commute long distance over this route to London (Howe, 1997).

Alternative mode choices for the said route (Bristol to London) were also considered. For example, those commuting by coach were too small to merit a survey. Whereas, those commuting by car, believed to be small, would have been difficult to track. It re-enforces Fowkes and Nash's (1991) study on the said point.

Yet, it is envisaged that the research methodology, developed for the above route, can be applied to other routes that carry long distance train passengers, to get corresponding results.

The above factors help to explain the contextual position of this study.

CHAPTER THREE

METHODOLOGY AND DATA SOURCES

3.0 Introduction

This Chapter describes the methodology, which will be adopted in pursuing the study's objective, stated in Chapter One, and the data needed to implement or support it. The chapter is therefore fundamental in identifying the basis (both in terms of the data adopted and their respective uses) for the analyses, which will be undertaken in the succeeding chapters.

3.1 Structure

Section 3.2 will therefore describe the methodology adopted in pursuit of the study's objectives. Section 3.3 will focus on the approach adopted – in defining how the methodology is applied. In Section 3.4, the key data needed to support the methodology in respect of the primary objective is examined. A similar approach is adopted in Section 3.5, in respect of the secondary objective. Section 3.6 will specify the supplementary data sources consulted to obtain specialist information relating to long distance commuting. Whereas the condition of some of the data used will be examined in Section 3.7. The conclusions are presented in Section 3.8.

3.2 Methodology

This section describes the methodology adopted, by the study, in pursuit of the objectives stated in Chapter One. The key features of which involved:

A Primary Objective

* to analyse, at the aggregate level, the trends and growth in long distance commuting (LDC) to Greater London since the nineteen fifties – an era in which most of the developments in LDC to Greater London have taken place.

* to seek an understanding of, or provide an explanation for the nature of such developments.

But the above will only explain developments in long distance commuting to Greater London occurring at the top level, because of the nature of the censal data used. It cannot explain factors, which are generating the growth in LDC at the sub-level. For this purpose, the study adopts the following secondary objective, which is complementary to the first.

* to test LDCs sensitivity to time and price elasticity as well as the 'value of time', which are prime factors in the determinants of long distance commuting taking place at the sub-level of LDC to Greater London. Arising from this,

* to seek an explanation or understanding of the factors that influence the elasticities and 'VOT' earlier described.

* to identify and similarly explain the new patterns of commuting within the general trend of contemporary LDC to Greater London.

The methodology adopted, in response to the above objectives, has two main interdependent stages. The first is a general descriptive analysis (using in main censal data) which aims to identify trends related to the development in LDC to Greater London – since the nineteen fifties. An in-depth analysis is also undertaken to identify the factors, which might explain the latter developments.

In the second method, a long distance survey is undertaken to obtain primary data – necessary to analyse the study's secondary objective. In terms of this analysis, stated preference (SP) methods, seen as appropriate, are used in the LDC Survey to obtain data for the estimation of LDC time and price elasticity as well as the value of time. Industry evidence (PDFH 2005) indicates that they are factors, which determine commuting behaviour. By implication they could help to explain developments in LDC to Greater London occurring at the sub-level. A logit formula, of the ordered type, is then applied to identify the factors, which influence LDCs' sensitivity to time and price elasticities. Comparisons are also made with the findings of industry or pertinent studies elsewhere in order to place the study's findings in context.

The LDC Survey may well unearth new factors, appertaining to the development of LDC to Greater London. But until tested can only be regarded as hypotheses. A statistical test of significance, using Fisher's test of hypothesis, will be applied to determine whether the research hypotheses, are statistically significant. As above, comparisons will be made with the findings of pertinent studies elsewhere - inorder to place the study's findings in context.

In the present work, a major LDC route (Bristol to Paddington) is adopted for detailed analysis and study. It is one of thirteen national rail commuter routes, through which workers commute long distance to Greater London, from beyond the South East Region. It also fits the criterion, adopted by the study, for long distance commuting.

Namely, commuting to Greater London, which originates in areas that are beyond the South East Region – as defined by the 1964 South East Study (Map1).

In the case of the study route, it is the only fast and direct rail link (operated by First Great Western) between the South West of England and Greater London. This makes it, a captive route for long distance commuters to London, who live in South Wales, Bristol, Bath (Spa), Chippenham, Didcot, Swindon or other areas within the catchment areas of the above route.

It is envisaged that the methodology, adopted in this study, can be applied to the other nine national rail routes (Map 1), through which workers commute long distance to Greater London – to obtain corresponding results.

3.3 Approach Adopted

Previous studies on commuting in the UK have either utilised the National Census or National Travel Survey statistics, as a means of analysing trends in journey to work – at the macro level of analysis. Banister and Gallent (1998), Cameron and Muelbauer (2000), Mackett and Bird (1989), Mackett and Nash (1985) represent some of the studies in this mode.

Alternatively, studies have used private surveys as a means of examining features of commuting – at a macro level of analysis. The studies of Green et al (1999), Levinson (1997) and National Travel Survey 2003 are incorporated in this mode.

Diagram 3.1: Rationale Behind Two-Dimensional Approach Adopted by the Study in Analysing Developments in LDC

Method of Analysis Using	Advantages	Disadvantages
UK National Census data	Will give an idea of general trends (1966 - 2001), in long distance commuting.	Unable to provide indication of underlying developments, within the general trend, because of aggregated nature of the data.
National Travel Survey data	Will give an idea of general trends in short distance commuting. NTS will also give characteristics (age, gender etc) of commuters.	-
Sample survey	Provides information on underlying developments within the general trend.	Unable to provide information on general trend in LDC, because, the data is temporal, as against longitudinal, in the case of the Census.
Two Dimensional Approach incorporating National Census, NTS and Private Survey	**Advantages** Will cover the advantages expressed above and none of the limitations. Especially, in the area of long distance commuting where information on general trend (in LDC) is available. But not much is known about underlying developments within the general trend.	

The two approaches are useful. But as Diagram 3.1 shows, a uni-dimensional approach, using censal data alone, will give some indication of trends in long distance commuting. But, on the other hand, will conceal underlying developments, which may be significant. The reverse is true of commuting studies, utilising sample surveys (Diagram 3.1).

This explains the two dimensional approach, adopted by the study, whereby the Census, NTS and LFS, are used to examine longitudinal trends (1981-2001) in the development of LDC to Greater London and a private survey, conducted on an appropriate sample of LDCs, is employed to examine underlying developments, which may exist within the general trend of long distance commuting. The analysis of earlier trends in the development of LDC to London is undertaken in the more appropriate context of Chapter Four.

By so doing, both of the advantages obtained by using aggregated (censal) as well as dis-aggregated (sample survey) data for the analysis of LDC to London are obtained. Whereas, the disadvantages are avoided (Diagram 3.1).

The two dimensional approach is also important especially in an area of long distance commuting, where information on the general trend in LDC is available, via the UK Census, but not much is known about the underlying developments within the general trend.

This explains the focus in Section 3.4 on the data needed to implement the study's methodology – earlier discussed in Section 3.2.

3.4 Data Needed to Implement (or Support) the Methodology

Fundamental to the application of the methodology, earlier described, is the data needed to implement it. A brief reference was made to some of the data in the earlier discussion. But in this section a full analysis of the said data (including the sources) is undertaken.

3.4.1 Primary Objective – Data Considerations

To determine their respective utility in pursuing the above objective, three key data sources were consulted.

The first was the UK National Census, which will be used for an analysis and extraction of trends in long distance commuting over time. As well as, a cross-sectional analysis of the factors, which are generating trends in long distance commuting. These include an analysis of long distance commuting by demography, gender, and SEG occupations, which are revealed by the literature review, to have a generating effect on trends in long distance commuting.

For this exercise the study will make use of the journey to work data, published by the Office of National Statistics for the 1971 and 1981 Censuses. These are no longer available on the censal computerised database, but could be purchased. Commuting data, pertaining to the 1991 and 2001 Censuses will also be utilised. The 1971-2001 censal datasets will offer the opportunity to analyse the factors earlier described.

In order to place the above findings in context, an analysis will also be undertaken of the development of middle distance commuting (MDC) and short distance commuting (SDC) to Greater London also using the 1971-2001 censal datasets. For purposes of application, middle distance commuting refers to workers who are commuting from the South Eastern Counties (as defined in the 1964 Study) to Greater London. These fall within the criteria laid down by other studies (Adcock et al, 1995) of commuting to London from stations that are between 50 and 75 miles from London. By contrast, short distance commuting refers to the journeys undertaken by workers, who reside and work within Greater London.

3.4.2 National Travel Survey

Although, not comparable on the scale or scope of the national census, the National Travel Survey 1985-97, held at ITS, Leeds, contains a large database (sample size 39,949) on long and short distance commuting at both the aggregate and dis-aggregate levels of detail (Diagram 3.1). Given the void left by the unavailability of the most recent census data, it was considered that the NTS data could be used for an analysis of LDC to London in the post censal period 1992 – 1997. At least, part of the gap (i.e. 1992 – 1997) left void by the unavailability of the 2001 Census would be covered. However, during the latter part of this work, the 2001 Census, journey to work tabulations became available in March 2005. This obviated the need to use NTS for the above analysis. But the secondary analysis, referred to below, did apply.

Secondly the National Travel Survey can also serve as a useful source of independent data, which can be used for comparison with the findings of this study. One vital area of comparison, for example, is what specifically singles out long distance commuters from their counterparts such as middle distance or short distance commuters. NTS will be able to provide the data necessary to make this important analysis. Areas, where this is used will be identified in the appropriate text of the succeeding chapters.

The National Travel Survey data is additionally useful, in that it offers the opportunity to examine: commuting over different distance bands, which tend to tail off, with distance, at the 80 km mark. Beyond this distance, there are fewer but more extensive journeys undertaken by car and train. Additionally, the data can be used to examine commuting patterns which are linked to good rail services, plus any other features, which may hold significant clues, for follow-up analysis, in this study.

3.4.3 Labour Force Survey

* The Labour Force Survey (LFS)

  For example, provides information on `the usual home to work travel time, in minutes and other factors that are linked to the respondent's occupation, socio-economic classification, period of residence at current address and household tenure. This covers 60,000 households. Most of this data refer to short distance commuting. Like NTS, it serves as a useful resource if, for example, one wanted to compare the characteristics of long distance commuters with short distance commuters. The latest available data is the LFS 2004.

3.5 Secondary Objective – Data Consideration

A similar approach, as in the case of the primary objective, was adopted in respect of the methodology applied to the secondary objective and the data needed to support it.

As part of the total concept and planning of the study, consideration was given at a very early stage to the data, which will be needed to analyse the study's objective – at the dis-aggregate level of detail. Especially as the said data is not available from existing sources.

Details of the consideration applied and the planning and concept of the related LDC Survey are given in Chapters Six and Seven, as the subject requires special treatment.

Intuitively, there must be factors, within the sub-level of LDC, which are fuelling the general trend in LDC to London. Except that the aggregated nature of the censal data does not permit an examination of the explanatory factors at this level. The survey's LDC primary data will permit such an analysis and, in particular, the factors stated earlier (Section 3.4) in respect of the secondary objective.

The four sets of data (Census, NTS, LFS and the LDC Survey) will provide the two-dimensional approach (at the aggregate and disaggregate levels), necessary to support the methodology and to achieve a comprehensive analysis of developments in long distance commuting to Greater London, which remains the primary focus of the present study.

3.6 Supplementary Data Sources

The above will represent the key sources of data, employed in the study. But other sources of supplementary data will be examined to complement the above analyses.

These include:

* Economic Trends

  For an examination of economic and regional trends in the labour market and the effect of wage rates on long distance commuting - particularly centred on Greater London. Chapter Two, Section 2.2.1 shows how this can be used to the advantage of the study.

* Social Trends

  For information on the characteristics and life styles of commuters.

* PDFH

  The Passenger Demand Forecasting Handbook, which contains the rail industry's current research and findings on key factors, such as journey time and fare elasticity. Both of which are key determinants (in terms of demand) for rail LDC, as well as findings on the 'value of time'.

  As will be shown in Chapter Four, the study is taking place against wider developments in the long distance commuter market. The PDFH will serve as an important independent source through which the study's own findings on the subject (in Chapter Nine) can be examined within the context of what is happening in the LDC commuter market.

* UK National Accounts Statistics

The Blue Book for statistics on GDP and retail price index, which gives a clue to earnings and current market prices. As shown in Chapter Nine, these are values taken into consideration when assessing 'value of time' or how much workers are prepared to pay extra for a unit saving in time.

* Standard Occupation Classification 2000

This has been recently revised, by ONS, and brought into line with European convention on the subject. But the original concept remains. Namely, the kind of work performed (job) and the competent performance (or skill) of the tasks and duties. The SOC 2000, for example, serves as a common base for comparing the occupations of LDCs in the sample, with LDCs in the parent population.

3.6.1 Data Adopted from Pertinent Studies

Other studies of direct relevance are also consulted. In some (Adcock et al, 1995; South West Trains (SWT), 2005), the data are used. In others (Wardman et al 1997, 2003), the findings are compared with this study's – so as to place the latter in context.

3.7 Conditions Affecting Some of the Key Data Used

3.7.1 Collection and Presentation of Censal Statistics on Commuting

It is a pre-requisite of statistical reporting that the factors governing the collection and presentation of the incorporated statistics are stated. So that some idea is gained of the conditions under which the conclusions, based on such statistics, are drawn.

Currently, the British Census of Population is undertaken once every ten years. The exception is the Census of 1966, when a quinquiennial census was conducted on a ten percent sample of households. Otherwise, the population targeted by the Census is universal (i.e. all present, or usually resident in the country on Census night).

Demographic and socio-economic statistics from the Census self-completion questionnaire are generated for fine geographical areas. The near complete population coverage, and the degree of spatial disaggregation provided remain as two key strengths of the Census of Population.

Of interest to the study of commuting is the fact that the Census of Population collect information on place of residence and, for those in employment, the place of work. The origins and destinations of commuting flows and, by implication, the distance of journey-to-work, are derived from the residence and workplace addresses.

But it should be noted that the origins and destinations of such journeys relate to main or usual place of residence and the main or usual place of work. Those persons who are not reporting daily to fixed addresses or working mainly at home are coded separately. As are students, in the 2001 Census, who are in employment.

Diagram 3.2: **How LDC Data Is Derived From Journey to Work Tabulations of Census**

Format of 1991 and 2001 JTW Census Tabulations				
	Persons	**Males**	**Females**	**% of Total**
Total persons working in London	-	-	-	
Resident & Working in Greater London of which Workplace stated Workplace at home No fixed workplace Workplace not stated Armed forces Other not stated	-	-	-	-
(a) South East Counties	-	-	-	-
(b) Counties Outside South East	-	-	-	-
(a+b) Resident outside Greater London	-	-	-	-

Note: Data pertaining to long distance commuters, (those commuting from counties outside the South East) would be in column 3

Further, information on a ten percent sample of individuals, in employment, at the time of the Census is coded to the micro area (i.e. ward level) in the Special Workplace Statistics Tables (Flowerdew and Green, 1999) – thus making the census a very rich dataset for the analysis of commuting flows.

It is therefore on the basis of these factors, that one is able to deduce, as Diagram 3.2 shows, those who are commuting long distance to Greater London. Given that their journeys to London originate in areas, which are more remote (in terms of either distance or in vehicle time (IVT) from employment in London, compared, for example, with short distance commuters (SDCs) who reside and work in London or middle distance commuters (MDCs), who make relatively shorter journeys (than

LDCs) from residences in the South Eastern Counties to employment in Greater London.

3.7.2 Evaluation of Other Data

A search was undertaken of additional sources of statistics (official and unofficial) for hard evidence of data, which could support the study's aims and objectives. Whilst sources of UK official statistics are easily obtained from the `Guide to Official Statistics', published by HMSO. The University of Warwick Business Information Service also provides a useful guide on the sources of UK unofficial statistics.

Of the 30 sources consulted, only one had some relevance to commuting: Namely, the:

* British Household Panel Survey

    The same was true of the British Household Panel Survey (BHPS), which is conducted by the ESRC UK longitudinal Studies Centre(ULSC), together with the Institute for Social and Economic Research (ISER) at the University of Essex. The survey is based on a nationally representative sample of more than 5,000 households, making a total of 10,000 individual interviews.

    The individual questionnaire covers topics such as individual demographics, residential mobility, current employment and earnings, employment changes over the past year. The data also contained information on the time taken, door to door, to travel to work. Although, none of this could be linked directly to long distance commuting. In the sense, that a worker who commutes by express train from Peterborough to Central London, a distance of 123 km, would probably access his workplace in one hour.

Whereas, a worker who commutes from Edgware (on the Outer London fringe) to Central London, a distance of 21 km, would access his workplace in the same time.

Travelling time, in such circumstances, is therefore not a good indicator of long distance commuting. For this reason, the data contained in the BHPS database could not be used.

3.8 Conclusions

Several methods will have to be adopted to acquire the data, necessary to implement the study's methodology and, by implication, the analysis of the aims and objectives of this research.

Data from published sources (e.g. Census, NTS) will permit analysis of the specific aims and objectives of the research - at the aggregate level.

The two key data sets already identified, plus the supplementary data identified at Section 3.6 will help to achieve the two-dimensional approach required for a comprehensive analysis of developments in long distance commuting. It forms a salient part of the objective and focus of the study.

The above data sets will be complemented by data derived from the sample survey. The latter will further permit at the, disaggregate level, an analysis of the study's specific aims and objectives. This will be the subject of Chapters Five, Six and Seven.

CHAPTER FOUR

WIDER SETTING IN WHICH LDC TAKES PLACE AND ENSUING DEVELOPMENTS

4.0 Introduction

This chapter addresses the first of the two objectives, stated in Chapter One, in both a historical and contemporary context. As the two factors are complementary to an explanation of the developments (both past and present) that are taking place in long distance commuting to London

4.1 Structure

The above also helps to explain the wider contextual setting in which the study takes place, to which attention is drawn in Section 4.2. Within this perspective, Section 4.3 will examine briefly the historical development of LDC to London to show the part that history played in shaping the original form and structure of LDC to London. Section 4.4 will focus on the factors, which have contributed to the said historical development. Section 4.5 will examine the factors, such as demography, economic activity, and the advent of new technologies, which have continued the post-historic development of long distance commuting to London. Section 4.6 will present the conclusions.

The above analyses will help to give insights into the factors, which have contributed to the twentieth century development of LDC to London. It also needs to be said that these developments were not only taking place in Greater London. Similar LDC movements, on a much lesser scale than London, were experienced at a later date in the major conurbations of the UK – in particular Liverpool and Greater Manchester (Lawton, 1959, 1963, 1968).

4.2 Wider Contextual Setting Against Which LDC Takes Place

It is important, given the objectives set out in Chapters One and Two, to explain the wider contextual setting or background against which the present study is based. This begins with an examination of the effect of history on the development of long distance commuting to London.

4.3: LDC – the Historical Development

The evolutionary process of long distance commuting to Greater London may have started in earnest in the 1950s. Prior to that date, notably in the immediate post war era of the 1940s long distance journeys were made by residents of Brighton to London. But these were few and exceptional – because of the limited transport facilities for long distance commuting (Goddard and White, 1972).

Goddard, for example, established in 1954, *``that 1 million workers travelled into and out of Central London each workday. The majority of workers (60 per cent) came from the built up area, which extends approximately 24 km from the centre, or the area designated as Greater London in the South East Study. By contrast, there was a substantial minority of commuters whose journeys originate in the Greater Metropolitan Area, extending up to 65 km from the Capital and to an increasing extent from the outer parts of the South East Region''.*

Goddard's account of long distance commuting in South East England compares favourably with a six-year study (1974-80), which the Department of Environment, Transport and Regions conducted on long distance travel in the United Kingdom. The results of the study revealed:

``that long distance journeys reached a peak level of 1.6 millions in 1977-8. But by 1979-80, had fallen to 1.25 millions. In 1979-80, nearly ninety (90) per cent of long distance trips were less than 160 km long. Commuting journeys accounted for thirty (30) per cent of all long distance travel, of which a third were made by train. The study also indicated that the South East, compared with other regions, had the highest mean frequency of long distance journeys, that is 63 journeys per person per year''

These are the statistical factors, which defined the parameters of long distance commuting in the period 1954-80. In the twenty year gap since 1980, long distance commuting has evolved even further in volume and distance. Journeys of 160 km are now the norm, rather than the exception. Examples of this exist in the long distance centripetal commuting to London, which originates in areas such as Birmingham, Leicester in the Midlands and in areas, such as Southampton and Portsmouth in Southern England, which are at least 160 km from London (Map 1).

Given this evidence, contemporary long distance commuting at the beginning of the twenty first century, is now two and a half times greater (in terms of distance) than the long distance commuting observed in Goddard's era of the 1950s. It is greater still than the long distance commuting observed in the DETR's era of 1976.

4.4 Factors Contributing to the Historical Development of LDC to London

Two factors fuelled such movements. The first was speculative housing developments, which were taking place at a rapid pace on green field sites in the rural suburbs of the South East. The mortgage at the time was relatively cheap. A conspiracy of the banks with building speculators. The sum of £18,000 would purchase a detached four bedroom property in idyllic rural settings. So that housing was easily affordable by anyone (for example teachers and civil servants) earning a reasonable income. Many took advantage of the offer.

The above was further aided by the provision of comparatively cheap rail transport, which the railways, then in private ownership, were extending to the new housing sites. This was further aided by the 'Cheap Fares' Acts, which further made commuting to London from the rural green field sites, both possible and affordable.

Both factors were to create the early nucleus of long distance commuting to London, the contemporary development of which is examined in Section 4.5.

4.5 Evidence of the Post-Historic (or Contemporary) Development of LDC to London

The statistical base of the analysis is the 1981-2001 national census data on journey to work, because they aid the analysis. A twenty year period (1981- 2001) is sufficiently long to show any trends that are developing in long distance commuting to London. This is the evidence of Table 4.1, which indicates that there were increases in the three key areas of commuting (SDC, MDC and LDC) to London (Table 4.1, col.6

refers). By contrast, long distance commuting (LDC) to London represented the fastest growth, in relative terms, in commuting to the Capital.

Table 4.1: Increasing Trend in Commuting in % Terms (SDC, MDC. LDC) to Greater London, 1981-2001

	1981	1991	2001	Absolute Change 1981-2001	% change 1981-2001
Total Persons Working in Greater London	3,600,000	3,349,350	3,810,169	210,169	5.84
Resident and Working in Greater London (SDCs)	2,970,990	2,676,620	3,086,173	115,183	3.88
Resident in South Eastern Counties and Working in London (MDCs)	574,200	608,420	636,785	62,585	10.90
Resident in Counties Outside South East and Working in London (LDCs	54,810	64,310	87,211	32,401	59.11

Source: 1981 and 1991 Censuses, Workplace and Transport to Work Reports, Table 3 and 1991Census, Special Workplace Statistics, Set C – Trip Matrix Table 01 – in respect of 1981 and 1991 Census data.

2001 Census, Journey to Work Tabulation by Local Authority Areas (Table W101) – in respect of 2001 Census data.

This growth in LDC accelerated even faster in the last decade (1991-2001), by 61.73 percent (Table 4.3, col.8, row11), compared with an increase of just 17.33 percent in the previous decade (1981-1991) The latter percentage (not shown) is calculated from the absolute figures given in Table 4.1, columns 2-3, row 5.

Movements on this scale did not happen haphazardly or by chance. Further by looking solely at the journey, through statistical trends, do not provide an answer. For an explanation, it was necessary to examine the underlying factors, which might be generating the development in long distance commuting.

Rapid changes, for instance, in job markets, technologies, new ideas and ways of working tend to have an impact on contemporary work movements and can be the mechanics of the direction, flow and pattern of such movements (Goodwin et al, 1995). Some of these factors have been collated and presented in Diagram One – with respect to the development of long distance commuting to London.

Diagram 4.1: Some of the Core Factors Contributing to the Contemporary Development of LDC to Greater London 1981-2001

	Structural Forces (of the journey to work)	
Population	**Transport**	**Economic Activity**
Location of economically explained by:	As a generating factor on work journeys to the Capital	Labour demands of the Capital 's market. Skills to match Finance industries, International business, Government and related Public service activities
Increase in real income	Cheaper housing in the suburbs with better jobs in the City and transport improvements Together, they provide The catalyst for greater separation between home and workplace and long distance commuting	Better jobs, in terms of remuneration, quality and opportunities in London.
Commuters in higher income groups prepared to travel long distances in order to live in less built-up environment	Improvements in Transport Technology	
Demography		
Within the above ranks are workers, aged 35-44, who are highly skilled (SOC 1-3) and who are more in demand in the London job market than their shorter distance counterparts	Helped to liberate time and distance constraints on the journey to work making long distance commuting possible.	

The above explains the emphasis of the present chapter on such factors, as demography; the economy as it affects long distance commuting; the advent of new market technologies and the continuing development of the transport infrastructure. These four factors appear to be major dynamics, which explain the considerable changes that are taking place in contemporary long distance commuting centred on Greater London.

4.5.1: The Effect of Demography

The first was the effect of demography. Demographic changes affect not only the overall size of the labour force, but also its internal structure. Demography therefore gives a vital clue to changes which are occurring within the supply side of labour. It further enables part of the dynamics of change, generally occurring within the London labour supply market to be seen more clearly.

Evidence from the labour force survey (Table 4.2) shows the age structure of the labour force in London, compared to other areas in the United Kingdom – for the period 1988-2006. Although the Office of National Statistics, who compiled the data, does not single out long distance commuters specifically, they represent a sizeable proportion within the cumulative statistics of Table 4.2. Ipso facto, twenty per cent of those who work in the capital in 1991,(19 % in 2001, Table 4.3), are medium or long distance commuters, whose journeys, as shown earlier, either originate within the Counties of South East England or beyond.

Since 1988, the major changes in the age structure of London's labour force have seen large increases in the age strata between 25 and 44 but also, by comparison, a large proportionate fall in the percentage of workers, aged between 16 and 24 (Table 4.2).

Table 4.2: Age Structure of the Labour Force, London and the United Kingdom – 1988-2006

	London						United Kingdom					
	1988		1998		2006		1988		1998		2006	
Age Band		%		%		%		%		%		%
16 – 24	796,176	22.8	484,971	13.9	533,808	14.4	6,349,280	22.4	4,421,802	15.4	4,565,485	15.1
25 – 34	925,380	26.5	1,099,035	31.5	885,973	23.9	6,831,145	24.1	7,580,232	26.4	6,409,820	21.2
35 – 44	757,764	21.7	889,695	25.5	1,062,444	29.2	6,661,075	23.5	7,063,398	24.6	8,254,155	27.3
45 – 59 (females)/64 (males)	918,396	26.3	921,096	26.4	1,093,565	29.5	7,766,530	27.4	8,872,317	30.9	10,068,255	33.3
60 (females)/65 (males) or over	94,284	2.7	94,203	2.7	111,210	3.0	736,970	2.6	775,251	2.7	937,285	3.1
Total Labour Force	3,492,000	100	3,489,000	100	3707000	100	28,345,000	100	28,713,000	100	30,235,000	100

Source: Labour Force Survey, Office for National Statistics.

Note:

1. Household population who are in the labour force at Spring each year. The absolute numbers, along with percentages, are given in columns 2-13.
2. The London projections are based on 1994 estimates of the labour force. Whilst the United Kingdom projections use 1997 estimates for Great Britain and 1994 estimates for Northern Ireland

It is one factor which explains the increase in contemporary long distance commuting to Greater London. Three reasons are cited.

Of all the age groups, those aged between 25 and 44 represent the prime economically active group - encompassing within its rank a reservoir of youth combined with experience, higher education and training, modern skills and the occupational thrust to higher achievement demanded of the contemporary London labour market.

These changes were brought about partly by:

* the high birth rate of the 1960s and lower birth rates of the 1970s.

* the increased participation, during the period, in further and higher education. Baroness Sharp's report (1970) typifies this situation in respect of transport education. The cumulative results of which are coming to fruition in the 1990s.

* the higher education, training and skills which were more evident amongst long distance commuters, as Section 4.5.2 will show, than amongst their short distance counterparts.

The proportion of the labour force, aged under 25, is not expected to change greatly by 2006, but the proportion aged between 25 and 34 will show a large reduction as the low birth rates of the 1970s are reflected further up the age range (Office of National Statistics, 1998).

Table 4.3 Persons Working in London, 1991 - 2001

	1991				2001		
	Persons	Males	Females		Persons	Males	Females
Total persons working in London	**3,349,350**	**1,914,790**	**1,434,860**	**100.0**	**3,810,169** (+ 13.76%)	**2,101,271** (+ 9.74 %)	1,708,898 (+ 19.10 %)
Resident & Working in Greater London of which:	**2,676,620**	**1,445,490**	**1,231,430**	**79.9**	**3,086.173** *(+15.3 %)*	**1,623,974** *(+12.3 %)*	**1,462,199** *(+ 18.74 %)*
Workplace stated	2,243,120	1,156,180	1,086,940	67.0			
Workplace at home	122,570	65,290	57,280	3.7			
No fixed workplace	-	-	-	-			
Workplace not stated	-	-	-	-			
Armed forces	8,500	7,430	1,070	0.3			
Others not stated	116, 270	65,850	50,420	3.5			
(a) South East Counties	**608,420**	**422,480**	**185,940**	**18.1**	**636,785** (+4.66 %)	**418, 373** (-0.97%)	**218,412** (+17.46%)
(b) Counties Outside South East	**64,310**	**46,820**	**17,490**	**1.9**	**87, 211** (+35.61%)	**58, 924** (+25.85%)	**28, 287** (+ 61.73%)
(a+b) Resident outside Greater London	**672,730**	**469,300**	**203,430**	**20.0**	**723, 996** (+ 7.62%)	**477, 297** (+ 1.7%)	**246,699** (+21.27%)

Source: 1991 Census, Workplace and Transport to Work Report. Grossed up by a factor of 10 %
2001 Census, Journey to Work Tabulation by LAD (Table W101)

Notes:

Explanation of the data expressed in Rows: 2, 10, 11 and 12

The relevant statistics used in the text are highlighted in the above table. For example Row 1 states the total number of persons (sub-divided by males and females) who worked in London in 1991and 2001.

Row 2 states what proportion of the workforce were London residents in absolute terms

Row 10 states how many workers in absolute terms (male and female) commuted long distance from the South Eastern Counties to jobs in London, during 1991.

Row 11 provides the comparative figure for workers (male and female) involved in inter-regional long distance commuting to London.

Row 12 (absolute) data represent the sum of workers, shown in Columns 10 and 11, who commute long distance to jobs in Greater London.

Explanation of the percentages expressed in column 5

The percentages expressed in row 2, column 5 is calculated as follows: (2,676,620/3,349,350*100) %. This gives a result of 79.9 %, reflecting, in percentage terms, the proportion of residents who work in London.

The percentages presented for Rows: 10 -12 are similarly calculated.

The percentages in brackets under the main statistics for 2001, represent the respective differences between the 2001 and 1991 Censuses

The changes in the age structure of the UK labour force will follow a similar pattern, but the reduction in the population, aged between 25 and 34, will be less marked than in London. The above analysis partly explains the supply of labour to the Capital's labour market. Economic influences also play a major part. This is examined in Section 4.5.2.

4.5.2 Economic Influences

The economic influence of the London labour Market on the journey to work is evidenced by the 3.8 million workers (Table 4.3, row 2, col.6) who commute each work day to jobs in the Capital. They represent the 'supply' side of labour.

Table 4.4: Occupational Structure of London's Workforce, 1991

	All Workers	Live in London	Live out of London
		(SDCs)	(LDCs)
	% of workforce	% of workforce	% of workforce
Managers and Administrators	20	17	30
Professional	10	10	12
Associate professional and Technical	12	12	14
Clerical and Secretarial	20	21	17
Craft and related	10	11	8
Personal and protective services	8	9	5
Sales	6	6	5
Plant and Machine Operatives	6	6	4
Other	6	7	2
Not Stated	1	1	0
Total number	3,349,350	2,676,620	672,630

Source: 1991 Census, Workplace and Transport to Work Report, Table 4

Note:

Figures presented in the above Table in Rows 2-11, Cols. 2-4 are relative to the total numbers presented in Row 13, cols. 2-4

But even though the London market is a major employer, it depends on the job opportunities that are available (Mackett & Nash, 1985) and the skills demanded.

Past evidence, revealed by the census, has shown that this worked more to the benefit of the long distance commuter rather than the short distance commuter.

This was first noticed in the period 1981-1991. Howe (1997) indicates that up to 1991, traditional and short to medium distance commuting within London had decreased – owing to the depressed economy. Yet, by contrast, LDC to London had increased at the expense of those who commuted shorter distances.

This was only indirectly related to commuting. A closer look at the underlying factors showed that this was more to do with the skills in demand, which suited long distance commuters more than their short distance counterparts. Table 4.4 verifies this. Further examination by Howe also showed that the skills demanded by the London labour market were also higher in London compared with the position nationally and that most of those skills were concentrated in inner London rather than outer London.

Further, evidence of the 2001 Census (Table 4.3, col.8, row 11) shows that the increase in long distance commuting to Greater London has again increased by 35.61 % since 1991. By contrast, SDC and MDC have not increased as fast – suggesting a greater demand for long distance commuters, or rather their skills.

It is another factor, which provides an explanation, at least at the aggregate level, of the increase in long distance commuting to Greater London.

4.5.3: The Advent of New Technologies

In the era of the flexible labour force, paid work is recognised as taking place across a wide range of sites and is breaking down traditional boundaries between home and the workplace (Laurier E, Philo C, 1999).

This study focuses on the latter element, because it highlights how the advent of new technologies, like the motor car, mobile telephony and lap top computers, among recent developments, are creating a new phenomenon in long distance commuting which to date appear to be recognised in only a small number of literature (Laurier E, Philo C, (1998), Cresswell, 1993, 1996, Orr J. E, 1996).

Businesses and institutions have always relied on mobile workers to extend their business and control their catchment regions. This would not have been possible without the advent of new technologies in the latter half of the twentieth century. This includes the motor car, invented in the late nineteenth century, which features significantly as a mobile office and in the long distance inter-city commuter journeys, undertaken by mobile workers. A recent ESRC sponsored study estimated that, amongst adults, almost 70 per cent of all journeys to, from or in the course of work are made by car (Goodwin, 1995).

In the hubris of technological innovations, mobile telephony plays an important supporting role and has enabled the car to become a more effective mobile office.

Earlier generations of car travelling workers were heavily reliant on the payphone system, which was inconvenient since it required finding a functioning phone outside of the car, having the appropriate form of payment and getting out of the car (Spears 1995). The mobile phone conveniently obviates this need.

In addition lap top computers, which include e-mail and internet services, provide almost instant communication links for the long distance mobile commuter in pursuit of business interest and represent an important additional tool. The above analysis gives some idea of the dynamism of change that is inherent in contemporary long distance commuting.

4.5.4: The Effect of Improvements in the Transport Infrastructure

The above analysis (at Section 4.5.3) also reflects another factor. Namely, the continuing development of the UK transport infrastructure. Improvements in transport technology and in the rail and road infrastructure, have also helped to liberate time and distance constraints on the journey to work – making long distance commuting possible (Diagram 4.1).

4.6 Conclusions

The foregoing analyses have provided some insights into the development of long distance commuting to Greater London. It has briefly shown, for example, that history had a deterministic effect in shaping the original form and structure of LDC to London. It is also clear that LDC did not develop haphazardly, which might be the view gained, if an insular look is taken only of the LDC journey. Looking beyond the immediate boundary of LDC, it was clear that it was factors such as demography; the

London economy and the demand for jobs; the new technological advances in the twentieth century and the continuing development of the transport infrastructure. which have combined to produce LDC as we know it to-day.

These remain as answers to the study's first objective, where the intention was to identify and explain the factors, which are generating the increase in long distance commuting to London. The ensuing chapters will address the secondary objective.

CHAPTER FIVE

SURVEY DESIGN AND METHODOLOGY ADOPTED FOR THE COLLECTION OF PRIMARY DATA

5.0 Introduction

This chapter represents the first of a two-stage process, which is aimed at collecting the primary data – needed to pursue the study's objectives at the sub-level of LDC to London. The latter formed part of the subject and focus of Chapters One and Three.

The second stage is the planning and conduct of the LDC survey – the main instrument employed in the collection of the said data. This is fully described in Chapter Six.

The present chapter therefore focuses on the concept and design of the survey and the methodology adopted to collect the LDC data.

5.1 Structure

Arising from the above factors, Section 5.2 states the objectives that the survey is intended to achieve – within the overall concept and design of the survey. Section 5.3 will focus on the methodology adopted in support of the survey's objectives. Section 5.4 will show how the factors discussed in the previous two sections are fed into the design of the questionnaire schedule. Section 5.5 will focus on the pilot testing of the questionnaire schedule, also the ensuing results and lessons learnt from the pilot survey. The conclusions are stated in Section 5.6.

5.2 Background Factors Appertaining to Survey's Objectives

Data obtained from published sources, such as the Census and National Travel Survey

* would have been collected from different sources and for different applications.

* are historic

* would also have been in an aggregate form and therefore not amenable to an analysis of the underlying factors, which are generating the increasing trend in LDC

* would also not give key details of the individual, which might help to explain developments that are taking place within the general pattern of LDC. For example, lifestyle choices that are oriented towards residential location relative to employment and vice versa.

These factors explain the need:

* to obtain primary data in order to pursue, at the disaggregate level of detail, the specific aims and objectives of the research, previously described in Chapter One.

* to undertake a more detailed analysis of recent developments and underlying trends (e.g. LDC lifestyles, issues related to the increasing separation between housing and employment), within the general body of long distance commuting, which could not be obtained from the data on general trends.

It is clear that the above can only be accomplished within the efficient planning and mechanism of a survey – tailored to the above objectives and within established survey criteria (Illersic, 1964).

The study also recognised, from the outset, that it would be impossible for survey purposes to capture those commuting long distance by car. As they are constantly on the move and do not represent an easy captive population (Goodwin et al, 1995).

Whilst the load factors, according to National Express Coaches, on those commuting long distance by coach are very small (NEC, Bristol, 2003).

It was known from other studies, conducted at ITS, Leeds (Fowkes & Nash, 1991); Mackett & Nash, 1986), that the train was the dominant mode for LDC to Central London. Therefore the best, chance of capturing the target population would be those who commute long distance by train. This explains the concentration of this study on long distance train commuters. The on-train survey was also known to achieve a higher rate of return than other methods adopted. These factors explain the strategy adopted for the survey – in the form of the objectives stated below and the methodology needed to support it.

5.2.1 The Survey's Objectives

As Diagram 5.1 shows, the objectives of the survey are two fold:

First, to obtain the primary data for the pursuit or advancement of the study's objectives – stated in Chapters One and Three.

Second, and also with the study's objective in mind, to try and achieve through the survey, a LDC sample, which incorporates or reflects the salient features of the LDC parent population.

Diagram 5.1: How Survey's Objectives Are Achieved

Objectives	How Achieved	Through the Methodology Adopted in Support of the Study's objective
Objective One Collection of Primary Data	→	**Collection of Salient Data** Pertaining to age, gender, occupation, economic activity journey frequency etc. of LDCs are represented in the data collected.
Objective Two Representiveness of sample in other areas of Parent LDC	→	Specialist or key features as applied to LDCs – also to be represented in sample. (Discussed in Section 5.4)
Other Representation	→	**Factors that might explain sub-developments in LDC** To use the survey to explore other areas of LDC, which may help to explain sub-developments taking place within the general pattern of LDC to London – which is the focus of the second part of the study's methodology described in Chapter Three These include LDCs' sensitivity to time and fare elasticity and VoT – factors, which are known to have impact on commuting (PDFH, 2005). (Discussed in Chapter Nine)

The latter springs from the rationale that population sampling is the alternative method adopted. In circumstances, where to survey the whole population would be prohibitive in time and cost. But lessons can be learnt about the parent population – if the sample taken is representative or reflects the key characteristics of the said population (Illersic, 1964; Harper 1965). The mechanics of how this is achieved is discussed in the more appropriate context of Section 5.3

5.3 Methodology Adopted in Support of Study's Objectives

Diagram 5.1 also shows the survey's methodology, which is designed in three stages and how it is applied in support of the study's objectives. A brief note on each stage of the process is presented.

•

Objective One

This is an automatic process, as the whole purpose of sampling is to collect data. But in this case, it is the collection of essential data, which reflects the characteristics of the LDC commuting population at large. This is the subject of Objective Two, which follows.

Objective Two – Methodology Adopted

Section 5.2 showed that it was important that the sample should reflect the characteristics of the parent population and the reason (s).

Diagram 5.1 shows the two stages on how the study intends to achieve this. First, as Section 5.2 has shown, by studying (through investigation or research) the key features, issues or characteristics that might explain the commuting behaviour of workers who are involved in long distance commuting to London. Also making sure that these factors are incorporated in the LDC Survey questionnaire. This is fully discussed in Section 5.4.

The second stage involves, using the survey to explore other areas of LDC, which might help to explain sub-developments that are taking place within the general pattern of LDC to London. This is the second part of the overall approach of the study described in Chapter Three.

These include LDCs' sensitivity to time and fare elasticity and the value of Time (VoT). Given that long distance commuters in particular spend a great deal of time commuting – each workday. They are factors, which by industry standards are known to have an impact on commuting (PDFH, 2005). These are discussed fully in Chapter Nine – where this aspect of the sample is analysed.

Sections 5.3.1 – 5.3.2 now focus on the broader issues concerning Objective One. In which an examination is made of the factors, which are needed to achieve a balanced representation in the sample. These relate to the data requirements in respect of the LDC Personnel Targeted and the Survey strategy applied. Whereas, Sections 5.3.3 – 5.3.17 look at the specialist issues in respect of Objective 2.

5.3.1 Examination of the Factors Needed to Achieve Balanced Representation in the LDC Sample – with respect to Objective One

5.3.1.1 Research and Other Factors Employed in the Pre-Planning of the Survey

Commuting flows are a function of the location of residences ('origin'), the location of workplaces ('destinations') and the nature and character of the transport system that links them. Therefore changes in the distribution and behaviour of the population, the geography and the character of employment and the development and usage of the transport infrastructure, all have implications for commuting (DETR, 1988).

In addition to the government's view, long distance commuting, considered at either the aggregate or disaggregate level, is also a function of lifestyles; job opportunities that match the individual's training or skills; earning aspirations/motivations; as well as the tolerance levels endured (in terms of time and cost) to long distance commuting.

Considerable time and effort, extending almost a year (August 2002 – May 2003) were invested in determining how to capture those elements in the survey. It was time well spent monitoring, observing and studying the long distance commuter population:

* through review meetings with supervisors
* extensive literature search – most of which was reported in Chapter Two
* discussions with study groups, at work, on some of the key facets of the long distance commuter market
* through travelling on some of the long distance commuter routes, earlier identified in Chapters One and Two, to gain first hand experience of long distance daily commuting.

LDC Personnel Targeted

The pre-survey fact finding exercise had indicated that there were six types of workers involved in contemporary long distance commuting. These are identified below.

To be representative, the survey needed to capture a balanced spread of the above commuters and the questions, incorporated in the survey schedule, also needed to reflect this.

Long distance commuting, on the other hand, does not happen in isolation. Empirical evidence indicate that there are four distinct types of journey-to-work movements, which take place within the body of mass commuting centred on Greater London (Howe, 1997).

These consist of:

1. the short to medium distance journey-to-work movements that comprise a centripetal movement, which emanates, in the morning, from residences situated inside the M-25 in London and are destined for workplaces, which are situated mostly in Central London. This is the major journey-to-work flow, which in 2001, accounted for 80.9 per cent of all work movements concentrated on Central London (Chapter Four, Table 4.3, row 2, col.6).

2. a centrifugal movement of workers, who commute from the Inner London Boroughs to work destinations in the Outer London Boroughs.

3. peripheral or cross-country work journeys, which are made mostly by private cars to work destinations on the outskirts of London.

4 London oriented long distance commuting as depicted by: intra-regional long distance commuting, which originate in counties within the South East Region and are destined for workplaces situated within the Inner or Outer London Boroughs. This represents the larger of the two flows of London-oriented long distance commuting – accounting for 16.7 per cent of all work journeys centred on Greater London (Chapter Four, Table 4.3, col.6, row 9).

5. long distance commuting undertaken on a weekly basis, as opposed to a daily basis (Green et al, 1999).

6. inter-regional long distance commuting, which emanates from regions outside the South-East of England, but destined for workplaces, situated in the Outer or Inner London Boroughs. This accounted for 2.28 per cent in 2001, of all work movements into Greater London (Chapter Four, Table 4.3, col.6, row 10). The above percentages are computed from the absolute data given in Table 4.3. The Table is designed to put into perspective the various journey to work movements that were taking place, in 2001, amongst the above groups. The data is also relevant to the above analysis.

5.3.2 Survey Strategy

Commuting groups 1-3 have been largely explored in literature. The same is not true of inter-regional long distance commuting (groups 5-6), which have remained unexplored. This study is an attempt to address that issue.

Although the focus of the study is on inter-regional long distance commuting, the latter cannot therefore be treated in isolation of the other forms of commuting (i.e. groups 1-4), because inter-regional long distance commuting does not exist in isolation.

The strategy therefore is:

* to build a profile of the different types of commuting to make it possible to identify the main differences between short/medium distance commuters and the long distance equivalent – measured against standard parameters such as

age, gender, social class etc. Plus any other differences which may exist between the two forms of commuting.

* subsequently, to undertake a detailed survey of long distance commuting over different distance bands. The latter action is explained by the fact that inter-regional long distance commuting does not take place over any single defined distance or time band. That would assume that long distance commuters, all live within the same region, work in the same locality and commute a common defined distance. When in reality, both residence and employment are dispersed – giving rise to commuting journeys undertaken over different distance or time bands.

The above analysis is also likely to produce a better understanding of the characteristics of long distance commuting.

5.3.3 Investigation of Issues Pertinent to LDC and Survey – with respect to Objective Two

The issues investigated were influenced by the survey strategy, outlined at Section 5.3.2 above and empirical evidence, which indicated that there could be a relationship between long distance commuting and the following issues.

The intention was to examine, in the text of Section 5.3.4 below, the issues and rationale for incorporating the above factors into the study. At least thirteen issues were identified. A brief discussion of each issue is presented below.

5.3.4 Issues related to Residence and Long Distance commuting

The norm of long distance commuting is characterised by the daily interchange of work journeys, which take place between residences, located in remote suburbia, and employment centres, located in centralised urban nodes.

Viewed from the perspective of residence, it is the fact that these journeys originate in the intra-regional counties of South-East England (and beyond). As shown in Section 5.3.1, the above represents a significant minority (20 per cent) of the total commuting workflow into Greater London. The journey, between residence and employment, is only made possible by the availability of express transport links.

In reality, the choice is not that simple. Workers are faced with certain issues that affect their choice of residence, employment and why they commute long distance.

This section therefore examines the issues, related to residence and long distance commuting, which:

* affect work journeys, originating in remote residential,
* specifically help to further an analysis of the study's aims and objectives, expressed in the 'Research Objectives' of Chapter One.
* the questionnaire will need to test.

Fourteen issues appear worthy of investigation. These are identified below.

5.3.5: Pull of Residence

Is the wish to move to a desired residential location stimulating workers to become long distance commuters?

5.3.6 Influence of House Prices

Is the influence of house prices forcing a wider separation between homes and workplaces and, by implication, long distance commuting?
Is this significant, amongst any particular gender, occupational or social group? And the reasons.

5.3.7 Residential Choice between Migration and Long Distance Commuting

Is long distance commuting preferable to a permanent move nearer the workplace – even if LDC is costly and physically onerous? Does the cost of moving nearer the workplace outweigh the benefits of children's education that would otherwise be lost by staying put? Or, indeed, the loss of social contacts? Consideration is also given to the groups of LDC, who may be affected.

5.3.8 Lifestyle of Long Distance Commuting – Arising From Residential Choice

To ascertain the benefits/dis-benefits of choosing to live in suburbia and choosing to commute long distance and the commuting groups among whom this aspect of commuting is prominent.

5.3.9 Residence and Access to Express Transport Links

Is access to express transport, a consideration in the choice of residence? For example, would workers change residence, if they were adversely affected by the availability or cost of transport? And the reasons?

Other Factors

What other factors might influence choice of residence and where would the ideal choice of residence be found?

5.3.10: Issues Related to Employment and Long Distance Commuting

5.3.10.1: Norm of Long distance Commuting – from employment perspective

The norm of long distance commuting, from the perspective of employment, is dictated by the daily interchange of work journeys between residences, located in the suburbs, and centralised urban workplaces.

Viewed from the perspective of employment, it is significant that the majority of journeys are concentrated on Central London, an area of 31 km^2 (12 square miles). Whereas, the minority of journeys are concentrated on Outer London.

As in journeys, emanating from residential choice, the common link, between residence and workplace, is the availability of express transport.

In reality, the choice is not that simple. As far as the worker is concerned, long distance commuting may be a necessity, rather than choice, which is dictated more by market demand to suit training, inclination and skills, earnings, career prospects, etc. The journey-to-work being a necessary means to that end.

This section will therefore focus on issues, which

- * pertain to employment factors that generate long distance commuting
- * need to be tested by the questionnaire.

Six issues (at 5.3.11 – 5.3.16) appear worthy of investigation.

5.3.11: Job Profile of the Long Distance Commuter

What are the occupational sub-groups involved in long distance commuting

- * gender type
- * single or double income earners
- * the influence of demography and social skills

which represent a few examples.

5.3.12 Sustainability of Long Distance Commuting, Arising from Permanent or Temporary Employment

How many workers, for example, were travelling to the same place of work, without changing residence for "X" number of years? By contrast, how many had retained residence, but were travelling equally long distances to a different place of work - and had sustained this over a given period?

The converse is also true. How many workers had changed both residence and workplace, during "X" number of years, but were still commuting long distance? How many considered long distance commuting sustainable and for how long? How many considered long distance commuting temporary and for how long? Given the above circumstances, how many considered that they were unable to sustain long distance commuting and the reasons?

5.3.13 Benefits Derived from Employment-oriented Long Distance Commuting

* What do workers consider are the benefits to be derived from employment-oriented long distance commuting?

  i.e. job security, higher earnings, career progression, job to suit inclination and skill, self-employed, therefore can ply skill wherever there is demand, able to work part-time, or other reasons.

* What do workers consider, are the dis-benefits they derive from employment-oriented long distance commuting?

  e.g. long hours spent travelling, work day is unduly long, exhausted at end of day, family/social life suffers, other reasons.

5.3.14 Effect of Advances in Information and Communication Technologies

Will the continuing advances of 20th century information/communication technologies (such as the lap top computer, mobile telephony in conjunction with the car) lead to:

* long distance commuting spreading to a wider range of occupational groups?

* or less occupational groups travelling long distances to work?

5.3.15 The Influence of Uncertain Job Prospects or Unemployment on Long Distance Commuting.

* Is the search for job opportunities, arising from unemployment or uncertain job prospects, a generator of long distance commuting?

* Is there a section of the workforce more vulnerable to this influence than others?

5.3.16 Testing the Influence of Work-oriented Migration or Longer Distance Commuting

If employment had decentralized, would workers consider migrating with the job, retaining the job and commuting longer distances than previous? Also would they continue to commute the longer distances, while searching for a job nearer home?

In terms of work-oriented commuting, how far would workers be prepared to commute? In terms of work-oriented commuting, under what circumstances would workers not be prepared to commute long distance?

5.3.17 Transport

Transport remains the crucial link between residence and workplace. But it is even more crucial when as in long distance commuting, compared to short or medium distance commuting, there are greater distances involved. Transport is therefore adopted as a variable for analysis to establish:

* whether transport consideration is significant, when regressed with other factors such as housing and employment, in generating long distance commuting.

* as empirical evidence (Franklin 1979; Howe, 1997) suggest that long distance commuting is increasing, to examine the level of commuting tolerance (i.e. the maximum distance that workers would be prepared to commute and in what circumstances) among surveyees.

5.3.18 Frequency of Long Distance Commuting.

* Will fewer commuting journeys mean longer journeys to work?

5.4 How Factors Relating to Objectives One and Two of the Survey Have Been Fed into the Questionnaire

Diagram 5.2 helps to show how the objectives discussed in the previous Sections (5.2 and 5.3) have been fed into the questionnaire.

Objective One, for example, is covered by Section 1: Questions 1-17 of the Survey Schedule. This is illustrated by Diagram 5.2. Section 7: Questions 1-7, appertaining to the personal characteristics of LDCs, also serves the same purpose. The fact that the latter questions are put last (rather than at the front of the questionnaire) is a deliberate strategy adopted by the study – to deal with non-refusals by potential interviewees who might dislike giving personal details on a questionnaire schedule.

Diagram 5.2: How Factors Relating to Objectives One and Two Have Been Fed Into The Questionnaire

Survey Objective	How Incorporated in Survey Schedule
Objective One **Collection of primary data** To be incorporated in the pursuit or advancement of the study's secondary objective.	1.1 Expressed by a brief introductory statement, made to Interviewees, participating in the survey and by the factors cited at 1.2 and 1.3 below. 1.2 Basic data relating to the journey to work characteristics of LDCs (e.g. origin and destination of LDC journeys; mode of transport; frequency of commuting; journey time and cost; nature of employment (Section 1: Questions 1-17 Survey Questionnaire). 1.3 Collection of basic data – relating to personal characteristics of LDCs (age, gender, occupation, household composition income). Section 7: Questions 1-7 of Questionnaire).
Objective Two **Representiveness of Sample** a) to ensure, through the strategy adopted by the survey that the key or salient features, appertaining to the LDC parent population are represented in the sample.	2.1 as shown in the issues to be investigated, which were described in Sections 5.3.3 – 5.3.18 and reflected in the questions on employment (Section 3.1 – 3.9) and residence (Section4: Questions 4.1 – 4.7).
Other Representation b) Factors, such as LDCs' sensitivity to journey time and cost, as well as the value of time (VoT) – which are known to have an impact on commuting (PDFH, 2005) and which may further help to explain sub-developments taking place within the general trend of LDC to to London.. The latter is a focus of the study.	2.2 As reflected in the questionnaire schedule: - at Section 2: Questions 2.1 – 2.11, on 'Tolerance of Long Distance Commuting'. - at Section 5: Questions 5.1 – 5.2, on 'Sustainability of Commuting' - at Section 6: Question 6.1 on 'The Effect of Information Technology on Long Distance Commuting'.

Objective Two is covered by the remaining questions on the survey form. This is also covered by Diagram 5.2.

5.5 Pilot Study

It was decided that a limited trial of the questionnaire should take place among some of my former colleagues at the Civil Aviation Authority and National Air Traffic Services PLC, who were known to commute long distances to work.

5.5.1 Findings of the Pilot Workplace Survey of Long Distance Commuters

The pilot survey took place during 10-14 September 2001 and was intended:

* to test the feasibility and/or weakness of the approach, adopted in the pilot survey for the collection of data.

* to pre-test the schedule and/or questions - looking in particular for any inherent weakness(es) that may exist either in the design of the schedule and/or questions and how either can be improved.

* to pre-test responses to the questions, set in the schedule, and to ascertain whether such responses would be useful to the survey.

* to obtain `first hand' feed back from surveyees or their observations on any aspect of the survey.

5.5.2 Findings

The findings of the pilot survey are reported under the following headings:

5.5.3. Useful features of the pilot survey

5.5.5. Analysis of findings measured against pilot survey criteria

5.5.9. Post survey discussion with surveyees and observations

5.5.3 Useful Features of the Pilot Survey

Although it is suggested that a main survey should be preceded by a pilot survey for most of the reasons, stated at Section 1, paragraphs 4-7. In practice, this only holds true if:

* the individuals/groups, surveyed in the pilot study, have the same characteristics as the individuals/groups who will be targeted in the main survey.

* the pilot survey also captures a representative section of the targeted population.

This will enable a better picture to be gained of the population that is likely to be targeted in the main study and the factors, which are likely to create setbacks for the main survey - permitting in the latter case, the necessary corrective action.
This can only be achieved by undertaking the pilot survey among individuals/groups, who are homogeneous with the groups targeted in the main study.

The pilot workplace survey, recently conducted, encapsulates most of the practical aspects of piloting, which are likely to help the main study.

Table 5.1 shows the demographic composition of surveyees who took part in the pilot survey. Two features of the table are noteworthy. First the gender composition is equally divided among males and females. This was not an intended aim, it just happened that way. Secondly respondents, taking part in the pilot survey, are concentrated within the three core commuting age groups of 25-34, 35-44 and 45-60 years - with possibly a slight bias towards the lower age group of 25-34 years.

Table 5.1: Demographic Make-up of Pilot Surveyees

Gender	Age					Total
	16-24	25-34	35-44	45-60	60 +	
Female	-	2	1	-	-	3
Male	-	-	2	1	-	3
Total (by age) Male and Female	-	2	3	1	-	6

Source: Pilot Workplace Survey of Long Distance Commuting, Sept. 2001

Because of the age and gender composition, the sample although small (but at this stage size of sample is not significant) will provide useful indicators in the way different age or gender groups treat the questionnaire and whether the latter needs to be refined further.

5.5.4 Pilot Encapsulated Representative Cross-Section of Main Survey Groups to be Targetted

The pilot survey also incorporated a representative section of the individuals/groups who will be targeted in the main study. Table 5.2, for example, shows that the pilot survey captured 6 of the 10 interest sector individuals who are involved in long distance commuting to Central London and who will be targeted in the main survey.

The answers, supplied by these various individuals, will be varied and perhaps interesting. But their answers would help to determine whether the questionnaire is adequately designed to capture the views of the interest sector groups, who will be targeted in the main survey. This is the subject of Sections 5.5.5 – 5.5.7.

Table 5.2: Representative Cross-Section of Main Groups to be Targeted Found in Pilot Survey

1.	Workers in full time jobs undertaking long distance commuting five days per week
2.	Workers in part-time jobs undertaking long distance commuting three days per week
3.	Long distance commuters nearing age of retirement (in this case 45-60 years).
4.	Long distance commuting arising from choice of residential location and/or employment location.
5.	long distance commuting arising from choice of residence, which is central to working couple's location of employment.
6.	long distance commuting arising from choice of residence, which is near to children's place of education

Source: Pilot Workplace Survey of Long Distance Commuting, Sept. 2001

5.5.5 Analysis of Findings Measured Against Pilot Survey Criteria

It is against the criteria, stated at Section 5.2.1, paragraphs 4-7, that the findings of the pilot survey are assessed.

The first criterion was intended to test the feasibility of using self-completion methods (as against personal interviewers) for the collection of data.

The interviewees expressed the view, that they are all working people. They thought that it was a good idea to allow them to complete the questionnaire in their own time, rather than have an interviewer intrude on their working space and time, which can be very busy. They thought that the approach adopted was good.

Criterion two was intended to test the schedule and/or questions for any inherent weakness(es), either in the design of the schedule and/or questions and if so, how either can be improved.

There was an unanimous view, amongst surveyees, that the format and presentation of the questionnaire were very good. It was helped by the fact, that they found the survey very interesting. The survey was opportune, in that it helped to concentrate minds on a subject which many will be facing in the year 2003, when National Air Traffic Services PLC will be moving their headquarters from Central London to the new purpose built headquarters at Hampshire.

As a result, some workers who are long distance commuters now may become even longer distance commuters in two years. Also those who commute relatively short or medium distances to NATS in Central London could possibly become long distance commuters in 2003. Some may even resign rather than move with the job. Because of this factor, most of the surveyees would like to maintain an interest in the survey and have left their name and follow-up contact number.

5.5.6: Questionnaire Presented on Double Sided Pages

Some preference was expressed for the questionnaire to be presented on back-to-back pages. As this would reduce the number of pages to be completed, but not the number of questions.

In the end, it was regarded as a `psychological thing', which did not hinder the filling in of the questionnaire

5.5.7 Assessment under Criterion Two of Responses to Questions

Table 5.3 shows that the response to the questions set in the schedule was very high.

* 30 out of the schedule's 44 questions (or 68 %) were answered by all interviewees.

* a further 14 questions (or 32 %) were answered by 5 out of 6 surveyees - bearing in mind that 6 surveyees participated in the pilot survey.

Table 5.3: Summary Analysis of Responses to Pilot Questionnaire

Section Heading	Quest. per Hdg	Questions answered by		Ans. helpful	Quest N/A	Observation
		all surveyees	some surveye			
1.Journey to work Profile	13	9	4	yes	4	note 1
2.Tolerance of LDC	9	4	5	yes	5	-
3.Employment	7	3	4	yes	4	note 2
4. Residence	5	5	-	yes	-	-
5. Sustainability of LDC	2	1	1	yes	1	note 3
6. Effect of IT	1	1	-	yes	-	-
7.Personal Characteristic	7	7	-	yes	-	-
Total	44	30	14	yes		

Note:
1. Four questions (Q1.5, 1.10, 1.11, 1.12) were answered by 5 out of 6 surveyees. In the case of the non-response the question did not apply, as the surveyee (a former LDC) now lives and works in London.
2. Four questions (Q3.4, 3.5, 3.6 &3.7) were answered by 5 out of 6 surveyees. In the case of 1 surveyee, the question did not apply.
3. Question 5.1 was answered by 5 out of 6 surveyees. One who should not have been included in the survey did not answer the question - as it did not apply.

Were it not for one surveyee, a former long distance commuter who now lives and works in London and who on hindsight should not have been incorporated in the survey, the response rate to the questionnaire would have been total.

5.5.8 Answers Helpful for Purposes of the Survey

The answers provided by surveyees were also helpful for purposes of the survey. This obviated the need to amend or delete any of the questions.

The third criterion was intended to obtain 'first hand' feed back from surveyees or their observations on any aspect of the survey. This is the subject of Sections: 5.5.9 and 5.5.10.

5.5.9 Post Survey Discussion with Surveyees and Observations

The group of pilot surveyees met on 19 September 2001, in advance of my pre-arranged meeting with them on 20 September 2001, to discuss their general observations on the survey and to present a united response. Their views are expressed below.

"We found the questionnaire generally interesting and thought provoking to complete. Yes, it would probably be better for the questionnaire to be double-sided. Some people pointed out that the questionnaire referred to long distance travel, whereas their journeys were fairly short. Therefore, they were not sure whether you still wanted their data. They were also unsure whether this would affect the randomness (if any) of your survey, if I went looking for long distance travelling specifically.

Some of the questions looked a bit subjective and provoked questions about how were the values derived in some of the lifestyle questions.

As I said on the whole, most rewarding and interesting. Let me know the results and outcomes of your research''. P Vidler, on behalf of the group of pilot surveyees.

5.5.10 Follow-up Discussions

Questions were raised in the above comment, which were followed-up at a pre-arranged meeting with the group on 20 September 2001.

Q4.5 Suppose you had the choice between two options. Option A represents the example of living remote from the job (in a rural locality) and commuting long distance. Option B represents living in an urban area closer to the workplace. These are set out below.

Housing Option A	**Housing Option B**
3 Bed detached property, valued at £245k, in rural Rutland, Leicestershire	3 Bed flat in Fulham, London SW6, valued at £300k on the market
Involves long distance commuting of approximately 80 minutes each way by rail	Involves approximately 35 minutes commuting to work by underground rail
Fare: £22 per day	Fare: £4 per day

Which option would you choose? _____

If you chose option A, what increase in the fare on option A would be just sufficient to make you change your mind? _____

If you chose option B, what reduction in the fare on option A would be just sufficient to make you change your mind? _____

For example, the comment was made that some of the questions looked a bit subjective and provoked questions as to how the values were derived in some of the lifestyle questions.

At Question 4.5, positioned above for convenience, the surveyees wanted to know how the values on housing and transport were derived.

They found the question and accompanying options very interesting ....and had them thinking, because many of them are facing a similar situation at the moment. The particular situation was previously explained at Section 3, paragraphs 2-3 on page 5..

The surveyees thought that the values placed on housing and transport at Question 4.5 looked subjective. They felt the answer to that question really depended on someone's circumstances. They thought the question hinged on the limit of one's financial means.

If, for example, one is earning quite a lot and had chosen Option A, rural lifestyle, that person would not be tempted by Option B.

If on the other hand, one was on average income (possibly with very little to spare) then that person may be tempted by Option A.

The group is concerned that Question 4.5, as laid out, may not capture everybody. But if, for example, the question were to state `what limit in earnings (if you were on Option A) might tempt you towards Option B? That might get a larger response.

The following factors were taken into consideration in re-designing the main survey schedule.

5.5.11 Extended Test

The pilot test alone was not sufficient to determine whether the replies received, from the pilot study, would provide useful data, which would be amenable to the type of modelling that the research would employ to analyse the study's objectives.

For this purpose, the study instituted a second test. The latter was intended to test the above objective.

A schematic plan was accordingly devised to show how appropriate data will be collected to analyse or measure the right relationships between variables in the LDC Survey. This is shown as Table 5.4. The latter was seen as instrumental to the analyses that will be undertaken in Chapter Six and the subsequent tests, instituted in Chapters Seven and Eight.

It was therefore important to get this aspect of the survey right, before undertaking the main survey. The results of the pilot survey were tested, using the guidance given in the schematic plan. In some cases, synthetic data were used. But overall the test did not reveal any areas of weakness, in terms of the data collected and whether it would be amenable to modelling.

5.6 Conclusions

In this chapter, the first of a two stage process, aimed at collecting the study's primary data, was examined. An account was given of the thorough research and planning that was entered into – prior to the concept and design of the survey questionnaire. This included months of research into the relevant issues, appertaining to LDC, which the study needed to take into consideration – if the survey was going to capture some of the key features of the LDC parent population and therefore proved efficient for later analyses which would be undertaken in the study. This chapter also showed how these issues were fed into the survey questionnaire.

A pilot survey was then carried out to test response to the design of the questionnaire and the questions incorporated in it. Apart from the fact that the questionnaire's design had to be modified slightly for purposes of the main survey, a satisfactory response, to both the above factors, was received.

A subsequent test was carried out on the data collected from the pilot survey. This was in view of the analytical exercises, which the study needed to undertake – using data collected from the survey. This also proved satisfactory in two ways. First, the response to the survey questions did provide useful data, which could be used in the analytical exercises stated. Secondly, the initial exercises carried out did prove satisfactory.

The next stage is a report on the planning and conduct of the survey, which is the subject of Chapter Six.

TABLE 5.4: SCHEMATIC PLAN SHOWING HOW APPROPRIATE DATA WILL BE COLLECTED TO ANALYSE/MEASURE THE RIGHT RELATIONSHIPS BETWEEN VARIABLES IN THE LDC SURVEY

Question	Variable of Interest and Type of Analysis - To Be Effected	Data Required to Effect Analysis	Is data Available To Carry Out Analysis	
			Yes	No
			Which Question Will Provide Data	How Will the Data Be Obtained.
1. Journey to Work Profile Q1.1 Where do You Live? to Q1.13 What proportion of after tax income do you spend on commuting?	<u>*Background Information on LDC Surveyees*</u> Data, obtained from Q1.1-1.13 will be presented in tabular format to provide background information on the type of surveyees captured by the LDC survey and to establish their journey-to-work profiles.	Basic data (to begin with) on surveyees' residence, employment and transport mode used for the journey to work - to give some idea of the type of person who commutes long distance. This will be supported by data on personal characteristics derived from Questions: 7.1 - 7.6.	Answers to Q1.1-Q1.13 will provide the data for the analysis.	-
2. Tolerance of Long Dist. Commuting Q2.1. If the journey time by your current means were to get longer, what is the maximum amount of time that you would be prepared to spend commuting to work	<u>*Journey Time Elasticity on Long Distance Commuting*</u> by: a) mode choice b) route similar exercises, for comparative purposes will be undertaken for SDC.	Journey time elasticity for LDC is likely to be a function of: * age, cost, gender and frequency of trip making * journey time, if maximum time tolerated is exceeded - e.g. - once per week twice per week * in the sense of measuring the fall in demand, if an increase in journey time (e.g. by 5, 10, 15 %) brings about a corresponding decrease in demand.	Data will be derived from answers supplied to Q2.1.	-

TABLE 5.4 A: SCHEMATIC PLAN SHOWING HOW APPROPRIATE DATA WILL BE COLLECTED TO ANALYSE/MEASURE THE RIGHT RELATIONSHIPS BETWEEN VARIABLES IN THE LDC SURVEY

Question	Variable of Interest and Type of Analysis - To Be Effected	Data Required to Effect Analysis	Is Data Available To Carry Out Analysis	
			Yes Which Question Will Provide Data	**No** How Will the Data Be Obtained.
2. Tolerance of Long Dist. Commuting (cont'd) Q2.2. What would you do if journey times on your current mode exceeded the maximum time that you would tolerate for the journey to work?	<u>*Analysis of LDCs' response to journey time exceeding the maximum time tolerated.*</u> Analysis will be effected by the use of a behavioural model, such as the logit model, given the 7 options (listed below) which are presented to surveyees in Q2.2. * Work more at home & travel less frequent * Work longer hours - travel less frequent * Stay over in London & travel less frequent * Switch to a different means of travel. * Change jobs * Move home * Other	This will most likely be a function of: 1) Residence - a) current residence in relation to employment. b) housing availability in relation to current employment (re: Option 6 to 'Move home'. 2) Accommodation cost near area of workplace - if surveyees were to select Option 3 -i.e. 'Stay over in London. 3) Employment - a) flexibility of employment contract/ working conditions (re: Options 1+2). b) vacancies in the labour market (re: Option 5, to 'Change jobs'). c) GDP - related to vacancies in the labour market 4) Transport - a) function of mode choice, travel route, cost, frequency of travel, journey time door -to-door. 5) Other - dependent on 'other' choices made by surveyees. Data will therefore be required for the above factors.	Data will be derived from answers given, by respondents, to the options stated in Q2.2. It would also be useful to have supplementary data on external factors, which could also affect or explain the choice made by surveyees in response to journey time exceeding max. time tolerated.	a) Housing Statistics External statistics on area housing will be obtained b) Employment Statistics External statistics on area employment and area or national GDP will be obtained from the National Trends Blue Book, published by ONS, or the Index of Quarterly Statistics on Employment published on ONS website.

TABLE 5.4 B: SCHEMATIC PLAN SHOWING HOW APPROPRIATE DATA WILL BE COLLECTED TO ANALYSE/MEASURE THE RIGHT RELATIONSHIPS BETWEEN VARIABLES IN THE LDC SURVEY

Question	Variable of Interest and Type of Analysis - To Be Effected	Data Required to Effect Analysis	Is Data Available To Carry Out Analysis: Yes — Which Question Will Provide Data	No — How Will the Data Be Obtained.
2. Tolerance of Long Dist. Commuting (cont'd) Q2.3. If you would travel less frequently, how many fewer days per week would you travel	*Frequency of Travel* - when journey time exceeds maximum time tolerated. Answers will be presented in tabular format.	Data for the Table, based on Q 2.3, will be retrieved from answers supplied by respondents.	-	-
Q2.4. What is the maximum amount that you would be prepared to spend on commuting?	*Maximum spend on Commuting*	Information presented in tabular format to reflect position on maximum spend on commuting and will be based on answers supplied by surveyees.	-	-
Q2.5. What would you do, if fares increased above this point	*Analysis of LDC response to fare increase above maximum fare tolerated.* Analysis will be effected by the use of a behavioural model, such as the logit model, given the 8 options (listed below) which are presented to surveyees in Q2.5. . * Work more at home & travel less frequent (cont'd on page 4)	Response to fare increase above maximum is likely to be a function of: 1) age, cost, gender, frequency of work trips, earnings, stage reached in work cycle. 2) Employment Conditions a) flexibility of employment contract/working conditions at the workplace (re: options 1+2). b) vacancies in the labour market (re: options 5+6) 3) Conditions in the Housing Market a) accommodation costs near workplace (option 3) b) housing availability (re; option 7) Data will be required for the above factors (see col. 4).	As in Q2.2, data will be derived from answers supplied by respondents to options stated in Q2.5.	Also conditional on the responses given are the external factors, operating in the housing and employment markets which could affect or explain the choice(s) made in response to Q2.5. The data will be obtained from stats published by ONS & Land Registry.

TABLE 5.4 C: SCHEMATIC PLAN SHOWING HOW APPROPRIATE DATA WILL BE COLLECTED TO ANALYSE/MEASURE THE RIGHT RELATIONSHIPS BETWEEN VARIABLES IN THE LDC SURVEY

Question	Variable of Interest and Type of Analysis - To Be Effected	Data Required to Effect Analysis	Is Data Available To Carry Out Analysis	
			Yes	**No**
			Which Question Will Provide Data	How Will the Data Be Obtained.
2. Tolerance of Long Dist. Commuting (cont'd)				
Q2.5. What would you do, if fares increased above this point?	* Work longer hours - travel less frequent * Stay over in London & travel less frequent * Switch to a different means of travel. * Look for a better paid job * Change to a job nearer home * Move home * Other	Please see comments made in columns 3-5 on page 82.		
Q2.6 If you would move home, about how much nearer to L'don would you move? Q2.7 If you would change to a job nearer home, about how much nearer home would it be?	Questions 2.6 and 2.7 seek to examine more closely the *consequential effects of fare increase above the maximum tolerated* in a situation where it may lead to: a) surveyees moving nearer to workplace in London - hence may cease to be a LDC. b) surveyees working locally - a situation in which they may also cease to be long distance commuters.	Data for this analysis will be retrieved from the answers supplied by respondents to Questions 2.6 and 2.7. Information will be presented in tabular format.	-	-

TABLE 5.4.D: SCHEMATIC PLAN SHOWING HOW APPROPRIATE DATA WILL BE COLLECTED TO ANALYSE/MEASURE THE RIGHT RELATIONSHIPS BETWEEN VARIABLES IN THE LDC SURVEY

Question	Variable of Interest and Type of Analysis - To Be Effected	Data Required to Effect Analysis	Is Data Available To Carry Out Analysis	
			Yes	**No**
			Which Question Will Provide Data	How Will the Data Be Obtained.
2. Tolerance of Long Dist. Commuting (cont'd) Q2.8 If you would stay over in London would you * stay with family/ friends * rent a flat * stay in hotel/guest house * other	*Objective of analysis is as stated for Questions 2.6 and 2.7* (on page 4). Except for surveyees, who choose to stay over in London this could lead to: a) less frequent long distance commuting or b) week-end long distance commuting compared to their former status of regular long distance commuting.	Data for this analysis will be retrieved from the answers supplied by respondents to Questions 2.8. Information will be presented in tabular format.	-	-
Q2.9 What would you like to do, but cannot do, because of the time spent commuting long distance?	The objective here is to analyse the *opportunity cost of long distance commuting*. This will be effected by applying a multi-nomial regression model to the 8 options, presented to surveyees in Q2.9. * See more of my children (cont'd on page 6)	Opportunity cost of long distance commuting is likely to be a function of: * journey time * loss of social amenity, leisure activity (options 1,2 +5-7 * loss of opportunity for increased earnings (option 3) and further education (option 4), For which data on the above factors will be required.	Analysis will be dependent on data supplied by respondents	-

TABLE 5.4.E: SCHEMATIC PLAN SHOWING HOW APPROPRIATE DATA WILL BE COLLECTED TO ANALYSE/MEASURE THE RIGHT RELATIONSHIPS BETWEEN VARIABLES IN THE LDC SURVEY

Question	Variable of Interest and Type of Analysis - To Be Effected	Data Required to Effect Analysis	Is Data Available To Carry Out Analysis	
			Yes	**No**
			Which Question Will Provide Data	How Will the Data Be Obtained.
2. Tolerance of Long Dist. Commuting (cont'd) Q2.9 (cont'd)	* Spend more time with partner * Increase earnings with evening job * Use the time to further education * Pursue hobby * Engage in community volunteer work * Spend more time in leisure activities * Other (please specify)	As stated in column 3, page 84.	-	-
3. Employment Q3.1 How long have you been employed in your present job? Q3.2 Are you employed Full time, Part time or Self employed? Q3.3 If you had a job previous to this one, how long were you employed in that job?	_Questions 3.1 - 3.5 examine the past employment status of surveyees to determine whether (in relation to residence) their long distance commuting had started with past job._ (cont'd on page 7.)	Data will be derived from answers supplied by respondents and will be presented in statistical table format.	Q 3.1 - 3.5	-

TABLE 5.4.F: SCHEMATIC PLAN SHOWING HOW APPROPRIATE DATA WILL BE COLLECTED TO ANALYSE/MEASURE THE RIGHT RELATIONSHIPS BETWEEN VARIABLES IN THE LDC SURVEY

Question	Variable of Interest and Type of Analysis - To Be Effected	Data Required to Effect Analysis	Is Data Available To Carry Out Analysis	
			Yes	**No**
			Which Question Will Provide Data	How Will the Data Be Obtained.
3. Employment Q3.4 Were you employed full time, part time or self employed? Q3.5 Where was the job located?	As stated in columns 2-4, on page 6	-	-	-
Q3.6 What were the reason(s) for changing to your present job? * Promotion * Office relocation * Better job * Improved salary * Redundancy *New job more conveniently located * Children grown up * Job security	_Questions 3.6 examines whether the present job (rather than the past job) may be responsible for surveyees originally embarking on long distance commuting_ - as it is possible that some surveyees may fall into this category. As it is a behavioural type situation, taking place in response to a changing set of circumstances, a multinomial type of model will be used to analyse the responses -provided the response to Q3.6 is large enough. Failing which, the data will be compiled in a statistical table for analysis.	Employment oriented long distance commuting is likely to be a function of: 1) Employment Conditions * promotion, better job, improved salary, job location, job security 2) Job Insecurity * redundancy 3) GDP From which the data (except GDP) required to undertake the analysis will be derived.	Data will be derived from answers supplied, by respondents, to Q3.6 -	Data on GDP will be obtained from national GDP statistics, published by ONS.

TABLE 5.4.II: SCHEMATIC PLAN SHOWING HOW APPROPRIATE DATA WILL BE COLLECTED TO ANALYSE/MEASURE THE RIGHT RELATIONSHIPS BETWEEN VARIABLES IN THE LDC SURVEY

Question	Variable of Interest and Type of Analysis - To Be Effected	Data Required to Effect Analysis	Is Data Available To Carry Out Analysis	
			Yes	**No**
			Which Question Will Provide Data	How Will the Data Be Obtained.
4. Residence Q4.4 What were the reason(s) for moving to your present address? * Housing in area suits my budget * Area/property suits lifestyle * Access to good transport * More convenient for commuting * Acquired a better property. * Changed job * Proximity to children's school * Partner's job location * Location central to self & partner's workplace * Children left home.	*Resident oriented long distance commuting* If not past residence, Q 4.4 examines whether present residence is responsible for a surveyee commuting long distance and the associated reasons.	Resident oriented long distance commuting is likely to be a function of: 1) Lifestyle * area/property suits my lifestyle 2) Affordable housing * Housing in area suits budget * Acquired better property * Index of Area Housing Sales (Land Registry) 3) Level of earnings 4) Transport * Access to good transport * Commuting convenience 5) Education of young family members * Proximity to children's school 6) Location of Employment (in relation to residence) * Partner's job location * Location which is central to self & partner's workplaces 7) GDP From which the data required to undertake the analysis will be derived.	Data will be derived mainly from answers, supplied by respondents, to the options presented in Q4.4 (col. 1). This will be compiled and presented in a statistical table. Secondary data on housing, earnings*, will be looked at for 2 reasons: * external data may help to explain further choices made by surveyees in response to Q4.4 * data required for comparative purposes to say, for example. whether surveyees earnings are in keeping with national figures.	Data on National GDP will be obtained from the 'National Trends Blue Book', published by ONS Or area GDP from ONS quarterly publication on their website. Data on Index of Housing will be obtained from the Land Registry on their website.

TABLE 5.4.1: SCHEMATIC PLAN SHOWING HOW APPROPRIATE DATA WILL BE COLLECTED TO ANALYSE/MEASURE THE RIGHT RELATIONSHIPS BETWEEN VARIABLES IN THE LDC SURVEY

Question	Variable of Interest and Type of Analysis - To Be Effected	Data Required to Effect Analysis	Is Data Available To Carry Out Analysis	
			Yes	**No**
			Which Question Will Provide Data	How Will the Data Be Obtained.
4. Residence Q4.5 Suppose you had the choice between two two options. Option A represents the example of living remote from the job (in a rural locality) and commuting long distance. Option B represents living in an urban area closer to the workplace	*Voluntary Long and Short Distance Commuting* The questionnaire previously looked at how commuters would re-act given certain `forced' circumstances (e.g. fare increase above maximum fare tolerated, journey time above maximum time tolearted. Q4.5 examines voluntary response: a) in the case of long distance long distance commuters transferring to short distance commuting (Option A) b) in the case of short distance commuters transferring to long distance commuting (Option B) - given certain housing inducements.	Voluntary long or short distance commuting, oriented on place of residence, is likely to be a function of: * level of earnings * affordable housing costs (e.g. mortgage or rent). * commuting costs * lifestyle * access to good transport * locality of employment remaining `fixed' in the medium term * commuting time getting longer.	Data will be derived from answers offered by surveyees. But additional options need to be inserted in Q4.5 to obtain the data, identified in col.3 The resulting data will be compiled and presented in a statistical table.	Questionnaire will be amended to reflect factors, stated in columns 3 and 4.

TABLE 5.4.J: SCHEMATIC PLAN SHOWING HOW APPROPRIATE DATA WILL BE COLLECTED TO ANALYSE/MEASURE THE RIGHT RELATIONSHIPS BETWEEN VARIABLES IN THE LDC SURVEY

Question	Variable of Interest and Type of Analysis - To Be Effected	Data Required to Effect Analysis	Is Data Available To Carry Out Analysis	
			Yes	**No**
			Which Question Will Provide Data	How Will the Data Be Obtained.
5. Sustainability of Commuting				
Q5.1 Looking towards the future, even if you felt that your present employment was secure, how much longer would you envisage commuting long distance?	<u>*Future of long distance commuting*</u>	Data will be derived from answers supplied by respondents and will be presented in tabular format	-	-
Q5.2 How likely are the following factors to influence your long distance commuting in the future?	<u>*Likely influence on the future of long distance commuting*</u>	Data for this analysis will be derived from answers supplied by respondents. This data will be compiled and presented in a statistical table to show the factors, which are likely or unlikely to have an effect on surveyees' long distance commuting.	-	-
6. Effect of IT on Long Distance Commuting				
Q6.1 What reduction in annual salary would you be prepared to accept in return for being able to work at home twice a week with IT?	<u>*Effect of IT on long distance Commuting*</u>	The data required for this analysis is based on an 'annual salary', negotiated by surveyees to accommodate working at home two days per week with IT. The data will be compiled from answers supplied by respondents and presented in tabular form to give some idea of the effect that IT has on surveyees' long distance commuting.	-	-

TABLE 5.4.K: SCHEMATIC PLAN SHOWING HOW APPROPRIATE DATA WILL BE COLLECTED TO ANALYSE/MEASURE THE RIGHT RELATIONSHIPS BETWEEN VARIABLES IN THE LDC SURVEY

Question	Variable of Interest and Type of Analysis - To Be Effected	Data Required to Effect Analysis	Is Data Available To Carry Out Analysis	
			Yes	**No**
			Which Question Will Provide Data	How Will the Data Be Obtained.
7. Personal Characteristics				
Q7.1 Are you?___M ___F Q7.2 To which age group do you belong? Q7.3 What is your occupation? Q7.4 How many people are there in your house - hold? Q7.5 How many members in your household are of school age? Q7.6 Within which group does the total annual income of your house-lie (before deduction of tax, national insurance, etc.)?	<u>*Personal Characteristics of LDC*</u> Questions 7.1 - 7.6 aim to establish a picture of the type of person who regularly commutes long distance to work.	The analysis, stated in column 2, is seen to be based on 5 possible factors. Namely, age, gender, type of occupation, composition of family house- hold, medium (£30k) to high (£60k) annual income - for which data on the above will be required.	It is expected that the survey will yield relevant data, from Q7.1-7.6. This will be compiled and presented in a statistical table. The information will also be used to back up analysis on the questions raised at Q1.1- 1.13.	-

CHAPTER SIX

THE MAIN LDC SURVEY

6.0 Introduction

The methodology adopted by the study and the data needed to support it was previously discussed in Chapter Three. Part of that methodology concerned the collection of the primary data. The latter was intended to serve as the basis of the analysis of sub-developments, which may be taking place within the general level of LDC to London. Given that this was not possible with the census' aggregate data.

In this chapter, the process of collecting the primary data, through a sample survey of LDCs is described. This process involves the planning and execution of both the on-train pilot survey and the main LDC survey.

6.1 Structure

First, in Section 6.2, the selection of the rail services on which the surveys will be conducted and the sample size are discussed. In Section 6.3 details are given of the on-train pilot survey carried out to test the survey environment (in advance of the main LDC Survey) and the lessons learnt. Subsequent to this, details on the planning and conduct of the main survey are discussed in Section 6.4. The conclusions are presented in Section 6.5.

6.2: Selection of Rail Route, Rail Services and Sample Size

The main rail route, selected for the LDC Survey, was the West Coast rail route between Bristol and Paddington. As indicated in Chapters One and Two, it is one of ten rail routes (Map 1, page 2) through which workers commute long distance to Greater London. It also fits the criterion, adopted by the study, for long distance commuting to London, which originates in areas beyond the South East Region.

6.2.1 Long Distance Rail Services

The inter-city services between Bristol (in South West England) and Paddington, London are operated by First Great Western (FGW) – as part of the franchise, which the Strategic Rail Authority (SRA) awarded to the company in 1996. This is due to expire in April 2006.

Diagram 6.1: FGW Commuter Services Operating Between Bristol and Paddington

Bristol Temple Mead to Paddington, London		
Early Fringe	**Core Commuting Period**	**Late Fringe**
D (05:40 – 05:55 hrs)	Depart: (06:07 - 06:45 hours)	Depart: (07:15 hours)
A (07:15 - 07:30 hrs)	Arrive: (07:45 - 08:15 hours)	Arrive: (08:45 hours)
2 services from	2 services from Bristol to	1 service from
Bristol - Paddington	Paddington, London.	Bristol - Paddington

Bristol Parkway to Paddington, London		
Early Fringe	**Core Commuting Period**	**Late Fringe**
D (05:07 – 06:05 hrs)	Depart: (06:30 - 07:00 hours)	Depart: (07:40 hours)
A (06:35 - 07:30 hrs)	Arrive: (08:00 - 08:30 hours)	Arrive: (09:00 hours)
2 services from	2 services from Bristol to	1 service from
Bristol - Paddington	Paddington, London.	Bristol - Paddington

Note:

FGW's time table in operation at time of surveys

At the height of the commuting period (06:07 – 06:45 hours) FGW operates two express services (approximately thirty minutes apart) between Bristol Temple Meads, Bristol and Paddington in London. Similar express services are provided between Bristol Parkway (Bristol's second main line station) and Paddington. Except that the latter starts slightly later at Bristol Parkway (Diagram 6.1).

So that, during the core period of commuting, which in this case extends from 06:07 to 07:00 hours, for trains departing Bristol for London, a total of four trains are operated (Diagram 6.1). This is in addition to the commuter trains that operate at the early 'fringe' of the rush hour, between 05:40 and 06:05 hours and at the late 'fringe' between 07:15 and 07:40 hours. Further, the services are geared towards LDC, with a maximum of five stops (at Bath Spa, Chippenham, Swindon, Didcot Parkway and Reading - on some services fewer stops) between Bristol and Paddington. Gauging from the survey experience, the trains are usually full. Such is the demand for the services.

6.2.2 Competition

In terms of competing services on the West Coast route, competition from coach is nil, for the reasons cited in Chapter Two (page 26). Whereas, competition from air services is also limited. In addition, the train has the distinct advantage over competing modes – in that it is relatively fast, frequent and operates from City Centre (Bristol City), in the case of Bristol Temple Meads station, but not Bristol Parkway, to City Centre (Paddington, London).

It was felt that if anything of interest to the study would be learnt, then the evidence most likely would be found where there was a large pool of the population targeted and where they could be easily accessed. The probability of this happening was most likely to occur on a route, which was more in demand and heavily used by LDCs than a lesser-used route.

6.2.3: Planning of Survey – With Regard to Sample Size

A key difficulty, as Green et al (1999) indicated, in any study of long distance commuting is identifying the long distance commuters in the first place. They are not categorised explicitly in any of the available published statistical sources. Nor are they easily identified 'on the ground', particularly on crowded trains operating during the rush hour period, which on the route, in question, lasted between 05:07 hours and 09:00 hours.

Even if a long distance commuter was contacted, would the person fit the survey criterion adopted for interviewees – namely, someone who was commuting long distance to London on a regular five day week basis or a minimum of two days per week. It was of concern that these factors might limit the numbers who might be available to participate in the survey.

In addition, as Chapter Two has shown, no previous study on long distance daily commuting, from beyond the South East Region, could be found. So as to gauge what represented a viable sample size for purposes of the study. Perhaps inhibited by the same factors, Green et al, who in 1999 were engaged in a study of 'Long Distance Weekly Commuting', as opposed to this study, had to settle for a sample size of 126 members – based on the successful number of self-completion questionnaires, completed during on-train and on-coach journeys.

Goodwin et al (1995), who undertook a study of long distance car commuting had to settle for a sample size of six members. This was based on diaries, which the LDC car commuter used to give detailed information about their journeys. Goodwin et al admitted that the difficulty faced with the sample size, emanated from the fact that the target population was always on the move and that it would be difficult to contact them otherwise.

In the end, given the above circumstances, the decision was made, after due consultation with my supervisors, to try and contact as many LDCs as possible who fitted the survey criterion for participation in the study. The results are expressed in the more appropriate text of Section 6.4.3.

6.3 On-Train Pilot Survey

A pilot survey was undertaken, within the on-train survey environment, with two purposes in mind. Whilst the first pilot survey, reported in Chapter Five, was intended to test the questionnaire's design and response to the questions. This second pilot survey was designed to test the management and conduct of the survey, within the on-train survey environment.

One expects that trains operating during the core period of the rush hour would be crowded. There might also be operational problems (e.g. signal failure) and it was not sure how the survey population would react to a survey in such circumstances.

These were the theoretical considerations and it was hoped that the pilot survey would provide some insight, which would enable the main survey to be managed and conducted efficiently.

.6.3.1 Findings of On-Train Pilot Survey

The pilot on-train survey was conducted on 20 May 2003, on the 06:45 FGW express train – a scheduled commuter service, which departs from Bristol Temple Meads station and arrives at Paddington (London) at approximately 08:15 hours (Diagram 6.1). This train operates at the peak of the long distance commuter service, between Bristol and Paddington.

It was considered, that if there were lessons to be learnt from the on-train pilot survey. This would be best acquired from a train, which operated at the heart of the rush hour – rather than at the peak fringes.

Useful insight into the on-train survey environment was gained during the pilot survey, which helped towards the successful planning and execution of the full survey.

The FGW commuter express, operating between Bristol Temple Meads and Paddington (London) stops, as previously mentioned, at five stations en-route. It was noticed that once the train had departed Didcot, it became too crowded to carry on with the survey, or even to return to collect the completed questionnaires.

For the main survey, this was overcome in two ways. First, by employing more than one person (mostly family) to simultaneously survey sections of the train. Secondly, by supplying self addressed envelopes to those who were not willing to leave questionnaires, filled with their personal data, on the train seats for later collection.

Secondly, it was considered beforehand that the on-train surveys should start at Reading. Given that on departure from Reading, the trains would run non stop to London and more significantly, from the study's viewpoint, would be carrying passengers, including workers from the upper reaches of the line, who would be commuting directly to Central London.

Given the factors earlier reported, this was not a feasible option. Because of this factor, surveys undertaken during the main exercise were initiated as soon as the service departed from Bristol. Two further reasons accounted for this. Firstly, it took time getting from one passenger to the next to ascertain whether the passenger was a regular long distance commuter to London.

In addition, some passengers had raised questions, pertaining to the survey – before actually accepting the self completion questionnaire. These passengers could not be ignored. All of this had to be done before the train became too crowded to continue with the survey.

Without the on-train pilot survey, these factors would not have been known or appreciated. They might have only served to inhibit the survey with deleterious effect on the ensuing process of data collection.

6.4 Planning and Conduct of Main On-Train Surveys

The main on-train LDC Surveys were conducted in two phases. The first phase of surveys took place during the period, 17–19 June 2003 and the second phase during 16-17 July 2003. Originally, the plan was to conduct the surveys during the 17-20 June 2003. But this was always going to be subject to operational and other factors, experienced on the 'ground' - during the period originally planned for the conduct of the surveys. These are discussed in the more appropriate text of Section 6.4.3.

6.4.1 Selection of Trains for LDC Surveys

Beyond the survey dates, a strategy plan was also formulated with regard to the trains, which will be surveyed. This was intended to work to the benefit of the survey and First Great Western, who wanted to ensure that full co-operation and assistance would be provided by their on-board train staff – during the course of the said surveys. Appropriate acknowledgement is given in the 'Acknowledgment Section' for the grateful support, which FGW gave during the on-train field surveys.

Diagram 6.2: FGW Commuter Services Operating Between Bristol and Paddington

Bristol – Paddington, London		
Early Fringe	**Core Commuting Period**	**Late Fringe**
(05:40 – 06:05 hours)	(06:07 – 07:00 hours)	(07:15 – 07:40 hours)
4 services from	4 services from Bristol to	2 services from
Bristol - Paddington	Paddington, London.	Bristol - Paddington

Two factors conditioned the selection of the trains for the conduct of the field surveys. First it was intended to conduct the field surveys on train services, which operated:

* on the 'fringes' of either side of the core commuter period – as shown in Diagram 6.2 and

* during the core commuting period. That is on trains departing Bristol between 05:40 and 07: 40 hours. These trains would normally arrive at Paddington, London - during the core 'rush hour' period of 07:45 – 08:15 hours.

This was to ensure that the sample would contain a good spread of long distance commuters, using the above services; or indeed a good coverage of the LDCs, who were using this route.

Secondly, and by conducting it this way, the survey was also likely to capture a fair representation of LDCs, who commute on the West Coast line to Greater London.

6.4.2 On-Train Survey Experience

It would have been optimistic to expect, that the train experience encountered during the on-train pilot survey (happy though it was), would again be experienced during the main surveys – as far as reception of the main survey was concerned.

No two train journeys or travel experiences are alike. In fact this researcher was warned beforehand, that some interviewees could even be hostile. One reason might be an intense dislike (by some workers) to surveys.

Far from it, the researcher found that many interviewees did in fact welcome the survey, because they could identify with the aims and objectives of the research.

Testimony to this effect is also stated on many of the completed questionnaires handed back.

6.4.3 Operational Problems Encountered With Main Surveys

Despite the strategic planning, earlier discussed, and the co-operation provided by First Great Western, problems were encountered during the field surveys. These are expressed in the ensuing text.

But one of the advantages of contingency planning is that it enables one to plan and implement an alternative course of action – should unforeseen or unexpected problems arise. It also needs to be stressed that it was because of the latter, which formed part of the strategic survey plan and co-operation by FGW, that success was achieved with the surveys. The following explains.

With regard to the main survey, the first phase conducted between 17-19 June 2003 proceeded smoothly and to plan. Mondays were avoided, in case there would be over-running week-end track maintenance, which could affect Monday's rail services and consequently surveys conducted on the day. Although, it was originally planned to avoid Fridays. Mostly, because it would be approaching the end of the working week, when interviewees might be tired and therefore would not be so receptive to a survey.

But on the Thursday evening (19 June 2003), a track-side fire at Burnham, in Berkshire, caused the Berkshire Fire Brigade to declare a safety zone around the fire area. The two factors combined seriously disrupted FGW's services from 15:45pm the Thursday evening (19 June 2003) through to 16:00 hrs on Friday (20 June 2003). It meant that the survey, planned for Friday, 20 June 2003, had to be called off.

Train services were back to normal soon after. But it was still necessary to ensure, again working in close collaboration with First Great Western, that the survey would take place during a period, which would be free of track maintenance or other problems. Given that the latter could affect the smooth conduct of the survey. It explains why the final survey took place on Friday 18 July 2003 on the 07:15 London bound train departing from Bristol Temple Meads.

This replaced the original service on Friday 20 June 2003, which was originally planned for the final survey. But even then, the final survey also had to be suspended, halfway through the journey from Bristol to Paddington – because of signal problems, between Swindon and Didcot, which seriously disrupted train services on the day. It was considered (by on-board train manager and researcher) that LDCs, caught up in this situation and already late for work, might not be receptive to a survey. It was not a risk worth taking.

In all a total of five surveys were conducted on FGW trains - based on the strategic plan earlier described. A total of 290 completed questionnaires were obtained from the surveys – which gave an average response rate of fifty eight questionnaires per survey. It could have been more, were it not for the fire disruption and signal problems earlier reported. Given the conditions pertaining to sample size, stated at Section 6.2.3, this was considered reasonable.

From the study's viewpoint, it was considered that a total of almost 300 successful interviews were helpful – especially with regard to the logit, hypothesis and elasticity models, which will be used in analysing some of the data.

6.5 Conclusions

In this chapter, the process of collecting the primary data necessary to advance the study's objectives (stated in Chapters One and Three) was discussed. These included both the planning and conduct of the main LDC Survey and, prior to that, the on-train pilot survey. The latter was intended to test the survey environment. But also to use, to the benefit of the main LDC survey, the lessons learnt from the pilot survey.

Based on a strategic survey plan, a total of five surveys were conducted on FGW trains – spread across the range of commuter services operated by First Great Western (FGW). This was intended to obtain best coverage. The survey was also conducted on one of the busiest routes used by LDCs to London – namely, the West Coast rail route that FGW operates between Weston-Super Mare and Paddington. It was felt that both the above approaches represented the best possibility of obtaining the primary data and evidence necessary to pursue the objectives of the study.

In all, a total of 290 completed questionnaires were obtained from the surveys. It could have been more, were it not for the fire and signal problems, which disrupted train services, whilst the surveys were in progress.

From the viewpoint of the study, it was considered that a total of almost 300 successful interviews were helpful – especially with regard to the logit, hypothesis and elasticity models, which will be used in analysing some of the data.

The data obtained will also form the basis of the analysis in the succeeding two chapters.

CHAPTER SEVEN

NATURE AND CHARACTERISTICS OF ON TRAIN LONG DISTANCE COMMUTING SURVEY

7.0 Introduction

The intention in this chapter is to examine the key features of the data collected from the LDC sample and the extent to which the data reflects the characteristics of the population from which it is taken. This is in keeping with standard practice, which is applied in population sampling. Arising from this, to draw out observations or hypotheses, that are likely to give some insight into the nature and characteristics of the long distance commuters under study - which can then be used in the advancement of the study's objectives, previously discussed in Chapters One and Three.

7.1 Structure

First, in Section 7.2, an exercise is undertaken to eliminate irrelevant material from the survey's data - prior to the undertaking of the analyses earlier identified. Section 7.3 will examine the key features of the data collected and the extent to which the survey data reflects the characteristics of the population sampled. Subsequent to this, Section 7.4 will draw out observations or hypotheses, relating to the nature and characteristics of the workers under study, which can then be used in the advancement of the study's objectives. Section 7.5 will present the conclusions.

7.2 Elimination of Irrelevant Material from Sample

Prior to the analyses, undertaken in Sections 7.3 and 7.4, an exercise was instituted to check and clean the data of irrelevant material. This is standard practice – particularly with surveys.

7.2.1 Exclusion of Unusable Material from the Study

During the field surveys, two problems (entirely outside the control of the surveyor) occurred, which led to some questionnaires being excluded from the study.

It needs to be stated that these problems (discussed below) were neither detected during the pilot testing of the questionnaire or the on-train pilot survey – discussed in Chapter Six. Even though there were contingency plans in place (Chapter Six, Section 6.4.3), at least one of the problems was not anticipated. The following explains.

The first stage, in the post survey verification process, was to undertake a validation check of the completed questionnaires obtained from the survey. This was intended to verify whether respondents, who had filled in the questionnaires, had strictly met the criterion, adopted by the survey, for long distance commuting to Greater London. That is long distance commuters, who were commuting on a regular full time or part-time basis to jobs in Greater London. This was stated during the screening process, so as to determine, from amongst train passengers (not all of whom would be commuters) who would qualify to take part in the survey. Only if the latter fact was ascertained and the respondent had agreed – would a questionnaire be handed out.

Unusable Questionnaires

It was during the verification process, that a number of questionnaires were found to be unusable for use in the study. The details are presented below.

Unusable Questionnaires – Reason for Their Elimination from Study	No
1. Infrequent Long Distance Commuters to London Examples included: * workers who commuted to London ½ day per week * workers who commuted to London 1 day per fortnight/month * workers who commuted to London 2 days per quarter In addition most of those in this category often indicated 'N/A', when responding to the survey questions on commuting tolerance (i.e. time and fares) - possibly because of their infrequent visits to London. As such the information provided by the latter group was unusable.	15
2. Respondents Supplying Inadequate Information * that is just filling in the first page (or part of the first page) of the questionnaire Most of this happened, during the final survey, (18 July 2003), when a signal problem caused serious delays to FGW's services. One expected, in the circumstances, that some commuters were more concerned with getting to work. But there were others, caught up in the same situation, who were only too willing to take part in the survey (because it related to their LDC circumstances) and filled in the questionnaires properly.	24
4. Commuters Picked Up During the Surveys on FGW Services between Bristol and Paddington Whom One Would Not Expect to be Regular Commuters on this Service * Examples included respondents, who gave their area of residence as Plymouth Devon, Cheltenham and Somerset. The latter group was excluded	11

7.2.2: Elimination of Business Travellers

It is also very easy, in surveys of this nature, to mistake business travellers with commuters, because of the similarities that exist between the two groups. In a survey that is centred on long distance commuting, there is no place for business travellers. But inevitably, and in spite of careful screening, of potential surveyees, there was always the possibility that business travellers might be caught up in the survey.

Subsequent screening of the data, by the process fully described in Appendix Three, unearthed 40 business travellers who were caught up in the survey. These have been eliminated from the ensuing analyses.

This left a total of 200 usable questionnaires, which provided (for the study's purposes) a useful sample – made up as follows:

Table 7.1: Composition of LDC Sample

Type of LDC Captured by Survey	No	%
Full time LDCs	93	46.5
Multi-destination LDCs	62	31.0
Part-time LDCs	45	22.5
Total	200	100.0

Notes:

1. Full time LDCs are workers, who commute long distance on a regular (5-days per week) to jobs in either central or outer London.

2. Part-time LDCs are workers, who commute long distance to jobs in London on a part-time basis, but not less than two days per week. The data pertaining to the journey to work frequency of this group is given in Table 7.13.

3. Multi-destination LDCs are workers, who commute long long distance to jobs in London, during part of the working week, but for the remainder of the working week are employed elsewhere in England.

4. Data in column three are expressed as a percentage of the Total sample (i.e. 200).

Table 7.1 gives the basic membership (in terms of numbers) of the LDC sample. But a more interesting picture emerges, when the composition of the sample is further classified (Table 7.2) by employment status, gender and age).

Three salient factors emerge:

* both male and female LDCs are represented in the three employment categories (i.e. full time, part-time and multi-destination workers) – denoted by Table 7.2.

  and also in the respective age groups. This is useful for purposes of the objective stated at Section 7.0.

* the majority of the sample's LDCS (male and female) are represented within the core work force age (i.e. between 25 – 45 years). Howe (1997) indicates that they are the most important group within the labour force – given that they possess the training, skills and experience combined – that are necessary to maintain British industry.

* there is representation also (male and female) amongst LDCs, who have either just joined the labour market or nearing retirement.

The result is a balanced spread of the three major types of LDC workers represented in the sample, which is useful for the analytical exercises undertaken in the subsequent text.

Table 7.2: Composition of LDC Sample (by Employment Status, Age and Gender)

Male LDCs Captured by Survey	**Age Group – Male LDCs**											
	16-24		25-34		35-44		45-60		Over 60		Total	
	no	%	no	%	no	%	no	%	no	%	no	%
Full time LDCs	-	-	7	*3.59*	26	*13.33*	39	*20.00*	1	*0.51*	73	*37.43*
Part-time LDCs	-	-	3	*1.54*	18	*9.23*	25	*12.82*	1	*0.51*	47	*24.10*
Multi-destination LDCs	2	*1.03*	10	*5.13*	13	*6.67*	11	*5.64*	1	*0.51*	37	*18.98*
Total (Male LDCs)	2	*1.03*	20	*10.26*	57	*29.23*	75	*38.46*	3	*1.53*	**157**	***80.51***
Female LDCs Captured by Survey	**Age Group – Female LDCs**											
	16-24		25-34		35-44		45-60		Over 60		Total	
	no	%	no	%	no	%	no	%	no	%	no	%
Full time LDCs	-	-	8	*4.10*	4	*2.05*	5	*2.56*	-	-	17	*8.72*
Part-time LDCs	-	-	2	*1.03*	5	*2.56*	3	*1.54*	-	-	10	*5.13*
Multi-destination LDCs	2	*1.03*	3	*1.54*	5	*2.56*	1	*0.51*	-	-	11	*5.64*
Total (Female LDCs)	2	*1.03*	13	*6.67*	14	*7.18*	9	*4.61*			**38**	***19.49***
Total (All LDCS											**195**	***100.0***

Notes:

1. Data in percentage columns are expressed as a percentage of total LDCs (male and female) i.e. 195
2. Five respondents did not state their age, which accounts for the difference between Table 7.1 and this table.
3. Definitions pertaining to full time, part time and multi-destination LDCs were previously given in Table 7.1.

7.3: Key Features of the Data Collected and Extent to which It Is Representative of Parent Population

If a survey is to bear validity, then it must reflect the characteristics of the parent population from which it is taken. Therefore, in this section, an examination is made of the key features of the data collected and the extent to which it reflects the characteristics of the LDC population sampled.

For purposes of the objectives, stated at Section 7.0, it needs to be noted that in terms of LDC, four key features of the survey data (which are core elements within LDC) bear close similarity, in percentage terms, with the LDC parent population.

7.3.1: Number of LDCs (Relative to Census) Involved in Commuting Between SW England and London and Respective Areas of Journey Origin

In terms of the numbers (relative to the census), involved in long distance commuting between SW England and London and the areas from which such journeys originate, the interesting point which emerges from the evidence of Table 7.3 is the extent to which the LDC sample mirrors the LDC (Census) population at large.

In Table 7.3, we compare the number of LDCs, we interviewed, with what the Census 2001 indicate is the total number of LDCs who commute from the South West Region of England to London. Two important factors, pertaining to the representativeness of the LDC sample (relative to the Census 2001) or LDC parent population are revealed by the evidence of Table 7.3.

First, Table 7.3 reveals that the sample has captured a high proportion (40 %) of the LDCs involved in the above movements (Table 7.3, cols. 2 and 4, last row, 166/415).

Table 7. 3: The Location of Residence For Long Distance Commuters in the Study Compared with Equivalent Areas from Census 2001

Location of Residence	LDC Sample		Census 2001	
	No	%	No	%
Weston Super Mare	2	1.2	34	8.2
Bristol and Environs (Cluton, Yate, Winterbourne, Kingswood, Chew Magna, Clevedon, Iron Acton, Sedgemoor, Portishead, Saltford, Bones, Keynsham)	48	28.9	112	27.0
Bath and Environs (Chew valley, Bradford on Avon, Trowbridge, Oathill, Radstock, Holt, Gurney Slade)	46	27.7	85	20.5
Chippenham and Environs (Calne, Bremhill, Corsham, Marlborough, Kington Langley, Malmesbury, Bromham, Devizes, Melksham)	44	26.5	123	29.6
Swindon and Environs (Wootton Bassett)	26	15.7	61	14.7
Total	**166**	**100.0**	**415**	**100.0**

Sources: 1. On-Train LDC Survey (Bristol – Paddington), 2003
2. Table W101 – Origin-Destination Statistics for Local Authorities, 2001 Census (in the above table, it is with respect to workers from the above areas who commute to Greater London)

3. Data in column 3 (LDC Sample) are expressed as a % of the total workers (166) – who commute long distance to Greater London from the above areas.

4 Data in column 5 (Census 2001) are expressed as a % of the total workers (415), who commute long distance to Greater London from the same areas as the LDC Sample.

Secondly, for long distance commuting, in general, the rural location of residence is influenced by access to and speed of the transport link to the workplace (Vickerman, 1984).

It explains the concentration of residence, by the majority of workers on this route in areas, such as Bristol, Bath, Chippenham and Swindon, which are well served by First Great Western. They are factors which are reflected in both the LDC sample and Census (Table 7.3).

Overall, the evidence of Table 7.3 helps to place the study's sample in context. Particularly in terms of commuting distance and how well the sample reflects the LDC population at large.

7.3.2: Demography

The second core feature of the sample data that has similarity with the parent population is demography. As shown in Chapter Four (Section 4.5.1), demography constitutes an important characteristic of LDC behaviour – at the top level.

Table 7.4: Age by Distance Travelled to Work in London (LDC population compared with Sample)

	Census 2001		LDC Sample	
Age group	All People	%	No	%
16-24	5372	14.99	4	2.05
25-34	12018	33.54	33	16.92
35-44	9321	26.01	71	36.41
45-54	6194	17.28	84	43.08
55-60	2932	8.18	3	1.54
Total	35837	100.00	195	100.00

Source (1) Table S120, Journey to Work Tabulations, Census 2001

(2) LDC Survey Sample

Note:

1. The distance travelled is a calculation of the straight line between the postcode of place of residence and postcode of workplace. The census data in this table represents workers who have commuted 60 km and more to workplaces in Greater London. It is a close approximation, for example, for LDC workers in the sample, who commute in from Reading, Swindon and Didcot.

2. Five respondents in the sample did not state their age, which accounts for the sample total of 195.

In this area, the study also found that there were close similarities, in percentage terms, between the age structure of the LDC sample and the parent population. Table 7.4 provides the evidence.

The study found that the survey has captured, in three respects, some of the features that exist within the parent LDC labour force in Greater London. Firstly, in both the sample and LDC parent population, there is in percentage terms, a predominance of workers within the age strata, 25-54 (Table 7.4). These make up the prime work force within the existing population, because they contain within their ranks, the skills, knowledge, experience and numbers, which are essential to the support or maintenance of UK industry. Secondly, this is also the case – even when the above examination is made at the gender level (Table 7.5).

Thirdly, and at the extreme ends, both in terms of LDCs newly joining the labour force (age 16-24) and those about to retire (age 45-60), there is a lesser concentration in percentage terms in both the sample and general population (Table 7.4).

Table 7.5: Sex and Age by Distance Travelled to Work in London (LDC Population and Sample Classified by Gender)

	Census 2001				LDC Sample			
Age Grp	Males	%	Females	%	Males	%	Females	%
16-24	3110	8.68	2262	6.31	2	1.02	2	1.02
25-34	8109	22.63	3909	10.91	20	10.26	13	6.67
35-44	6653	18.56	2668	7.00	57	29.23	14	7.18
45-54	4427	12.35	1767	4.93	75	38.46	9	4.62
55-60	2124	5.93	808	2.25	3	1.54	-	-
Total (1)	24423	68.15	11414	31.85	157	80.51	38	19.49
Total (2)								
(Males + Females)	35837 = 100 %				195 = 100 %			

Source: As Table 7.4
Note
Percentages, in the case of the census, are relative to the total 35837. Whereas, in the LDC sample it is relative to the sample total of 195.

7.3.3: Difference between Sample and LDC Parent Population

The LDC sample differs from the general LDC population in London in two respects. First, the sample contains slightly older workers than the Census. Forty three percent of workers in the sample, for example, are in the age group 45-54, compared with seventeen percent in the Census. Secondly the sample, compared with the Census, is predominantly male.

Indeed male workers, as revealed by the 1991 Population Census, have been the dominant gender in long distance commuting. But the 1991 Census also revealed that more female workers (including those involved in LDC) have been coming on to the labour market (Howe, 1997). The 2001 Census (Table 7.5) confirms the above position. The LDC sample similarly reflects this. Except that the sample differs from the 2001 Census in terms of the proportion of male and female LDCs who are represented therein.

The above evidence also underlines the fact that LDCs, who reside in areas furthest from London, compared to their medium or shorter distance counterparts, tend to be older and predominantly male.

Overall, and of importance to the study is the fact that the LDC survey has captured some of the core characteristics, in terms of age structure and composition, that are present in the parent labour force of LDC to London and, by implication, the population sampled.

7.3.4: Occupation

It is evident, from Table 7.6, that long distance commuters (in the sample) are strongly represented in the higher socio-economic groups (SOC 1-3) – as applied in the Standard Occupation Classification 2000. These include LDCs, who are working as senior managers, professionals, and in the assistant professional and technical grades. It is also a feature, which is dominant in the general population from which the sample is taken (Table 7.6).

Table 7.6: Occupation by Age (Census 2001 and LDC Sample)-Expressed in % Terms

CENSUS 2001											
Age Group SOC	Man. (1)	Prof. (2)	Assoc. Prof (3)	Admn. (4)	Skilled (5)	Person- -nel (6)	Sales (7)	Process (8)	Elem- entay (9)	Total %	Total Nos.
16-24	1.08	1.19	2.32	2.48	0.93	0.95	2.63	0.37	1.76	13.72	448435
25-39	9.35	8.08	9.89	6.63	3.16	2.33	2.22	1.78	3.08	46.51	1520168
40-49	4.15	3.08	3.30	3.23	1.89	1.41	0.98	1.28	1.88	21.20	692917
50-54	1.59	1.32	1.27	1.56	0.80	0.58	0.42	0.61	0.88	9.04	295470
55-64	1.42	1.19	1.19	1.58	0.93	0.64	0.47	0.82	1.28	9.53	311486
others	0.02										
Total										100.0	
Nos.	575579	485696	587345	505960	252000	193166	219642	158848	290240	-	3268476

LDC SAMPLE											
Age Group SOC	Man. (1)	Prof. (2)	Assoc. Prof (3)	Admn (4)	Skilled (5)	Person- -nel (6)	Sales (7)	Process (8)	Elem- entry (9)	Total	Total Nos
16-24	-	1.04	1.04	-	-	-	-	-	-	2.08	4
25-39	4.15	6.74	5.18	0.52	-	0.52	0.52	-	-	17.63	34
40-49	13.99	12.44	9.33	-	0.52	-	0.52	-	-	36.80	72
50-54	21.76	8.29	11.92	-	-	-	-	-	-	41.97	82
55-64	0.52	0.52	0.52	-	-	-	-	-	-	1.56	3
Total											
Nos.	79	57	54	1	1	1	2	0	0		195

Note

1. Census data in columns above are expressed as a percentage of the total skilled workforce (3,268,476) in Greater London, recorded in Table S033, 2001 Census of Population. Whereas the sample data are expressed as a percentage of 195.

2. Cells in the Census Table have been randomly adjusted to avoid the release of confidential data

3. The occupation classification is SOC 2000 (Standard Occupation Classification).

The above evidence mostly reflected the expectancy that those involved in long distance commuting are highly skilled.

What is remarkably interesting, are the results which emerge when the skills, appertaining to the respective age groups, are examined. The study found that in both the sample and parent population, the skills, in percentage terms, are concentrated in the age groups 25-39 and 40-49 – again the prime working age group (Table 7.6, col.11, rows 6-7).

In the parent population, these two groups account for just over two thirds (67.71 %) of the skilled workforce in Greater London. Almost a similar result (54.43 %) is obtained in the sample – if the corresponding two age groups (25-39 and 40-49), in the sample, are taken into consideration.

One finds, in the case of LDCs (or those living furthest from the job), that they are highly skilled (SOC 1-3, Table 7.6); highly paid (associated with high skilled employment) and hence wealthier than, for example, SDCs.

In the case of LDC skills, this is reflected both in the sample and census – except that the sample contains more of the said workers than the census.

7.3.5: Economic Activity

An essential feature of the LDC survey must be, how the workers (captured by the survey) are employed and whether this reflects reality or what is happening in the real world.

Table 7.7: Age by Economic Activity (Census 2001 and LDC Sample)

Census 2001						
Age Group	Full Time	%	Part Time	%	Self Employed	%
16-24	296765	11.33	39719	1.52	800	0.03
25-34	824837	31.49	98242	3.75	4076	0.16
35-44	560653	21.40	135268	5.16	6259	0.24
45-54	387246	14.78	100485	3.84	4916	0.19
55-59	118592	4.53	39828	1.52	1963	0.07
Total	2188093	83.53	413542	15.79	18014	0.69
Grand Total	(Full Time + Part Time + Self Employed) =2,619,649 = 100.01%					

LDC Sample						
Age Group	Full Time	%	Part Time	%	Self Employed	%
16-24	4	2.05	-	-	-	-
25-34	28	14.36	2	1.03	3	1.54
35-44	63	32.31	1	0.51	7	3.59
45-54	77	39.49	2	1.03	5	2.56
55-59	1	0.51	1	0.51	1	0.51
Total	173	88.72	6	3.08	16	8.21
Grand Total	(Full Time + Part Time + Self Employed) =195 = 100%					

Notes:

1. For the Census, the ONS defines part-time as working 30 hours or less a week in the four weeks before the Census. Full Time as working 31 or more hours a week.

2. For comparative purposes, the LDC sample data pertaining to part-time working have been adjusted to take account of the above definition.

Regarding this, the interesting fact to emerge, from the evidence of Table 7.7, is that the majority of workers, in both the sample (88.72 %) and general population (83.53 %) are engaged in full time economic activity (ref. Table 7.7, col.3, row 9). It represents further evidence of how the LDC Survey has captured some of the key elements of the wider long distance commuting community.

Where there is a difference, between the LDC Sample and 2001 Census, it is in the part-time activity sector of Table 7.7. There are more LDCS engaged in part time activity in the Census (15.79 %) than is evidenced in the sample (3.08 %,). Table 7.7, col.5, row 9 refers. The situation is reversed in respect of the self employed.

Interestingly, it can be seen from the above evidence that the thorough exercise undertaken in the planning and execution of the LDC survey, has produced some quality results in terms of how well the sample reflects reality.

7.4: Nature and Characteristics of Study's LDCs

The analysis of Section 7.3 has shown that in terms of commuting distance, age, occupation and economic activity, the characteristics of the LDC sample reflect, in the main, the characteristics of the general or parent population. With regard to the latter, the characteristics were previously examined in Chapter Four.

The advantage of the LDC sample is that one can exploit the data further for any developments, which may be occurring at the sub-level of LDC. But which also will help to explain factors that are fuelling the increasing trend in LDC to London – reported in Chapter Four. By so doing, both of the advantages obtained by using aggregated (censal) data as well as disaggregated data (sample survey) for the analysis of LDC are obtained, whereas the disadvantages are avoided. The latter was previously demonstrated in Diagram 4.1 (Chapter Four). Strategically, it is also the aim of the second objective, based on the methodology explained in Chapter Three.

Appertaining to the above a number of issues, relating to the LDCs under study, are examined. One of these issues is access to railhead.

7.4.1: Access to Railheads

7.4.1.1: Data Applied

The main source of the data used in this analysis (and in the analyses of the succeeding sections) is the survey's primary data. But in order to place the study's findings in context, season ticket data from South West Trains Rail Study (2005) on access distance to railhead, are co-opted. The latter data is useful in that it contains 13,300 observations on an amalgam of LDCs, MDCs and SDCs, who are commuting between between the South West Region of England and London.

As such, the data provides an additional source of relevant information against which the findings obtained by this study on LDCs' access distance to railhead (as well as MDCs and SDCs) can be compared. A fuller description of SWT's data is given in the appropriate context of Chapter Eight.

7.4.1.2: General Theory – Access to Railhead

Access to the station railhead forms a constituent part of the total concept of commuting, which also involves the in-vehicle journey (IVJ) and egress from the station (PDFH, 2005). It also applies to other forms of travel.

The importance of access to or egress from the station, as part of the *generalised* cost of travel, and in particular long distance travel, is gauged by the number of studies that have investigated the subject since 1986 (Adcock et al (1995), British Rail OR Memoranda 13403 (1986), and Transecon International (1986).

Most of the studies are either undertaken by or sponsored by rail operating companies. As such, they bear a bias towards passenger transport demand analysis.

In contrast to this approach, Cross (1988) points out that access to railheads has implications on where workers, involved in long distance travel (which is akin to long distance commuting) may choose to reside, because it would form part of the consideration given to the *generalised* time for workers - in this case long distance commuters.

As the workers in this study are all long distance commuters, it is perceived that surveyees did not choose to reside, where they have done, without access to railheads or knowledge of the generalised cost and time of the work journey to London.

But it is not only the *generalised* cost of travel, which needs to be considered. If, as Adcock and Lampkin (1995), Benito and Oswald (1999) and Faye (1992) suggest, that LDCs tend to live further from their station of access than SDCs, then this is likely to lengthen an already long form of commuting – in terms of commuting distance and time.

Benito and Oswald, in particular, did find that wealthy commuters or those of higher social standing (Social Class 1 and 11) tended to travel longer journeys and also resided further from the railhead than their SDC counterparts.

.7.4.1.3: Difference between Earlier Studies and LDC Study – on Access to Railhead

None of these studies, however, were specific to long distance commuting in general (i.e. where commuting flows were greater than 75 miles in length (PDFH, 2005) or in a specific sense, under the criterion adopted by the study – namely LDC to London that originate in areas from outside the South East region (Chapters One and Three).

Benito and Oswald's (1999) study, for example, is a study of the differentials in commuting times experienced by SDCs and MDCs in the South East Region - compared with the rest of Great Britain during the 1990s and the associated factors. The study does not incorporate long distance commuters.

Fae's (1992) study relates to commuting journeys made between the South East Region and London as well as the explanatory factors. Whereas, Adcock and Lampkin's (1995) is a study of inter-city travellers (e.g. business, leisure, commuting) which also includes commuters.

So that in terms of long distance commuting and access distance to railhead, a different relationship might exist between LDCs and SDCs. Given that in terms of LDC, time is of essence. Consequently, one would have thought that faced with a lengthy in-vehicle journey (IVJ), anything which helps to reduce the total journey time (between residence and location of employment) of which access to railhead is a constituent part, would be beneficial to LDCs. Unless, there are factors at play that are unknown.

Both the LDC sample of this study and SWT's (2005) rail study provide the opportunity to examine the above theory – with respect to long distance commuting to Greater London. Unlike the previous studies reported, their data relate specifically to long distance commuting (under the criteria earlier described) and are current. In addition, SWT's

(2005) rail study contains access data on rail journeys made by MDCs (i.e. 21-60 miles) and SDCs (i.e. 1-20 miles) to Greater London – which are useful for the ensuing analyses.

Given these two sets of data on LDC (SWT's and this study), the opportunity was taken to establish (by hypothesis testing) whether there is any significant difference between the two groups - in terms of the mean access distance that either group resides from the station railhead. If the test indicates that no significant difference exist between the two groups (in terms of access distance), then either the mean distance of the study's LDC (8.5 miles) or SWT's (8.85 miles) could be used as the LDC basis for comparing LDCs' access distance to railhead with SDC's.

7.4.1.4: LDCs' Access Distance to Railhead (LDCs of This Study Compared with SWT's LDCs)

Table 7.8: Access in Terms of Distance to Station Railhead
- LDC, SWT Study

Percentiles – Station Access (Miles)							
	5	10	25	50	75	95	99
LDCs							
LDC Study Sample	1.0	1.0	2.85	7.8	9.8	27.0	27.21
SWT (LDC) Sample	0.89	1.3	2.6	7.3	12.3	23.2	40.07
SDCs							
SWT (SDC) Sample	0.4	0.6	1.0	1.8	3.7	8.2	12.45

	LDC (Study) Sample	SWT (LDC) Sample	SWT (SDC) Sample
Mean	8.5 miles	8.8543 miles	2.7 miles
SD	7.4	7.9821	2.5483
Variance	54.76	63.7142	6.4938
N	200	457	334
	App. Table 8.1	App. Tables 8.4 & 8.5	App. Table 8.2

Source

1. LDC Sample in respect of Study's LDCs.

2. SWT's (2005) Rail Study – in respect of SWT's LDC Data (i.e Appendix Tables 8.2, 8.4 and 8.5 as indicated in Table 7.8, Section 2, col. 3, last row.

Note: Access distance to railhead is the distance travelled by LDCs (or SDCs) between residence and station of rail access – at the start of the commuter journey

In terms of access distance to railhead, the evidence of Table 7.8 indicate that the two LDC groups (LDCs of this study and SWT's) are almost at parity in terms of the mean distance (LDC = 8.5 miles and SWT's LDC = 8.85 miles) that either group resides from the station of rail access. The standard deviation is almost as similar (Table 7.8, Section 2, cols. 1-5).

Table 7.9 Test Criteria and Summary Results - Hypothesis Test LDC Samples

Hypothesis (	$H_0 = \mu_{LDC(\text{this study})} - \mu_{LDC(\text{SWT study})} = 0$
(	$H_1 = \mu_{LDC(\text{this study})} - \mu_{LDC(\text{SWT' study})} \neq 0$
Significance level	$\alpha = 0.05$
	1. LDC Survey data in respect of Study's LDCs.
Data employed	
	2. SWT's Rail Study (2005) data in respect of
	SWT's LDCs.
Sample size	n = 200 for study's LDC sample
	n = 457 for SWT-LDC Sample
Mean access distance to railhead	Study's LDCs = 8.5 miles
	SWT's LDC = 8.8543 miles
S.E. DIFF. means (Study's LDC/SWT-LDC samples)	= 0.64
Critical value of $\pm Z \alpha/2 = \pm 1.96$	$Z = [(8.543 - 8.5) - 0]/0.64 = 0.55$
Conclusion: $\lvert Z \rvert < \lvert Z \alpha/2 \rvert$ i.e. 0.55 < 1.96	

Source:

1. LDC Sample (in respect of LDC data).
2. SWT's rail study (2005) in respect of SWT's LDC data.

Note:
The supporting evidence, in terms of the data used in the above calculations; the computation of the mean, standard deviation and standard error of the difference between the means (both LDC samples) are given in the appendices at App. 8.1, 8.4 and 8.5.

To determine whether there was any significant difference between the two groups, a hypothesis test was employed. For this method of testing, the confidence interval approach (Coates, 2000; Dobson 2001), using the formula for the Z – statistic, was adopted. This is the standard application, (based on the theory of normal distribution), where the difference in sample means between independent groups is tested for significance. The critical criteria adopted for the test and the results are presented in Table 7.9.

Not surprisingly, the test indicates that in terms of their mean access distance to station railhead, the difference between the two LDC groups, is not statistically significant (Table 7.9, col. 1, last row).

7.4.1.5: Difference between LDC and SDC – in terms of Access Distance to Railhead

The above finding would represent, on average, a LDCs' access distance (8.5/2.7 miles) that is three times greater than the average distance (2.7 miles) that SDCs reside from their station of rail access (Table 7.9, last row). But it is not known whether the above difference between the two groups is significant and until tested can only remain as a hypothesis. This is undertaken within the appropriate context of Chapter Eight.

Two interesting factors are further revealed by the evidence of Table 7.8. The first, is the fact that short distance commuters involved in such movements are virtually walking to the station of rail access – given that SDCs' mean access distance is 2.7 miles (Table 7.8, Sect.2, col. 4, row 1) and Table 7.8, Sect. 1 on percentiles). Whereas for long distance commuting, workers are driving between 10 and 42 miles to access the nearest station for the journey to work (Appendix Table 8.5).

Secondly, the journey to work is a question of time relative to distance, rather than distance alone. In the case of LDCs, the speed of travel has helped to liberate both time and distance constraints on the journey to work. So that a worker can choose a location of residence, relative to employment – irrespective of distance and vice versa in the case of employment. This provides an explanation as to why LDCs can afford (time or distance wise) to live further from the station of rail access than their short distance counterparts.

7.4.1.6: TIME CONSIDERATION

Previous studies on railheading also tended to concentrate on access or propensity to railhead in terms of distance. Where perhaps in long distance commuting, it might have been similarly useful to concentrate on access time, as part of the *generalised* time for the work journey, as this could be crucial - when viewed from the LDC's perspective.

But it is perceived, that this is more likely to give an indication of speed of access to the station (depending on the mode used and, through that process, the time taken to access the station) rather than how far one lives from the station. It could also produce anomalies.

A worker, for example, who lives five km from Bristol Temple Meads station and travels to the station by taxi or by 'kiss and ride' is likely to access Bristol Temple Meads quicker than another worker who lives 2.5 km (i.e. half the distance) from the station, but travels to the station on foot.

7.4.2: LDCs' Egress from Destination Station to Place of Employment

This section focuses on the third component of the LDC journey, earlier stated in Section 7.4.1.2, paragraph 1. Specifically, the section of the journey, which deals with LDCs' egress (in terms of distance travelled) from the destination railhead to place of employment in London. For purposes of the analysis, the destination railhead is the mainline rail terminus at the London end of the LDC journey from Bristol. In this case, it is the Paddington rail terminus (at London, W2), which is the final stop for LDCs commuting on First Great Western's services, between Bristol and London.

Therefore, complimentary to the analysis of LDCs' access to station railhead (at Section 7.4.1) is an examination of the 'egress aspect' of the LDC journey.

The response to Question 1.2 of the LDC Questionnaire (Appendix 2) – presented below for ease of reference – served as the basis for this examination.

Q1.2 Where do you work? ____________________ (Name of area/borough & post code)

For purposes of the analysis, the mean egress distance is interpreted as the distance travelled by LDCs from the destination rail station (i.e. Paddington) to their respective place of employment in either Central or Outer London. The egress distance is also a calculation of the distance (measured on a straight line) between the post code of the destination station (i.e. Paddington, W2) and the post code of LDCs' area of employment. It is also the criterion, adopted by the ONS (e.g. the Census 2001) for the measurement of distance in commuting studies – as earlier defined in Table 7.4.

Table 7.10: Main Egress Distance Travelled by Study's LDCs - from Final Rail Stop to Place of Employment in London

Destination of LDCs on Egress from Paddington –the final rail stop	No	%	Cumulative %	Mean Egress Distance Travelled (miles)
a) Four Central London Boroughs				
City	49	*24.5*	*24.5*	4.4
Westminster	37	*18.5*	*43.0*	3.2
Camden	46	*23.0*	*66.0*	3.1
Kensington and Chelsea	16	*8.0*	*74.0*	2.6
b) Remainder of Inner London Boroughs Islington Lambeth Tower Hamlets Southwark	31	*15.5*	*89.5*	4.0
c) Outer London Boroughs (mostly Ealing, Greenwich and Newham)	21	*10.5*	*100.0*	8.7
Total	200	*100.0*	-	-

Notes:

1. Mean egress distance in column 5 of the above table is based on the calculation of distance (measured on a straight line) between the post code of the destination station (i.e. Paddington, W2) and the post code of LDCs' area of employment. It follows the criterion, adopted by ONS (e.g. Census 2001), for the measurement of distance in commuting studies.

2. Table 7.10 identifies (a) the four central London boroughs to which the majority of the sample's LDCs are attracted as well as (b) the remaining inner London boroughs, where this occurs.

3. In the case of outer London, the boroughs which attract the sample's LDCs (10.5 %) are Newham (the part containing the London City Airport and its associated services, Ealing (Wembley) and Greenwich.

It was useful, for purposes of the analysis, to divide Central London into two categories. To present the data for Central London, in an aggregated way, under one heading would have concealed crucial information, pertaining to the egress aspect of the LDC journey. In this respect, Central London is divided into:

Table 7.10: Main Egress Distance Travelled by Study's LDCs - from Final Rail Stop to Place of Employment in London

Destination of LDCs on Egress from Paddington –the final rail stop	No	%	Cumulative %	Mean Egress Distance Travelled (miles)
a) Four Central London Boroughs				
City	49	*24.5*	*24.5*	4.4
Westminster	37	*18.5*	*43.0*	3.2
Camden	46	*23.0*	*66.0*	3.1
Kensington and Chelsea	16	*8.0*	*74.0*	2.6
b) Remainder of Inner London Boroughs Islington Lambeth Tower Hamlets Southwark	31	*15.5*	*89.5*	4.0
c) Outer London Boroughs (mostly Ealing, Greenwich and Newham)	21	*10.5*	*100.0*	8.7
Total	200	*100.0*	-	-

Notes:

1. Mean egress distance in column 5 of the above table is based on the calculation of distance (measured on a straight line) between the post code of the destination station (i.e. Paddington, W2) and the post code of LDCs' area of employment. It follows the criterion, adopted by ONS (e.g. Census 2001), for the measurement of distance in commuting studies.

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It was useful, for purposes of the analysis, to divide Central London into two categories. To present the data for Central London, in an aggregated way, under one heading would have concealed crucial information, pertaining to the egress aspect of the LDC journey. In this respect, Central London is divided into:

* the four Central London boroughs:

  (i.e. Westminster, Camden, Kensington and Chelsea and the City of London) in which the majority (74 %) of LDCs' workplaces are located (Table 7.10, col. 4, row 5).

* the remainder of the Inner London Boroughs:

  (i.e. Islington, Lambeth, Southwark and Tower Hamlets), which attracts 15.5 % (Table 7.10, col.3, row 6) of LDCS.

Together, the inner London boroughs accounted for 89.5 per cent of all destinations at egress from Paddington (Table 7.10, col.4, row 6) – thus re-enforcing the evidence of earlier studies (Fowkes and Nash (1991), DETR, 2003), that the majority of long distance commutes by rail to London are destined for Central London.

The reverse was also true of Outer London. The evidence of this study showed that only 3 of the 25 Outer London boroughs featured in LDCs' egress analysis. These included the boroughs of Newham, Ealing and Greenwich.

The core evidence which emerges from the analysis of LDCs' egress from destination railhead to place of employment in London are fourfold:

* Compared with access to railhead at the start of the journey (Table 7.8), LDCs travel a much shorter distance (identified below) from the destination railhead at Paddington to their respective place of employment in London. This is not surprising. One contributory factor is the closeness of the destination station

(Paddington, W2) to the four Central London boroughs, in particular Westminster, Kensington and Chelsea and Camden.

* In this study, for example, egress distance (from destination railhead to place of employment in Central London), ranges from 2.6 to 4.4 miles (4.2 – 7.1 km) (Table 7.10, col. 5).

* For the rest of inner London, the mean egress distance is 4 miles (or 6.4 km, Table 7.10, col. 5, row 6). This is accounted for by the relatively longer journeys, which are made to areas like the Borough of Tower Hamlets, which houses the new industrial development at Canary Wharf where some of the mainstream financial services (including the Financial Services Authority) have decentralised from the 'City' and the Borough of Islington. Both boroughs are more remote from Paddington than the Central London boroughs previously identified.

* As expected, the mean egress distance for LDCs travelling to Outer London is longer at 8.7 miles (or 13.95 km, Table 7.10, col. 5, row 12). This is almost twice as long, compared with LDCs' egress to Central London boroughs. Largely accounting for this, are workers who travel to the Outer London borough of Newham, which houses the London City Airport.

Newham is also one of the Outer London boroughs (the other is Waltham Forest), which will experience further development – in line with the development plans for the 2012 Olympic Games. The latter is contained in the 'Olympic Proposals Plan' for 2012, which is still in its development stage.

A search was made of the journey to work literature and other sources, including the National Travel Survey and the British Household Panel Survey, for any previous evidence on the subject. This would have helped to place the study's findings in context. But none was found.

In conjunction with 'access to railhead', examined in Section 7.4.1 and the in-vehicle journey (IVJ), examined in Chapter Nine, the above analyses help to give a full insight into the distance travelled to work by the study's LDCs.

Whilst the above is useful, especially in a study involved in long distance commuting, it needs to be noted that the journey to work is a matter of the speed of travel, relative to distance – rather than distance alone. A commuter, for example, living in Swindon which is located 81 miles (129.9 km) to the south west of London is able to access her/his workplace in Central London – in approximately the same time (i.e. one hour) as, for example, a resident of Edgware, located 13 miles (20 km) north of Central London, and also commuting to a Central London workplace. This is because of the reason cited above. It provides some explanation as to why LDCs commute such long distances to work in Central London

In this study, the average journey distance, for LDCs commuting from Bristol, Bath and Chippenham to the City is 126 miles (Table 7.11, col.7, row 7). Whereas to Westminster it is 125 miles (Table 7.11, col.8, row 4).

Table 7.11: Length of LDC Journey – Distance Travelled between Residence and Workplace

Journey Origin	Access Railhead	Access Distance (residence to railhead (miles)	IVJ main Journey (miles)	Egress Distance (destination station to workplace)		Distance Travelled between Residence and Workplace	
				City	Westminster	City	Westminster
Bristol	Bristol TM	14.2	118.5	4.4	-	137.1	
				-	3.2	-	135.9
Bath	Bath Spa	11.7	114	4.4	-	130.1	
				-	3.2	-	128.9
Chippen-ham	Chippen - ham	7.9	99	4.4	-	111.3	
				-	3.2	-	110.1
Average Distance Travelled (between residence and workplace)		11.3	110.5	4.4		126.2	
				-	3.2		125

Notes:
1. Mileage presented in columns 3 – 4 are common for LDCs who travel either to the City or Westminster.
2. Data on average access distance to station Railhead is derived from Table 7.8.
3. Data on average egress distance to workplace is as computed in Table 7.11.

7.4.3: Nature and Characteristics of Part Time Workers Involved in Long Distance Commuting

7.4.3.1: Background Factors

Another issue examined, as part of the objective stated at Section 7.0 was the nature and characteristics of part-time workers involved in long distance commuting. There is very little evidence in transport literature, concerning part time workers, who are involved in long distance commuting to the Capital.

Statistically, a great deal of data on part time working is available. The UK national Censuses (1966 - 2001), for example, provide statistics (in the censal journey-to-work tabulations) on the journey origin and destination of workers involved in commuting -

either on a local or regional basis. This also incorporates part-time workers, who are involved in long distance commuting. One example is the 2001 Census Table S 028, used in Table 7.7 on economic activity by age, in Section 7.3.6.

Additional to the National Census, statistics on workers commuting part-time to work are provided by the National Travel Survey and The Time Used Surveys – which incorporate periodic surveys on how workers use their time when not at work.

Both are sponsored by the Department for Transport. But these relate to short distance commuting.

The Census of Employment additionally provides statistics for both part time and full time workers. But only for those who are registered on the PAYE system.
The availability of such data, as far as the study is aware, has not attracted much research interest.

Using the 1971-91 censal data, Howe (1997) drew attention to the trends in commuting to London by workers (full and part time), whose journeys originated outside London. But beyond that did not seek to establish the causal factors – as this was not a specific focus of the study.

Prior to the introduction, in February 2003, of flexi-part time working (for parents), established under the Employment Act 2002, a few studies on flexi-part time working appeared (Scottish Executive, 2003). Most of these looked at the employment market (3.9

million), which could be affected by such legislation and offered guidelines, which both industry and parents could adopt.

Beyond that, the literature on part time workers involved in either short distance or long distance commuting generally, and specifically to London, is sparse.

A special interest of this study (Question 1.6, of the On Train Survey Questionnaire) was to ascertain what part time workers did on days when they were not commuting to work.

This led to an important discovery. Seemingly, part time long distance commuters, in the study, appear to commute to one location, two or three days per week. But when such workers are followed up, to ascertain what they do on other days, it is then that a different picture emerges.

Table 7.12 reflects the situation:

* More than half of the said workers (34) commuted to work at branch offices, on days when they were not commuting to the head office in London (Table 7.12, col.4, row 4).

* a similar work style was adopted by those who visited outside firms (15) or worked at home (4) (Table 7.12).

Although the above workers therefore commute to one location (in this case London), two or three days per week, on average. For the rest of the working week, they are occupied on work related activities elsewhere.

The above represents an important find by this study (not seen in any other study), concerning the latter workers, who could be mistaken for 'part-time' workers – given the characteristics, earlier explained, of their commuting behaviour.

7.4.3.2: Causal Factors

Yet it is not unusual, because such movements are dictated by changes which are occurring in the labour market.

Two factors help to explain:

First, the survey found that most of the workers involved in 'multi-directional' long distance commuting (which is defined as long distance commuting undertaken during the week or month to other destinations in the UK, when not commuting to London) are:

* employees who are engaged by multinational firms, that have branches in different locations throughout the United Kingdom and whose work commitments involve attendance on duty at the said branch offices - for at least part of the working week or month.

Table 7.12: What 'Multi-Destination' LDCs Do On Days When They Are Not Commuting To London

Frequency of Commuting to London	Work at Home (between 1-4 dys)	Visit Outside Firms (between 1-3 dys)	Work at Branch Office (between 1-4 dys)	Not Work Some Days (between 1-4 dys)	Stay Over in London (between 1-3 ngt)	Total		Cum. %
						No	*% of total sample (n=200)*	
2 days per week	2	7	21	-	5	35	*17.5*	*17.5*
3 days per week	1	4	10	-	2	17	*8.5*	*26.0*
4 days per week	1	4	3	2	-	10	*5.0*	*31.0*
TOTAL (multi – destination LDCs who commute to London between 2-4 days per week)	4	15	34	2	7	62	*31.0*	-

Notes:

1. Multi-destination LDCs seemingly commute to work in London between 2 - 4 days per week. Table 7.12 shows how they spend the rest of the working week.

2. Data in percentage column are relative to the total number of LDCs in the sample (i.e. 200).

* the self employed - in that they own or operate their own business, or

* professionals - who work as consultants to large companies, mostly on engineering projects.

These are the reasons, stated on the questionnaire, by interviewees for the journeys made to multi-work destinations.

`In the case of the multinationals or the self employed, they may opt to relocate to an area, where markets are conducive to profits - if present location is stagnant to profitable trading. Or where high location cost reduces the business' ability to operate profitably (Laurier, E; Philo, C, 1999). Such changes would also influence the direction of work journeys, made by the self employed.

Secondly, and in the latter case, the work projects in which consultants are engaged are not long term. Once such employment has ended, their journeys would switch again to where new employment is found.

The above also marks a distinct difference between long and short distance commuting. The flexibility and adaptability, offered by long distance commuting, could never be accomplished by short distance commuting, because of the changing geography of work places, which involve long distance commuting or because of the temporal nature and changing conditions, attached to self employment, or consultancy work, which as this survey has shown, involves travelling long distances to wherever the job is located.

The above remains a salient feature of the type of long distance commuter, unearthed by the study, who during the course of the working week or month is involved in commuting to multiple work destinations – including London.

No comparable data exist, for example, in the National Census, the Census of Employment or National Travel Survey, with which to compare this finding.

What information that exists (Time Used Surveys, DFT 2003) show that when part time workers are not on the job, they are engaged on non-job interests during the rest of the working week. Some of which involve leisure activities, shopping and nursery care.

The study's findings will further bring new light to an area of long distance commuting, where very little is known or published.

It is hypothesised that 'multi-directional' long distance commuting may be influenced by such factors as age, income, distance travelled, employment opportunities to name a few. The above findings will be tested, on part time sector groups within the sample, in the appropriate context of Chapter Eight.

7.4.3.3: GENUINE PART TIME COMMUTERS

In contrast to the previous analysis, there is evidence in this study of workers who are genuinely involved in part-time commuting. Table 7.13, for example, indicates that the majority of part-time LDCs are working on some of the days, when they are not

Table 7.13: Factors Contributing to Less Frequent Commuting – by Part-Time LDCs

i) Nature of Work and Non-work Activity

Frequency of Commuting to London	Work at Home (between 2-3dys)	Work at Tel. Centre (between 2-4dys)	Stay Over in London (between 1-3ngt)	Not Work on Off- Days (between 1-3dys)	Total		*Cum. %*
					No	*% of total Sample (n= 200)*	
2 days per week	6	-	6	2	14	*7.0*	*7.0*
3 days per week	16	1	3	1	21	*10.5*	*17.5*
4 days per week	8	-	-	2	10	*5.0*	*22.5*
TOTAL (part-time LDCs who commute to London between 2-4 days per week)	30	1	9	5	45	*22.5*	-

ii) Long Working Hours

Frequency of Commuting to London	5-6		7-8		9-10		11-12		Total	
									No	*% of total Sample (n= 200)*
	no	%	no	%	no	%	no	%		
2 days per week	-	-	2	*1.0*	5	*2.5*	2	*1.0*	9	4.5
3 days per week	3	*1.5*	6	*3.0*	6	*3.0*	-	-	15	7.5
4 days per week	1	*0.5*	8	*4.0*	12	*6.0*	-	-	21	10.5
TOTAL (part-time LDCs who commute to London between 2-4 days per week)	4	*2.0*	16	*8.0*	23	*11.5*	2	*1.0*	45	22.5

Note: 1. Part-time LDCs commute to work in London between 2 - 4 days per week. Table 7.13 shows how they spend the rest of the working week
2. Data in percentage column are relative to the total number of LDCs in the sample (i.e. 200).

commuting to London. Although, in this respect we do not know the nature of the work that they are involved in.

At least fifteen percent of part-time LDCs work at home, between two to three days per week, when they are not commuting to jobs in London. Whilst 4.5 per cent of part-time LDCs exercise the option to overnight in London, between one and four nights per week – in preference to regular long distance commuting (Table 7.13, Section 1).

By contrast, there are five LDCs in the sample (Table 7.13, Section 1, col.5, row 4), who are genuine part-time commuters – in the sense, that they do not work on the days, when they are not commuting to London.

King and Leibling (2003) indicate that part-time LDCs are different from other groups involved in LDC. In that, they commute less frequently. But by contrast work long hours.

In this study, part-time commuting is also linked to long working hours (Table 7.13, Section (ii), columns 4-5) and less frequent commuting. This remains true for both types of part-time commuters identified above.

Yet, it is clear that the above factors are exogenously affected by changes in working methods (i.e. working at a telecommunications centre) and flexible working arrangements (that is (a) not working some days or (b) working at home some days).

The commuting characteristics of the part-time workers, reported above, may be different from other workers in the study. But it cannot detract from the fact, that within the developing trend of LDC to Greater London, these workers form a constituent part of the core workforce, who are involved in such movements. Flexible working arrangements, in particular, are creating a new work style and pattern of commuting for part-time workers - within the general trend of LDC to Greater London.

7.4.4: Nature and Characteristics of Full Time Workers Involved in Long Distance Commuting

The evidence of history (Jackson, 1973), and follow-up studies on labour migration, housing and commuting (Cameron and Muelbauer (2000) indicate that many of those involved in long distance commuting to London were:

* originally London's workers, who moved residence to a rural location - aided by public policies on housing migration. But further aided by improvements in public transport (particularly rail) commuted back to jobs, which they retained in London,

* migrant workers to the London labour market, who first obtained a job in London but then chose to live rurally.

A new factor, in the development of long distance commuting to London has been detected by the study.

Table 7.14: Where Current LDCs Previously Lived and Worked

Previously Lived	Previously Worked												Total	
	C/Ldon		O/Ldon		Locally		Other UK		Europe		First LDC			
	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Locally[2]	14	*7.0*	10	*5.0*	76	*38.0*	12	*6.0*	1	*0.5*	23	*11.5*	136	*68.0*
C/L'don	-	-	-	-	1	*0.5*	-	-	-	-	-	-	1	*0.5*
O/L'don	6	*3.0*	9	*4.5*	8	*4.0*	1	*0.5*	-	-	-	-	24	*12.0*
Oth. UK Areas	7	*3.5*	3	*1.5*	11	*5.5*	10	*5.0*	-	-	-	-	31	*15.5*
Europe[4]	1	*0.5*	-	-	3	*1.5*	-	-	3	*1.5*	1	*0.5*	8	*4.0*
Total													200	*100*

Notes:

1. Figures in italics are expressed as a percentage of the total 200.
2. Local areas include Cardiff, Bristol, Bath, Swindon etc.
3. Other UK Areas include Scotland, Yorkshire, Manchester, Birmingham, Liverpool to name a few.
4. Europe and overseas include France, Israel, USA, Canada, South Africa and Kenya

Table 7.14 shows that a minority (12.0 %) of survey residents, now involved in long distance commuting to London, originally lived in London but are now commuting from the study area to London (Table 7.14, cols. 2-7, rows 2-3). They provide some evidence of London's residents who moved out of London, but are reverse commuting to jobs in the Capital. We do not know, however, that they have made the two moves at the same time or necessarily in the same order.

In addition, nineteen per cent of those now commuting long distance to jobs in London were previously resident in other areas of the United Kingdom and mainland Europe (Table 7.14, cols. 2-11, rows 4-5).

Where historically, it was considered that long distance commuters first obtained a job in London and then moved out, this study has found that:

* 68 per cent of respondents, currently involved in long distance commuting to London, were in fact local residents, of whom, 38 per cent were previously involved in short distance commuting to local jobs (Table 7.14, col.15, row 1).

Labour migrants (6.5 %), who previously lived and worked in other UK mainland areas or Europe, prior to taking up residence locally and commuting to jobs in London, help to complete the above background analysis (Table 7.14, cols. 8-11, rows 4-5).

The above required further examination. In particular, to establish how long LDCs were in residence locally compared with employment in Greater London. The parallel picture, with regard to local residence and local employment was presented in the previous paragraphs and in Table 7.14.

The evidence of Table 7.15 is typical of what is to be expected in the relationship between period of occupancy in present residence compared with length of employment in current job. LDCs, for example, who have been in current residence between one and two years or three and four years, have spent a similar time in employment – mostly in Central London. By contrast, the remainder of surveyees have spent a longer period of occupancy in current residence than they have spent in present employment in London

Table 7.15, above all, reflects that LDCs in the study (including those previously shown to be SDCs) have, within the past 1 - 6 years (in some cases longer), been commuting to jobs in the Capital - whilst retaining local residency.

Table 7.15: Length of Stay at Current Address and Employment

Location of Residence for LDCs in the Study and Length of Stay		Length Of Period Employed in Present Job (Years) In															
		Central London							Outer London							LDCs	
		< 1	1 - 2	3 - 4	5 - 6	> 6	Total	%	< 1	1 - 2	3 - 4	5 - 6	> 6	Total	%	Total	%
Bristol and Environs	under 1yr	1	-	-	-	-	1		2	3	-	-	-	5			
(Cluton, Yate, Bones	1-2 yrs	-	-	-	1	1	2		-	1	-	-	-	1			
Winterbourne, Keynsham	3-4 yrs	2	1	5	2	3	13		-	-	-	-	-	-			
Chew Magna, Iron Acton)	5-6 yrs	-	1	2	4	1	8		1	-	1	-	-	2			
	> 6 yrs	3	2	2	-	4	11		-	-	-	1	1	2			
Total (Bristol)							35	17.5						10	5.0	45	*22.5*
Bath and Environs	under 1yr	-	2	1	1	-	4		-	-	2	2	1	5			
(Chew Valley, Oathill	1-2 yrs	-	2	-	-	1	3		-	1	-	-	4	5			
Bradford on Avon, Holt,	3-4 yrs	-	1	2	-	3	6		-	-	1	-	-	1			
Gurney Slade, Trowbridge)	5-6 yrs	-	-	2	-	3	5		-	1	-	-	1	2			
	> 6 yrs	1	1	1	2	3	8		-	2	1	-	3	7			
Total (Bath)							26	13.0						20	10.0	46	*23.0*
Chippenham & Environs	< 1 yr	1	-	-	-	-	1		1	-	-	-	1	2			
(Calne. Bremhill, Corsham	1-2 yrs	-	-	-	1	1	2		4	-	3	-	1	8			
Marlborough, Devizes	3-4 yrs	2	1	2	2	3	10		2	-	1	-	-	3			
Melksham, Bromham)	5-6 yrs	-	1	2	2	1	6		-	2	-	1	-	3			
	> 6 yrs	3	2	2	-	5	12		-	-	5	-	3	8			
Total (Chippenham)							31	15.5						24	12.0	55	*27.5*
Other Areas	< 1 yr	-	-	-	1	-	1		1	-	-	-	-	1			
(Gloucester, South Wales	1-2 yrs	-	1	-	3	1	5		-	-	-	-	1	1			
Weston Super Mare	3-4 yrs	1	1	-	1	1	4		-	1	-	-	-	1			
	5-6 yrs	-	1	1	-	1	3		-	-	-	-	-	0			
	> 6 yrs	1	1	2	1	5	10		-	-	-	-	1	1			
Total (Other Areas - UK)							23	11.5						4	2.0	27	*13.5*
LDCs (Not Applicable)*		-			-	-	-	-	-	-	-	-	-	-	-	27	*13.5*
Total (All LDCs)																**200**	***100.0***

Notes: Figures in Italics are expressed as a percentage of the total 200. Data in Table 7.15 is typical of what is to be expected in the relationship between period of occupancy in present job and current employment. Between 1- 4 yrs LDCs have spent similar time in residence as in employ. In later years, they have either spent a longer period of occupancy in current residence than they have spent in employment or vice versa.

* Data in Table 7.15 is also intended to show LDCS, who lived and worked locally but at some point decided to commute long distance to London. LDCS who previously lived in mainland Europe and overseas (i.e.27) did not fit into this category – hence N/A to reflect the latter LDCs

This is contra to the evidence earlier identified (Section 7.4.4, paragraphs 1-3). It also represents a new development within the current trend of long distance commuting, which has not been seen elsewhere in published literature. As such, it represents a new find unearthed by this study.

It can be hypothesised, that factors such as higher education, training and skills, or income may be the determinants, which are motivating local residents to commute to jobs in London. As employment opportunities, suitable to inclination, skills or income may not be available locally. This will be examined further within the relevant context of Chapter Eight.

7.4.5: Long Distance Commuting Examined in Conjunction with Residence

For long distance commuting, in general, the rural location of residence is influenced by access to and speed of the transport link to the workplace (Vickerman, 1984); by income and social status (Benito and Oswald 1999; Faye, 1992); by increased flexibility of residential location, caused by improvements in public transport (in particular rail transport) and raised car ownership levels (Cross 1988), Franklin 1979); and by life cycle changes (Cross 1988).

These factors are present in the current study. The FGW service, for example, which operates between Bristol and Paddington, provides the fast rail link that enables workers to commute long distance from Bristol to the Capital. The study's workers are on high incomes, averaging between £15-25 k per annum at age 16-24 and between £35-95 k per annum in the higher age bands. Most are within the top three classification of occupations (SOC i - iii) (Table 7.16).

As expected, LDCs aged 16-24 (who are just starting off on the labour market) are less represented amongst the professional grades. But the reverse is true for LDCs within the prime working age groups of 25-34 and 35-44. It confirms the earlier evidence, cited in Section 7.3.

Table 7.16: Classification of Age by Average Income and Occupation

Age Group	Mean Income P.A.	Classification of Occupations			
		Mgm/ Admin	Prof Occup	A/prof & Tec.	Cler/ Sec.
		SOC 1	SOC 2	SOC 3	SOC 7
16 - 24	£ 15 - 25 k	-	1	3	-
(	£ 35 - 65 k	4	7	6	1
25 - 34 (	£ 66 - 95 k	2	3	2	1
(	£ 35 - 65 k	6	11	4	-
35 - 44 (	£ 66 - 95 k	7	3	8	1
(	£ 35 - 65 k	7	5	7	-
45 - 60 (	£ 66 - 95 k	22	9	6	-
Over 60	25 k	-	--	1	-
	75 k	-	1	-	-

The previous analysis (Section 7.4.4) above showed that most (68 %) of the study's long distance workers, chose to retain local residence, whilst making centripetal long distance journeys to jobs in Greater London.

In addition to the above, two further factors have emerged, which have influenced (or which have bearing) on the location of workers' residence.

7.4.6: Effect of Life Cycle Changes on Location of Residence

The first is the new effect discovered of life cycle changes on the location of LDCs' residence. The previous evidence (Bonheim and Taylor (2000), King and Leibling 2003) of life cycle changes on commuters' choice of residence indicated that:

.* it was the young, aged 16 - 24, who chose to live in executive inner city housing (as evident in Leeds and London) close to the workplace, and

* those with families, or living in a family household of 3 or 4 members, aged 35- 44, who chose to live rurally - but commuted back to jobs in London.

The evidence of this study (Table 7.17) is:

* that workers, within the age group 16 - 24 and 25 - 34, have been residentially mobile. In each case, the tenure of residence, at either previous or present home, has been short stay - that is no more than 3 - 4 years.

Table 7.17: Age by Length of Occupancy at Previous and Present Addresses

	Living at Previous Address (Yrs)							Living at Present Address (Yrs)						
Age Grp.	< 1	1-2	3-4	5-6	7-8	9-10	Ln.	< 1	1-2	3-4	5-6	7-8	9-10	Ln.
16-24	1	1	2	-	-	-	-	2	2	-	-	-	-	-
25-34 2 A hse hld	2	12	10	1	-	-	-	12	11	5	4	-	-	-
35-44 3/4 Fam hse	-	15	21	13	11	8	4	9	11	17	15	4	6	8
45-60 3/4 Fam hse	2	11	14	16	7	12	22	6	8	6	14	4	10	37
Over 60	-	-	-	2	-	-	-				1	1		1

Notes:
1. Ln - indicates a tenure of residence longer than the years previously specified.
2. 2 A hse hld - two adult household
3. 3/4 Fam. hse - family household of 3-4 members

* The older age group of LDCs (aged between 35 - 44 and 45 - 60 years) have been relatively more stable. Table 7.17 shows that this consisted of families or those living in family households of 3 or 4 members.

* The result is that both groups of workers have chosen to retain local residence, whilst maintaining commuting links with Greater London.

The study's evidence on the effect of life cycle changes on long distance commuting expresses a characteristic of commuters (either in short or long distance commuting), which has not been seen before in published literature and represents a new finding.

In addition to the above, Bonheim and Taylor (2000) indicate that a change of job usually brings improved income, which workers used to acquire better housing.

Table 7.18: Correlation of Change of Residence with Change of Job

	Mean	Std Deviation	N
Time employed in current job (yrs)	4.71	4.23	198
Living at present address (yrs)	4.58	3.29	198

			Time employed in current job (yrs)	Living at present address (yrs.)
Spearman's rho	Time employed in current job (yrs.)	Correlation coefficient	1.000	.196 **
		Sig. (2 – tailed)		.006
		N	198	198
	Living at present address (yrs.)	Correlation coefficient	196 **	1.000
		Sig. (2 – tailed)	.006	
		N	198	198

** Correlation is significant at 99 % level (2-tailed), (p > .01).

It is observed in this study, that there is a correlation, at the 99 per cent level of significance (correlation coefficient = 1.000, $p > .01$), between change of residence and change of job - suggesting a move to better housing with increased income or a move resulting from increase(s) in family household (Table 7.18). It is observed from the evidence of Table 7.17 that most people did not change job or residence at the same time, but some did.

Whereas, with a change of job and/or improved income, London's commuters tended to move to rural areas, where better housing stock at more affordable prices, is available than in London. LDCs in the study, tended to transfer residence within the home area.

It marks an interesting difference to previous evidence on the subject.

7.4.7: Factors Which Might Affect the Growing Tendency Towards Long Distance Commuting

A balanced view has to be taken (or presented) of the factors, which on the one hand aid the development of LDC to London. This was the focus of Sections: 7.4.3 – 7.4.6. As well as the factors (analysed in this section), which might militate against the latter tendency. The two issues need to be examined in tandem, if a fuller or balanced insight is to be gained of the issues that affect long distance commuting (at the sub level) to Greater London.

LDC, for example, is expensive in terms of cost, time and the energy expended on the journey. An innovative idea that arose from the study (given that the study is unaware that the topic has been examined elsewhere in published literature) was to determine in what circumstances LDCs might wish to switch from LDC to SDC – thereby giving up long distance commuting. Also would such factors substantially alter LDCs' predisposition to long distance commuting.

The response to Question 4.5 of the LDC Questionnaire (Appendix 2) – presented below for ease of reference – provides the basis for this analysis.

Q4.5 Suppose you had the choice between two options. Option A represents the example of living remote from the job (in a rural locality) and commuting long distance. Option B represents living in an urban area closer to the workplace. These are set out below.

Housing Option A	**Housing Option B**
Property similar to your present one, in similar location, at current price. (i.e. as now.)	Similar Property, in similar area, costing £50k more in London, or nearer workplace.
Involves long distance commuting of approximately 80 minutes each way by rail.	Involves approximately 35 minutes commuting to work by underground rail.
Fare: £22 per day	Fare: £8 per day

Which option would you choose? _____

7.4.7.1: Predisposition to Long Distance Commuting

Table 7.19 LDCs' Choice - Given Options A or B Under Question 4.5 of LDC Questionnaire

	No	%
Option A	156	78
Option B	34	17
Not stated	10	5
Total	200	100

The study found that the majority of LDCs are predisposed to long distance commuting.

* 78 per cent of LDCs chose Option A – thereby opting to maintain the status quo (Table 7.19, col.3, row 1).

But when asked to consider, which of the following factors would be sufficient to bring about a change of mind (Question 4.6, LDC questionnaire cited below):

Q4.6 If you chose Option A, which of the following factors would be just sufficient to make you change your mind?

Increase in cost of commuting by £ _____ (Please state amount of increase per week/month/year)

Increase in mortgage/rent by £ _____ (Please state amount of increase per week/month/year)
Increase in journey time by _____ mins. _____ hours (per week)
Other (please specify) ____

* 37 per cent, the highest number of LDCs, with a predisposition to LDC, indicated that an increase in journey time of 144 minutes per week (representing the mean increase in journey time) is likely to bring about such a change (Table 7.20, Section 1, row 13).

* 25 per cent, the second highest category with an inclination towards LDC, indicated that an increase in commuting cost of £ 50 per month – representing the mean cost increase- would force a change of mind (Table 7.20, Section 2, row 15).

Table 7.20: Factors Which Affect LDC's Who Have a Predisposition to LDC (Option A) and Others Who Do Not (Option B)

Option A: Respondents who are predisposed to LDC, but could change mind if the factors cited in Sections 1-3 below materialise

Increase in journey time (minutes per week)

Section 1	No	%
1 – 30	9	5.8
31 – 60	15	9.6
61 – 90	5	3.2
91 – 120	5	3.2
121 – 150	3	1.9
151 – 180	0	-
181 – 210	0	-
211 – 240	1	0.6
241 – 270	2	1.3
271 – 300	6	3.9
Greater than 300	12	7.7
Total	58	37.2
Mean increase J/time = 144.3 mins. p wk		

Increase in commuting cost (£ per month)

Section 2	No	%
1 – 10	7	4.5
11 – 20	10	6.4
21 – 30	3	1.9
31 – 40	5	3.2
41 – 50	0	-
51 – 60	2	1.3
61 – 70	0	-
71 – 80	0	-
81 – 90	0	-
91 – 100	3	1.9
101 – 110	4	2.6
111 – 120	1	0.6
Greater than 120	5	3.2
Total	40	25.6
Mean increase com. cost = £50.25 p mth		

Increase in mortgage/rent (£ per month)

Section 3	No	%
1 – 10	4	2.6
11 – 20	6	3.9
21 – 30	2	1.3
31 – 40	2	1.3
41 – 50	2	1.3
51 – 60	0	-
61 – 70	0	-
71 – 80	0	-
81 – 90	1	0.6
91 – 100	0	-
101 – 110	0	-
111 – 120	3	1.9
Greater than 120	4	2.5
Total	24	15.4
Mean increase mtge/rent = £52.58 p mth		

Other Factors

Section 4	No	%
Lifestyle more important	2	1.3
Nothing would change mind	3	1.9
If partner's job move	2	1.3
Would not work	1	0.6
Do not like living in towns	2	1.3
Others	24	15.4
Total	34	21.8

Option B: Respondents who are not entirely predisposed to LDC and could opt for SDC with Inducements, but would revert to LDC if inducements dissipate

Increase in journey time (minutes per week)

Section 5	No	%
1 – 10	0	-
11 – 20	3	8.8
21 – 30	6	17.7
31 – 40	1	2.9
41 – 50	0	-
51 – 60	1	2.9
Greater than 60	1	3.0
Total	12	35.3
Mean increase J/time =29.7 mins. p wk		

Increase in mortgage/rent (£ per month)

Section 6	No	%
11 – 20	1	2.9
21 – 30	3	8.8
31 – 40	0	-
41 – 50	1	2.9
51 – 60	0	-
61 – 70	0	-
71 – 80	0	-
81 – 90	0	-
91 – 100	1	3.0
Greater than 100	4	11.8
Total	10	29.4
Mean increase com. cost = £65.50 p mth		

Increase in commuting cost (£ per month)

Section 7	No	%
1 – 10	1	2.9
11 – 20	0	-
21 – 30	3	8.8
31 – 40	1	2.9
41 – 50	1	3.0
51 – 60	0	-
Greater than 60	3	8.9
Total	9	26.5
Mean increase mtge/rent = £39.94 p mth		

Other Factors

Section 8	No	%
Combination of costs and lifestyle	2	5.9
Relocate	1	2.9
Total	3	8.8

Notes: 1. Data in percentage columns in Sections 1-4 (upper half of above table) are relative to total LDCs (156), who elected for Option A.
2. Data in percentage columns in Sections 5-8 (lower half of above table) are relative to total LDCs (34), who chose Option B.

* whereas, 15 per cent cited an increase in housing mortgage or rent of £ 52 per month (the average increase tolerated in housing costs) – as another reason, which could bring about a change (Table 7.20, Section 3, row 15).

* It was noticed that 21 per cent of LDCs, in this category (just over a fifth) would not change their minds. It is clear that these were hard core LDCs (Table 7.20, Section 4, col. 3, row 7).

7.4.7.2: Not Predisposed Entirely to LDC

By contrast, 17 per cent of LDCs in the study were not entirely predisposed to long distance commuting (Table 7.19, col. 3, row 2).

But although offering to accept the inducements, offered in Question 4.7(??) of the LDC Questionnaire, Appendix 2, they were unlikely to remain as SDCs – if such inducements dissipated over time. Table 7.20, Sections 5 – 8, give the factors under which LDCs having opted for short distance commuting with inducements, might revert back to LDC.

Overall, it would appear that factors such as the increase in journey time, commuting cost and housing costs (which on the above evidence may affect a switch from long distance to short distance commuting) may be dependent on such factors as gender, age, occupation or disposable income. They are factors, which will be examined within the more appropriate context of Chapter Nine.

It is also clear from the evidence of PDFH, 2005, that any response to the above factors is more likely to occur over the longer term. Two factors account for this. The first is the cost and upheaval of LDC respondents moving home. The second is the time taken, as in the case of Option A LDCS, for the increases in journey time, commuting cost and housing cost to materialise, or as in the case of Option B LDCs for the benefits/disbenefits of the inducements to be accrued. They are factors, which are less likely to affect the predisposition of the study's workers to long distance commuting – over the short term.

7.4.7.3: LDC - the Longer Term Prospect

The issue, discussed at Section 7.4.7, paragraph 1, was also examined in a temporal sense.

At the time of the survey, the evidence was that the majority of LDCs were involved in long distance commuting – some three to five years previous (Table 7.15, cols. 7 and 14). The question which arises: is to what extent this would be sustainable in the future? And, if not, was this likely to have an effect on LDC to Greater London in the future?

7.4.7.3.1: Sustainability of Long Distance Commuting

Question 5.1 was inserted in the questionnaire to ascertain how long, those currently involved in LDC, would continue to do so in the future. Also could the latter factor adversely affect the development of LDC to London in the foreseeable future?

Q5.1 Looking towards the future, even if you felt that your present employment was secure, for how much longer would you envisage commuting long distance?

Less than 2 years	☐	2-5 years	☐
6-10 years	☐	11-16 years	☐
Longer (Please state)___________			

Key Features of Table 7.21

The specific indications are that:

* almost a third of workers (24.1 % males, 8.0 % females) indicate that they will only continue to commute long distance up to two years (2005) in the future (Table 7.21, last col., rows 1 and 11).

* over a third of workers (29.7 % males, 6 % females) indicate that they will commute, up to five years (2008) in the future (Table 7.21, last col., rows 2 and 12).

* a fifth of workers (15.9 % males, 4.5 % females) indicate that they will commute long distance, up to ten years (2013) in the future (Table 7.21, last col., rows 3 and 13).

To focus only on the journey will tend to loose sight of the reason for such journeys - which is mainly work. The last group of workers, who would commute long distance up to 2013, best symbolises this.

Whilst a fifth of such workers will continue to commute until retirement, many in this group are in the age range 45-60 and are most likely at the top of their professional careers. It would therefore be disadvantageous to give up commuting. Yet given the age factor, the prospect of this group continuing to commute long distance in the future will be no longer than 5-10 years

For most female workers (14.7 %), whether married or single, the future prospect of long distance commuting is short term that is 2-5 years. Or until such time as they are ready to start a family (Table 7.21, last col., rows 1-2, in female section of the table).

Yet there are those (mostly male) who are self employed, either as consultants or own private businesses, who have indicated that they will keep going until they are no longer able to cope with the long journey. (Table 7.21, last column, row 6).

These factors express the longer term prospect for current LDCs, who are involved in long distance commuting to Greater London. It is clear that some workers, mostly those nearing the age of retirement and female workers who may be ready to start a family would stop commuting. But on current evidence (identified above), the longer term prospect for LDC to Greater London (for the next ten years at least) is not likely to be adversely affected in a substantial way.

Table 7.21: Future of LDC

Future of LDC (yrs.)	Age Group- Male LDCs										Total	
	16-24		25-34		35-44		45-60		Over 60			
	no	%	no	%	no	%	no	%	no	%	no	%
Male LDCs'												
Under 2	-	-	7	*3.6*	20	*10.3*	18	*9.2*	*2*	*1.0*	47	*24.1*
2-5	2	*1.0*	7	*3.6*	17	*8.7*	31	*15.9*	*1*	*0.5*	58	*29.7*
6-10	-	-	1	*0.5*	11	*5.6*	19	*9.8*	-	-	31	*15.9*
11-16	-	-	1	*0.5*	5	*2.6*	5	*2.6*	-	-	11	*5.7*
Longer	-	-	-	-	-	-	1	*0.5*	-	-	1	*0.5*
Indefinitely	-	-	-	-	1	*0.5*	-	-	-	-	1	*0.5*
Not stated	-	-	-	-	2	*1.0*	-	-	6	*3.1*	8	*4.1*
Total (Male LDCs)	2	*1.0*	16	*8.2*	56	*28.7*	74	*38.0*	9	*4.6*	**157**	***80.5***

Future Of LDC (Yrs)	Age Group - Female LDCs										Total	
	16-24		25-34		35-44		45-60		Over 60			
	no	%	no	%	no	%	no	%	no	%	no	%
Female Workers												
Under 2	1	*0.5*	7	*3.6*	5	*2.6*	3	*1.5*			16	*8.0*
2-5	-	-	5	*2.6*	5	*2.6*	2	*1.0*			12	*6.0*
6-10	1	*0.5*	1	*0.5*	4	*2.1*	3	*1.5*			9	*4.5*
11-16	-	-	-	-	-	-	-	-			-	-
Longer	-	-	-	-	-	-	-	-			-	-
Indefinitely	-	-	-	-	-	-	-				-	-
Not stated	-	-	-	-	-	-	1	*0.5*			1	*0.5*
Total (Female LDCs)	2	*1.0*	13	*6.7*	14	*7.3*	9	*4.5*			**38**	***19.5***

Source: On-Train LDC Survey (Bristol- Paddington), 2003

Note: Data in percentage columns are expressed as a percentage of the total in the survey group (200), of whom 186 (95 %) indicated that they would commit to LDC in the future. Five respondents did not state their age, which accounts for the total (males and females) of 195.

7.5 Conclusions

The intention in this chapter was two fold. First, to examine the key features of the data collected in the LDC sample and the extent to which the data reflects the characteristics of the parent population. Second, and arising from the first, to draw out observations or hypotheses, which can give some insight into the nature and characteristics of the LDCs under study, which can then be used in the advancement of the study's objectives.

Findings Emanating from First Objective

The study indicated that if a sample was to bear validity, then it must reflect the characteristics of the population from which it was taken. The characteristics of the 2001 journey-to-work Census – representing in this case the characteristics of the parent population – was compared (where possible) with the characteristics of the LDC sample

The study found that in terms of the core features of LDC – distance, age, occupation and economic activity – the sample very largely reflected the characteristics of the parent population.

Differences between Sample and LDC Parent Population

Some important differences, between the sample and LDC parent population (Census 2001) were also noted. In terms of demography, the sample differed from the general LDC population in two respects:

* First, the LDC sample contained slightly older workers than the Census.

* Secondly the sample, compared with the Census, is predominantly male.

This is not unusual. Male workers have been the dominant gender in long distance commuting. But since 1991, more female workers (including those involved in LDC) have been coming on to the labour market (Howe, 1997). Both the LDC Sample and Census reflect this – except that the LDC sample contains more male LDCs than the Census.

The above evidence also underlines the fact, that LDCs who reside in areas furthest from London, compared to their short distance counterparts, tend to be older and predominantly male.

The latter was also apparent, when the occupational skills of LDC workers in the sample were compared with the occupational skills of LDCs in the Census. The study found in the case of LDCs (or those living furthest from the job), that they were more highly skilled (SOC 1-3) than SDCs and hence wealthier – by virtue of greater income.

Findings of Second Objective

The second objective was undertaken so as to examine under developments, which may be occurring within the main body of LDC to London. But which may have been concealed within the aggregated nature of the census data, used in the analysis of

Chapter Four. This was part of the methodology adopted by the study and is fully explained in Chapter Three.

The study found that the traditional form of long distance commuting, from fixed rural residence to a fixed workplace in Greater London is still maintained. But a number of new patterns have emerged.

Whereas, it was previously considered that workers first obtained a job in London and then moved out. But aided by improvements in transport, reverse-commuted to the jobs, which they retained in London. The study found that there were a number of local residents, who previously worked locally. But who have retained residence and are now commuting long distance to London. This was contra to conventional thinking on the subject.

Also discovered are a number of workers, who commuted to London two to four days per week and who seemingly could be mistaken for part-time workers. But when followed up (e.g. as to what they did on days when they were not commuting to London), the study discovered that they were commuting to other work destinations in the UK – part of the hub activity these days of commercial and business life. This represented an important new finding, which was not seen elsewhere in published literature.

With regard to the genuine part timers, the study found that part-time commuting is still associated with working long hours and less frequent commuting. But the study also found that part-time commuters were affected more by changes in working

CHAPTER EIGHT

TESTING THE HYPOTHESES OF CHAPTER SEVEN FOR SIGNIFICANCE

8.0 INTRODUCTION

This chapter aims to test the hypotheses obtained in Chapter Seven to determine whether they are statistically significant. If true, to compare the said findings or results, where relevant, with pertinent findings from commuting studies elsewhere (e.g. SWT's rail study, 2005), to establish whether they are specific to long distance commuters and in fact could not be attributed to other sub-groups (e.g. MDCs or SDCs) within the commuting population.

If the findings of Chapter Seven (now tested in Section 8.4) are found to be significant and if they are solely characteristic of long distance commuters - then this would validate the new findings, revealed by Chapter Seven, and throw important light on some of the developments that have been taking place in long distance commuting to London (at least from South West England). This remains a major focus of the thesis.

8.1: STRUCTURE OF CHAPTER

Towards this objective, Section 8.2 will describe the data employed in the hypothesis test. The succeeding section (8.3) will focus on the appropriateness of the hypothesis test for testing the significance of the hypotheses unearthed in Chapter Seven. Section 8.4 will report the main findings of the tests. This will be followed by the conclusions in Section 8.5

methods (e.g. working at a telecommunications centre) and flexible working arrangements (i.e. working at home some days or not working some days), than the traditional links earlier expressed.

The commuting characteristics of part-time commuters, reported above, may be different from other workers in the study. But it cannot detract from the fact, that within the developing trend of LDC to Greater London, these workers form a constituent part of the core workforce, who are involved in such movements. Flexible working arrangements, in particular, are creating a new work style and pattern of commuting for part-time workers - within the general trend of LDC to Greater London.

It was also these factors, which are giving rise to new patterns of long distance journey-to-work movements undertaken by part-time LDCs.

A number of hypotheses, relative to the above findings, were also raised. These will be examined further within the appropriate text of Chapter Eight.

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Each of the above factors will be examined in sequence.

8.2 DATA EMPLOYED IN HYPOTHESIS TESTS

The statistical tests are based around two main data sources, which comprise:

* The study's LDC sample data.

This is the main data used, given that the ensuing tests are based on sub-groups within the sample.

Other data will be used, where relevant, in support of the analysis to be undertaken. This is specified as follows:

For the analysis, in which LDCs are compared with SDCs and MDCs – in terms of access distance to railhead - data from South West Trains rail study (2005) will be used for this exercise. The latter is a large dataset, which comprises 13,300 observations, which were based on commuter journeys, made in 2005, by SWT's season ticket holders.

The data contains a mix of commuter journeys, undertaken over long distances (e.g. 110 miles), medium distances (between 21 and 60 miles) and short distances in the region of 1-20 miles. The data therefore had the essentials, which were considered quite appropriate for use in the ensuing tests.

In addition, the data also shows:

* the origin and destination stations, for the respective journeys made by SWT's commuters.

* the distance travelled (miles), by commuters in order to access their respective stations.

* the length of the respective journeys made between stations. An example of the above is given in Appendix 8.3.

The data was supplied by J Tyler of Passenger Transport Networks Consultancy.

Criteria Adopted for LDC, MDC and SDC

For working purposes, the criteria adopted for LDC in the following tests are as earlier defined in Chapter One, that is long distance commuting to London, which originate from outside the South East Region. For this purpose, the data is co-opted from the LDC Sample.

For MDC and SDC, the following criteria apply.

* MDC, for purposes of the ensuing analyses, is defined as a commuter rail journey, which is between 21 – 60 miles in length – irrespective of whether the journeys are made to London or elsewhere. The fact that the journeys are made on South West Trains means the said journeys are related to areas in South West England.

For comparative purposes, the latter provides the common base from which the LDC and MDC data (in terms of access to railhead) can be compared because they are related to the same region.

* SDC is a commuter rail journey, which does not exceed 20 miles. For working purposes, the conditions pertaining to the application of the MDC data (described above) also apply in the case of SDC.

8.3: APPROPRIATENESS OF HYPOTHESIS TEST -FOR TESTING THE SIGNIFICANCE OF THE HYPOTHESES UNEARTHED BY CHAPTER SEVEN

Conventional theory indicates that where inferences are made about a given population and where such inferences need to be tested, then the appropriate test is the hypothesis test (Coakes and Steed (2003); Dobson (2002); Fleming et al, 2002).

It is a factor, which is confirmed by studies undertaken in the British context (Attanasio et al, 2000; Blundell et al, 2004) and elsewhere (Hagen, 1997). With regard to this study, the hypotheses of Chapter Seven are based on a LDC sample, which is taken from a population of long distance commuters and from which inferences are made about the said population. This is in keeping with Neyman – Pearson's theory of the hypothesis test.

Each of the hypotheses, raised in Chapter Seven, is now tested in sequence.

8.4 Test 1: LDC's Access Distance to Railhead Compared with SDC's

Hypothesis

It was hypothesised (in Chapter Seven) that workers who make long distance work trips tend to live further from their station of rail access than those who make relatively shorter work journeys.

But to take the hypothesis one stage further, is the above factor also significant in terms of the distance:

* LDCs reside from their station of rail access compared with MDCs? Or

* MDCs reside from their respective station railhead compared with SDCs?

The three groups (LDC, MDC and SDC) represent important sub-groups within the commuting community and, as such, there is justification for examining the three groups within the hypothesis cited.

Objective

In accordance with criteria, stated at Section 8.0, to test:

a) Whether, in terms of access distance to railhead, LDCs reside further from their station of access than SDCs – as the first objective. The second objective (Test Two) would be to test whether the hypothesis is true in the case of LDC and MDC. The third objective (Test Three) would be to test the equivalent relationship (in terms of access to railhead) between MDCs and SDCs.

b) If condition (a) is true, to ascertain whether the difference between the respective groups is statistically significant.

c) whether the condition stated at (a) above (in respect of LDC and assuming that it proves significant) is solely characteristic of LDC or whether it could also be attributed to other groups, such as MDC, within the commuting population.

The null hypothesis adopted is that no significant difference exist between the respective pair of the groups being tested.

The Main Test

For the main test, the method of testing employed is the confidence interval approach (Coates, 2000; Dobson 2001), using (a) the formula for the Z – statistic. This is the standard application, (based on the theory of normal distribution), where the difference in sample means between independent groups is tested for significance.

A summary of the results is presented in Table 8.1. The supporting evidence, in terms of the data used in the calculation; the computation of the mean, standard deviation and standard error of the difference between the means are given in the Appendices (at App. Tables 8.1, 8.2 and 8.4).

In terms of the test, we found that by comparing LDCs with SDCs, there is a difference in the mean distance ($\bar{x}$ = 8.5 miles) that LDCs reside from their station of rail access, compared with SDC's ($\bar{x}$ = 2.7 miles) (Table 8.1). To determine whether the difference is significant, we applied the test formula – using as input the data in Table 8.1. We found that the difference expressed by ($|Z| > |Z\alpha/2|$ i.e. 10.7 > 1.96) is significant at the 95 percent level of probability (Table 8.1).

Table 8.1 Summary Results Hypothesis Test 1

(	H_0: $\mu_{LDC} - \mu_{SDC} = 0$
Hypothesis (	H_1: $\mu_{LDC} - \mu_{SDC} \neq 0$
Significance level	$\alpha = 0.05$
	1. Study's LDC Survey data in respect
Data employed	of LDCs
	2. SWT's rail study (2005) data in
	respect of SDCs
Sample size (	n = 200 for LDC sample
(	n = 334 for SDC Sample
Mean access distance to railhead	LDC = 8.5 miles
	SDC = 2.7 miles
S.E. DIFF. means (LDC/SDC samples)	= 0.54
Critical value of $\pm Z\alpha/2 = \pm 1.96$	$Z = [(8.5 - 2.7) - 0]/0.54 = 10.7$
Conclusion: $|Z| > |Z\alpha/2|$ i.e. 10.7 > 1.96	

Source:

1. LDC Sample (in respect of LDC data).
2. SWT's rail study (2005) in respect of SDC data.

Note:
The supporting evidence, in terms of the data used in the above calculations; the computation of the mean, standard deviation and standard error of the difference between the means (LDC/SDC samples) are given in the appendices at App. Tables 8.1, 8.2 and 8.4).

We conclude, that the test result did not support the default hypothesis.

(H_0: μ_{LDC} - $\mu_{SDC} = 0$) - leading to the acceptance that there is a significant difference, between the two groups, in terms of access distance to railhead. The hypothesis of Chapter Seven, that LDCs tended to live further from their station of rail access than SDCs, is supported by the above result.

The above finding may also give the impression that, for LDCs who are already involved in lengthy journey to work movements, this would make the journey even longer. But the journey to work is a matter of time, relative to distance. So that the speed of travel (as in the case of LDCs' express train journeys to Central London) may have a much more decided influence.

Also in terms of access to railhead, the above finding may be a function of the fact that, rurally, LDCs live in wider geographical areas than SDCs who live in urban areas, where population density is more compact. An examination of the above found that the latter may not be necessarily true.

For example Loughton Station, which is located within London's M-25 Motorway cordon, has a large catchment area comparable to Bath Spa, Chippenham and Swindon on the study route. Chadwell Heath in Essex (but located on the eastern fringe of London) and Stanmore station, in the London Borough of Harrow, are also in a similar position.

However the same is not true for stations like Finchley Road and West Hampstead (both located within the London Borough of Camden) and Mill Hill Broadway (within the London Borough of Barnet), which have to compete with nearby underground stations for passengers commuting to central London.

8.4.1: Test Two:

LDCs' Access Distance to Railhead Compared with MDCs

The Main Test

As in the previous test, the same procedure was adopted in testing the second hypothesis. The edited results of which are presented in Table 8.2. The supporting evidence, pertaining to the data used in the above test and computation of the critical test factors (such as the mean, standard deviation, and standard error of the difference between the sample means) are given in Appendix 8 (i.e. App. Tables 8.1, 8.3 , 8.4).

Table 8.2 Summary Results Hypothesis Test 2

(	H_0: $\mu_{LDC} - \mu_{MDC} = 0$
Hypothesis (	H_1: $\mu_{LDC} - \mu_{MDC} \neq 0$
Significance level	$\alpha = 0.05$
Data employed	LDC Survey data in respect of LDCs
	SWT's (2005) data in respect of MDCs
Sample size (	n = 200 for LDC Sample
(	n = 236 for MDC Sample
Mean access distance to railhead (	LDC = 8.5 miles
(	MDC = 4.2 miles
S.E. DIFF. means (LDC/MDC Samples)	= 0.598
Critical value of $\pm Z \alpha/2 = \pm 1.96$	$Z = [(8.5 - 4.2) - 0]/0.598 = 7.19$
Conclusion: $\lvert Z \rvert > \lvert Z \alpha/2 \rvert$ i.e. $7.19 > 1.96$	

Source:

1. LDC Sample (in respect of LDC data).
2. SWT's rail study (2005) in respect of MDC data.

Note:

The supporting evidence, pertaining to the above calculations, are given in Appendix Tables 8.1, 8.3 and 8.4).

Based on the results of the test, expressed by ($|Z| > |Z\ \alpha/2|$ i.e. 7.19 > 1.96), we found that there was a significant difference, between LDC and MDC, in terms of how far either group lived from their station of rail access.

8.4.2: Test Three:

MDCs' Access Distance to Railhead Compared with SDCs'

The Main Test

Table 8.3 presents the summary results of the test conducted on Hypothesis Three. The supporting evidence is presented in Appendices at 8.2, 8.3 and 8.4 – in order not to subsume the main text.

A similar procedure, as applied in the previous two tests, was also adopted for Hypothesis Test Three.

Table 8.3 Summary Results Hypothesis Test 3

(	H_0: μ_{MDC} - μ_{SDC} = 0
Hypothesis (	H_1: μ_{MDC} - $\mu_{SDC} \neq 0$
Significance level	$\alpha = 0.05$
Data employed	As specified in footnote.
Sample size (	n = 236 for MDC sample
(	n = 334 for SDC sample
Mean access distance to railhead (	MDC = 4.2 miles
(	SDC = 2.7 miles
S.E. DIFF. means (MDC/SDC samples)	= 0.32
Critical value of $\pm Z\ \alpha/2 = \pm 1.96$	$Z = [(4.2 - 2.7) - 0]/0.32 = 4.69$
Conclusion: $\|Z\| > \|Z\ \alpha/2\|$ i.e. 4.69 > 1.96	

Source: SWT's rail study (2005) – in respect of MDC and SDC Samples.
Note:

The supporting evidence, pertaining to the above calculations are given in Appendix Tables 8.2, 8.3 and 8.4).

Based on the results of the test (Table 8.3), expressed by ($|Z| > |Z\ \alpha/2|$ i.e. 4.69 > 1.96), we found that statistically, there was a significant difference, between MDCs and SDCs, in terms of the average distance that either group resided from the stations of rail access.

We conclude, from this result, that Hypothesis Three is significant.

8.4.3: Test Four Commuting Characteristics of Traditional LDCs Compared with Characteristics of 'New Found' LDCs

This section examines the commuting characteristics of both the study's traditional and 'new found' LDCs – where in both cases long distance commuting are influenced by choice of residence. Also to determine whether in terms of their characteristics, there is a significant difference between the two groups.

Traditional LDCs

Previously, it was considered that most workers involved in long distance commuting to Greater London were formerly residents of London, who first found jobs in London and moved out to the suburbs. But with improvements in public transport (particularly rail) they reverse commuted to the jobs, which they retained in London. This is the conceptual thinking and there is evidence of this journey-to-work movement in this study.

New Found LDCs

But the study also found that the majority of its workers involved in long distance commuting were local residents, who had retained local residency and were commuting long distance to jobs in Greater London. This was contra to the conceptual thinking earlier defined and represented a new finding.

Objective

For purposes of the objectives stated at Section 8.0, it was necessary to ascertain: in terms of their characteristics (age, income) whether there was any difference between the two groups. If true, is the difference (s) statistically significant – at the 95 percent level of significance.

Null Hypothesis

The null hypothesis, stipulated in Table 8.4, is that in terms of their characteristics there is no difference between the two groups.

Table 8.4 shows the critical data, used in Hypothesis Test Four. For convenience the supporting evidence is presented in Appendix 8.6 – as to place the latter here would overpower the text.

The Main Tests

We first attempted to find out whether there was any difference between the characteristics of the traditional LDCs, earlier discussed and 'new found' LDCs. For this purpose, we used SPSS to test their mean age and mean income – given that they were characteristics, which were common in both groups and therefore served as a valid basis of comparison. Table 8.4 also shows the rest of the critical criteria applied in the test.

Table 8.4 :Critical Data and Summary Results Appertaining to Hypothesis Test Four

Hypothesis ((	$H_0: \mu_{TRAD} - \mu_{NEW} = 0$ $H_1: \mu_{TRAD} - \mu_{NEW} \neq 0$
Significance level	$\alpha = 0.05$
Data employed	LDC Survey data
Sample size	n = 138, broken down as follows: [3] New Found LDCs = 82 Traditional LDCs = 56
ANOVA Computed F-Value (ANOVA) Compared with Significant F-Value	New LDC / Trad. LDC Mean age: 42.10 / 45.54 Mean Income P.A: £70.69k / £82.07k **Difference between New Found and Traditional LDCs** 1) Age Computed F-Value: 3.663; DF: (1, 136); Significant F-Value: 3.92 (1, 120) df at (α = .05) level, or 6.85 at (α = .01) level Result: Computed F-value is less than the significant F-value shown above, at 95 percent level of probability. The difference, in age, between the two groups is not significant.
	2) Income Computed F-Value: 5.393; DF: (1, 111); Significant F-Value: 3.92 (1, 120) df at (α = .05) level, or 6.85 at (α = .01) level Result: Computed F-Value is greater than the significant F-Value at the 95 percent level of probability. In effect, there is a significant difference between the two groups in terms of mean income.

Source: LDC Sample

Note:

1. Test Criteria
The test criteria adopted for Hypothesis Test Four are as defined in Table 8.4, columns 1-2, rows 1-7. Only the edited results, pertaining to Hypothesis Test Four, are presented in Table 8.4. Details of the full calculation are given in Appendix 8.6.

2. New found LDCs and Traditional LDCs are as defined in Section 8.4.3 of the main text.

3. Data Pertaining to the Sample Size Used in the Above Test

This concerned (a) LDCs (i.e 93, ref Table 7.1), who were commuting full time to jobs in London and within whose ranks, 'new found' LDCs and traditional LDCs were found (Chapter Seven). The sample, used in the above test, also includes (b) part time commuters, who are considered a legitimate part of the test exercise, as amongst their members are workers (i.e. 45) who are 'new found' LDCs as well as traditional LDCs. This accounts for the sample size of 138.

Comparing the journey-to-work characteristics of both groups we found that: in terms of mean age $LDC_{TRAD.}$ (45.54 years) has a superior age difference compared to LDC_{NEW} (42.10 years). The same was true in terms of mean income ($LDC_{TRAD.}$ = £ 82.07 k p.a.; LDC_{NEW} = £ 70.69 k p.a.).

Use of ANOVA

As is standard practice (Coakes and Steed (2003), Dobson (2002), we undertook an ANOVA test, using SPSS, to determine whether the difference between the two groups in terms of their mean age or mean income was due to chance (or sampling error) or whether the differences, as cited between the two groups, were statistically significant and, if yes, to what degree of significance.

The edited results, emanating from the ANOVA, are given in Table 8.4. The supporting evidence is presented in Appendix Table 8.6 – for the reasons cited in the earlier tests.

Based on the results of the test, given in Table 8.4, we found:

* that the mean age of the LDC_{NEW} group was not significantly different to the mean age of the LDC_{TRAD} group (Table 8.4, col.2, rows 15 - 23).

For an explanation, pertaining to the above finding, we examined the age distribution of both the Traditional and New Found LDCs. This is presented in Table 8.5. We found that with the exception of one age category (mean age 39 years), there was very little age difference between the Traditional and New Found LDC groups. It is a factor which helps to underline the non-significant result obtained for 'age' in Table 8.4.

Table 8.5: Age Distribution – New and Traditional LDCs

Mean Age	New LDCs		Traditional LDCs	
	No	%	No	%
20	2	2.44	1	1.79
29	13	15.85	7	12.50
39	30	36.59	11	19.64
49	3	3.66	2	3.57
52	32	39.02	35	62.50
62	2	2.44	-	-
Total	82	100.00	56	100.00

Source: LDC Sample
Note
Data in percentage columns are relative to the total number in each group

By contrast, we found that the two groups were significantly different at the 95 percent level of probability in terms of the mean income earned per annum (Table 8.4,, col.2, rows 25 - 31).

Table 8.6: Income Distribution – New and Traditional LDCs

Mean Income (£ k.p.a)	New LDCs		Traditional LDCs	
	No	%	No	%
25	7	8.54	-	-
35	8	9.76	-	-
45	2	2.44	4	7.14
55	5	6.10	4	7.14
65	6	7.32	5	8.93
75	19	23.17	5	8.93
85	5	6.09	5	8.93
95	5	6.09	5	8.93
105	15	18.29	13	23.21
Sub- Total (rows 4-10)	72		41	
Income not disclosed [2]	10	12.20	15	26.79
Overall Total	82	100.00	56	100.00

Source: LDC Sample
Note
1. Data in percentage columns are relative to the total number in each group
2. Gives the number of LDCs, who (under Q 7.7 of LDC Questionnaire) had opted not to disclose their income

We found in the evidence, provided by Table 8.6, two contributory factors. The first was the effect on the mean of the size of income earned by both groups and, in particular, the distribution of income relative to the number of income earners in either group (Table 8.6, cols. 1-5).

Secondly, in relative terms, Traditional LDCs are the higher income earners – in every category between £45-65 k p.a. mean income levels and £85 – 105 k p.a. mean income levels. The exception was LDCs earning a mean income of £ 75k p.a.

The ANOVA test is variance sensitive and it probably explains, given the two factors earlier explained, why the difference between the two groups proved to be significant at the 95 percent level of probability.

At least, in one respect (income), there was a significant difference between the above groups, which led to the rejection of the default (H_0) hypothesis stipulated in Table 8.4.

8.4.4: Test 5 Commuting Characteristics of 'Multi-destination' LDCs Compared with Commuting Characteristics of Full Time LDCs

Hypothesis

It was earlier found (Chapter Seven), that although some workers in the survey commuted to Greater London two or three days per week. For the rest of the working week, they were engaged on work related activities, which included working at branch offices or visiting outside firms.

It is hypothesised that the determinants of the above LDC may emanate from factors such as age; or age reached in the work cycle; income and employment opportunities - wherever the latter exist for such workers. The latter, for example, would determine their respective journey to work movements – particularly in the case of the multi-destination LDCs. But it is not known, whether the same factors are the determinants of full time long distance commuting, or whether there is a difference. It is a hypothesis, which merits examination.

Null Hypothesis

The null hypothesis is that there is no significant difference between the 'multi-destination' LDCs, identified above, and full time LDCs – on the basis that their journey-to-work movements are governed by the same factors.

Objective

In accordance with criteria stated at 8.0, to test:

* whether in terms of their commuting characteristics, 'Multi-destination' LDCs differ significantly from full time LDCs – at the 5 % level of significance.

Main Test

Hypothesis Five was tested – using the procedure applied in the previous two tests. For the first part of the test, the analysis of the means, we used two independent variables, namely age and income – because they were characteristics, which appeared in both groups and therefore served as a common basis for the purpose of comparison.

Table 8.7 Critical Data and Summary Results Appertaining to Hypothesis Test Five

Hypothesis ((	H_0: $\mu_{F/TIME} - \mu_{MULTI\text{-}D} = 0$ H_1: $\mu_{F/TIME} - \mu_{MULTI\text{-}D} \neq 0$
Significance level	$\alpha = 0.05$
Data employed	LDC Survey data
Sample size	n = 155, broken down as follows: Full Time LDCs = 89 Multi-destination LDCs = 66
ANOVA Computed F-Value (ANOVA) Compared with Critical F-Value	Full LDC Multi. LDC Mean age 44.29 39.28 Mean Income P.A £74.04k £64.65k **Difference between Full Time and Multi-destination LDCs** 1) Age Computed F-Value DF Significant F-Value 10.248 (1, 148) 6.85 (1,120) df at (α = .01) level of significance. Result: Computed F-value is greater than the Sig. F-value at the 99 per cent level of probability.
	2) Income Computed F-Value DF Significant F-Value 4.644 (1, 128) 3.92 (1,120) df at (α = .05) level or 6.85 (at (α = .01) level. Result: Computed F-value is greater than Sig. F-value at 95 per cent level of probability.
	3. Employment Computed F-Value DF Significant F-Value 151.525 (1, 153) 6.85 (1,120) df at (α = .01) level Result: Computed F-value is greater than Sig. F-value, quoted Above, at 99 per cent level of significance.

Source: LDC Survey data (in respect of Full Time LDC and Multi-destination Samples).

Note:

1. Test Criteria
   The test criteria adopted for Hypothesis Test Five are as defined in Table 8.7, columns 1-2, rows 1-7.
2. Full time LDCs and Multi-destination LDCs are as defined in Section 8.4.4 of the main text.
3. Only the edited results, pertaining to Hypothesis Test Five, are presented in Table 8.7. Details of the full calculation are given in Appendix Table 8.7.

Using SPSS to conduct the above test, we found:

* that in terms of mean age $LDC_{F/TIME}$ (44.29 years) has a superior age difference over LDC_{MULTI} (39.28 years) (Table 8.7, col.2, row 9).

* the same factor was true in terms of mean annual income earned by either group ($LDC_{F/TIME}$ = £74 k p.a., compared with LDC_{MULTI} = £64 k p.a.) (Table 8.7, col.2, row 10).

As in the previous test, we applied the ANOVA to test whether the differences shown (above) between the two groups, were due to chance or sampling error. Or whether, the said differences between the two groups were statistically significant and, if yes, to what level of significance.

Based on the test results, stipulated in Table 8.7, col. 2, rows 13-20, we found that:

* the mean age of the $LDC_{F/TIME}$ group was significantly different from the mean age of the LDC_{MULTI} group – at the 99 percent level of significance.

Table 8.8: Age Distribution – Full Time and Multi-destination LDCs

Mean Age	Full Time LDCs		Multi-Dest. LDCs	
	No	%	No	%
20	-	-	4	6.06
29	14	15.73	15	22.73
39	27	30.34	27	40.91
49	3	3.37	2	3.03
52	44	49.44	17	25.76
62	1	1.12	1	1.51
Total	89	100.00	66	100.0

Source: LDC Sample

Note: Data in percentage columns are relative to total numbers in each group

The significance of the ANOVA test, on the age difference between full time and multi-destination LDCs, is best revealed when the age distribution (Table 8.8) between the two groups are compared. We found that in terms of the older workers (aged 52 years), there was a distinct difference (in absolute numbers) between the two groups (Table 8.8, cols. 1-3, row 6). There was however very little difference (in absolute numbers) amongst the younger workers (mean age 29-49 years) of the two groups of LDCs.

We also found that:

* the average annual income earned by $LDC_{F/TIME}$ was significantly different from the income earned by LDC_{MULTI} – at the 95 percent level of significance (Table 8.7, col.2, rows 21- 28).

Table 8.9: Income Distribution – Full Time and Multi-destination LDCs

Mean Income (£ k.p.a)	Full Time LDCs		Multi-Dest. LDCs	
	No	%	No	%
15	-	-	2	3.03
25	-	-	6	9.09
35	7	7.87	6	9.09
45	4	4.49	5	7.58
55	8	8.99	8	12.12
65	9	10.11	3	4.54
75	19	21.35	8	12.12
85	7	7.86	7	10.61
95	6	6.74	2	3.03
105	13	14.61	10	15.15
Sub- Total (rows 4-13)	73		57	
Income not disclosed [2]	16	17.98	9	13.64
Total	89	100.00	66	100.00

Source: LDC Sample

Note

1 Data in percentage columns are relative to the total number in each group

2 Gives the number of LDCs, who (under Q 7.7 of LDC Questionnaire) had opted not to disclose their income

Table 8.9 shows that the mean income earned by Full Time LDCs (relative to the earnings of their counterparts (the Multi-destination LDCs) in four areas (eg. mean income £65k, £75 k, £95k, and £105k) were sufficient to make a significant difference in mean earnings between the two groups of LDCs.

It was also important, given that it may have bearing on the nature or type of LDC undertaken by either group, to examine whether there was any difference between the two groups, in terms of employment oriented LDC movements, and whether the difference would be significant. Inevitably, the latter would determine journey to work movements – particularly in the case of the 'multi-destination' LDCs.

For the test, a code 1 was applied to LDCs who commuted full time to jobs in Greater London during the working week. This specifically related to the 'new found' LDCs. A code 2 was applied to LDCs, who spent part of the week working in London and the remainder working elsewhere – i.e. the 'multi-destination' LDCs.

Examined on the above factor, the test indicated that there was a significant difference, at the 99 percent level, between the two groups in terms of their journey to work movements (Table 8.7, col.2, rows 29- 35). This in turn would have been dictated by the location of employment relative to residence.

So where it was presumed, under the default hypothesis (H_0) stated earlier, that there was no difference between the two groups, we conclude with this result that Hypothesis Five is significant.

8.5: CONCLUSIONS

This chapter had set out to test whether the hypotheses, raised in Chapter Seven, were statistically significant.

Tests 1 – 3: LDCs Access Distance to Railhead Compared with MDCs and SDCs

The test established that there was a significant difference, at the 95 per cent level of probability, between LDCs and SDCs, in terms of how far either group resided from their respective station of rail access.

This test result matches Adcock and Lampkin's (1995), which was obtained a decade earlier (1995-2005), in respect of the catchment areas of the stations situated along the study route - (i.e. between Bristol in South West England and Paddington in Central London). A focus of this study (Section 8.0) has been to establish whether the above factor was solely characteristic of LDCs or whether it was also true for other groups (i.e MDCs) within the commuting community.

For this reason, LDCs' propensity to railhead was also tested against MDCs'. The test established that there was a significant difference between LDCs and MDCs, in terms of how far either group resided from their station of rail access.

For LDCs, who are already involved (distance wise) in comparatively longer work journeys than MDCs and SDCs, this might tend to lengthen their journeys to work even further. But as indicated earlier, the relative speed of travel may, in this respect, have a decided influence.

Also the indication, given by the evidence of Table 8.3, that MDCs tended to live further from their station of rail access than SDCs was evidence not seen elsewhere.

Test Four: Commuting Characteristics of Traditional LDCs Compared with Commuting Characteristics of 'New Found' LDCs

Two key features, common to both groups, were tested. These included the mean age and income levels of both groups.

We found that there were two factors, which made a significant difference between the two groups. We found that LDC_{NEW}, compared with LDC_{TRAD}, had a superior age difference. Also in terms of income, the mean annual income of LDC_{NEW}, compared with LDC_{TRAD}, was significantly higher.

Test Five: Commuting Characteristics of 'Multi-destination' LDCs Compared with Commuting Characteristics of Full Time LDCs

The same variables, as applied in Test Four, were also tried in Test Five. In addition, it was also considered that the location of employment, relative to residence, might also have a bearing on the journey to work movements of LDCs – in particular the multi-destination LDCs. This was also tested.

We found that there were three factors, which made a significant difference between the two groups. We found that $LDC_{F/TIME}$, compared with LDC_{MULTI}, had a superior age difference. The same factor was true, in terms of the mean income earned by $LDC_{F/TIME}$, compared with LDC_{MULTI}. The two groups were also different in terms of their pattern of commuting.

This is not surprising – given that LDC_{MULTI}, compared to $LDC_{F/TIME}$, were undertaking much more commuting to workplaces, located in London and other destinations, during the working week than their full time counterparts, who commuted from home to a fixed workplace in London.

Some limitations in the analytical approach were highlighted. But so too were the strengths, which helped to bring some understanding (in an otherwise complex situation) to the socio-economic and other characteristics of workers who are involved in long distance commuting.

CHAPTER NINE

FACTORS INFLUENCING LONG DISTANCE COMMUTING BEHAVIOUR

9.0: Introduction

This chapter examines some key factors, which influence long distance commuting behaviour.

Attention is focussed here on the journey time and cost elasticities for the study's LDCs. Given that either journey time or cost elasticity, is a response by workers to changes in journey time or cost which, as shown in Section 9.2, may be a function of age, cost, gender, frequency of travel, employment, income and distance, to name a few.

In addition, there are external factors (such as the strength of competition from other modes and generalised journey time), which are known to have significant effect on either journey time or fare elasticity (PDFH, 2005). These are fully discussed within the appropriate text of Section 9.2.

The above factors are now examined, as part of the overall objective of the study, namely to investigate factors, which may explain developments in long distance commuting to London.

A similar examination will be made in respect of the Value of Time for the LDC workers under study – given the intrinsic relationship that exists between value of time and time elasticity (DoT, 1987).

9.1 Structure of Chapter

Section 9.2 will examine the background factors, appertaining to the estimation of journey time elasticity. Section 9.3 will focus on estimating the journey time elasticities for the study's workers and the associated influences. This will be followed in Section 9.4 by an examination of LDC's alternative options – if in-vehicle journey time (IVT) exceeds maximum time tolerated. In Section 9.5 an estimation will be made of LDCs' fare elasticities and the associated influences. This will be followed in Section 9.6 by an examination of LDC's alternative options – if fares increase above maximum tolerated. Section 9.7 will deal with estimating the value of time for the study's commuters and comparison of findings with pertinent findings elsewhere. Section 9.8 will present a summary.

9.2 Background Factors Pertaining to Estimation of Journey Time Elasticity

By industry standards (PDFH, 2005), journey time is an important determinant for rail travel. Further, there is empirical evidence (Wardman, 1992; Wardman and Whelan, 2004) that journey time plays a significant part in the determinants of long distance commuting, both in respect of London and non-London flows.

But so too are the background influences. For example, with regard to long distance commuting flows (> 30 miles) to Central London, that is of the type which can be related to the journeys undertaken by workers in the study. It is the industry's view that journey time elasticities are significantly affected by the portfolio of the travellers they attract and the strength of the competition from other modes (PDFH, 2005).

There are also complexed longer-term effects on LDC's journey time elasticity, which involves changes in residential and employment location decisions. With respect to the study's LDCs, these were previously highlighted in Chapters Seven and Eight. There is also the effect of mode switching. Except that over time, the aggregate effect of these factors on journey time elasticity is thought to be relatively low.

Yet for long distance rail commuting to Central London, it needs to be said that commuters undertaking such journeys are likely to have less opportunities to change mode. Nor would they want to. Basically, because the LDC rail service, operating at peak commuter times, is direct (city centre to city centre) and is faster than competing modes. Except air commuting, which does not operate city centre to city centre and of which there is very little evidence in the United Kingdom, (or in this study, Section 9.6).

Whilst it is also accepted that one can commute by car door-to-door. The marginal cost is also cheap. It is however not a viable alternative for commuting long distance to London – given the congestion charging and parking restrictions that operate at the destination end.

A case in point, concerning the LDC rail service, is the express inter-city commuter services, which First Great Western operates between Bristol and Paddington, London. But there are also similar examples to be found on the remaining nine long distance rail commuting routes, which have been identified by the study (Chapters One and Two). Where, in long distance commuting, time is of essence these factors would have a significant influence on in-vehicle time elasticity for the surveyed population.

The effect of redistribution, through changes in house or job locations, is also likely to have an effect on journey time elasticity. Although, this is more likely to be long term. In the short term, the latter effect will be low (PDFH, 2005).

Some commuters (as found in the present study, (Chapter Seven) will also have their season ticket paid by the employer. Hence the 'medium' importance of money, in the consideration of journey time elasticity – a factor that will be returned to in Sections 9.3 – 9.5.

It is against these background factors that journey time elasticities are computed for the study's workers. This is undertaken below – starting at Section 9.3 and then up to Section 9.5. Steps will also be taken to isolate the factors, which are significant in explaining the said elasticities.

9.3 Estimation of LDCs' Journey Time Elasticities

Journey time elasticity is the industry's recommended method of calculating the effect of journey time changes on demand. The method of establishing (or calculating this) comes from either revealed preference models, which try to explain people's observed choices (e.g. of mode) in terms of the journey times, other attributes and the alternative options available. Studies using this approach include (Fowkes, Marks and Nash (1986), who adopted it as one method of analysing business travel in the 1980s.

But there is also evidence from stated preference research, which offers individuals hypothetical choices, involving direct trade-offs between prices and times. Studies using this approach include Job van Excel (2000), who used the method in a study of inertia of travel behaviour in a stated preference analysis of commuting in Holland.

The basis for the estimation of journey time elasticity in this study is based on the latter approach. Two questions (specified below) were inserted into the LDC questionnaire, which were aimed at evaluating journey time elasticity for the study's long distance commuters. These questions were related to:

* Basic journey time

  Q1.4: How long does the journey to work normally take one-way door to door? _____hours _____ minutes.

* Transfer Time

  Q2.1: If the journey time by your current means of travel were to get longer, what is the maximum amount of time that you would tolerate for the journey to work? _____ hours ______ minutes.

This was also in accordance with the schematic plan drawn up in Chapter Five for analysing the survey data.

Data, derived from responses to questions 1.4 and 2.1, were to form the basis of the calculations (undertaken by SPSS) to estimate the journey time elasticity, with respect to LDC, which are undertaken by workers in the study. The method of achieving this is presented in Appendix Table 9.1, as to present the calculations here would subsume the text. The main results of the calculation are presented in Table 9.1.

9.3.1 Computed Estimates of Journey Time Elasticities

Table 9.1: Passenger Demand Retained or Lost on Increases in LDC Journey Time

Passenger Demand	Journey Time Increased By		
	5 %	10 %	15 %
Retained	144	120	87
Fell off	11	35	68
Total	155		

Table 9.1 shows the composite results for absolute journey time elasticities, which reflect changes in the demand for LDC rail patronage, when IVT increases from five to fifteen percent.

The relative elasticities for increases in journey time, with respect to IVT, are then computed – using the Arc elasticity formula. This is undertaken in order to compare the findings with other pertinent studies. The main results are presented in Table 9.2.

Table 9.2 Journey Time Elasticities Estimated for Study's LDCs

% Δ JT	Elasticity
5 %	- 1.508
10 %	- 2.68
15 %	- 4.02

It is to be expected, that different elasticities will be obtained when in-vehicle journey time (IVT) are proportionately increased from five to fifteen per cent. But of significance is the fact that the 5 % journey time elasticity (-1.5) is somewhat higher than Wardman and Whelan's (2004) findings (-.607) for long distance journeys to London.

By contrast it is also clear, from Wardman and Whelan, that long distance commuters to London have higher journey time elasticities (-0.607) than their short distance counterparts (-0.431). The reason given is that LDCs are more time constrained.

The above evidence leads to an evaluation of the underlying factors, which explain the time elasticities obtained by this study. It is another focus of the study, which is pursued in the succeeding section.

9.4 Factors Influencing Journey Time Elasticity

A binary logit model is used to estimate the factors which affect LDC patronage, when IVT increases by ten percent – at the disaggregate level of detail. The basic form of the model is presented below. But it is from this basic form, that the functional form of the logit model, used in this exercise, is adopted. This is explained in the ensuing text.

$$\text{Logit (p)} = \ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1{*}X_1 + \beta_2{*}X_2 + \text{--------}\ \beta_n{*}X_n + \varepsilon \qquad (9.0)$$

Where, in the exercise under consideration

P is the probability in the dependant variable, (Tela10pc), that individual demand would be retained, if IVT increases by ten percent (Section 9.5 refers).

1-P is the probability of this not happening.

β_0, β_1, β_n are the parameter estimates for the independent variables.

X_1, X_2, X_n are the independent variables employed in the above model

Whereas ε is the unexplained random component.

Odds ratio P/(1-P)

are the odds in favour of an independent variable having an impact on the dependant variable and hence on demand, when IVT increases, for example, by ten percent which is the example used in this chapter.

Logit(p) is the natural log of the odds ratio (described above). As shown at (9.0), the log of the odds ratio is a linear function of the explanatory variables (X_1, X_2, ...X_n).

This is explained by two factors. First, the elasticity evidence of Table 9.1 (col.3) on which the ensuing analysis is based, approximates to a binary format, if the value of 1 is applied to the individual commuter who is retained when IVT increases by ten percent and the value (0) if the individual is not retained. In such circumstances, the binary logit model is the standard application (Gujarati, 1992).

The logit model applied is modelled on the above theory and takes the functional form (9.1) described at Section 9.5.

The alternative is the probit model, which produces similar results. But it is mathematically and comparatively more complexed in its application – hence the adoption of the logit model.

A major feature of the logit model is that the log of the odds ratio is a linear function of the explanatory variables. It is the latter factor, which partly explains the linear regression form of the logit model, specified at 9.1.

9.5 Logistic Regression Runs

The functional form of the logit model employed was only determined after three logit regression runs were made – using the binary logit application in the SPSS computer software. These were intended to prove three factors:

In the first run, all the variables that intuitively had some bearing on the subject. (Some of these are subsequently discussed in this Section) were tested to determine which would have a significant effect on demand – at the ten percent level of increase in IVT.

As expected, the model produced a high level of explanation ($R^2 = 0.86$).

But this was not satisfactory for working purposes. Given that the model contained a high number of independent variables, which were neither significant nor meaningful to the exercise in hand.

The second logit regression run contained more meaningful and sensible variables. Given that the insignificant variables found in the first model were deleted. But this produced a lower level of explanation ($R^2 = 0.76$).

This was accounted for by the removal of variables which were not significant and which only served to inflate the level of explanation.

A third change was to delete insignificant time bands. For example eight different time bands (ranging from time 1 to time 8) were originally entered into the model. Time 1 representing an average in-vehicle journey time (IVT) of 75 minutes and Time 8 representing an average IVT of 195 minutes.

Until this trial or entry process took place, it was not possible to determine whether any of the time variables provided a significant explanation for individual LDC patronage – If IVT increased by ten percent above the norm. This also assumed that all other factors remained constant.

Table 9.3: Results of Logit Regression on Journey Time Elasticity

Goodness of Fit	85.600
Nagelkerke - R^2	.661

Hosmer and Lemeshow Goodness-of-Fit Test Results

	Chi-Square	df	Significance
Goodness of fit test	1.5957	8	.9817

Significant Variables of Influence on LDC Time Elasticity

Influences & Assoc Variable		B	S.E.	Wald	df	Sig.
Constant		8.5189	5.9278	2.0652	1	.1507
1. Primary						
Age 4	Avg. age – 52 years	4.2874	1.9112	5.0326	1	.0249
Frequen 3	LDC three days per week	-7.8067	2.6129	8.9269	1	.0028
Time 6	Journey time 165 mins.	3.3077	1.9708	2.8169	1	.0933
Dist-B	Journey dist.(75-125 mls)	-1.9042	1.4221	1.7928	1	.1806
Clondemp	C/London employment	1.5970	1.4228	1.2599	1	.2617
2. Economic						
Inc 10	Mean income £95 k P.A.	-6.8109	3.7326	3.3295	1	.0680
Occup 2	Asst. Prof & Tech LDCs	-3.2375	2.0058	2.6052	1	.1065
Hse3wm	Hsehold 3 wkg members	-4.9237	2.6323	3.4989	1	.0614
Wrkstdhr	Work standard hours	-2.7329	1.9425	1.9794	1	.1595
Pcomvofm	Pt com & visit other firm	2.7293	1.8495	2.1776	1	.1400
Pcomsldn	Pt com & stay over L'don	-1.5560	1.3238	1.3816	1	.2398
Pcomwbof	Pt com. & visit b/office	.7032	.6224	1.2764	1	.2586
3. Life Style						
Whmtles	Work home & travel less	4.6592	2.2642	4.2343	1	.0396
Wlontles	Wrk longer hrs travel less	7.0870	3.8491	3.3900	1	.0656
Sldntles	Stay in L'don - travel less	2.5269	1.6108	2.4609	1	.1167
Purhobby	Pursue hobby	-4.0926	2.0179	4.1134	1	.0425
4. Other Factor						
Wrkcom	Work while commuting	2.5254	1.4897	2.8739	1	.0900

Note:

Table 9.3 shows the contribution of each of the predictor variables to the logistic model. The Wald statistic is used to examine whether each of the predictor variables in Table 9.3 makes a statistically significant unique contribution to the model (Dewberry, 2004).

In this model Age4 (p = .0249), Frequen 3 (p = .0028), Whmtles (p = .0396) and Purhobby (p = .0425) are significant, because the probability of every other predictor variable being significant (given in col.7, headed 'sig'. – an abbreviation for significance) is greater than .05

Apart from 'Time 6', which represented a mean IVT of 165 minutes for the single LDC journey outward, the remaining time bands were highly correlated with each other. Their level of significance, were also very low.

When the above time variables were deleted, the model's level of explanation became ($R^2 = 0.66$) percent.

The critical data, pertaining to the final model (Table 9.3) showed that the model's level of explanation ($R^2 = 0.66$) was reasonably high. The chi-square statistics (1.5957 for 8df and 0.991 significance) also indicated that the final model represented a very good fit to the data. Above all the model contained data, which were significant and meaningful to the exercise in hand.

The result is the final logit model, for ordered choices, which is specified as follows:

$$\begin{aligned} \mathrm{Ln}\,(P_{tela10pc} / 1 - P_{tela10pc}) = \; & \beta_0 + \beta_1 \mathrm{Age4} - \beta_2 \mathrm{Frequen3} + \beta_3 \mathrm{Time6} - \beta_4 \mathrm{Distanb} + \\ & \beta_5 \mathrm{Clondemp} - \beta_6 \mathrm{Inc10} - \beta_7 \mathrm{Occup2} - \beta_8 \mathrm{Hse3wm} - \\ & \beta_9 \mathrm{Wrkstdhr} + \beta_{10} \mathrm{Pcomvofn} - \beta_{11} \mathrm{Pcomsldn} + \\ & \beta_{12} \mathrm{Pcomwbof} + \beta_{13} \mathrm{Whmtles} + \beta_{14} \mathrm{Wlontles} + \\ & \beta_{15} \mathrm{Sldntles} - \beta_{16} \mathrm{Purhobby} + \beta_{17} \mathrm{Wrkcom} + \varepsilon \; \ldots\ldots (9.1) \end{aligned}$$

The criteria pertaining to the log of the odds ratio [ln (p /1-p)] in the above model was previously described at Section 9.4. This included reference to the dependent variable, Tela10pc. The terminology [In ($P_{tela10pc}$ /1 – $P_{tela10pc}$)] will be cumbersome to repeat often in the text. Therefore, for simplicity as well as for computational purposes in SPSS only the dependent variable (Tela10pc) will be used. But to all intent and purposes, it will have the same properties as the log of the odds ratio.

The independent variables used in the above model:

Age 4, Frequen 3, Time 6, Clondemp, Inc.10 ...... are more appropriately explained in Table 9.3, which relates to the above model.

ε in the above model is the unexplained random component

Table 9.4: Dependent Variable: Tela10pc – Time Elasticity (10 % Increase in IVT)

Nagelkerke $R^2 = 0.661$

Independent Variables	β	S.E.	Wald	Sig.
Constant	8.5189	5.9278	2.0652	.1507
Having Significant Impact				
Age 4	4.2874	1.9112	5.0326	.0249
Frequen 3	-7.8067	2.6129	8.9269	.0028
Whmtles	4.6592	2.2642	4.2343	.0396
Purhobby	-4.0926	2.0179	4.1134	.0425
Not Having Significant Impact, (but by contrast to the above are referred to in the text)				
Occup 2	-3.2375	2.0058	2.6052	.1065
Hse3wm	-4.9237	2.6323	3.4989	.0614
Clondemp	1.5970	1.4228	1.2599	.2617
Income 10	-6.8109	3.7326	3.3295	.0680
Time 6	3.3077	1.9708	2.8169	.0933
Wlontles	7.0870	3.8491	3.3900	.0656
Wrkcom	2.5254	1.4897	2.8739	.0900

Note:

Definitions pertaining to the above variables were given in Table 9.3

Table 9.4 shows the significant values (at the 95 % level of probability) computed for model (9.1). These have been extracted from Table 9.3.

9.6 Commentary on Results Obtained of Logit Computation

The results obtained from the SPSS logit computation are mixed. The constant term (8.5189), for example, is positive. But there are variations in the logit results that are above and below the line of best fit (Table 9.4).

Four explanatory variables (identified in the ensuing text) were found to have significant impact on demand when IVT increased by ten percent. Some were positive – indicating the likelihood of retention if IVT increased by ten percent. Others were negative – implying the opposite effect.

Negative Impact

Among the variables having a negative impact, all other factors holding constant, is journey frequency (Frequen 3) that is LDCs who commute to London three days per week. It is hypothesised that the reason for their appearance in the analysis is that they are less likely to cope with an increase in IVT of ten percent than say FREQUEN 2, those who commute less frequently or FREQUEN 4 and 5, who by regular commuting have a more built in tolerance to increases in journey time. This is supported by the fact that neither FREQUEN 2 nor FREQUEN 4 or 5 appear in the final analysis as significant.

Highly skilled workers, namely LDCs who are in Occupation Level 2 – Professionals, and who possibly might be allied to income level 10 with average earnings of £95k P.A. (but no correlation was found) would also be less adversely affected – if IVT increased by ten percent. It leads to the possible observation that workers in this category, relative to other workers in the survey, maybe less sensitive to an increase of ten percent in journey time. But the fact is that the alternative option, namely commuting long distance by car or by coach to central London on time consideration alone, is less attractive.

It is also envisaged that increases in IVT may also be far more disruptive on multi – worker LDC households (in this case households with 3 LDC members) than single LDC households. It probably explains the negative impact shown by Table 9.4 for the increase in IVT on the former group.

Positive Impact

By comparison, there were two variables, each of which had positive co-efficients and significant estimates ($p > .05$) at the 95% level of probability. This gives some indication that workers in such categories would be retained if IVT increased by ten percent.

Some are obviously understandable. Workers within Age band 4 (mean age 52 years), relative to workers in age bands two and three, for example, would be more likely retained, if IVT increased by ten percent. This is presumably because they are nearing retirement.

Also included in this category were some workers (identified above), who indicated in the survey that they would travel less – if IVT increased (Table 9.4). The alternative method adopted would be to work more at home and travel less ($p = .0396$). These workers identified in Table 9.3, as Whmtless, would be retained if IVT increased by ten percent.

In terms of journey time, the influence of the train for LDC trips to London is also revealed by the evidence of Table 9.3. It was clear from the latter table that Central London employment (clondemp) ($p = .2617$), was not one of the factors that would have a significant adverse impact, if IVT increased by ten percent. Primarily because alternative modes would be less attractive.

As expected primary influences are likely to have a significant effect on LDC demand – if IVT increases. In this respect, workers in Age band 4 (mean age 52 years), relative to other age groups, are more likely to be retained. The reverse is true for workers who commute to London three days per week. The evidence indicate that compared to LDCs, who commute more frequently to London (i.e. four to five days per week), the said workers may have a lesser in-built tolerance to an increase in journey time of ten percent.

Also, they would have comparatively less opportunity to switch mode than LDCs, who are living closer to London (Time bands 2-5) and have access to competing rail services or coach.

Table 9.5: Relative Significance of Explanatory Variables on J/Time Elasticity

Analysis of Significant Influences on J/Time Elasticity	Logit (p) value
1. Primary Influences	
$\beta_0 + \beta_1 Age4 - \beta_2 Frequen3$ $= 8.5159 + 4.2874(5.0326) - 7.8067(8.9269)$	
For the predicted probability of primary influences (taken as a group) on LDC demand when IVT increases: Logit P = exp(β*X)/1+ exp(β*X) is applied. This is the standard application. Incorporating the values in lines 2-3 above .	
Logit P = exp(-39.5969)/1 + exp(-39.5969) = 6.3575/7.3575 = 0.864	0.864
2. Life Style Influences	
Work home and travel less (Whmtles) and time to pursue hobby(Purhobby) $= 8.5159 + 4.6592(4.2343) - 4.0926(4.1134)$.	
Logit P = exp(11.4099)/1 + exp(11.4099) = 90210.4/ 90210.4 = 0.99	0.99

Note:

The variables used in the above table were previously defined in Table 9.3.

The analysis of Table 9.5 has in fact captured, some of the key background influences, previously discussed in Section 9.2, which are likely to have impact on demand when IVT increases. These include primary, which had the second most significant impact and lifestyle influences both of which are seen in the evidence of Table 9.5

These are the factors, which represent the sensitivities, in this study, to LDC time elasticity.

9.7: Alternative Options LDCs Would Take If IVT Exceeds Maximum Time Tolerated

A factor, which is implicit in the findings of the journey time elasticities presented above, is what LDCs, adversely affected by increases in IVT, would do.

Table 9.6 LDC Alternative Options – If IVT Increases Above Tolerated Time

Alt. Options Taken – If IVT is Greater Than Tolerated Time	No	%
Work home and travel less	42	27.0
Work longer hours per week and travel less	9	5.8
Stay over in London and travel less	39	25.2
Switch mode	6	3.9
Change job	50	32.3
Move home	9	5.8
Total	155	100.0

Table 9.6 also bears out the evidence discussed in Section 9.2, that in the short term, LDCs are likely to take short term measures, such as travelling less by either working at home (27.0 %) or staying over in London (25.2 %).

But there is also some evidence (38.1 %) of redistribution (that is change of home or jobs), (Table 9.6) – possibly taking place in the longer term (Section 9.2).

Table 9.7 presents the evidence of mode switching – if IVT increases above the maximum time tolerated by LDCs.

Table 9.7 Evidence of LDC Mode Switch – If IVT Increases above Maximum Time Tolerated

Alt. Mode Switching – If IVT is Greater than Tolerated Time	No	%
Not switching mode	148	95.5
Car	5	3.2
Plane	1	0.65
Motor bike	1	0.65
Total	155	100.0

9.8: Estimation of LDCs' Fare Elasticities

Conditions

No attempt has been made to segment the computation of fare elasticity by ticket type. Given the evidence (Chapter Seven), that the sample contained a number of business travellers, whose fares have been paid by the employer and these have been eliminated from the analysis. Of those remaining, the majority (90 %), based on frequency of travel, have purchased a season ticket (some with interest free loan) for the work journey. So that the results obtained would largely reflect this.

To get over the difference in ticket types, all fares (irrespective of whether a season, daily, travel card or other type of ticket were purchased for the work journey) were converted to the equivalent standard unit cost in pence per person (pppsj) for the single journey outward (Appendix 9.4). The computation of journey fare elasticity is described below.

As in the computation of journey time elasticity, a similar procedure is employed in the estimation of fare elasticity with respect to London commuter journeys – undertaken by workers in the study. The method of achieving this is presented in Appendix Table 9.2 – so as to avoid the latter subsuming the text.

Table 9.8 Passenger Demand Retained or Lost on Increases in LDC Journey Fare

Passenger Demand	Journey Fare Increased By		
	5 %	10 %	15 %
Retained	144	120	87
Fell off	12	36	69
Total	156		

Table 9.8 shows the composite results for absolute journey fare elasticities, which are based on increases, between five and fifteen per cent, computed on the mean pence (mpsj) for the outward London journey.

For purposes of comparison with other pertinent studies, the relative elasticities for increases in commuting fares, based on the evidence of Table 9.8, are then computed – using the Arc elasticity formula. The results are presented in Table 9.9.

Table 9.9 Fare Elasticities Estimated for Study's LDCs

% Δ JF	Elasticity
5 %	- 1.64
10 %	- 2.75
15 %	- 4.18

In terms of flow type and distance, and in particular for London commuter flows, the results of this study at the five percent level of elasticity (-1.6) is somewhat higher than Wardman and Shires (2004), who obtained an elasticity of -1.00 for long distance commuting (of 75 miles) to London.

But also of interest to this study, given that the LDC surveys were conducted on First Great Western trains, is the finding by Wardman, who obtained a similar elasticity (-0.8 to -1.0) for Great Western's long distance commuters. The latter study would have incorporated long distance commuting to London.

Further, although the study's findings on fare elasticity is consistent with findings elsewhere for LDC, it is considerably higher than elasticities obtained by external studies (Wardman and Shires, 2004) for short distance commuting to London.

Given that it is commuting distance that separates the two groups of commuters, it remains a plausible explanation for the difference in fare elasticity between long and short distance commuting. More importantly, it serves also as another pointer to a commuting characteristic that identifies LDCs from other groups within the sub-commuting population. The latter remains a focus of this study.

In general, the above provides the basis for the analysis, which follows, into the factors, which have significant influence on the study's LDC fare elasticities.

9.9 Factors Influencing Fare Elasticity.

As in the previous analysis, a similar procedure is applied in estimating the factors, which influence fare elasticity. The model adopted is the ordered binary logit model. which has a similar functional form, as stated at 9.1. Except that the relevant variables are applied. A similar process, as adopted in time elasticity (section 9.4), was also used to determine the final fare's model.

Fare Elasticity Results

Table 9.10 shows the computed estimates for the independent variables, which are estimated to have significant influence on LDC fare elasticity.

For purposes of the ensuing analysis, a variable in Table 9.10 with a Wald estimate, of ($p > .05$) (col.6), is regarded as significant – at the 95 percent level of probability (ref. Table 9.10, footnote)

Applying the above criteria to Table 9.10 eight variables are seen to have significant impact (some negative, others positive) on individual demand when fares increase by five percent.

Negative Impact

It is clear, from the evidence of Table 9.10, that primary influences in terms of age, journey frequency, journey time and occupation, would have a negative impact on individual demand for rail, patronage – if fares increased by five percent.

Table 9.10: Results of Logit Regression on Fare Elasticity

Goodness of Fit	54.957
Nagelkerke - R^2	.448

Hosmer and Lemeshow Goodness-of-Fit Test Results

	Chi-Square	df	Significance
Goodness of fit test	1.9760	8	.9817

Significant Variables of Influence on LDC Fare Elasticity

Influences & Assoc Variable		B	S.E.	Wald	df	Sig.
Constant		9.8683	3.3060	8.9099	1	.0028
1. Primary						
Age 2	Mean age of 29 years	-4.5885	1.9544	5.5122	1	.0189
Age 4	Average age of 52 years	-3.5927	1.6095	4.9823	1	.0256
Frequent 2	LDC to L'don 2 days per wk.	-6.9619	3.0847	5.0937	1	.0240
Frequen 3	LDC to L'don 3 days per wk.	-4.3159	1.6925	6.5025	1	.0108
Time 5	IVT of 150 mins (single jney)	-2.4343	1.0717	5.1599	1	.0231
Male		-1.6878	1.6750	1.0153	1	.3136
2. Economic						
Occup. 1	LDCs in senior management	-1.7644	.9604	3.3752	1	.0662
Pcomwhme	Pt. commute and work home	3.1571	1.3341	5.6006	1	.0180
Pcomsldn	Pt. commute & stay over Ldon	2.8817	1.3546	4.5255	1	.0334
Pcomvofm	Pt. commute & visit o/ firms	2.0866	1.1721	3.1694	1	.0750
Pcomwbof	Pt. commute & work b/office	4.0727	1.6536	6.0661	1	.0138

Note

Table 9.10 shows the contribution of each of the predictor variables in the fare's logistic model. The Wald statistic is used here to examine whether each of the predictor variable makes a statistically significant unique contribution to the model (Dewberry, 2004).

In the fare elasticity model (above), Age 2 ($p = .0189$), Age 4 ($p = .0256$), Frequen 2 ($p = .024$), Frequen 3 ($p = .0108$), Time 5 ($p = .0231$), Pcomwhme ($p = .018$), Pcomsldn ($p = .0334$) are significant, because the probability of every other predictor variable being significant, given in column 7 (column headed 'sig'. – an abbreviation for significance) is greater than 0.05.

Within this category, it is observed that LDCs who commute three days per week (FREQUEN 3) appear to be intolerant of any increase. This is irrespective of whether the increase is in journey time (Table 9.4) or fares (Table 9.10). It is a plausible factor, which explains why the said workers appear to be adversely affected by the respective increase in both analyses.

They are joined by workers (FREQUEN 2) who commute even less often. One reason could be season ticket purchases. It is known, for example, PDFH, 2005) that full time workers who purchase season tickets obtain better value for money in terms of pence per mile per single journey (pppsj), than LDCs who commute less frequently. Because it may be, from the latter's perspective, more beneficial to purchase day return tickets.

Positive Impact

By contrast some economic influences would have a positive effect on the elasticity of demand – if fares increased by five percent. This is supported by the evidence of part time workers in the analysis of Table 9.10.

This is particularly the case of multi-destination LDCs (pcomwbof, p= 0.0138) who commute to London between two to three days per week, but for the rest of the working week are commuting to different work destinations outside London.

Also in this category are LDC part time workers, (pcomwhme (p > .05) who commute less frequently In the case of both sets of workers, this may reflect the benefits still to be gained (in terms of savings in journey time and cost) by LDC train commuting over an alternative such as the car.

On the one hand, the latter may offer convenience and office-to-office communication. But on the other, the journey may be more time consuming, onerous and costly. Given the parking charges and restrictions that may exist at the destination end.

Non Effects on Fare Elasticity

Yet unlike time elasticity, fare elasticity was not dependent on factors such as distance, which is surprising. Given that fares are related to distance. (Wardman, 1997, 2005). But the analysis may be reflecting, that the transfer cost of those commuting long distance may be well above a five percent increase in journey fare and hence can tolerate it.

Fare elasticity was also not dependent on employment. In this case, workers involved in LDC are highly skilled (Chapter Four) and earn high incomes. One explanation therefore is that such workers are able to absorb moderate fare increases.

These are the factors, which express the sensitivities in this study to LDC fare elasticity.

9.10: LDC Alternative Options – if Fares Increase Above Maximum Fare Tolerated

Table 9.11 LDC Alternative Options – If Fares Increase Above Maximum Tolerated

Alt. Options Taken – If Fare Increase is Greater than Maximum Fare Tolerated	No	%
Work home and travel less	25	23.2
Work longer hours and travel less	4	3.7
Stay over in London and travel less	15	13.9
Switch mode	10	9.3
Seek better job in London	8	7.4
Change to Job near home	41	37.9
Alternatively move home	5	4.6
Total	108	100.0

Unlike the previous evidence on IVT (Section 9.4), the effect of an increase in fare, above the maximum tolerated, will (for those affected) bring about a sizeable return (37 %) to short distance commuting or less long distance commuting (23 %) – as shown in the evidence of Table 9.11. They are additional factors, which provide further insight into the objective, stated at Section 9.0, and the focus of this study.

9.11 Estimation of LDCs Value of Time

Background Influences

For workers involved in such movements, long distance commuting is a matter of time rather than distance. Allied to this fact is the importance of how long distance commuters value their time. As this will determine what mode (or combination of modes) LDCs choose for their work journey.

The importance of this was revealed by a Department of Transport (1987) study which found that there were distinct differences in observed behavioural values, which workers adopt between travel modes – based on self-selectivity and journey purpose.

Self selectivity is explained by the fact that individuals with higher values of time often chose the faster mode. This was especially evident among income differences between individuals.

It is conventional thinking that commuting behaviour is explained by the commuting characteristics of those involved in commuting (DoT, 1987) study and Chapter 6, this study). An examination of the 'value of time' is therefore a key point in that assessment and is an essential focus of this study – given the objectives stated at Section 9.0. This is undertaken in the succeeding section.

9.11.1 Mechanics of VoT Calculation

The formula applied by the study to the evaluation of LDCs' value of time is:

$$\text{VoT} = \left(\frac{\textit{transfer price}}{\textit{transfer time}} \right)$$

which represents the ratio of transfer price and transfer time for each individual in the surveyed population (PDFH, 2005). From this, the mean is calculated to arrive at the estimated mean VoT and the parameters (expressed by the standard error of the mean), within which the results are valid.

A summary of the computed estimate, undertaken by SPSS, for the study's LDCs is presented in Table 9.12. The supporting details are presented in Appendix 2 – as the latter will subsume the main text.

Table 9.12 Computed Estimate of VoT for Study's LDCs

Summary of VoT Statistics	
Sample Size	156
Mean VoT	- 16.6972
Standard Error of Mean	- 2.4265

As Table 9.12 shows, the mean value of time, computed for the study's LDCs, is **16.69** pence per minute (± 2.42).

9.11.2: Study's VoT Result Compared with PDFH's

Conventional VoTs often provide a useful benchmark against which the results of fresh studies can be assessed (PDFH, July 2002).

This enables the study's findings on VoT to be placed in context.

The model adopted by PDFH for the computation of VoT is expressed as follows. It is also adopted here for comparative purposes.

$$VoT = G^{0.723} D^{0.184} e^{-4.545} [\, 0.258\, IU + 0.968 EB + 0.754 EB1 + 0.100\, Comm + 0.147\, LSE \,] \quad \text{..........} \quad (9.3)$$

where:

* VoT is the value of time, in pence per minute, in prices and incomes of Quarter Four 2003.

* G denotes gross domestic product (GDP) per capita in real terms. The elasticity of VoT to GDP is 0.723.

* D is distance in miles. The elasticity of VoT to distance is 0.184.

* IU is one for an inter-urban journey of over 30 miles, else it is zero. An inter-urban journey has a VoT, which is 29 % higher.

** EB is one for employer's business travel, else it is zero. These travellers have VoT's, which are 163 % higher than leisure travellers.

** EB1 is an extra effect for 1st class business travellers, which adds 113 % to the VoT.

.* Comm is one for commuting trips, else it is zero. The VoT for commuters is 10 % higher than for leisure travellers.

** LSE is one, if the trip is within London and the South East area, else it is zero. Those in the South East have a VoT, which is 16 % higher.

Conditions 5, 6 and 8 above (i.e. those marked with a double asterisk) do not apply, as the study is only concerned with computing the VoT for a commuting distance over 48.27 km.

Deleting these values, formula (9.3) above is reduced to:

$$VoT = G^{0.723} D^{0.184} e^{-4.545} [\, 0.258\, IU + 0.100\, Comm] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9.4)$$

In applying the above model:

* $G^{0.723}$ is given a valuation of $G_{2003} = 4643$, which is raised to $^{0.723}$.

* Distance is the mean distance (125 miles) commuted by study's LDC group.

Taking the above factors into consideration Formula (9.4) becomes:

$$\mathrm{VoT} = \mathrm{G}_{2003q4}{}^{0.723}\, \mathrm{D}_{125}{}^{0.184}\, \mathrm{e}^{-4.545}\, [\, 0.258\, \mathrm{IU} + 0.100\, \mathrm{Comm}] \ldots\ldots (9.5)$$

$$= 4643^{0.723}\, 125\mathrm{ml.}^{0.184}\, e^{-4.545}\, [\, 0.258\,(1) + 0.100\,(1)] \ldots\ldots\ldots\ldots (9.6)$$

= (447.8117* 2.43126 * 0.015192), when GDP, distance and e are computed.

which equates to a VoT of **16.54 ppm**.

The computed value of VoT, obtained for the study is 16.69 ppm. This compares favourably with PDFH's computed VoT of 16.54 ppm. and it helps to place the study's findings in context.

As shown by earlier evidence (Section 9.10), this high value of VoT would explain why LDCs in the study would opt for the mode that would get them to work in the quickest time. Where, as in this case, it involves centripetal commuting (> 125 miles) to London. This would inevitably mean the train.

9.11.3: Influences on LDCs' Value of Time

As in the case of the computed results on time and fare elasticity, the results are mixed. In that there are variations in the logit results that are above and below the regression line of best fit.

9.11.4: Interpretation of Results

As expected, it is workers in higher SOC employment, specifically those employed in professional (certified) occupations, and those earning high incomes relative to other workers, for whom value of time is significantly higher (Table 9.13).

Also of significance in the VOT equation is the distance commuted (i.e. dista and distb bands), as well as the time (Time 8- approximately (180) minutes, IVT) spent on commuting - single outward journey only.

The last result is not surprising, given that in the case of long distance commuting, workers do spend a great deal of time on commuting – each working day of the week.

Table 9.13 Results of Computed Regression Estimates on Value of Time

Model	R	R Square	Adj. R Square	Std. Error of Estimate	Change Statistics: R^2 Change	F Change	df1	df2	Sig F Change
1	.977	.954	.781	9.6109	.954	5.501	53	14	.001

Anova

Model		Sum of Squares	df	Mean Square	F	Sig.
1.	Regression	26930.729	53	508.127	5.501	.001
	Residual	1293.159	14	92.368		
	Total	28223.888	67			

Coefficients

Model		Unstandardized Coefficients: B	Std Error	Standar-dized Coeff. Beta	t	Sig	95% Confidence For B: Lower Bound	Upper Bound
1. Constant		64.449	37.579		1.715	.108	-16.149	145.048
Income level 4	(mean inc. £ 35 k P.A.)	18.788	9.699	.241	1.937	.073	- 2.015	39.590
Income level 5	(mean inc. £ 45 k P.A.)	18.154	12.102	.210	1.500	.156	-7.801	44.109
Income level 7	(mean inc. £ 65 k P.A.)	50.110	24.245	.416	2.067	.058	-1.891	102.110
Income level 10	(mean inc. £ 95 k P.A.)	26.158	12.160	.264	2.151	.049	.078	52.238
LDCs from dual worker households		30.584	10.719	.392	2.853	.013	7.595	53.574
LDCs in professional occupations		9.905	4.991	.218	1.985	.067	-.799	20.609
Dist. Group A (LDC journey > 125 miles)		7.397E-02	.065	.225	1.134	.276	-.066	.214
Dist. Group B (LDC journey 76-124 miles)		.143	.139	.231	1.026	.322	-.156	.442
Maximum journey-to-work cost		2.930	1.236	.407	2.371	.033	.280	5.580

9.12 Conclusions

In this chapter, further examination was made of some key factors which, in addition to those previously considered in Chapters Seven and Eight, were likely to have impact on the long distance commuting undertaken by the study's workers. This was also undertaken within the context of the overall objectives of the study, stated at Chapter One.

The study found that journey time elasticity, at the 10% level of increase of IVT (-1.5), was dependent on factors such as age, and commuting frequency - as appertained to the study's LDCs. Journey time elasticity was however independent of either income or occupation.

The study's findings on time elasticity were also consistent with the findings of pertinent studies conducted elsewhere.

In terms of fare elasticity, at the 5% level of fare increase (-1.6), the study found that factors such as demography, journey frequency and in-vehicle journey time represented relative sensitivities to fare elasticity. But the latter was not affected by gender or employment.

On the basis of the elasticities obtained, it was felt that the study's LDCs were more sensitve to increases in fares than they were to increases in (IVT) journey time.
In the case of VoT, the study's findings on VoT (16.69 ppm), is consistent with industry's findings of 16.54 ppm for London commuter flows < 75 miles.

Viewed within the general increase in LDC, discovered at the disaggregate level of analysis, the findings here provide important knowledge and insight into the under currents that have been generating such movements, at least along the south western long distance corridor (Bristol to London). The latter is one of ten routes along which LDCs travel to London. It also helps to underline the importance of the focus of this study, earlier stated in Chapters One and Two.

CHAPTER TEN

CONCLUSIONS

10.0 Introduction

This chapter presents a summary of the study's main findings, within the following structure. Section 10.1 focuses on the reason for the investigation (research) into long distance commuting into London and arising from that, the objectives of the study. Section 10.2 examines the methodology adopted in pursuing the objectives and the data needed to implement it. Section 10.3 presents the findings of the research. Suggestions for further research are presented in Section 10.4.

10.1 Reason for the Research into Developments in LDC to London

The stimulus for this work is the development in long distance commuting to Greater London, from areas beyond the South East Region, which has been increasing since the early nineteen fifties. Evidence of this is reported in the five-censal periods dating back to 1966. Arising from this factor, the key objective in this thesis has been to identify and understand the factors, which are generating the increase in the above movement.

10.2: Methodology Adopted

The methodology developed, in response to the above objective, had two interdependent stages. The first was a general descriptive analysis, undertaken at the aggregate level, which aimed to identify the contributory factors behind the increasing trend of LDC to London. This was postulated in Chapter Four. The second was the undertaking of a new survey to identify and explain, at the disaggregate level, factors (within the sub-level of LDC), which are contributing to the general increase in LDC earlier described. This was discussed in Chapters Five to Seven.

The study adopted for detailed analysis, long distance rail commuting between Bristol in South West England and Paddington in Central London, which is one of ten national rail routes, through which workers commute long distance to Greater London. Long distance commuting by car was not considered, because the latter does not represent an easy captive market for the survey of LDC journeys. Whereas long distance commuting by air or coach between Bristol and London is negligible.

10.2.1: Approach Adopted

The study found that previous studies on commuting in the UK have either utilised the National Census or National Travel Survey statistics, as a means of analysing trends in journey to work – at the macro level of analysis. Banister and Gallent (1998), Cameron and Muelbauer (2000), Mackett and Bird (1989), Mackett and Nash (1985) represent some of the studies in this mode.

Alternatively, studies have used sample surveys as a means of examining features of commuting – at the micro level of analysis. The studies of Green et al (1999), Levinson (1997) and National Travel Survey 2003 are incorporated in this mode.

The two approaches are useful. A uni-dimensional approach, using censal data alone, will give some indication of trends in long distance commuting. But, on the other hand, this will conceal underlying developments, which may be significant. The reverse is true of commuting studies, utilising private surveys.

This explains the two dimensional approach, adopted by the study, whereby the Census, NTS and LFS, are used to examine longitudinal trends (1981-2001) in the development of LDC to Greater London and a LDC sample survey, conducted on an appropriate sample of LDCs, is employed to examine underlying developments, which may exist within the general trend of long distance commuting.

In support of the above objective, stated preference methods were used to test LDCs' sensitivity to journey time and price elasticity, which by industry's evidence are known to affect commuting behaviour. A logit formula, of the ordered type, was then applied to explain the latter. Other issues (economic activity, demography, location of residence relative to employment, advancement in technology and transport), which affect commuting behaviour were also investigated.

By using both approaches, the advantages obtained by using aggregated (censal) as well as disaggregated (private survey) data for the analysis of LDC to London are obtained. Whereas, the disadvantages are avoided.

The two dimensional approach is also important especially in an area of long distance commuting, where information on the general trend in LDC is available, via the UK Census, but not much is known about the underlying developments within the general trend.

10.3: Findings of the Study

The framework developed proved powerful enough to shed light on some of the key factors, which have contributed to the development of long distance commuting to London – both historic and contemporal.

10.3.1: Findings Pertaining to the Development of LDC to London – at the Aggregate Level of LDC

First the study made a longer term assessment, using the 1951-2001 Census and other data to determine what developments in LDC to London may have taken place and, if so, to explain the contributory factors.

Our findings indicate that, at the aggregate level, there were two developmental trends taking place in LDC to London - both occurring at different periods. These were:

* the pre-1980s developing trend in LDC to London

* the post-1980 or contemporary development of LDC to London

It is claimed that the major factors which generate the daily journey to work are to be found not so much in the journey itself but also in all the other external factors (economic, demographic and income), which impact on the journey to work (Franklin, 1979). The above (journey to work) drivers were also evident in this study. They are also factors, which are recognised in the studies undertaken for the PDFH, 2005. This helps to explain the factors reported below, which were the main drivers behind the early development of long distance commuting to London from outside the South East Region in the period 1954-1980.

These included:

* speculative housing developments in the suburbs, combined with comparatively cheap rail transport (then in private ownership), which linked the new housing developments to London – thereby extending London rurally, but also lengthening the distance that LDCs then commuted to jobs in London.

* economy of the London labour market, which tended to favour the higher skills of the long distance commuter, rather than the short distance commuter.

* rapid changes in job markets, technologies, new ideas and ways of working occurring in the London Employment Market, which tended to have impact on the direction, flow and pattern of work movements to the Capital. This tended to suit LDCs, more than any other commuting subgroup (i.e. MDCs or SDCs).

* improvements in transport technology and the rail and road infrastructure, which have helped to liberate time and distance constraints on the journey to work – thus making long distance commuting possible.

10.3.2: Findings from the LDC Sample Survey

Intuitively, it was felt that developments in LDC to London, analysed at the general or aggregate level, could only provide part of the explanation. Possibly, there could be other developments, taking place within the sub-level of LDC, which are concealed within the mass body of long distance commuting to London.

The data required for such an analysis was not available from published sources. A sample survey of on-train long distance commuters therefore remained a feasible alternative – given the following factors.

A sample survey, for example, is used in situations where the cost in terms of finance, man hours and time of surveying the whole population would be prohibitive. On the other hand, the essence or technique of sampling is to devise a survey methodology, which would enable the end-sample to capture some of the salient features of the parent population.

The methodology adopted for the present sample enabled four salient features of the LDC parent population to be captured. These are indicated in the ensuing section.

10.3.3: Key Features of the LDC sample Data

The study found that there were three features of the sample which bear close similarities with the LDC commuting population at large. These included:

* the number of LDCs (relative to the Census) who are involved in long distance commuting between South West England and Greater London, and the areas from which such journeys originated.

* occupation – particularly in the SOC 1-3 skills category.

* economic activity.

10.3.4: Differences between Sample and LDC Parent Population

Some important differences, between the sample and LDC parent population (Census 2001) were noted. In terms of demography, the sample differed from the general LDC population in two respects:

* First, the LDC sample contained slightly older workers than the Census. Forty three percent of workers in the sample, for example, are in the age group 45-54 years, compared with seventeen percent in the Census.

* Secondly the sample, compared with the Census, is predominantly male.

Indeed male workers, as revealed by the 1991 Population Census, have been the dominant gender in long distance commuting. But the 1991 Census also revealed that more female workers (including those involved in long distance commuting) have been coming on to the labour market (Howe, 1997). The 2001 Census confirms the above position. The LDC sample similarly reflects this. Except that the sample differs from the 2001 Census in terms of the proportion of male and female LDCS represented therein.

The above evidence also underlines the fact, that LDCs who reside in areas furthest from London, compared to their short distance counterparts, tend to be older and predominantly male.

The latter was also apparent, when the occupational skills of LDC workers in the sample were compared with the occupational skills of LDCs in the Census. The study found in the case of LDCs (or those living furthest from the job), that they were more highly skilled (SOC 1-3) than SDCs and hence wealthier – by virtue of greater income.

The above provided the foundation for the subsequent analysis of the LDC sample data. Arising from this, the study found that there were at least six underlying developments, which were occurring within the general level of LDC to London – four of which have not been seen before in published literature. These are identified in the text under developments 1-6.

10.3.5: Diversity of Movements in the Pattern of LDC to London

The study also found that there were developments of a different nature to the ones reported earlier (Section 10.3.1), which were taking place within the sub-level of LDC to London.

This concerned the diversity in the pattern of LDC movements, which helped to explain the developments that were taking place in (contemporary) LDC to London. The latter at all times remained the focus of this work. The said movements and the contributory factors are presented below.

*** Traditional form of LDC to London Maintained**

The study found that long distance commuting to London encompassed a very complexed pattern of movements, which were taking place within the sub-level of

LDC. But even within this complexed pattern of movement, the study found that the traditional form of LDC, undertaken from 'fixed' residence rurally to a 'fixed' place of employment in Greater London had been maintained. Although this movement appears to be 'fixed' the study also found that the separation between homes and jobs was increasing.

Development 1: LDCs Responding More to Opportunities That Exist in the London Labour Market than Local Job Market

LDCs are also responding more to opportunities that exist in the London labour market – rather than the local market. This is not unusual. LDCs are highly skilled (SOC 1-3) and there may not be opportunities locally to suit inclination, training and skills. What is unusual is that many of those involved in this type of movement were formerly working locally. So that rather than move nearer the job, they have chosen instead to retain rural residence and commute long distance to employment in London. This was contra to the conventional concept of LDC, where it was previously considered that workers first obtained a job in London and then moved out. But by the use of express commuter services were able to reverse commute to the jobs, which they retained in London.

Development 2: LDCs Commuting to Multi-Work Destinations Other than London during the Working Week

Two new important findings were unearthed by the study. First, the study found that the development of twentieth century technology (e.g. the car and the fast developing methods of electronic communication) and the hub of business life are leading both firms and employees to develop new ways of working. The result is that commuting from a fixed place of residence to a fixed place of work, five days per week appear no longer to be the norm.

A new type of LDC movement is developing, in response to market demands, where workers are still commuting from fixed residences, but to multiple work units on different days of the working week – instead of to fixed work locations. It was seen that long distance commuting, as opposed to short distance commuting, offered the flexibility and opportunity to achieve both the above objectives. The result is that long distance commuters are more mobile than was previously believed.

Development 3: LDCs were Entrepreneurial

Added to the above movement, the study found that some LDCs (approximately ten percent) were entrepreneurial. Namely, workers who maintained local residence, but applied their skills on short term contracts to wherever the job opportunity exists – another form of commuting, which is only offered by long distance commuting and the availability of an integrated transport infrastructure and different journey modes.

Development 4: New Journey to Work Pattern Detected in Part-time Long Distance Commuting

With regard to part-time LDCs, the study found that part-time commuting is still associated with working long hours and less frequent commuting. But the study also found that part-time working was affected more by changes in working methods (e.g.

working at a telecommunications centre) and flexible working arrangements (i.e. working at home some days or not working some days), than the traditional links earlier expressed.

The commuting characteristics of part-time workers, reported above, may be different from other workers in the study. But it cannot detract from the fact, that within the developing trend of LDC to Greater London, these workers form a constituent part of the core workforce, who are involved in such movements. Flexible working arrangements, in particular, are creating a new work style and pattern of commuting for part-time workers – within the general trend of LDC to Greater London.

Development 5: High Sensitivity Shown by LDCs to Time and Price Elasticity

The study also adopted, as part of the research methodology, stated preference methods to analyse LDCs' sensitivity to journey time and cost.

One of the factors that affect commuting behaviour and indeed demand for public transport is workers' sensitivity to journey time and price. Yet for workers, who are commuting such long distances and spending so much time commuting, it is perhaps not surprising.

The study found that LDCs had a high sensitivity to journey time (-1.5), which was twice as high (- 0.6) for that obtained by Wardman and Whelan (2004) for short distance commuting. It was considered that in the case of the LDC, the journey was time consuming. Whereas with SDCs, the journeys are relatively shorter and take less time. Further, SDCs can switch modes.

In terms of how LDCs valued their time, a computed value of VoT of 16.69 ppm was obtained for the study's LDCs. This compared favourably with PDFH's computed value of 16.54 ppm for long distance commuting journeys and it helps to place the study's findings in context.

This high value of VoT would explain why LDCs in the study would opt for the mode that would get them to work in the quickest time. Where, as in this case, it involves a work journey of more than 125 miles, it would inevitably mean the train.

Added to this, LDCs had indicated that they would adopt alternative options to LDC - if journey time or cost increased beyond the point that was considered tolerable. In the short term, LDCs are likely to take short term measures, such as travelling less frequently either by working at home (29.6 %) or staying over in London (25.0 %). In the long term, some evidence (37.8 %) of redistribution (that is a change of home or job) is indicated – if journey time or cost increased beyond the point that LDCs considered tolerable.

Development 6: LDCs' Propensity to Live Further Than SDCs from Their Respective Stations of Rail Access and the Impact on the LDC Journey to Work

In general, long distance commuting extends beyond the in-vehicle journey. The latter forms part of the total concept of commuting, which also involves access to the station railhead (i.e. distance travelled from home to the station) and egress from the station. It applies to other forms of travel.

For LDCs, who are already involved in lengthy in-vehicle journeys (IVJ), it was important to examine the access and egress aspects of their journey as this would give some idea of the total journey that such workers undertake – within distance and time parameters.

In terms of access distance to railhead, the study found, in common with Adcock and Lampkin (1995), that LDCs tended to live further from their station of rail access (up to 44 km from the station) than SDCs – most of whom lived within walking distance of the station.

The above finding may give the impression, of LDCs who are already involved in lengthy journey to work movements, that this would make the LDC journey even longer. But the journey to work is a matter of time, relative to distance. So that the speed of travel may have a much more decided influence – as, for example, in the case of the LDC train journey to Central London, which may get LDCs to work faster than SDCs, who are travelling by underground rail from Outer London to Central London.

In terms of the egress aspect of the journey (from destination station to workplace), the study found that compared to the distance travelled at the start of the journey to station railhead, the end or egress distance of the LDC journey was comparatively short (mean egress distance 3.5 miles).

This is not surprising, given that most LDCs in the study worked within Central London. The destination station Paddington (in London W2) is also situated in

Central London – which explains why the egress distance is relatively short. In addition to the main in-vehicle journey, which attracts much more attention than the journey undertaken on the fringes (i.e. the access and egress aspects of the journey), the above helps to give some idea of the total concept of the LDC journey – undertaken by workers in the study.

These are the factors, which are contributing to the increasing trend in LDC to London and to the developments that are taking place within the subject of review. At least, four of the above factors have not been seen elsewhere in published literature.

10.3.6: Factors Which May or May Not Restrict the Future Development of LDC to London

Yet in a study of this nature a balanced view has to be taken, on the one hand, of the factors which aid the development of LDC to London and, on the other, the factors which might militate against such development. With regard to the latter, two issues were examined. First, given the choice of living closer to the workplace, with suitable housing and journey cost inducements, would LDCs give up long distance commuting for short distance commuting? Secondly, given the present rate of development in LDC to London, was this sustainable for the foreseeable future and was this likely to affect the development of LDC to London in a substantial way?

The study found that even with inducements to switch to SDC, the majority of LDCs would continue with long distance commuting. For the others, it was found that combinations of changes in fares, journey time and mortgages would return them to long distance commuting.

Overall, although the above factors were likely to have some effect on LDC to London, they were unlikely to affect adversely the development of long distance commuting to London in a substantial way.

It is envisaged that the methodology, adopted by this study, can also be applied to the eleven other national rail routes, through which workers commute long distance to Greater London – to obtain corresponding results.

10.4: Suggestions for Further Research

Time and resource constraints made it impossible to investigate another side of developments in long distance commuting to Greater London. This concerned the increase in long distance commuting by car to the outer London Boroughs or to areas, which are not well served by train.

10.4.1: Issues to be Investigated

The means of travel to work is a major part of the overall picture of commuting patterns to London. But as Howe (1997) indicates means of travel to work is affected by where people live as well as what transport services are available, and is not necessarily a matter of choice. Nevertheless, it is important information for the provision of services and for estimating traffic flows.

But from the workers' perspective, an adjunct to the above would be where workers' jobs are located in relation to residence and the public transport services, which are available to connect residence with employment. This is apparent here. The use of the car for commuter journeys to Central London is discouraged by parking and other restrictions at the destination end. On the other hand the availability of direct train services for workers commuting from outside London to the outer London boroughs is limited.

An examination of the 1991 and 2001 censal modal data had shown that train patronage had increased (from 39.0 % in 1991 to 46.05 % in 2001). Whereas, LDCs commuting by car had declined by 12 % since the 1991 Census. There may be other factors, other than the use of transport mode, which accounts for the above statistics. But they give some idea of the issues to be investigated.

Goodwin et al (1995) indicated that the target population, in this case the long distance car commuter, was very illusive because the car commuter was often mobile. But it is envisaged that for a study of this kind, the target population could be contacted at the workplace. This would be similar to the approach adopted by Green et al (1999), in their study of long distance weekly commuting.

10.4.2: Benefits

Such a study will help to complement the findings of this study. An understanding will also be gained in an area of economic activity, namely, long distance commuting by car to Outer London - where knowledge of the subject is limited.

This study, as well as the one suggested, can only be to the benefit of those involved in transport planning. In the case of London, it is 'Transport for London' who under the Greater London Authority Act 1999 (Section 155) is required to exercise its responsibility: "to secure and facilitate the implementation of the Mayor's Transport

Strategy for London and the provision of safe, integrated, efficient and economic transport facilities and services to, from and within Greater London." But this needs to be based on informed knowledge, which can only be acquired through serious research.

Society's needs are ever changing in response to social and economic demands as well as other circumstances. This is also true, as the study has shown, of long distance commuting to Greater London – which in itself is an indicator of such change.

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APPENDICES

APPENDIX 1 – PILOT SURVEY QUESTIONNAIRE

ITS

Dear Sir/Madam,

Survey Of Long Distance Commuting

This survey is being conducted as part of a PhD research project concerned with long distance commuting. I would be very grateful if you could take the time to complete this questionnaire. All information given will be treated in the strictest confidence. If you have any queries, please contact me on 0113 3435325 (e-mail Gfrankli@its.leeds.ac.uk).

Yours faithfully

George Franklin

Research Student

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1. JOURNEY TO WORK PROFILE

Q1.1 Where do you live? ______________________ (Name of district & post code)

Q1.2 How do you normally travel to work?

Car driver ☐ Car Passenger ☐ Train ☐ Coach ☐ Other ____________

Q1.3 How long does the journey to work normally take one way door to door? ____hours _____minutes

Q1.4 How often do you make this journey to London per week? ___________days per week

Q1.5 If you do not make this journey five days per week, what do you do in a typical week?

Work at home ____days
Visit outside firms _____ days
Stay over in London _____nights
Other (Please specify) ______________________________
Work at branch office ____days (Please state where____________)
Work at Telecommuting centre____ days
Do not work ____days

Q1.6 How many hours per day do you typically spend at your workplace? _____ hours per day

Q1.7 How many hours are you contracted to work? _____hours per day/week* (Delete as appropriate)

Q1.8 Do you work: Standard hours ☐ Flexi-hours ☐

Q1.9 Do you also work when you are commuting? Yes ☐ No ☐

Q1.10 If you are a public transport user, how often do you get a seat when you are commuting?

Almost always ☐ Usually ☐ Rarely ☐ Almost never ☐

Q1.11 How much does it cost you to travel to and from work?

£ __________ per day/week/month/quarter/ year* (Delete as appropriate).

Q1.12 If you are a public transport user, what type of ticket do you normally use for the journey to work?

Weekly season ticket ☐ Monthly season ticket ☐ Annual season ticket ☐
Rail pass/Privilege ticket ☐ Quarterly season ticket ☐ Other ____________ ☐

Q1.13 If you are a train commuter, do you travel? First class ☐ Standard class ☐

Q1.14 Is your fare paid by your employer? Yes, in part ☐ Yes, in full ☐ No ☐

Q1.15 Is your fare paid by interest free loan? Yes ☐ No ☐

Q1.16 About what proportion of your after tax income do you spend on commuting? ________

2. TOLERANCE OF LONG DISTANCE COMMUTING

Q2.1 If the journey time by your current means of travel were to get longer, what is the maximum amount of time per day that you would be prepared to spend commuting to and from work?

_______hours ______minutes

Q2.2 What would you do if the journey time on your current mode exceeded the maximum time that you would tolerate for the journey to work? (please tick as many boxes as appropriate)

Work more at home and travel less frequently ☐
Work longer hours and travel less frequently ☐
Stay over in London and travel less frequently ☐
Switch to a different means of travel ☐ (Please specify) ________________
Change jobs ☐
Move home ☐
Other ☐ (Please specify) ________________

Q2.3 What is the maximum amount that you would be prepared to spend on commuting?

£ __________ per day/week/month/quarter/ year* (Delete as appropriate).

Q2.4 What would you do if fares increased above this point?

Work more at home and travel less frequently ☐
Work longer hours and travel less frequently ☐
Stay over in London and travel less frequently ☐
Switch to a different means of travel ☐ (Please specify) ________________
Look for a better paid job in London ☐
Change to a job nearer home ☐
Move home ☐
Other ☐ (Please specify) ________________

Q2.5 If, in response to Questions 2.2 or 2.4, you would work more at home, how many days per week would you work at home? _____ days

Q2.6 If, in response to Questions 2.2 or 2.4, you would travel less frequently, how many <u>fewer</u> days per week would you travel? _____ days

Q2.7 If, in response to Questions 2.2 or 2.4, you would work longer hours to travel less frequently, how many <u>additional</u> hours per week would you work? _____ hours

Q2.8 If, in response to Questions 2.2 or 2.4, you would stay over in London would you:

Stay with family/friends ☐ Rent a flat ☐ Stay in hotel/guest house ☐ Other ☐

Q2.9 If, in response to Questions 2.2 or 2.4, you would move home, about how much nearer to London would you seek to move? _____ miles

Q2.10 If, in response to Questions 2.2 or 2.4, you would change to a job nearer home, about how much nearer home would it be? _____ miles

Q2.11 What would you like to do, but cannot do, because of the time spent commuting long distance?

See more of my children ☐
Spend more time with partner ☐
Increase earnings with evening job ☐
Use the time to further education ☐
Pursue hobby ☐
Engage in community volunteer work ☐
Spend more time in leisure activities ☐
Other (Please specify) ____________________

3. EMPLOYMENT

Q3.1 How long have you been employed in your present job? ____years ____months.

Q3.2 Are you employed: Full Time ☐ Part Time ☐ Self Employed ☐

Q3.3 If you had a job previous to this one, how long were you employed in that job? ___yrs ___months.

Q3.4 Were you employed: Full Time ☐ Part Time ☐ Self Employed ☐

Q3.5 Where was the job located? _______________ (Please give area/borough and post code if known).

Q3.6 What were the reason(s) for changing to your present job?

Had no previous job ☐
Promotion ☐
Office relocation ☐
Better job ☐
Job security ☐
Improved salary ☐
Redundancy ☐
New job more conveniently located ☐
Children grown up ☐
Other (Please specify) __________

Q3.7 How did you normally travel to your previous work?

Car driver ☐ Car Passenger ☐ Train ☐ Bus or Coach ☐ Other ________

Q3.8 **How long did the journey to work normally take door to door?** ____hours _____minutes

Q3.9 **If you have not had a previous job, why did you choose to work in London?**

No alternative ☐
High salary ☐
Job security ☐
Career development opportunities ☐
Other (Please specify) ___________

4. RESIDENCE

Q4.1 **How long have you resided at your present address?** _____years _____months.

Q4.2 **Where did you live previously?** __________________ (Please give area/borough and post code)

Q4.3 **How long did you live at your previous address?** _____years _____months.

Q4.4 **What were the reason(s) for moving to your present address?**

Marriage/moved in with partner ☐
Housing in area suits my budget ☐
Area/property suits my lifestyle ☐
Access to good transport ☐
More convenient for commuting ☐
Acquired a better property ☐
Changed job ☐
Proximity to children's school ☐
Partner's job location ☐
Location central to partner's and own workplace ☐
Children left home ☐
Other (Please specify) ____________________

Q4.5 **Suppose you had the choice between two options. Option A represents the example of living remote from the job (in a rural locality) and commuting long distance. Option B represents living in an urban area closer to the workplace. These are set out below.**

Housing Option A	Housing Option B
Property similar to your present one, in similar location, at current price. (i.e. as now.)	Similar Property, in similar area, costing £50k more in London, or nearer workplace.
Involves long distance commuting of approximately 80 minutes each way by rail.	Involves approximately 35 minutes commuting to work by underground rail.
Fare: £22 per day	Fare: £8 per day

Which option would you choose? _____

Q4.6 **If you chose Option A, which of the following factors would be just sufficient to make you change your mind?**

Increase in cost of commuting by £_____ (Please state amount of increase per week/month/year)
Increase in mortgage/rent by £_____ (Please state amount of increase per week/month/year)
Increase in journey time by _____ mins. _____ hours (per week)
Other (please specify) ____

Q4.7 If you chose Option B, which of the following factors would be just sufficient to make you change your mind?

Increase in cost of commuting by £ ______ (Please state amount of increase per week/month/year)
Increase in mortgage/rent by £ ______ (Please state amount of increase per week/month/year)
Increase in journey time by ______ mins. _____ hours (per week)
Other (please specify) ________________

5. SUSTAINABILITY OF COMMUTING

Q5.1 Looking towards the future, even if you felt that your present employment was secure, for how much longer would you envisage commuting long distance?

Less than 2 years	☐	2-5 years	☐
6-10 years	☐	11-16 years	☐

Longer (Please state)____________

Q5.2 How likely are the following factors to influence your long distance commuting in the future?

	Very Likely	Possible	Very Unlikely
1. Commute until I retire	☐	☐	☐
2. Children leaving home	☐	☐	☐
3. Have to do it because of negative equity	☐	☐	☐
4. To support existing lifestyle	☐	☐	☐
5. Until I can find a house near to workplace	☐	☐	☐
6. Until I can find a job near to residence	☐	☐	☐
7. I have a job which cannot be conducted off-site	☐	☐	☐
8. Convenience and/or reliability of public transport	☐	☐	☐
9. Until I am tired of commuting long distance	☐	☐	☐
10. Other (please specify)	☐	☐	☐

6. EFFECT OF INFORMATION TECHNOLOGY ON LONG DISTANCE COMMUTING

Information Technology (IT) is widely used in the workplace and has brought flexibility to traditional methods of working. Presented below are two options. Option A is based on traditional methods of working and involves daily commuting to the office. Option B involves carrying out the same duties with IT, allowing you to work (with IT) off-site two days per week (either at home or at a telecommuting centre), but at a lower salary.

Option A	Option B
5 days per week at London office	3 days per week at London office 2 days per week at home
Full annual salary	Annual salary negotiable

Q6.1 What reduction in annual salary would you be prepared to accept in return for being able to work at home twice a week? £________

7. PERSONAL CHARACTERISTICS

We need to have some idea of the type of person who regularly commutes long distance to work. Information provided to the questions below will help us to achieve this objective. This information will be treated with strictest confidence.

Q7.1 Are you? Male ☐ Female ☐

Q7.2 To which age group do you belong?

16 - 24 ☐ 25-34 ☐ 35 – 44 ☐ 45 – 60 ☐ Over 60 ☐

Q7.3 What is your occupation? ________________

Q7.4 How many people are there in your household? _______

Q7.5 How many other people in your household work? _______

Q7.6 How many members in your household are 16 years and under? _______

Q7.7 Within which group does the total annual income of your household lie (before deduction of tax, national insurance etc.)?

Less than £10,000	☐	£10,000-£20,000	☐	£20,001-£30,000	☐
£30,001-£40,000	☐	£40,001-£50,000	☐	£50,001-£60,000	☐
£60,001-£70,000	☐	£70,001-£80,000	☐	£80,001-£90,000	☐
£90,001-£100,000	☐	More than £100k	☐	Do not wish to answer	____

Thank you, for completing this questionnaire. If you are prepared to talk further with us about the study, please provide a name and contact telephone number below.

Name and telephone number ______________________

____

APPENDIX TWO

FINAL FORM OF SURVEY QUESTIONNAIRE

ITS

Dear Sir/Madam,

Survey Of Long Distance Commuting

This survey is being conducted as part of a PhD research project concerned with long distance commuting. I would be very grateful if you could take the time to complete this questionnaire. All information given will be treated in the strictest confidence. If you have any queries, please contact me on 0113 3435325 (e-mail Gfrankli@its.leeds.ac.uk).

Yours faithfully

George Franklin

Research Student

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1. JOURNEY TO WORK PROFILE

Q1.1 Where do you live? ______________________ (Name of district & post code)

Q1.2 Where do you work? ______________________ (Name of area/borough & post code)

Q1.3 How do you normally travel to work?

Car driver ☐ Car Passenger ☐ Train ☐ Coach ☐ Other ____________

Q1.4 How long does the journey to work normally take one way door to door? ____hours _____minutes

Q1.5 How often do you make this journey to London per week? ___________days per week

Q1.6 If you <u>do not</u> make this journey five days per week, what do you do in a typical week?

Work at home ____days
Work at branch office ____days (Please state where____________)
Visit outside firms ____ days
Work at Telecommuting centre____ days
Stay over in London ____nights
Do not work ____days
Other (Please specify) ______________________________

Q1.7 How many hours per day do you typically spend at your workplace? _____ hours per day

Q1.8 How many hours are you contracted to work? _____hours per day/week* (Delete as appropriate)

Q1.9 Do you work: Standard hours ☐ Flexi-hours ☐

Q1.10 Do you also work when you are commuting? Yes ☐ No ☐

Q1.11 If you are a public transport user, how often do you get a seat when you are commuting?

Almost always ☐ Usually ☐ Rarely ☐ Almost never ☐

Q1.12 How much does it cost you to travel to and from work?

£ __________ per day/week/month/quarter/ year* (Delete as appropriate).

Q1.13 If you are a public transport user, what type of ticket do you normally use for the journey to work?

Weekly season ticket	☐	Monthly season ticket	☐	Quarterly season ticket	☐
Annual season ticket	☐	Rail pass/Privilege ticket	☐	Other ____________	☐

Q1.14 If you are a train commuter, do you travel? First class ☐ Standard class ☐

Q1.15 Is your fare paid by your employer? Yes, in part ☐ Yes, in full ☐ No ☐

Q1.16 Is your fare paid by interest free loan? Yes ☐ No ☐

Q1.17 About what proportion of your after tax income do you spend on commuting? ________

2. TOLERANCE OF LONG DISTANCE COMMUTING

Q2.1 If the journey time by your current means of travel were to get longer, what is the maximum amount of time per day that you would be prepared to spend commuting to and from work?

_______hours ______minutes

Q2.2 What would you do if the journey time on your current mode exceeded the maximum time that you would tolerate for the journey to work? (please tick as many boxes as appropriate).

- Work more at home and travel less frequently ☐
- Work longer hours and travel less frequently ☐
- Stay over in London and travel less frequently ☐
- Switch to a different means of travel ☐ (Please specify) ______________
- Change jobs ☐
- Move home ☐
- Other ☐ (Please specify) ________________

Q2.3 What is the maximum amount that you would be prepared to spend on commuting?

£ __________ per day/week/month/quarter/ year* (Delete as appropriate).

Q2.4 What would you do if fares increased above this point?

- Work more at home and travel less frequently ☐
- Work longer hours and travel less frequently ☐
- Stay over in London and travel less frequently ☐
- Switch to a different means of travel ☐ (Please specify) ______________
- Look for a better paid job in London ☐
- Change to a job nearer home ☐
- Move home ☐
- Other ☐ (Please specify) ______________

Q2.5 **If, in response to Questions 2.2 or 2.4, you would work more at home, how many days per week would you work at home?** _____ days

Q2.6 **If, in response to Questions 2.2 or 2.4, you would travel less frequently, how many fewer days per week would you travel?** _____ days

Q2.7 **If, in response to Questions 2.2 or 2.4, you would work longer hours to travel less frequently, how many additional hours per week would you work?** _____ hours

Q2.8 **If, in response to Questions 2.2 or 2.4, you would stay over in London would you:**

Stay with family/friends ☐ Rent a flat ☐ Stay in hotel/guest house ☐ Other ☐

Q2.9 **If, in response to Questions 2.2 or 2.4, you would move home, about how much nearer to London would you seek to move?** _____ miles

Q2.10 **If, in response to Questions 2.2 or 2.4, you would change to a job nearer home, about how much nearer home would it be?** _____ miles

Q2.11 **What would you like to do, but cannot do, because of the time spent commuting long distance?**

See more of my children ☐
Spend more time with partner ☐
Increase earnings with evening job ☐
Use the time to further education ☐
Pursue hobby ☐
Engage in community volunteer work ☐
Spend more time in leisure activities ☐
Other (Please specify) ___________________

3. EMPLOYMENT

Q3.1 **How long have you been employed in your present job?** ____years ____months.

Q3.2 **Are you employed:** Full Time ☐ Part Time ☐ Self Employed ☐

Q3.3 **If you had a job previous to this one, how long were you employed in that job?** ___yrs ___months.

Q3.4 **Were you employed:** Full Time ☐ Part Time ☐ Self Employed ☐

Q3.5 **Where was the job located?** _______________ (Please give area/borough and post code if known).

Q3.6 **What were the reason(s) for changing to your present job?**

Had no previous job ☐
Promotion ☐
Office relocation ☐
Better job ☐
Job security ☐
Improved salary ☐
Redundancy ☐
New job more conveniently located ☐
Children grown up ☐
Other (Please specify) __________

Q3.7 **How did you normally travel to your previous work?**

Car driver ☐ Car Passenger ☐ Train ☐ Bus or Coach ☐ Other ________

Q3.8 How long did the journey to work normally take door to door? ____hours _____minutes

Q3.9 If you have not had a previous job, why did you choose to work in London?

No alternative ☐
High salary ☐
Job security ☐
Career development opportunities ☐
Other (Please specify) ___________

4. RESIDENCE

Q4.1 How long have you resided at your present address? _____years _____months.

Q4.2 Where did you live previously? ____________________ (Please give area/borough and post code)

Q4.3 How long did you live at your previous address? _____years _____months.

Q4.4 What were the reason(s) for moving to your present address?

Marriage/moved in with partner ☐
Housing in area suits my budget ☐
Area/property suits my lifestyle ☐
Access to good transport ☐
More convenient for commuting ☐
Acquired a better property ☐
Changed job ☐
Proximity to children's school ☐
Partner's job location ☐
Location central to partner's and own workplace ☐
Children left home ☐
Other (Please specify) ______________________

Q4.5 Suppose you had the choice between two options. Option A represents the example of living remote from the job (in a rural locality) and commuting long distance. Option B represents living in an urban area closer to the workplace. These are set out below.

Housing Option A	Housing Option B
Property similar to your present one, in similar location, at current price. (i.e. as now.)	Similar Property, in similar area, costing £50k more in London, or nearer workplace.
Involves long distance commuting of approximately 80 minutes each way by rail.	Involves approximately 35 minutes commuting to work by underground rail.
Fare: £22 per day	Fare: £8 per day

Which option would you choose? _____

Q4.6 If you chose Option A, which of the following factors would be just sufficient to make you change your mind?

Increase in cost of commuting by £ _____ (Please state amount of increase per week/month/year)
Increase in mortgage/rent by £ _____ (Please state amount of increase per week/month/year)
Increase in journey time by _____ mins. _____ hours (per week)
Other (please specify) ____

Q4.7 If you chose Option B, which of the following factors would be just sufficient to make you change your mind?

Increase in cost of commuting by £ ______ (Please state amount of increase per week/month/year)
Increase in mortgage/rent by £ ______ (Please state amount of increase per week/month/year)
Increase in journey time by ______ mins. _____ hours (per week)
Other (please specify) ________________

5. SUSTAINABILITY OF COMMUTING

Q5.1 Looking towards the future, even if you felt that your present employment was secure, for how much longer would you envisage commuting long distance?

Less than 2 years ☐ 2-5 years ☐
6-10 years ☐ 11-16 years ☐
Longer (Please state)___________

Q5.2 How likely are the following factors to influence your long distance commuting in the future?

	Very Likely	Possible	Very Unlikely
1. Commute until I retire	☐	☐	☐
2. Children leaving home	☐	☐	☐
3. Have to do it because of negative equity	☐	☐	☐
4. To support existing lifestyle	☐	☐	☐
5. Until I can find a house near to workplace	☐	☐	☐
6. Until I can find a job near to residence	☐	☐	☐
7. I have a job which cannot be conducted off-site	☐	☐	☐
8. Convenience and/or reliability of public transport	☐	☐	☐
9. Until I am tired of commuting long distance	☐	☐	☐
10. Other (please specify)	☐	☐	☐

6. EFFECT OF INFORMATION TECHNOLOGY ON LONG DISTANCE COMMUTING

Information Technology (IT) is widely used in the workplace and has brought flexibility to traditional methods of working. Presented below are two options. Option A is based on traditional methods of working and involves daily commuting to the office. Option B involves carrying out the same duties with IT, allowing you to work (with IT) off-site two days per week (either at home or at a telecommuting centre), but at a lower salary.

Option A	Option B
5 days per week at London office	3 days per week at London office 2 days per week at home
Full annual salary	Annual salary negotiable

Q6.1 What reduction in annual salary would you be prepared to accept in return for being able to work at home twice a week? £_______

7. PERSONAL CHARACTERISTICS

We need to have some idea of the type of person who regularly commutes long distance to work. Information provided to the questions below will help us to achieve this objective. This information will be treated with strictest confidence.

Q7.1 Are you? Male ☐ Female ☐

Q7.2 To which age group do you belong?

16 - 24 ☐ 25-34 ☐ 35 – 44 ☐ 45 – 60 ☐ Over 60 ☐

Q7.3 What is your occupation? ________________

Q7.4 How many people are there in your household? ______

Q7.5 How many other people in your household work? ______

Q7.6 How many members in your household are 16 years and under? ______

Q7.7 Within which group does the total annual income of your household lie (before deduction of tax, national insurance etc.)?

Less than £10,000	☐	£10,000-£20,000	☐	£20,001-£30,000	☐
£30,001-£40,000	☐	£40,001-£50,000	☐	£50,001-£60,000	☐
£60,001-£70,000	☐	£70,001-£80,000	☐	£80,001-£90,000	☐
£90,001-£100,000	☐	More than £100k	☐	Do not wish to answer	_____

Thank you, for completing this questionnaire. If you are prepared to talk further with us about the study, please provide a name and contact telephone number below.

Name and telephone number ______________________

____

APPENDIX 3: ELIMINATION OF BUSINESS TRAVELLERS FROM LDC SAMPLE

3.0 Elimination of Business Travellers

During the screening process of the survey, great care was taken to enquire of surveyees whether they were travelling to work in Greater London. Only when this fact was established were they given survey forms.

Yet it is possible that not everyone, captured by the survey, may be long distance commuters. Some may be business travellers and therefore must be eliminated from the study.

The study adopted two criteria to distinguish long distance commuters from business travellers.

The first criterion is based on the frequency of the surveyee's journey to Greater London. For example, the criterion for long distance commuting, adopted by the study, is based on workers who commute regularly (that is two days or more) from residences located outside the South East region to jobs in Greater London.

Where this was not the case, the surveyee was most likely a business traveller who was caught up in the survey.

The second criterion is allied to the first and is based on who bears the cost of such journeys. In the case of the business traveller, the cost of the journey would be borne by the employer.

Q1.15 Is your fare paid by your employer? Yes, in part ☐ Yes, in full ☐ No ☐

Question 1.15 (above) provided the opportunity to examine the survey data and to eliminate from the survey, those who were considered business travellers - using the criteria for business travel earlier defined.

This was undertaken, using the data menu of SPSS – as shown in Diagrams A-3.1 and A-3.2 to de-select cases which were regarded as business travellers.

Diagram A 3.1: Mechanics of Eliminating Business Travellers from LDC Data Base - First Stage

The first stage involved: 1. opening the appropriate SPSS data file, which in this case is the 'On-Train LDC Survey, Brist. – Padd., 2003. . 2. click on the **Data** label of the menu bar. A drop down menu appears 3. click **Select** Cases, IF .... 4. The following formula is entered: IF **ID** = (comfare = 1) or (comfare = 3). where 'comfare' is the variable that applies to Q 1.15 and refers to commuting fare. So that **comfare = 1** represents LDCs, whose fares are not paid by employers. **comfare = 3** represents LDCs, whose fares are paid in part by employers. The formula above is designed to eliminate **comfare = 2**. That is, those whose fares are paid in full by the employer.

The procedure, adopted in Diagram A 3.1, leads to the following syntax file (Diagram A- 3.2), which is then executed.

Diagram A- 3.2: Mechanics of Eliminating Business Travellers from LDC Data Base (cont'd)

```
Syntax
USE ALL
COMPUTE filter_ $ = ((comfare = 1 or (comfare = 3))
VARIABLE LABEL filter_ $ '(comfare = 1) or (comfare = 3)....(FILTER)'
VALUE LABELS filter _ 0 'Not Selected' 1 'Selected'.
FORMAT filter _ $ (f1.0).
FILTER BY filter _ $
EXECUTE
```

Source: On-Train LDC Survey, Bristol - Paddington, 2003

The results are presented in a SPSS Table, which is similar to Table A- 3.1 (below) - as there is no direct interface between the SPSS table, in question, and MS Excel or MS Word. But it is useful to demonstrate how SPSS de-selected the cases that were regarded as business travellers. This is indicated by the diagonal line which runs across the ID number.

Table A - 3.1: Showing SPSS Results When Cases Are Deleted

Id	locresid	locemp	ldctype	cjtwrk	jtimecj	jfreque	pcomw	pcomvf	pcomsl
1	9	1	1	3	5	5	0	0	0
~~2~~	9	2	1	3	5	5	0	0	0
3	13	1	1	3	6	5	0	0	0
4	6	1	1	1	3	1	2	0	0
5	14	2	1	3	7	5	0	0	0
~~6~~	13	1	1	3	5	4	1	0	0
~~7~~	13	2	1	3	5	5	0	0	0
8	15	2	1	3	5	5	0	0	0
9	4	1	1	3	6	3	2	0	0
~~10~~	16	1	1	3	5	5	0	0	0
11	17	1	1	3	8	5	0	0	0
~~12~~	16	2	1	3	4	5	0	0	0
13	16	2	1	3	9	4	0	0	2
~~14~~	6	2	1	3	6	5	0	0	0
15	18	1	1	3	9	5	0	0	0
16	9	2	1	3	5	5	0	0	0

Source: On-Train LDC Survey, Bristol - Paddington, 2003

The actual SPSS table showed that there were 114 surveyees, who indicated that the employer paid the cost of their journey. Therefore, under the criteria for business travel earlier described, these should be eliminated from the study.

It is nevertheless advisable after the completion of any exercise, undertaken with SPSS, to re-examine or check the original data, in case the results are not consistent with expectation (Wardman, 2004).

The advice was justified. The 114 cases, which SPSS de-selected, were examined by reference to the information, which they supplied on the original questionnaire.

Table A - 3.2: Re-examination of (114) Cases Originally Selected as Business Travellers

	No	%
Full Time LDCs		
- commuting to London 5 days per week	17	*14.9*
Part Time LDCs		
- commuting to London 2 days per week	24	*21.0*
- commuting to London 3 days per week	19	*16.7*
- commuting to London 4 days per week	14	*12.3*
Business Travellers		
- commuting to London 1 day per week, per fortnight or per month.	40	*35.1*
Total	114	*100.0*

Source: On-Train LDC Survey, Bristol - Paddington, 2003
Note: Numbers presented in italics in column 3 are expressed as a percentage of the total cases examined, i.e.114.

The result of the examination, presented in Table A- 3.2 (above), showed that:

* in each of the 114 cases examined, the surveyee indicated that the employer had paid his or her fare.

* 17 of the 114 cases were regular long distance commuters. That is commuting, five days per week, to work in London.

* 57 or (or 50 %) of the 114 cases were part time long distance commuters - travelling to work in London, between two and four days per week.

* Ten of the 114 cases examined were engaged in 'Sales' occupations. Therefore we do not regard these as commuters but as business travellers. Examples given were 'Head of Retailing', 'International Trade or Sales Advisers', 'and Telecom Sales'. London was therefore one market in which they traded on one day of the week. The journey to London would often be made by train.

* Nineteen of the 114 cases, caught up in the survey, indicated that they normally worked in branch offices, located in Bristol, Bath etc., whose

headquarters are in London. The latter workers often travelled to the London head office one day per week or fortnight.

Workers in this category worked as 'Company Managers' (including bank managers); 'IT Professionals' (including IT consultants and business analysts); and 'Legal Affairs' (including patent attorney and tax law) - to name a few.

* Eleven of the 114 cases examined, normally commuted to work by car. Examples of which include journeys made between Bristol and Swindon or Gloucester and Oxford. Such workers also made infrequent journeys to London on one day per week, per fortnight or per month. Preferring to use the train whenever they travelled to London.

It is therefore the last three groups, comprising 40 surveyees, who were eliminated from the study.

APPENDIX TABLE 8.1: LDCs' ACCESS DISTANCE TO RAILHEAD

Summary

	Miles	km
Mean	8.5	13.68
Std. Deviation	7.4	11.91
Variance	54.76	88.11
n	200	

Case No	Location of Residence	Access Station	Access Distance to Station (miles)	(km)
1	Swindon SN6 8HQ	Swindon	9.8	15.8
2	Swindon SN6	Swindon	9.8	15.8
3	Calne SN11 8AH	Chippenham	7.5	12.1
4	Steeple Ashton BA14	Bath Spa	16.9	27.2
5	Calne SN11 0LD	Chippenham	7.5	12.1
6	Calne SN11 9PA	Chippenham	7.5	12.1
7	Corsham SN13	Chippenham	8.0	12.9
8	Bristol BS48 3JN	Bristol Temple Meads	8.0	12.9
9	Chippenham SN14	Chippenham	8.6	13.8
10	Chew Valley	Bristol Temple Meads	11.8	19.0
11	Chippenham SN14	Chippenham	8.6	13.8
12	Chippenham SN15	Chippenham	9.2	14.8
13	Bath BA1	Bath Spa	1.0	1.6
14	Wells BA5 2UZ	Bath Spa	21.9	35.2
15	Swindon SN2	Swindon	1.5	2.4
16	Bath BA1 8ES	Bath Spa	1.0	1.6
17	Bath BA1 3NS	Bath Spa	1.0	1.6
18	Swindon SN1	Swindon	1.5	2.4
19	Kington Langley	Chippenham	2.9	4.7
20	Chippenham SN14 6YA	Chippenham	8.6	13.8
21	Bath BA1	Bath Spa	1.0	1.6
22	Swindon SN4 8QD	Swindon	4.5	7.2
23	Wootton Bassett SN4 7AW	Swindon	4.9	7.9
24	Bristol BS8	Bristol Temple Meads	4.1	6.6
25	Swindon SN3 4RQ	Swindon	5.1	8.2
26	Swindon SN25	Swindon	3.7	6.0
27	Wickwar GL12 8PJ	Bristol Temple Meads	15.9	25.6
28	Cotswolds GL54 3EJ	Bristol Temple Meads	27.0	43.4
29	Somerset BS39 4JX	Bristol Temple Meads	11.1	17.9
30	Chippenham SN14	Chippenham	8.6	13.8
31	Bath BA11	Bath Spa	14.6	23.5
32	Bath BA1 6SY	Bath Spa	1.0	1.6
33	Bath BA1	Bath Spa	1.0	1.6
34	Bath BA1 2PT	Bath Spa	1.0	1.6
35	Wilts SN3 6NJ	Chippenham	5.1	8.2
36	Chippenham SN15 5NJ	Chippenham	9.2	14.8
37	Bath BA2 4LZ	Bath Spa	1.5	2.4
38	Gloucester GL4 8JH	Bristol Parkway	27.0	43.4
39	Longlot, Oxfordshire SN7 7TY	Reading	27.2	43.4
40	Swindon SN25	Swindon	3.6	5.8
41	Swindon SN25	Swindon	3.6	5.8
42	Bremhill SN11	Chippenham	6.6	10.6
43	SN14	Chippenham	8.6	13.8

44	Bristol BS40	Bristol Temple Meads	10.1	16.3
45	Cheltenham GL50 2SL	Bristol Temple Meads	27.0	43.4
46	SN15	Chippenham	9.2	14.8
47	Chippenham SN14	Chippenham	8.6	13.8
48	SN15	Chippenham	9.2	14.8
49	Wilts BA15	Bath Spa	8.6	13.8
50	SN14 7NB	Chippenham	8.6	13.8
51	Bath BA1 2TF	Bath Spa	1.0	1.6
52	Bristol BS6 7YH	Bristol Temple Meads	3.2	5.1
53	Monmouthshire ND7 6AL	Bristol Parkway	22.0	35.4
54	Bishopson Bristol BS7 8OH	Bristol Temple Meads	4.2	6.8
55	Monmouthshire NP25 4TX	Bristol Parkway	22.0	35.4
56	Bristol BS6	Bristol Temple Meads	3.2	5.1
57	Bristol BS4	Bristol Temple Meads	1.6	2.6
58	Yate BS37	Bristol Temple Meads	11.8	19.0
59	Bristol BS9	Bristol Temple Meads	3.9	6.3
60	Winterbourne BS36 1RP	Bristol Temple Meads	8.5	13.7
61	Kingswood BS15 9ZA	Bristol Temple Meads	3.7	6.0
62	Bristol BS32	Bristol Temple Meads	11.2	18.0
63	Cardiff CF10 3DP	Bristol Parkway	22.0	35.4
64	Swindon SN5 8NL	Swindon	2.2	3.5
65	Bristol BS15	Bristol Temple Meads	3.7	6.0
66	Bristol BS6	Bristol Temple Meads	3.2	5.1
67	Bristol BS11 9QL	Bristol Temple Meads	8.9	14.3
68	Cothu Bristol BS6	Bristol Temple Meads	3.2	5.1
69	Horfield BS7 8RN	Bristol Temple Meads	4.2	6.8
70	Iron Acton BS37 9XT	Bristol Temple Meads	11.8	19.0
71	Bristol BS32 8BD	Bristol Temple Meads	11.2	18.0
72	Bristol BS8 3HB	Bristol Temple Meads	4.1	6.6
73	Bristol BS34	Bristol Temple Meads	7.0	11.3
74	Cardiff CF5	Bristol Parkway	22.0	35.4
75	Sedgemoor BS28	Bristol Temple Meads	20.0	32.2
76	Abergavenny	Bristol Parkway	22.0	35.4
77	Bristol BS32	Bristol Temple Meads	11.2	18.0
78	Swindon SN1 4AY	Swindon	1.5	2.4
79	Marlborough	Chippenham	21.0	48.9
80	Swindon SN1	Swindon	1.5	1.9
81	Bath BA1 2LX	Bath	1.0	1.6
82	Bradford-on-Avon BA15 2PU	Bath	8.6	13.8
83	Bristol BS8 4PP	Bristol Temple Meads	4.1	6.6
84	Wiltshire SN15	Chippenham	9.2	14.8
85	Malmesbury SN16	Chippenham	18.1	29.1
86	Calne SN11	Chippenham	7.8	12.6
87	Bromham SN15	Chippenham	9.2	14.8
88	Bath BA15 1TJ	Bath Spa	8.6	13.8
89	Devizes SN10 1RY	Chippenham	12.1	19.5
90	Chippenham SN15	Chippenham		14.8
91	Chippenham SN16 9AA	Chippenham	18.1	29.1
92	Bath BA1 7ER	Bath	1	1.6
93	Wantage OX12 9YR	Reading	27.2	43.8
94	Wootton Bassett (Nr Swindon) SW4 8DQ	Swindon	6.4	10.3
95	Swindon SN25 4XS	Swindon	3.7	6.0
96	Bath BA1	Bath Spa	1.0	1.6
97	Chippenham SN15	Chippenham	9.2	14.8
98	Chippenham SN15	Chippenham	9.2	14.8
99	Swindon SN4 9PA	Swindon	4.5	7.2
100	Oxfordshire OX25 6LB	Reading	27.2	43.8

101	Swindon SN15	Swindon	2.7	4.3
102	Southmoor OX13 5HZ	Reading	24.1	38.8
103	Swindon SN25 2BL	Swindon	3.7	6.0
104	Wantage OX12	Reading	27.2	43.8
105	Swindon SN25	Swindon	3.7	6.0
106	Wantage OX12	Reading	27.2	43.8
107	Glouscestershire GL20 7BP	Bristol	27.2	43.8
108	BA14	Bath Spa	9.3	15.0
109	Bristol BS6	Bristol Temple Meads	3.2	5.1
110	Bath BA2 2AT	Bath Spa	1.5	2.4
111	Malmesbury SN16	Chippenham	18.1	29.1
112	Bath BA14	Bath Spa	9.3	15.0
113	Corsham	Chippenham	4.7	7.6
114	Malmesbury SN16	Chippenham	18.1	29.1
115	Trowbridge BA14 6LF	Bath Spa	9.3	15.0
116	Didcot	Didcot	1.0	1.6
117	Chippenham SN15 Wilts	Chippenham	9.2	14.8
118	Swindon SN1 4AX	Swindon	1.5	2.4
119	Corsham SN13 9AP	Chippenham	4.7	7.6
120	SN16	Chippenham	18.1	29.1
121	Bath BA2	Bath Spa	1.5	2.4
122	Swindon, Wiltshire SN25 4GN	Swindon	3.7	6.0
123	Lechcape GL7 3AR	Bristol Temple Meads	27.0	43.4
124	Chippenham SN15	Chippenham	9.2	14.8
125	Bath BA2 6NN	Bath Spa	1.5	2.4
126	Wiltshire SN15 2PF	Chippenham	9.2	14.8
127	Weus BA5 1LF	Bath Spa	21.9	35.2
128	Chippenham SN15 4DE	Chippenham	9.2	14.8
129	Swindon SN3 4JW	Swindon	5.1	8.2
130	Chippenham SN15	Chippenham	9.2	14.8
131	Chippenham SN15	Chippenham	9.2	14.8
132	Bristol BS39	Bristol Temple Meads	11.1	17.9
133	Chippenham Wilts, SN15 3NE	Chippenham	9.2	14.8
134	Odd Down Bath BA2 2AJ	Bath Spa	1.5	2.4
135	Bath BA2 04A	Bath Spa	1.5	2.4
136	Bristol BS31	Bristol Temple Meads	5.5	8.8
137	Chippenham SN11 9TD	Chippenham	7.8	12.6
138	Bath BA1	Bath	1.0	1.6
139	Chippenham SN15	Chippenham	9.2	14.8
140	Chippenham SN15	Chippenham	9.2	14.8
141	B & N, Wilts SN13	Chippenham	8.0	12.9
142	Bath BA2 7DD	Bath Spa	1.5	2.4
143	Bath BA2 4SE	Bath Spa	1.5	2.4
144	Bath BA1	Bath Spa	1.0	1.6
145	Bath BA2 4DU	Bath Spa	1.5	2.4
146	Swindon SN1 4HP	Swindon	1.5	2.4
147	Swindon SN5 5TF	Swindon	1.7	2.7
148	Melksham SN12 7HG	Chippenham	8.9	14.3
149	Gloucester GL3	Bristol Temple Meads	28.0	45.1
150	Swindon SW25 4YH	Swindon	3.7	6.0
151	Chippenham SN14	Chippenham	8.6	13.8
152	Bath BA1	Bath Spa	1.0	1.6
153	Calne SN11 8EN	Chippenham	7.5	12.1
154	Melksham SN12 6FS	Chippenham	8.9	14.3
155	Calne SN11 2Y	Chippenham	7.8	12.6
156	North Wilts SN11	Chippenham	7.8	12.6
157	Chippenham SN14 OXJ	Chippenham	8.6	13.8
158	Bath BA2	Bath Spa	1.5	2.4

159	Wiltshire SN14 8EF	Chippenham	8.6	13.8
160	Wilts BA15 1SQ	Bath Spa	9.4	15.1
161	Bath BA1 5SP	Bath Spa	1.0	1.6
162	Bristol BS40	Bristol Temple Meads	10.1	16.3
163	Bath BA1 2YB	Bath Spa	1.0	1.6
164	Bones BS40	Bristol Temple Meads	10.1	16.3
165	Bath BA1	Bath Spa	1.0	1.6
166	Chow Magna BS40	Bath Spa	10.1	16.3
167	Bath BA2 6HP	Bath Spa	1.5	2.4
168	Bristol BS7 8SJ	Bristol Temple Meads	4.2	6.8
169	Bath BA2 3RT	Bath Spa	1.5	2.4
170	Bath BA2 4NA	Bath Spa	1.5	2.4
171	Bath BA2 2AY	Bath Spa	1.5	2.4
172	Oathill BA3 5HX	Bath Spa	1.0	1.6
173	N.E. Somerset BS39	Bristol Temple Meads	11.1	17.9
174	Chippenham SN15 3AN	Chippenham	9.2	14.8
175	Chippenham SN15	Chippenham	9.2	14.8
176	Bristol BS4	Bristol Temple Meads	1.6	2.6
177	BS14	Bristol Temple Meads	3.9	6.3
178	Clutton BS39 5PC	Bristol Temple Meads	11.1	17.9
179	Bristol BS6	Bristol Temple Meads	3.2	5.1
180	Bath BA2 6AH	Bath Spa	1.5	2.4
181	Keynsham	Bristol Temple Meads	5.4	8.7
182	Chippenham SN15	Chippenham	9.2	14.8
183	Holt BA14	Bath Spa	9.3	15.0
184	Swindon SN25 4AE	Swindon	3.7	6.0
185	Grencester GL7 5ER	Bristol Temple Meads	27.0	43.4
186	Culham OX14 3DS	Reading	24.1	38.8
187	BS48	Bristol Temple Meads	8.0	12.9
188	Swindon SN4	Swindon	4.5	7.2
189	Gurney Slade BA3 4TS	Bath Spa	1.0	1.6
190	Bath BA1 5DU	Bath Spa	1.0	1.6
191	Faringdon	Swindon	12.1	19.5
192	Bath BA1 5DU	Bath Spa	1.0	1.6
193	Bristol BS5	Bristol Temple Meads	3.7	6.0
194	Swindon SN3	Swindon	5.1	8.2
195	Bath BA2	Bath Spa	1.5	2.4
196	Stroud GL2 7JN	Bristol Temple Meads	28.0	45.1
197	Western Super Mare BS22 9JB	Western Super Mare	2.0	3.2
198	Cardiff CF23 5ET	Bristol Parkway	22.0	35.4
199	Bristol BS31	Bristol Temple Meads	5.5	8.8
200	Bath 15	Bath Spa	9.4	15.1

Source: On-Train LDC Survey, Bristol – Paddington, 2003

APPENDIX TABLE 8.2: SDCS' ACCESS DISTANCE – (SWT, 2005)

Summary Statistics

n	334
Mean	2.7009
Std. Deviation	2.5483
Variance	6.4938

Journey Origin Station	Destination Station	Access Distance	Distance Travelled
Crystal Palace	Raynes Park	1.8	11.0
Ewell West	London Zone 1	1.0	19.9
Fulwell	London Bridge	2.3	17.8
Hampton Court	London Zone 1	2.3	19.3
Hinchley Wood	London Zone 2	1.1	15.4
Kew Gardens	London Zone 1	10.0	11.7
Kingston	London Bridge	0.3	16.4
Kingston	London Bridge	0.4	16.4
Kingston	London Bridge	0.5	16.4
Kingston	London Bridge	0.6	16.4
Kingston	London Bridge	0.7	16.4
Kingston	London Bridge	0.8	16.4
Kingston	London Bridge	0.9	16.4
Kingston	London Bridge	1.0	16.4
Kingston	London Bridge	1.1	16.4
Kingston	London Bridge	1.2	16.4
Kingston	London Bridge	1.5	16.4
Kingston	London Bridge	1.6	16.4
Kingston	London Bridge	2.8	16.4
Kingston	London Zone 1	0.4	16.4
Kingston	London Zone 1	0.5	16.4
Kingston	London Zone 1	0.6	16.4
Kingston	London Zone 1	0.7	16.4
Kingston	London Zone 1	0.8	16.4
Kingston	London Zone 1	0.9	16.4
Kingston	London Zone 1	1.0	16.4
Kingston	London Zone 1	1.1	16.4
Kingston	London Zone 1	1.2	16.4
Kingston	London Zone 1	1.3	16.4
Kingston	London Zone 1	1.4	16.4
Kingston	London Zone 1	1.5	16.4
Kingston	London Zone 1	1.6	16.4
Kingston	London Zone 1	1.7	16.4
Kingston	London Zone 1	1.8	16.4
Kingston	London Zone 1	1.9	16.4
Kingston	London Zone 1	2.0	16.4
Kingston	London Zone 1	2.1	16.4

Kingston	London Zone 1	2.2	16.4
Kingston	London Zone 1	2.5	16.4
Kingston	London Zone 1	2.6	16.4
Kingston	London Zone 1	2.7	16.4
Kingston	London Zone 1	3.2	16.4
Kingston	London Zone 1	3.3	16.4
Kingston	London Zone 1	3.4	16.4
Kingston	London Zone 1	3.6	16.4
Kingston	London Zone 1	4.0	16.4
Kingston	London Zone 1	4.1	16.4
Kingston	London Zone 1	4.2	16.4
Kingston	London Zone 1	4.6	16.4
Kingston	London Zone 1	4.9	16.4
Kingston	London Zone 1	5.0	16.4
Kingston	London Zone 1	5.1	16.4
Kingston	London Zone 1	5.3	16.4
Kingston	London Zone 1	9.0	16.4
Kingston	London Zone 1	1.6	10.8
Kingston	London Zone 1	1.7	10.8
Kingston	London Zone 1	1.9	10.8
Kingston	London Zone 1	3.8	10.8
Kingston	London Zone 1	4.6	10.8
Kingston	London Zone 1	4.7	10.8
Kingston	London Zone 1	5.5	10.8
Kingston	London Zone 1	6.2	10.8
Kingston	London Zone 1	1.5	5.0
Kingston	London Zone 1	2.6	5.0
Kingston	London Zone 1	3.2	5.0
Kingston	London Zone 1	4.2	5.0
Kingston	London Zone 1	5.4	5.0
Kingston	London Zone 1	7.7	5.0
Malden Manor	London Bridge	1.7	16.8
Malden Manor	London Zone 2	0.8	10.9
Malden Manor	Staines	0.4	17.6
Mortlake	London Zone 1	0.6	10.9
Mortlake	London Zone 1	2.1	10.9
Mortlake	London Zone 1	2.5	10.9
Mortlake	London Zone 1	2.8	10.9
Mortlake	London Zone 1	5.7	10.9
Motspur Park	London Zone 1	4.6	14.9
New Malden	London Bridge	0.3	14.8
New Malden	London Bridge	0.4	14.8
New Malden	London Bridge	0.5	14.8
New Malden	London Bridge	0.7	14.8
New Malden	London Bridge	0.8	14.8
New Malden	London Bridge	0.9	14.8
New Malden	London Bridge	1.0	14.8
New Malden	London Bridge	1.1	14.8
New Malden	London Bridge	1.2	14.8
New Malden	London Bridge	1.3	14.8
New Malden	London Bridge	1.5	14.8
New Malden	London Bridge	1.7	14.8

New Malden	London Waterloo	1.6	14.8
New Malden	London Zone 1	0.1	14.8
New Malden	London Zone 1	0.2	14.8
New Malden	London Zone 1	0.4	14.8
New Malden	London Zone 1	0.6	14.8
New Malden	London Zone 1	0.7	14.8
New Malden	London Zone 1	0.8	14.8
New Malden	London Zone 1	0.9	14.8
New Malden	London Zone 1	1.0	14.8
New Malden	London Zone 1	1.1	14.8
New Malden	London Zone 1	1.2	14.8
New Malden	London Zone 1	1.3	14.8
New Malden	London Zone 1	1.4	14.8
New Malden	London Zone 1	1.5	14.8
New Malden	London Zone 1	1.6	14.8
New Malden	London Zone 1	1.7	14.8
New Malden	London Zone 1	1.8	14.8
New Malden	London Zone 1	1.9	14.8
New Malden	London Zone 1	2.0	14.8
New Malden	London Zone 1	2.1	14.8
New Malden	London Zone 1	2.2	14.8
New Malden	London Zone 1	2.4	14.8
New Malden	London Zone 1	2.6	14.8
New Malden	London Zone 1	2.7	14.8
New Malden	London Zone 1	2.8	14.8
New Malden	London Zone 1	3.2	14.8
New Malden	London Zone 1	3.4	14.8
New Malden	London Zone 1	3.4	14.8
New Malden	London Zone 1	3.5	14.8
New Malden	London Zone 1	4.0	14.8
New Malden	London Zone 1	4.4	14.8
New Malden	London Zone 1	4.6	14.8
New Malden	London Zone 1	12.9	14.8
New Malden	London Zone 1	0.3	8.9
New Malden	London Zone 1	0.4	8.9
New Malden	London Zone 1	0.5	8.9
New Malden	London Zone 1	0.6	8.9
New Malden	London Zone 1	0.7	8.9
New Malden	London Zone 1	0.8	8.9
New Malden	London Zone 1	0.9	8.9
New Malden	London Zone 1	1.0	8.9
New Malden	London Zone 1	1.1	8.9
New Malden	London Zone 1	1.2	8.9
New Malden	London Zone 1	1.3	8.9
New Malden	London Zone 1	1.4	8.9
New Malden	London Zone 1	1.5	8.9
New Malden	London Zone 1	1.6	8.9
New Malden	London Zone 1	1.8	8.9
New Malden	London Zone 1	1.9	8.9
New Malden	London Zone 1	2.3	8.9
New Malden	London Zone 1	2.4	8.9
New Malden	London Zone 1	3.7	8.9

New Malden	London Zone 1	5.3	8.9
New Malden	London Zone 1	3.2	1.9
New Malden	London Zone 1	1.0	3.6
New Malden	London Zone 1	1.1	3.6
New Malden	London Zone 1	1.2	3.6
New Malden	London Zone 1	1.4	3.6
New Malden	London Zone 1	1.5	3.6
New Malden	London Zone 1	1.6	3.6
New Malden	London Zone 1	1.8	3.6
New Malden	London Zone 1	1.9	3.6
Norbiton	London Bridge	0.6	15.5
Norbiton	London Bridge	1.0	15.5
Norbiton	London Bridge	14.3	15.5
Norbiton	London Zone 1	2.8	15.5
Norbiton	London Zone 1	3.2	15.5
Norbiton	London Zone 1	5.7	15.5
Norbiton	London Zone 1	6.3	15.5
Norbiton	London Zone 1	1.2	9.8
North Sheen	London Zone 1	0.5	12.2
North Sheen	London Zone 1	1.1	12.2
Putney	London Zone 1	5.2	8.2
Raynes Park	London Bridge	0.2	13.3
Raynes Park	London Bridge	0.4	13.3
Raynes Park	London Bridge	0.5	13.3
Raynes Park	London Bridge	0.6	13.3
Raynes Park	London Bridge	0.7	13.3
Raynes Park	London Bridge	0.8	13.3
Raynes Park	London Bridge	0.9	13.3
Raynes Park	London Bridge	1.0	13.3
Raynes Park	London Bridge	1.2	13.3
Raynes Park	London Bridge	1.3	13.3
Raynes Park	London Bridge	1.5	13.3
Raynes Park	London Bridge	1.6	13.3
Raynes Park	London Bridge	2.8	13.3
Raynes Park	London Bridge	2.8	13.3
Raynes Park	London Bridge	10.7	13.3
Raynes Park	London Zone 1	0.4	13.3
Raynes Park	London Zone 1	0.5	13.3
Raynes Park	London Zone 1	0.6	13.3
Raynes Park	London Zone 1	0.7	13.3
Raynes Park	London Zone 1	0.8	13.3
Raynes Park	London Zone 1	1.0	13.3
Raynes Park	London Zone 1	1.1	13.3
Raynes Park	London Zone 1	1.2	13.3
Raynes Park	London Zone 1	1.3	13.3
Raynes Park	London Zone 1	1.4	13.3
Raynes Park	London Zone 1	1.5	13.3
Raynes Park	London Zone 1	1.6	13.3
Raynes Park	London Zone 1	1.7	13.3
Raynes Park	London Zone 1	1.8	13.3
Raynes Park	London Zone 1	1.9	13.3
Raynes Park	London Zone 1	2.0	13.3

Raynes Park	London Zone 1	2.3	13.3
Raynes Park	London Zone 1	2.4	13.3
Raynes Park	London Zone 1	2.5	13.3
Raynes Park	London Zone 1	2.7	13.3
Raynes Park	London Zone 1	2.8	13.3
Raynes Park	London Zone 1	2.9	13.3
Raynes Park	London Zone 1	3.0	13.3
Raynes Park	London Zone 1	3.9	13.3
Raynes Park	London Zone 1	3.9	13.3
Raynes Park	London Zone 1	4.4	13.3
Raynes Park	London Zone 1	4.9	13.3
Raynes Park	London Zone 1	5.6	13.3
Raynes Park	London Zone 1	6.3	13.3
Raynes Park	London Zone 1	7.6	13.3
Raynes Park	London Zone 1	8.4	13.3
Raynes Park	London Zone 1	9.2	13.3
Raynes Park	London Zone 1	11.0	13.3
Raynes Park	London Zone 1	13.2	13.3
Raynes Park	London Zone 1	0.1	7.4
Raynes Park	London Zone 1	0.2	7.4
Raynes Park	London Zone 1	0.3	7.4
Raynes Park	London Zone 1	0.4	7.4
Raynes Park	London Zone 1	0.6	7.4
Raynes Park	London Zone 1	1.0	7.4
Raynes Park	London Zone 1	1.2	7.4
Raynes Park	London Zone 1	1.3	7.4
Raynes Park	London Zone 1	1.4	7.4
Raynes Park	London Zone 1	1.8	7.4
Raynes Park	London Zone 1	2.1	7.4
Raynes Park	London Zone 1	2.3	7.4
Raynes Park	London Zone 1	2.6	7.4
Raynes Park	London Zone 1	3.1	7.4
Raynes Park	London Zone 1	4.4	7.4
Raynes Park	London Zone 1	8.0	7.4
Raynes Park	London Zone 1	0.2	2.1
Raynes Park	London Zone 1	0.7	2.1
Raynes Park	London Zone 1	0.8	2.1
Raynes Park	London Zone 1	0.9	2.1
Raynes Park	London Zone 1	3.1	3.7
Raynes Park	London Zone 1	0.2	5.5
Raynes Park	London Zone 1	0.4	5.5
Raynes Park	London Zone 1	1.4	5.5
Raynes Park	London Zone 1	1.8	5.5
Raynes Park	London Zone 1	3.7	5.5
Richmond	London Bridge	0.5	13.3
Richmond	London Bridge	0.7	13.3
Richmond	London Bridge	1.0	13.3
Richmond	London Zone 1	1.0	13.3
Richmond	London Zone 1	1.1	13.3
Richmond	London Zone 1	1.2	13.3
Richmond	London Zone 1	1.3	13.3
Richmond	London Zone 1	1.4	13.3

Richmond	London Zone 1	1.5	13.3
Richmond	London Zone 1	1.6	13.3
Richmond	London Zone 1	1.7	13.3
Richmond	London Zone 1	1.8	13.3
Richmond	London Zone 1	1.9	13.3
Richmond	London Zone 1	2.0	13.3
Richmond	London Zone 1	2.2	13.3
Richmond	London Zone 1	2.3	13.3
Richmond	London Zone 1	2.4	13.3
Richmond	London Zone 1	2.6	13.3
Richmond	London Zone 1	2.7	13.3
Richmond	London Zone 1	2.8	13.3
Richmond	London Zone 1	2.9	13.3
Richmond	London Zone 1	3.0	13.3
Richmond	London Zone 1	3.3	13.3
Richmond	London Zone 1	3.4	13.3
Richmond	London Zone 1	3.6	13.3
Richmond	London Zone 1	3.7	13.3
Richmond	London Zone 1	3.9	13.3
Richmond	London Zone 1	4.0	13.3
Richmond	London Zone 1	4.1	13.3
Richmond	London Zone 1	4.2	13.3
Richmond	London Zone 1	4.2	13.3
Richmond	London Zone 1	4.3	13.3
Richmond	London Zone 1	4.4	13.3
Richmond	London Zone 1	4.5	13.3
Richmond	London Zone 1	5.0	13.3
Richmond	London Zone 1	6.1	13.3
Richmond	London Zone 1	6.4	13.3
Richmond	London Zone 1	6.9	13.3
Richmond	London Zone 1	7.4	13.3
Richmond	London Zone 1	7.5	13.3
Richmond	London Zone 1	7.9	13.3
Richmond	London Zone 1	8.7	13.3
Richmond	London Zone 1	9.2	13.3
Richmond	London Zone 1	9.7	13.3
Richmond	London Zone 1	11.4	13.3
Richmond	London Zone 1	0.5	9.1
Richmond	London Zone 1	4.2	9.1
Richmond	London Zone 1	5.0	9.1
Richmond	London Zone 1	6.5	9.1
Richmond	London Zone 1	1.2	8.1
Richmond	London Zone 1	3.5	8.1
Richmond	London Zone 1	1.0	7.8
Richmond	London Zone 1	4.4	7.8
Richmond	London Zone 1	4.8	7.8
Richmond	London Zone 1	0.9	7.9
St Margarets (Grt Ldn)	London Zone 1	4.2	14.9
Stoneleigh	London Bridge	0.2	18.2
Stoneleigh	London Bridge	0.4	18.2
Stoneleigh	London Bridge	0.5	18.2
Stoneleigh	London Bridge	0.6	18.2

Stoneleigh	London Bridge	0.7	18.2
Stoneleigh	London Bridge	0.8	18.2
Stoneleigh	London Bridge	0.9	18.2
Stoneleigh	London Bridge	0.9	18.2
Stoneleigh	London Bridge	1.0	18.2
Stoneleigh	London Bridge	2.0	18.2
Stoneleigh	London Bridge	3.8	18.2
Stoneleigh	London Bridge	5.1	18.2
Stoneleigh	London Bridge	5.3	18.2
Stoneleigh	London Zone 1	1.0	18.2
Stoneleigh	London Zone 1	1.5	12.4
Sunbury	London Zone 2	0.7	17.9
Sunbury	London Zone 3	1.6	14.6
Surbiton	London Bridge	1.0	18.0
Surbiton	London Bridge	1.4	18.0
Surbiton	London Bridge	3.0	18.0
Surbiton	London Bridge	4.4	18.0
Surbiton	London Bridge	6.4	18.0
Surbiton	London Bridge	7.2	18.0
Surbiton	London Bridge	8.0	18.0
Surbiton	London Bridge	9.0	18.0
Surbiton	London Bridge	9.4	18.0
Surbiton	London Bridge	10.0	18.0
Surbiton	London Waterloo	12.9	18.1
Teddington	London Bridge	2.3	17.2
Teddington	London Zone 1	1.0	17.2
Teddington	London Zone 1	2.3	17.2
Teddington	London Zone 1	1.7	7.3
Thames Ditton	London Zone 1	0.9	20.0
Tolworth	London Zone 1	1.1	18.2
Twickenham	London Zone 1	5.7	9.1
Waddon	London Zone 1	1.0	15.7
West Byfleet	London Zone 1	1.2	15.2
Whitton	London Zone 1	7.1	17.5

Source: South West Trains Rail Study Data, 2005

APPENDIX TABLE 8.3: MDCS' ACCESS DISTANCE (SWT, 2005)

Summary Statistics

n	236
Mean	4.2
Std. Deviation	4.4573
Variance	19.8673

Journey Origin	Destination Station	.Access .Distance	.Length of .Journey
Ash Vale	Croydon BR	0.4	44.9
Ash Vale	London Zone 1	0.4	49.1
Ash Vale	London Zone 1	2.7	49.1
Ashford (Middlesex)	London BR	13.3	25.2
Basingstoke	Slough	0.6	43.9
Bracknell	Battersea Park	1.8	42.7
Bracknell	Clapham Junction	3.2	40.8
Bracknell	Croydon BR	0.5	45.6
Bracknell	Croydon BR	1.8	45.6
Bracknell	Lewisham	5.1	51.7
Bracknell	London BR	0.1	44.9
Bracknell	London BR	0.3	44.9
Bracknell	London BR	0.5	44.9
Bracknell	London BR	0.8	44.9
Bracknell	London BR	0.8	44.9
Bracknell	London BR	1	44.9
Bracknell	London BR	1	44.9
Bracknell	London BR	1.1	44.9
Bracknell	London BR	1.1	44.9
Bracknell	London BR	1.4	44.9
Bracknell	London BR	2	44.9
Bracknell	London BR	2	44.9
Bracknell	London BR	2	44.9
Bracknell	London BR	2.1	44.9
Bracknell	London BR	2.2	44.9
Bracknell	London BR	2.2	44.9
Bracknell	London BR	2.3	44.9
Bracknell	London BR	2.4	44.9
Bracknell	London BR	2.4	44.9
Bracknell	London BR	2.4	44.9
Bracknell	London BR	2.5	44.9
Bracknell	London BR	2.5	44.9
Bracknell	London BR	2.6	44.9
Bracknell	London BR	2.7	44.9
Bracknell	London BR	3.2	44.9
Bracknell	London BR	3.2	44.9
Bracknell	London BR	3.2	44.9
Bracknell	London BR	3.3	44.9
Bracknell	London BR	3.3	44.9
Bracknell	London BR	3.4	44.9

Bracknell	London BR	3.4	44.9
Bracknell	London BR	3.4	44.9
Bracknell	London BR	3.4	44.9
Bracknell	London BR	3.4	44.9
Bracknell	London BR	3.4	44.9
Bracknell	London BR	3.5	44.9
Bracknell	London BR	5.4	44.9
Bracknell	London BR	6.3	44.9
Bracknell	London BR	10.2	44.9
Bracknell	London Victoria	4.4	43.1
Bracknell	London Zone 1	0.3	44.9
Bracknell	London Zone 1	0.7	44.9
Bracknell	London Zone 1	0.7	44.9
Bracknell	London Zone 1	0.8	44.9
Bracknell	London Zone 1	0.8	44.9
Bracknell	London Zone 1	0.8	44.9
Bracknell	London Zone 1	0.9	44.9
Bracknell	London Zone 1	0.9	44.9
Bracknell	London Zone 1	0.9	44.9
Bracknell	London Zone 1	0.9	44.9
Bracknell	London Zone 1	1.1	44.9
Bracknell	London Zone 1	1.2	44.9
Bracknell	London Zone 1	1.3	44.9
Bracknell	London Zone 1	1.4	44.9
Bracknell	London Zone 1	1.4	44.9
Bracknell	London Zone 1	1.5	44.9
Bracknell	London Zone 1	1.5	44.9
Bracknell	London Zone 1	1.6	44.9
Bracknell	London Zone 1	1.6	44.9
Bracknell	London Zone 1	1.6	44.9
Bracknell	London Zone 1	1.6	44.9
Bracknell	London Zone 1	1.7	44.9
Bracknell	London Zone 1	1.8	44.9
Bracknell	London Zone 1	1.9	44.9
Bracknell	London Zone 1	2	44.9
Bracknell	London Zone 1	2	44.9
Bracknell	London Zone 1	2.3	44.9
Bracknell	London Zone 1	2.4	44.9
Bracknell	London Zone 1	2.5	44.9
Bracknell	London Zone 1	2.5	44.9
Bracknell	London Zone 1	2.6	44.9
Bracknell	London Zone 1	2.6	44.9
Bracknell	London Zone 1	2.8	44.9
Bracknell	London Zone 1	3.2	44.9
Bracknell	London Zone 1	3.2	44.9
Bracknell	London Zone 1	3.2	44.9
Bracknell	London Zone 1	3.2	44.9
Bracknell	London Zone 1	3.2	44.9
Bracknell	London Zone 1	3.4	44.9
Bracknell	London Zone 1	3.4	44.9
Bracknell	London Zone 1	3.4	44.9
Bracknell	London Zone 1	3.4	44.9

Bracknell	London Zone 1	3.4	44.9
Bracknell	London Zone 1	3.4	44.9
Bracknell	London Zone 1	3.4	44.9
Bracknell	London Zone 1	3.5	44.9
Bracknell	London Zone 1	3.6	44.9
Bracknell	London Zone 1	5.7	44.9
Bracknell	London Zone 1	6.5	44.9
Bracknell	London Zone 2	0.4	40.8
Bracknell	London Zone 2	0.6	40.8
Bracknell	London Zone 2	2.2	40.8
Bracknell	London Zone 2	3.4	40.8
Bracknell	Maze Hill	3.2	53.1
Bracknell	Wimbledon	3.1	37.9
Brookwood	London BR	1.3	42.3
Brookwood	London BR	3.8	42.3
Brookwood	London BR	5.6	42.3
Brookwood	London BR	21.6	42.3
Brookwood	London Zone 1	0.2	42.3
Brookwood	London Zone 1	0.4	42.3
Brookwood	London Zone 1	0.8	42.3
Brookwood	London Zone 1	1.3	42.3
Brookwood	London Zone 1	1.5	42.3
Brookwood	London Zone 1	1.5	42.3
Brookwood	London Zone 1	2.1	42.3
Brookwood	London Zone 1	2.2	42.3
Brookwood	London Zone 1	3.7	42.3
Brookwood	London Zone 1	7	42.3
Brookwood	London Zone 1	37.7	42.3
Byfleet & New Haw	London BR	0.8	30.4
Byfleet & New Haw	London BR	8.6	30.4
Byfleet & New Haw	London BR	11.2	30.4
Byfleet & New Haw	London BR	13.7	30.4
Byfleet & New Haw	London Zone 1	1.6	30.4
Byfleet & New Haw	London Zone 1	1.8	30.4
Camberley	London Zone 1	0.7	47.2
Chertsey	London BR	21.6	30
Chilworth	London Zone 1	2	42.9
Clandon	London Zone 1	2.2	37.9
Clandon	Wimbledon	2.5	27.1
Claygate	London Zone 1	1.4	22.7
Cobham & Stoke d'Abn	London BR	1.8	28.2
Cobham & Stoke d'Abn	London Zone 1	2.1	28.2
Cobham & Stoke d'Abn	London Zone 1	4.3	28.2
Dorking ~	London Zone 1	2.9	32.9
Effingham Junction	London BR	10.2	31.8
Effingham Junction	London Zone 1	9.3	31.8
Epsom	London Zone 1	5.3	21.8
Esher	London Zone 1	4	21.4
Farnborough Main	Croydon BR	2.3	46.7
Farnborough Main	London BR	1.4	49.9
Farnborough Main	London BR	1.5	49.9
Farnborough Main	London BR	3.5	49.9

Farnborough Main	London BR	3.8	49.9
Farnborough Main	London BR	4.9	49.9
Farnborough Main	London BR	5.1	49.9
Farnborough Main	London BR	5.9	49.9
Farnborough Main	London BR	6.2	49.9
Farnborough Main	London BR	6.9	49.9
Farnborough Main	London BR	6.9	49.9
Farnborough Main	London BR	7.1	49.9
Farnborough Main	London BR	7.4	49.9
Farnborough Main	London BR	10.3	49.9
Farnborough Main	London BR	20.7	49.9
Farnborough Main	London Zone 1	1.5	49.9
Farnborough Main	London Zone 1	1.8	49.9
Farnborough Main	London Zone 1	2.7	49.9
Farnborough Main	London Zone 1	2.8	49.9
Farnborough Main	London Zone 1	2.9	49.9
Farnborough Main	London Zone 1	3.2	49.9
Farnborough Main	London Zone 1	3.3	49.9
Farnborough Main	London Zone 1	3.3	49.9
Farnborough Main	London Zone 1	3.7	49.9
Farnborough Main	London Zone 1	3.8	49.9
Farnborough Main	London Zone 1	4.6	49.9
Farnborough Main	London Zone 1	4.7	49.9
Farnborough Main	London Zone 1	6.0	49.9
Farnborough Main	London Zone 1	6.1	49.9
Farnborough Main	London Zone 1	6.7	49.9
Farnborough Main	London Zone 1	6.8	49.9
Farnborough Main	London Zone 1	6.9	49.9
Farnborough Main	London Zone 1	7.2	49.9
Farnborough Main	London Zone 1	7.4	49.9
Farnborough Main	London Zone 1	9.5	49.9
Farnborough Main	London Zone 1	10.4	49.9
Farnborough Main	London Zone 1	11.2	49.9
Farnborough Main	London Zone 1	13.5	49.9
Farnborough Main	London Zone 1	23.4	49.9
Farncombe	Croydon BR	4	40.5
Farncombe	Croydon BR	6.4	40.5
Farncombe	London BR	8.1	48.2
Farncombe	London Zone 1	13.5	48.2
Farnham	London Zone 1	2.7	57.1
Fleet	London Zone 1	6.1	54.8
Godalming	London BR	5.6	49.8
Godalming	London BR	8.2	49.8
Godalming	London Zone 1	11.6	49.8
Guildford	Herne Hill	2.1	41.3
Guildford	London BR	2.2	43.9
Guildford	London BR	2.6	43.9
Guildford	London BR	2.7	43.9
Guildford	London BR	4	43.9
Guildford	London BR	17.3	43.9
Guildford	London Zone 6	13.4	26
Horsley	London Zone 1	1.6	33.4

Horsley	London Zone 1	7.3	33.4
Maidenhead	London Zone 1	14.6	41.6
Martins Heron	London Zone 1	7.5	44.1
Milford (Surrey)	London Zone 1	1.6	52.5
Oxshott	London Zone 1	8.3	25.3
Reading	London Zone 5	4.2	48.5
Shalford	London BR	3.5	45
Shalford	London BR	4.8	45
Shalford	London BR	5.4	45
Twyford	London Zone 1	6.5	51.4
Walton-on-Thames	London Zone 1	1.3	25.2
Walton-on-Thames	London Zone 1	2.6	25.2
Wanborough	London Zone 1	1	47.9
West Byfleet	London BR	1.9	32.5
West Byfleet	London BR	5.3	32.5
West Byfleet	London Waterloo	2	32.8
West Byfleet	London Zone 1	9.2	32.5
West Byfleet	London Zone 3	1.7	22.7
Weybridge	London BR	4	28.4
Weybridge	London Waterloo	4.9	28.7
Winchfield	London BR	2.6	59.9
Witley	London BR	1.3	55.5
Witley	London Zone 1	7.2	55.5
Woking	Bank Waterloo & City	1.8	39.2
Woking	Battersea Park	6.4	33.7
Woking	Croydon BR	4.2	32.6
Woking	Lewisham	6.4	41.3
Woking	London BR	0.6	36.8
Woking	London BR	2	36.8
Woking	London BR	9.8	36.8
Woking	London Zone 1	1.5	36.8
Woking	London Zone 1	12.5	36.8
Woking	New Cross	1	40.6
Woking	Streatham Hill	1.5	32.7
Wokingham	London BR	2.3	51.1
Wokingham	London Paddington	3.4	47.7
Wokingham	London Waterloo	1.4	51.7
Wokingham	London Zone 1	3.5	51.1
Worplesdon	London BR	4.4	40.3
Worplesdon	London Zone 1	3.8	40.3

Source: South West Trains Rail Study (2005)

APPENDIX TABLE 8.4: COMPUTATION OF STANDARD ERROR FOR THE DIFFERENCE BETWEEN MEANS

1. LDC – SDC Samples

Critical criteria

	LDC	SDC
Mean	8.5 miles	2.7 miles
SD	7.4 miles	2.5483 miles
Variance	54.76	6.4938
n	200	334
Source	App. Table .8.1	App. Table .8.2

Standard Formula Adopted

$$SD\left(\overline{X}_{ldc} - \overline{X}_{sdc}\right) = \sqrt{\frac{Var_{ldc}}{N_{ldc}} + \frac{Var_{sdc}}{N_{sdc}}}$$

assuming independence and N(0,1)

where Var_{ldc} is the variance of the LDC sample

Var_{sdc} is the variance of the SDC sample

n_{ldc} is the size of the LDC sample

n_{sdc} is the size of the SDC sample

Substituting the known values of n and Var_{ldc} and Var_{sdc}

$$\mathrm{SD}\left(\overline{X}_{ldc} - \overline{X}_{sdc}\right) = \sqrt{\frac{54.76}{200} + \frac{6.4938}{334}}$$

$$= \sqrt{0.2932425}$$

S.E. Diff. = 0.54

2. LDC – MDC Samples

Critical criteria

	LDC	MDC
Mean	8.5 miles	4.2 miles
SD	7.4 miles	4.46 miles
Variance	54.76	19.89
n	200	236
Source	App. Table .8.1	App. Table .8.3

Standard Formula Applied

$$\mathrm{SD}\left(\overline{X}_{ldc} - \overline{X}_{mdc}\right) = \sqrt{\frac{Var_{ldc}}{N_{ldc}} + \frac{Var_{mdc}}{N_{mdc}}}$$

assuming independence and $N(0,1)$

Substituting the known values of n and Var_{ldc} and Var_{mdc}

$$\text{SD}\left(\overline{X}_{ldc} - \overline{X}_{mdc}\right) = \sqrt{\frac{54.76}{200} + \frac{19.89}{236}}$$

$$= \sqrt{0.358}$$

S.E. Diff. = 0.598

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3. MDC – SDC Samples

Critical criteria

	MDC	SDC
Mean	4.2 miles	2.7 miles
SD	4.46 miles	2.5483 miles
Variance	19.89	6.4938
n	236	334
Source	App. Table .8.3	App. Table .8.2

Standard Formula Adopted

$$\text{SD}\left(\overline{X}_{mdc} - \overline{X}_{sdc}\right) = \sqrt{\frac{Var_{mdc}}{N_{mdc}} + \frac{Var_{sdc}}{N_{sdc}}}$$

Substituting the known values of n and Var_{mdc} and Var_{sdc}

$$\text{SD}\left(\overline{X}_{mdc} - \overline{X}_{sdc}\right) = \sqrt{\frac{19.89}{236} + \frac{6.4938}{334}}$$

$$= \sqrt{0.1037}$$

S.E. Diff. = 0.32

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4. LDCs (this study) – LDCs (SWT, 2005)

Critical criteria

	LDCs (This Study)	LDC (SWT's, 2005)
Mean	8.5 miles	8.8543 miles
SD	7.4 miles	7.9821 miles
Variance	54.76	63.7142
n	200	457
Source	App. Table .8.3	App. Table .8.2

Standard Formula Adopted

$$SD\left(\overline{X}_{ldc(ts)} - \overline{X}_{ldc(swt)}\right) = \sqrt{\frac{Var_{ldc(ts)}}{N_{ldc(ts)}} + \frac{Var_{ldc(swt)}}{N_{ldc(swt)}}}$$

Note: $\overline{X}_{ldc(ts)}$ = represents the mean of this study's LDC Sample.

Substituting the known values of n and $Var_{ldc(ts)}$ and $Var_{ldc(swt)}$

$$SD\left(\overline{X}_{ldc(ts)} - \overline{X}_{ldc(swt)}\right) = \sqrt{\frac{54.76}{200} + \frac{63.7142}{457}}$$

$$= \sqrt{0.2738 + 0.1394183}$$

$$= \sqrt{0.4132}$$

S.E. Diff. = 0.64

APPENDIX TABLE 8.5: LDCS' ACCESS DISTANCE – (SWT, 2005)

n	457
Mean	8.8543
Std. Deviation	7.9821
Variance	63.7142

Journey Origin Station	Destination Station	Access Distance	Distance Travelled
Andover	London BR	0.60	100.9
Andover	London BR	2.00	100.9
Andover	London BR	2.70	100.9
Andover	London BR	3.10	100.9
Andover	London BR	3.30	100.9
Andover	London BR	6.50	100.9
Andover	London BR	7.30	100.9
Andover	London BR	7.40	100.9
Andover	London BR	8.10	100.9
Andover	London BR	8.40	100.9
Andover	London BR	18.90	100.9
Andover	London BR	23.80	100.9
Andover	London BR	24.20	100.9
Andover	London BR	26.00	100.9
Andover	London Charing Cross	3.60	100.9
Andover	London Waterloo	7.00	101.5
Andover	London Zone 1	0.70	100.9
Andover	London Zone 1	2.80	100.9
Andover	London Zone 1	2.90	100.9
Andover	London Zone 1	3.60	100.9
Andover	London Zone 1	3.70	100.9
Andover	London Zone 1	3.80	100.9
Andover	London Zone 1	10.00	100.9
Andover	London Zone 1	10.30	100.9
Andover	London Zone 1	10.40	100.9
Andover	London Zone 1	11.60	100.9
Andover	London Zone 1	12.50	100.9
Andover	London Zone 1	12.90	100.9
Andover	London Zone 1	15.20	100.9
Andover	London Zone 1	17.00	100.9
Andover	London Zone 1	19.20	100.9
Andover	London Zone 1	19.50	100.9
Andover	London Zone 1	22.10	100.9
Andover	London Zone 1	28.70	100.9
Andover	London Zone 1	30.00	100.9
Andover	London Zone 1	42.10	100.9
Andover	Woolwich Arsenal	10.40	113.1
Basingstoke	Croydon BR	9.90	70
Basingstoke	Croydon BR	17.80	70
Basingstoke	Lewisham	6.60	78
Basingstoke	Lewisham	9.90	78
Basingstoke	London BR	1.00	72.2

Basingstoke	London BR	2.50	72.2
Basingstoke	London BR	2.60	72.2
Basingstoke	London BR	2.70	72.2
Basingstoke	London BR	2.80	72.2
Basingstoke	London BR	2.90	72.2
Basingstoke	London BR	3.40	72.2
Basingstoke	London BR	3.60	72.2
Basingstoke	London BR	3.90	72.2
Basingstoke	London BR	4.00	72.2
Basingstoke	London BR	4.90	72.2
Basingstoke	London BR	5.00	72.2
Basingstoke	London BR	5.70	72.2
Basingstoke	London BR	5.80	72.2
Basingstoke	London BR	6.60	72.2
Basingstoke	London BR	6.70	72.2
Basingstoke	London BR	7.80	72.2
Basingstoke	London BR	8.00	72.2
Basingstoke	London BR	8.30	72.2
Basingstoke	London BR	8.40	72.2
Basingstoke	London BR	8.40	72.2
Basingstoke	London BR	8.50	72.2
Basingstoke	London BR	8.80	72.2
Basingstoke	London BR	9.00	72.2
Basingstoke	London BR	9.00	72.2
Basingstoke	London BR	9.10	72.2
Basingstoke	London BR	9.10	72.2
Basingstoke	London BR	9.10	72.2
Basingstoke	London BR	9.30	72.2
Basingstoke	London BR	9.30	72.2
Basingstoke	London BR	9.40	72.2
Basingstoke	London BR	9.40	72.2
Basingstoke	London BR	9.40	72.2
Basingstoke	London BR	9.40	72.2
Basingstoke	London BR	9.50	72.2
Basingstoke	London BR	9.50	72.2
Basingstoke	London BR	9.60	72.2
Basingstoke	London BR	9.60	72.2
Basingstoke	London BR	9.60	72.2
Basingstoke	London BR	9.60	72.2
Basingstoke	London BR	9.80	72.2
Basingstoke	London BR	9.80	72.2
Basingstoke	London BR	9.80	72.2
Basingstoke	London BR	10.00	72.2
Basingstoke	London BR	10.10	72.2
Basingstoke	London BR	10.10	72.2
Basingstoke	London BR	10.20	72.2
Basingstoke	London BR	10.20	72.2
Basingstoke	London BR	10.20	72.2
Basingstoke	London BR	10.30	72.2
Basingstoke	London BR	10.30	72.2
Basingstoke	London BR	10.30	72.2
Basingstoke	London BR	10.30	72.2

Basingstoke	London BR	10.40	72.2
Basingstoke	London BR	11.00	72.2
Basingstoke	London BR	11.20	72.2
Basingstoke	London BR	11.20	72.2
Basingstoke	London BR	11.40	72.2
Basingstoke	London BR	11.50	72.2
Basingstoke	London BR	11.60	72.2
Basingstoke	London BR	11.60	72.2
Basingstoke	London BR	11.90	72.2
Basingstoke	London BR	12.30	72.2
Basingstoke	London BR	12.70	72.2
Basingstoke	London BR	12.70	72.2
Basingstoke	London BR	12.80	72.2
Basingstoke	London BR	13.00	72.2
Basingstoke	London BR	13.00	72.2
Basingstoke	London BR	13.10	72.2
Basingstoke	London BR	13.30	72.2
Basingstoke	London BR	13.60	72.2
Basingstoke	London BR	13.60	72.2
Basingstoke	London BR	13.70	72.2
Basingstoke	London BR	14.10	72.2
Basingstoke	London BR	14.40	72.2
Basingstoke	London BR	14.90	72.2
Basingstoke	London BR	15.00	72.2
Basingstoke	London BR	15.20	72.2
Basingstoke	London BR	15.30	72.2
Basingstoke	London BR	15.50	72.2
Basingstoke	London BR	16.00	72.2
Basingstoke	London BR	16.30	72.2
Basingstoke	London BR	17.80	72.2
Basingstoke	London BR	18.00	72.2
Basingstoke	London BR	18.00	72.2
Basingstoke	London BR	18.00	72.2
Basingstoke	London BR	18.90	72.2
Basingstoke	London BR	21.20	72.2
Basingstoke	London BR	21.40	72.2
Basingstoke	London BR	22.20	72.2
Basingstoke	London BR	22.50	72.2
Basingstoke	London BR	23.20	72.2
Basingstoke	London BR	24.40	72.2
Basingstoke	London BR	24.90	72.2
Basingstoke	London BR	26.50	72.2
Basingstoke	London BR	35.20	72.2
Basingstoke	London BR	42.60	72.2
Basingstoke	London BR	51.50	72.2
Basingstoke	London BR	55.60	72.2
Basingstoke	London Blackfriars	4.60	73.7
Basingstoke	London Waterloo	2.60	72.8
Basingstoke	London Waterloo	7.10	72.8
Basingstoke	London Waterloo	10.00	72.8
Basingstoke	London Zone 1	1.00	72.2
Basingstoke	London Zone 1	1.10	72.2

Basingstoke	London Zone 1	1.40	72.2
Basingstoke	London Zone 1	1.60	72.2
Basingstoke	London Zone 1	1.70	72.2
Basingstoke	London Zone 1	1.80	72.2
Basingstoke	London Zone 1	1.90	72.2
Basingstoke	London Zone 1	2.00	72.2
Basingstoke	London Zone 1	2.10	72.2
Basingstoke	London Zone 1	2.20	72.2
Basingstoke	London Zone 1	2.40	72.2
Basingstoke	London Zone 1	2.50	72.2
Basingstoke	London Zone 1	2.60	72.2
Basingstoke	London Zone 1	2.70	72.2
Basingstoke	London Zone 1	2.80	72.2
Basingstoke	London Zone 1	2.90	72.2
Basingstoke	London Zone 1	3.00	72.2
Basingstoke	London Zone 1	3.10	72.2
Basingstoke	London Zone 1	3.30	72.2
Basingstoke	London Zone 1	3.40	72.2
Basingstoke	London Zone 1	3.50	72.2
Basingstoke	London Zone 1	3.60	72.2
Basingstoke	London Zone 1	3.80	72.2
Basingstoke	London Zone 1	3.90	72.2
Basingstoke	London Zone 1	4.00	72.2
Basingstoke	London Zone 1	4.10	72.2
Basingstoke	London Zone 1	4.50	72.2
Basingstoke	London Zone 1	4.60	72.2
Basingstoke	London Zone 1	4.70	72.2
Basingstoke	London Zone 1	4.90	72.2
Basingstoke	London Zone 1	5.00	72.2
Basingstoke	London Zone 1	5.40	72.2
Basingstoke	London Zone 1	5.70	72.2
Basingstoke	London Zone 1	6.00	72.2
Basingstoke	London Zone 1	6.50	72.2
Basingstoke	London Zone 1	6.60	72.2
Basingstoke	London Zone 1	6.70	72.2
Basingstoke	London Zone 1	6.80	72.2
Basingstoke	London Zone 1	6.90	72.2
Basingstoke	London Zone 1	7.00	72.2
Basingstoke	London Zone 1	7.30	72.2
Basingstoke	London Zone 1	7.40	72.2
Basingstoke	London Zone 1	7.90	72.2
Basingstoke	London Zone 1	8.00	72.2
Basingstoke	London Zone 1	8.10	72.2
Basingstoke	London Zone 1	8.30	72.2
Basingstoke	London Zone 1	8.60	72.2
Basingstoke	London Zone 1	8.80	72.2
Basingstoke	London Zone 1	8.90	72.2
Basingstoke	London Zone 1	8.90	72.2
Basingstoke	London Zone 1	9.00	72.2
Basingstoke	London Zone 1	9.10	72.2
Basingstoke	London Zone 1	9.20	72.2
Basingstoke	London Zone 1	9.30	72.2

Basingstoke	London Zone 1	9.40	72.2
Basingstoke	London Zone 1	9.60	72.2
Basingstoke	London Zone 1	9.70	72.2
Basingstoke	London Zone 1	9.80	72.2
Basingstoke	London Zone 1	9.90	72.2
Basingstoke	London Zone 1	10.00	72.2
Basingstoke	London Zone 1	10.20	72.2
Basingstoke	London Zone 1	10.30	72.2
Basingstoke	London Zone 1	10.40	72.2
Basingstoke	London Zone 1	10.60	72.2
Basingstoke	London Zone 1	10.80	72.2
Basingstoke	London Zone 1	11.10	72.2
Basingstoke	London Zone 1	11.40	72.2
Basingstoke	London Zone 1	11.60	72.2
Basingstoke	London Zone 1	12.30	72.2
Basingstoke	London Zone 1	12.50	72.2
Basingstoke	London Zone 1	12.80	72.2
Basingstoke	London Zone 1	12.90	72.2
Basingstoke	London Zone 1	13.30	72.2
Basingstoke	London Zone 1	13.50	72.2
Basingstoke	London Zone 1	13.60	72.2
Basingstoke	London Zone 1	13.80	72.2
Basingstoke	London Zone 1	14.00	72.2
Basingstoke	London Zone 1	14.30	72.2
Basingstoke	London Zone 1	14.70	72.2
Basingstoke	London Zone 1	14.90	72.2
Basingstoke	London Zone 1	15.70	72.2
Basingstoke	London Zone 1	16.60	72.2
Basingstoke	London Zone 1	16.70	72.2
Basingstoke	London Zone 1	17.60	72.2
Basingstoke	London Zone 1	17.60	72.2
Basingstoke	London Zone 1	17.70	72.2
Basingstoke	London Zone 1	17.90	72.2
Basingstoke	London Zone 1	18.20	72.2
Basingstoke	London Zone 1	19.80	72.2
Basingstoke	London Zone 1	20.30	72.2
Basingstoke	London Zone 1	20.90	72.2
Basingstoke	London Zone 1	23.20	72.2
Basingstoke	London Zone 1	34.40	72.2
Basingstoke	London Zone 1	38.60	72.2
Basingstoke	London Zone 2	1.20	67.5
Bitterne	London BR	0.30	109.5
Botley	London Zone 1	1.50	103.1
Bournemouth	London BR	0.40	149.6
Bournemouth	London BR	0.60	149.6
Bournemouth	London BR	0.80	149.6
Bournemouth	London BR	0.90	149.6
Bournemouth	London BR	1.10	149.6
Bournemouth	London BR	1.80	149.6
Bournemouth	London BR	1.80	149.6
Bournemouth	London BR	2.00	149.6
Bournemouth	London BR	2.30	149.6

Bournemouth	London BR	2.40	149.6
Bournemouth	London BR	2.60	149.6
Bournemouth	London BR	2.70	149.6
Bournemouth	London Zone 1	0.60	149.6
Bournemouth	London Zone 1	1.40	149.6
Bournemouth	London Zone 1	1.40	149.6
Bournemouth	London Zone 1	1.90	149.6
Bournemouth	London Zone 1	2.10	149.6
Bournemouth	London Zone 1	3.70	149.6
Bournemouth	London Zone 1	4.00	149.6
Bournemouth	London Zone 1	9.60	149.6
Bramley (Hants)	London BR	0.30	68.1
Bramley (Hants)	London BR	3.30	68.1
Bramley (Hants)	London Waterloo	1.20	68.7
Bramley (Hants)	London Zone 1	2.20	68.1
Eastleigh	Croydon BR	2.00	98.4
Eastleigh	Croydon BR	3.40	98.4
Eastleigh	London BR	1.00	104.5
Eastleigh	London BR	2.00	104.5
Eastleigh	London BR	4.50	104.5
Eastleigh	London Waterloo	0.40	104.8
Eastleigh	London Waterloo	0.50	104.8
Eastleigh	London Waterloo	0.80	104.8
Eastleigh	London Waterloo	0.80	104.8
Eastleigh	London Waterloo	1.00	104.8
Eastleigh	London Waterloo	1.20	104.8
Eastleigh	London Waterloo	1.70	104.8
Eastleigh	London Waterloo	1.70	104.8
Eastleigh	London Waterloo	1.80	104.8
Eastleigh	London Waterloo	1.80	104.8
Eastleigh	London Waterloo	2.60	104.8
Eastleigh	London Waterloo	3.00	104.8
Eastleigh	London Waterloo	3.50	104.8
Eastleigh	London Waterloo	3.60	104.8
Eastleigh	London Waterloo	3.60	104.8
Eastleigh	London Waterloo	3.60	104.8
Eastleigh	London Waterloo	4.30	104.8
Eastleigh	London Waterloo	4.30	104.8
Eastleigh	London Waterloo	4.40	104.8
Eastleigh	London Waterloo	4.80	104.8
Eastleigh	London Waterloo	7.30	104.8
Eastleigh	London Zone 1	0.50	104.5
Eastleigh	London Zone 1	0.90	104.5
Eastleigh	London Zone 1	1.10	104.5
Eastleigh	London Zone 1	1.60	104.5
Eastleigh	London Zone 1	1.70	104.5
Eastleigh	London Zone 1	2.10	104.5
Eastleigh	London Zone 1	2.20	104.5
Eastleigh	London Zone 1	2.70	104.5
Eastleigh	London Zone 1	3.00	104.5
Eastleigh	London Zone 1	3.20	104.5
Eastleigh	London Zone 1	3.70	104.5

Eastleigh	London Zone 1	4.10	104.5
Eastleigh	London Zone 1	4.50	104.5
Eastleigh	London Zone 1	4.70	104.5
Eastleigh	London Zone 1	6.90	104.5
Fareham	London Zone 1	6.10	104.4
Fareham	London Zone 1	9.20	104.4
Fareham	London Zone 1	10.80	104.4
Grateley	London BR	4.10	110.8
Grateley	London BR	5.00	110.8
Grateley	London BR	5.30	110.8
Grateley	London BR	11.20	110.8
Grateley	London Waterloo	1.00	111.3
Grateley	London Waterloo	4.10	111.3
Grateley	London Zone 1	0.60	110.8
Grateley	London Zone 1	3.30	110.8
Overton	London BR	0.30	84
Overton	London BR	0.80	84
Overton	London BR	0.90	84
Overton	London Zone 1	0.90	84
Overton	London Zone 1	1.00	84
Overton	London Zone 1	8.70	84
Overton	London Zone 1	11.20	84
Romsey	London Zone 1	1.50	111.4
Romsey	London Zone 1	8.00	111.4
Salisbury	London BR	0.70	127
Salisbury	London BR	0.90	127
Salisbury	London BR	1.00	127
Salisbury	London BR	1.10	127
Salisbury	London BR	1.90	127
Salisbury	London BR	2.10	127
Salisbury	London BR	9.20	127
Salisbury	London BR	10.10	127
Salisbury	London BR	17.80	127
Salisbury	London BR	18.30	127
Salisbury	London BR	19.00	127
Salisbury	London Zone 1	1.30	127
Salisbury	London Zone 1	1.40	127
Salisbury	London Zone 1	7.90	127
Salisbury	London Zone 1	8.30	127
Salisbury	London Zone 1	9.10	127
Salisbury	London Zone 1	9.80	127
Southampton Airport	London BR	2.20	106.6
Southampton Airport	London BR	2.50	106.6
Southampton Airport	London BR	2.60	106.6
Southampton Airport	London BR	2.70	106.6
Southampton Airport	London BR	5.80	106.6
Southampton Airport	London BR	6.00	106.6
Southampton Airport	London BR	6.10	106.6
Southampton Airport	London BR	31.20	106.6
Southampton Airport	London BR	35.40	106.6
Southampton Airport	London Zone 1	2.40	106.6
Southampton Airport	London Zone 1	2.40	106.6

Southampton Airport	London Zone 1	2.50	106.6
Southampton Airport	London Zone 1	2.60	106.6
Southampton Airport	London Zone 1	2.70	106.6
Southampton Airport	London Zone 1	2.80	106.6
Southampton Airport	London Zone 1	4.90	106.6
Southampton Airport	London Zone 1	5.00	106.6
Southampton Airport	London Zone 1	5.10	106.6
Southampton Airport	London Zone 1	10.70	106.6
Southampton Airport	London Zone 1	10.80	106.6
Southampton Airport	London Zone 1	10.90	106.6
Southampton Airport	London Zone 1	14.90	106.6
Southampton Airport	London Zone 1	15.80	106.6
Southampton Airport	London Zone 1	15.90	106.6
Southampton Airport	London Zone 1	16.00	106.6
Southampton Airport	London Zone 1	16.40	106.6
Southampton Airport	London Zone 1	17.10	106.6
Southampton Central	London BR	2.00	112.2
Southampton Central	London BR	2.10	112.2
Southampton Central	London BR	2.20	112.2
Southampton Central	London BR	2.30	112.2
Southampton Central	London BR	2.50	112.2
Southampton Central	London Zone 1	2.00	112.2
Southampton Central	London Zone 1	2.10	112.2
Southampton Central	London Zone 1	2.10	112.2
Southampton Central	London Zone 1	2.20	112.2
Southampton Central	London Zone 1	2.30	112.2
Southampton Central	London Zone 1	2.40	112.2
Southampton Central	London Zone 1	16.90	112.2
Southampton Central	London Zone 1	18.40	112.2
Southampton Central	London Zone 1	20.20	112.2
Southampton Central	London Zone 1	23.00	112.2
Southampton Central	London Zone 1	30.70	112.2
Southampton Central	London Zone 1	32.10	112.2
Swanwick	London BR	4.60	106.4
Swanwick	London Zone 1	0.80	106.4
Tisbury	London Zone 1	15.60	145.2
Winchester	London BR	1.60	96.9
Winchester	London BR	1.70	96.9
Winchester	London BR	1.90	96.9
Winchester	London BR	2.00	96.9
Winchester	London BR	2.10	96.9
Winchester	London BR	4.60	96.9
Winchester	London BR	5.20	96.9
Winchester	London BR	5.50	96.9
Winchester	London BR	6.40	96.9
Winchester	London BR	6.50	96.9
Winchester	London BR	7.00	96.9
Winchester	London BR	7.20	96.9
Winchester	London BR	7.40	96.9
Winchester	London BR	9.30	96.9
Winchester	London BR	9.40	96.9
Winchester	London BR	9.50	96.9

Winchester	London BR	10.10	96.9
Winchester	London BR	10.50	96.9
Winchester	London BR	10.90	96.9
Winchester	London BR	11.10	96.9
Winchester	London BR	12.20	96.9
Winchester	London BR	12.30	96.9
Winchester	London BR	12.60	96.9
Winchester	London BR	15.70	96.9
Winchester	London BR	15.90	96.9
Winchester	London BR	16.20	96.9
Winchester	London BR	16.30	96.9
Winchester	London BR	16.40	96.9
Winchester	London BR	17.10	96.9
Winchester	London BR	17.30	96.9
Winchester	London BR	17.30	96.9
Winchester	London BR	17.50	96.9
Winchester	London BR	18.60	96.9
Winchester	London BR	19.80	96.9
Winchester	London BR	19.90	96.9
Winchester	London BR	21.00	96.9
Winchester	London BR	21.50	96.9
Winchester	London BR	25.20	96.9
Winchester	London BR	31.70	96.9
Winchester	London Bridge	0.70	99
Winchester	London Bridge	1.10	99
Winchester	London Bridge	1.40	99
Winchester	London Bridge	2.30	99
Winchester	London Bridge	2.60	99
Winchester	London Bridge	3.00	99
Winchester	London Bridge	6.10	99
Winchester	London Bridge	6.50	99
Winchester	London Bridge	11.40	99
Winchester	London Bridge	12.80	99
Winchester	London Charing Cross	10.00	96.9
Winchester	London Waterloo	1.40	97.2
Winchester	London Waterloo	1.50	97.2
Winchester	London Waterloo	1.80	97.2
Winchester	London Waterloo	6.00	97.2
Winchester	London Zone 1	0.20	96.9
Winchester	London Zone 1	12.10	96.9
Winchester	Vauxhall	2.70	95.8
Winchester	Westcombe Park	1.70	104.3
Winchester	Weybridge	0.20	68.6
Winchester	Wimbledon	1.30	87.2

Source: South West Trains Rail Study Data, 2005

APPENDIX TABLE 8.6: 'NEW FOUND' LDCS TESTED AGAINST TRADITIONAL LDCS

Hypothesis Test Four:

To test whether in terms of their characteristics (age, income), there is any difference between the two groups. If true, is the difference(s) statistically significant – at the 95 % level of significance.

Null Hypothesis:

The null hypothesis is that, in terms of their characteristics, there is no difference between the two groups.

Test Results:

Descriptives

		N	Mean	Std. Deviation	Std. Error	95 % Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Age	New Found LDC	82	42.10	11.12	1.23	39.65	44.54	0	62
	Traditional LDC	56	45.54	9.13	1.22	43.09	47.98	20	52
	Total	138	43.49	10.46	.89	41.73	45.25	0	62
Income	New Found LDC	72	70.69	27.00	3.18	64.35	77.04	5	105
	Traditional LDC	41	82.07	21.12	3.30	75.41	88.74	45	105
	Total	113	74.82	25.53	2.40	70.06	79.58	5	105

ANOVA

		Sum of Squares	df	Mean Square	F	Significance
Age	Between Groups	393.345	1	393.345	3.663	.058
	Within Groups	14605.148	136	107.391		
	Total	14998.493	137			
Income	Between Groups	3382.402	1	3382.402	5.393	.022
	Within Groups	69614.058	111	627.154		
	Total	72995.460	112			

APPENDIX TABLE 8.7: FULL TIME LDCs TESTED AGAINST 'MULTI-DESTINATION' LDCs

Hypothesis Test Five:

To test whether in terms of their characteristics (age, income and respective journey to work movements by employment location), there is any difference between the two groups. If true, is the difference(s) statistically significant – at the 95 % level of significance.

Null Hypothesis:

The null hypothesis is, that in terms of their characteristics, there is no difference between the two groups.

Test Results:

Descriptives

		N	Mean	Std. Deviation	Std. Error	95 % Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Age	Full Time LDC	86	44.29	9.05	.98	42.35	46.23	29	62
	Multi LDC	64	39.28	10.03	1.25	41.79	41.79	20	62
	Total	150	42.15	9.77	.80	43.73	43.73	20	62
Income	Full Time LDC	73	74.04	21.61	2.53	69.00	79.08	35	105
	Multi LDC	57	64.65	28.09	3.72	57.20	72.10	15	105
	Total	130	69.92	25.00	2.19	65.58	74.26	15	105
Employment location	Full Time LDC	89	1.28	.45	4.79	1.19	1.38	1	2
	Multi LDC	66	1.98	.12	1.52	1.95	2.02	1	2
	Total	155	1.58	.50	3.98	1.50	1.66	1	2

ANOVA

		Sum of Squares	df	Mean Square	F	Significance
Age	Between Groups	920.803	1	920.803	10.248	.002
	Within Groups	13298.670	148	89.856		
	Total	14219.473	149			
Income	Between Groups	2823.372	1	2823.372	4.644	.033
	Within Groups	77825.859	128	608.015		
	Total	80649.231	129			
Employment Location	Between Groups	18.780	1	18.780	151.525	.000
	Within Groups	18.962	153	.124		
	Total	37.742	154			

Appendix Table 9.1: Computed Estimates of Journey Time Elasticities – LDC Sample

Statistics

		Time Elasticity 5 %	Time Elasticity 10 %	Time Elasticity 15 %
n	Valid	155	155	155
	Missing	0	0	0

Frequency Table

Time elasticity – 5 %

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	11	7.1	7.1	7.1
	2.00	144	92.9	92.9	100.0
	Total	155	100.0	100.0	

Time elasticity – 10 %

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	35	22.6	22.6	22.6
	2.00	120	77.4	77.4	100.0
	Total	155	100.0	100.0	
Missing	System	0	0		
Total		155	100.0		

Time elasticity – 15 %

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	68	43.9	43.9	43.9
	2.00	87	56.1	56.1	100.0
	Total	155	100.0	100.0	

Source: On-Train LDC Survey, Bristol – Paddington, 2003

Appendix Table 9.2: Computed Estimates of Journey Fare Elasticities – LDC Sample

Statistics

		Fare Elasticity 5 %	Fare Elasticity 10 %	Fare Elasticity 15 %
n	Valid	156	156	156
	Missing	0	0	0

Frequency Table

Fare elasticity – 5 %

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	12	7. 7	7. 7	7. 7
	2.00	144	92. 3	92. 3	100. 0
	Total	156	100. 0	100. 0	

Fare elasticity – 10 %

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	36	23. 1	23. 1	23. 1
	2.00	120	76. 9	76. 9	100. 0
	Total	156	100. 0	100. 0	

Fare elasticity – 15 %

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	69	44. 2	44. 2	44. 2
	2.00	87	55. 8	55. 8	100. 0
	Total	156	100. 0	100. 0	

Source: On-Train LDC Survey, Bristol – Paddington, 2003

APPENDIX TABLE 9.3: MEAN VALUE OF TIME (VOT) FOR STUDY'S LDCS

VoT Statistics

n	Valid	156
	Missing	0
Mean		16.6972
Std. Error of Mean		2.4265

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
.00	46	29.5	29.5	29.5
.67	1	.6	.6	30.1
83	1	.6	.6	30.8
1.00	1	.6	.6	31.4
1.28	1	.6	.6	32.1
1.67	1	.6	.6	32.7
1.73	1	.6	.6	33.3
2.67	1	.6	.6	34.0
2.83	2	1.3	1.3	35.3
3.08	1	.6	.6	35.9
3.11	1	.6	.6	36.5
3.20	1	.6	.6	37.2
3.33	1	.6	.6	37.8
3.38	1	.6	.6	38.5
3.58	1	.6	.6	39.1
3.73	2	1.3	1.3	40.4
3.75	1	.6	.6	41.0
3.89	1	.6	.6	41.7
4.17	1	.6	.6	42.3
4.30	1	.6	.6	42.9
4.36	1	.6	.6	43.6
4.80	1	.6	.6	44.2
4.83	1	.6	.6	44.9
4.85	1	.6	.6	45.5
4.98	1	.6	.6	46.2
5.17	1	.6	.6	46.8
5.37	1	.6	.6	47.4
5.67	2	1.3	1.3	48.7
5.73	1	.6	.6	49.4
5.87	1	.6	.6	50.0
6.30	1	.6	.6	50.6
6.40	1	.6	.6	51.3
6.47	1	.6	.6	51.9
6.55	1	.6	.6	52.6
6.60	1	.6	.6	53.2
6.67	1	.6	.6	53.8
6.73	1	.6	.6	54.5
6.73	1	.6	.6	55.1
6.83	1	.6	.6	55.8
7.06	1	.6	.6	56.4
7.10	1	.6	.6	57.1
7.13	1	.6	.6	57.7

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
7.17	1	.6	.6	58.3
7.27	1	.6	.6	59.0
9.00	1	.6	.6	59.6
9.09	1	.6	.6	60.3
10.50	1	.6	.6	60.9
10.70	3	1.9	1.9	62.8
10.73	1	.6	.6	63.5
10.75	1	.6	.6	64.1
11.20	2	1.3	1.3	65.4
11.23	1	.6	.6	66.0
12.17	1	.6	.6	66.7
12.33	1	.6	.6	67.3
12.73	1	.6	.6	67.9
13.17	1	.6	.6	68.6
13.75	1	.6	.6	69.2
14.13	1	.6	.6	69.9
15.00	2	1.3	1.3	71.2
15.92	1	.6	.6	71.8
16.67	1	.6	.6	72.4
16.87	1	.6	.6	73.1
17.60	1	.6	.6	73.7
17.73	1	.6	.6	74.4
17.87	1	.6	.6	75.0
20.00	1	.6	.6	75.6
20.42	1	.6	.6	76.3
21.20	1	.6	.6	76.9
22.50	1	.6	.6	77.6
23.80	1	.6	.6	78.2
25.00	1	.6	.6	78.8
25.45	1	.6	.6	79.5
25.80	1	.6	.6	80.1
26.20	1	.6	.6	80.8
28.00	2	1.3	1.3	82.1
28.10	1	.6	.6	82.7
28.58	1	.6	.6	83.3
28.60	1	.6	.6	84.0
28.67	1	.6	.6	84.6
30.40	1	.6	.6	85.3
34.33	1	.6	.6	85.9
34.44	1	.6	.6	86.5
37.50	1	.6	.6	87.2
42.00	1	.6	.6	87.8
42.73	1	.6	.6	88.5
43.33	1	.6	.6	89.1
43.50	1	.6	.6	89.7
46.67	1	.6	.6	90.4
50.00	1	.6	.6	91.0
51.40	1	.6	.6	91.7
56.67	1	.6	.6	92.3
60.87	1	.6	.6	92.9
67.50	1	.6	.6	93.0
68.33	1	.6	.6	94.2
72.47	1	.6	.6	94.9
83.33	2	1.3	1.3	96.2

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
86.93	1	.6	.6	96.8
88.40	1	.6	.6	97.4
95.00	1	.6	.6	98.1
100.00	1	.6	.6	98.7
100.37	1	.6	.6	99.4
267.14	1	.6	.6	100.0
Total	156	100.0	100.0	

Source: On-Train LDC Survey, Bristol – Paddington, 2003

APPENDIX 9.4: COMPUTATION OF LDCs' JOURNEY FARE IN PENCE PER PERSON PER SINGLE JOURNEY

Introduction

As stated in the main text (Chapter Nine, Section 9.8), no attempt has been made to segment the computation of fare elasticity by ticket type - given the mix of tickets (i.e. seasons, dailies, travel cards) that are purchased by LDCs for the work journey.

To get over the difference in ticket types, all fares (irrespective of whether a season , daily, travel card or other type of ticket was purchased for the work journey) were converted to the equivalent standard unit cost in pence per person per single journey (PPPPSJ).

Answers provided by LDCs to Question 1.12 of the On-Train LDC Questionnaire (Appendix Two) were used as the basis for computing LDC journey fare on PPPPSJ. In addition to the criterion adopted above on the computation of PPPPSJ, a further adjustment (described in the ensuing text) had to be applied – given that Question 1.12 required LDCs to state the return journey cost of travelling to work on either a daily, weekly, monthly, quarterly or annual ticket.

This was applied as follows:

1. Computation of PPPPSJ for LDCs travelling on Annual Season Ticket

Travelling Allowance for year

Total opportunity to travel with annual season

\- 365 days

minus

time discounted, when LDCs are not commuting to work

i.e. 52 week-ends 104

public holidays 11

annual leave	20
Total (365 – 135)	230 days

For each day, the LDC would be making two journeys (i.e. 230 x 2) 460 single journeys.

Assuming that the yearly cost of a ticket is £ 6 k (Bristol to Paddington), the equivalent cost (ppsj) would be £ (6,000/460) = £13 per day per single journey.

2. Computation of PPPPSJ for LDCs travelling on Monthly Season Ticket

Travelling Allowance for month

Total opportunity to travel with annual season -	30 days
minus	
time discounted, when LDCs are not commuting to work	
i.e. 4 week-ends	8
public holidays	1
annual leave (pro rata per month)	1.6
Total (30 – 10.6)	19.4 days

For each day, the LDC would be making two journeys (i.e. 19.4 x 2) or 39 single journeys.

Assuming that the cost of a monthly ticket is £450 (Bristol to Paddington), the equivalent cost (ppsj) would be £ (450/39) = £11.54 per day per single journey.

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3. Computation of PPPPSJ for LDCs travelling on Weekly Season Ticket

Travelling Allowance for week

Total opportunity to travel with weekly season	
-	7 days
minus	
time discounted, when LDCs are not commuting to work	
i.e. 1 week-end	2
public holidays	1/4
annual leave	1/2
Total (7 – 2.75)	4.25 days

For each day, LDCs would be making two journeys (i.e. 4.25 x 2) or 8.5 single journeys.

Assuming that the weekly cost of a ticket is £ 90 (Bristol to Paddington), the equivalent cost (ppsj) would be £ (90/8.5) = £10.58 per day per single journey.

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4. Part Time Commuting

On the evidence of the LDC survey, LDCs in this category mostly purchased daily tickets (single or return) for the work journey. It was therefore relatively easier to compute the cost per single journey per day.

TABLE 5.4.G: SCHEMATIC PLAN SHOWING HOW APPROPRIATE DATA WILL BE COLLECTED TO ANALYSE/MEASURE THE RIGHT RELATIONSHIPS BETWEEN VARIABLES IN THE LDC SURVEY

Question	Variable of Interest and Type of Analysis - To Be Effected	Data Required to Effect Analysis	Is Data Available To Carry Out Analysis	
			Yes	**No**
			Which Question Will Provide Data	How Will the Data Be Obtained.
3. Employment				
Q3.7 If you have had a previous job, why did you choose to work in London? * Higher salary * Office relocation * Better job * Career development opportunities * Redundancy * New job more conveniently located * Children grown up * Job security * Other	*Question 3.7 is an extended analysis of Q3.6 and will be analysed along the lines* stated at Q3.6 (cols. 2-5, row 2, on page 7).	As indicated at Q3.6 on page 86.	-	-
4. Residence				
Q4.1 How long have you resided at present address?___ yrs Q4.2 Where did you live previously? _______ Q4.3 How long did you live at your previous address? ______ yrs	*Questions 4.1 - 4.3 examine the past residential status of surveyees to determine whether (in relation to employment) their long distance commuting had been initiated as a result of past residence.*	Data will be derived from answers supplied by surveyees and will be compiled and presented in statistical table format. ***NOTE***: Was LDC initiated on past record of (a) past employment or (b) past residence. It is a question of which happened first. Whether (a) having to take up employment remote from residence or (b) take up residence remote from employment will determine whether LDC first started with the location of residence or employment and whether that is still the case.	Data will be derived from answers supplied, by respondents, to Q4.1 - 4.3 and will be compiled and presented in a statistical table format.	-