Impact of Housing Options to Inform the Development of the Regional Spatial Strategy

A report prepared for *emda*

Experian

August 2006

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Impact of Housing Options to Inform the Development of the Regional Spatial Strategy

A report for East Midlands Development Agency

August 2006

For and on behalf of Experian	
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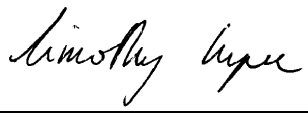
Signed:	

Impact of Housing Options

August 2006

Contents

Executive summary

- EMDA have commissioned Experian to assess the impact of the preferred housing option in the review of the Regional Spatial Strategy on output and employment. A further population assumption, called the "Plus 5" option, was also included in the study to assess the impact of a more even distribution of population growth.

- The preferred option for housing provision equates to an additional 36,000 residents in the East Midlands above the baseline by 2016. The "Plus 5" option equates to an additional 15,000 people above the baseline by 2016.

- Experian have incorporated the alternative population projections into the long-term county model, which is a supply-side model and is used to forecast the direction of sub-regional economy over the longer-term.

- The results of this research suggest that the preferred option will have a negligible impact on output and employment growth in the East Midlands over the next 10 years and that any additional growth accrues to the urban areas. Much of the rest of the region is likely to experience lower economic growth when compared to the baseline.

- Under the preferred option, both Lincolnshire and Derbyshire can expect employment growth to be more than halved relative to the baseline. Lincolnshire has been the strongest performer in the East Midlands economy over last few years although this growth was from a comparatively low base.

- The "Plus 5" option has a greater impact on economic growth across the East Midlands than the preferred option. This is due in part to the increase in the working age population but also due to the even spread of the population growth. This means that areas that have performed well in the past will continue to perform well in the future when compared to the baseline.

- The level of employment and output gains and losses that accrue to a county are also influenced by population and labour supply changes in surrounding areas due to the flow of commuters between sub-regions. The model accounts for the effects of commuting by using data on existing commuting patterns at the sub-regional level.

- There are two main approaches to using economic modelling to inform decisions on housing provision and employment land. The first involves looking at the demand side of the economy and considering what this will mean in terms of employment growth. The second involves looking at the supply side of the economy and considering what changes are expected to occur to population.

- Both the supply-side and demand-side approaches have their merits but the key to solving the housing, population, employment and land problem is how these two methods are drawn together in order to build either a consistent framework or to recognise that the relationship between employment growth is not fixed as variables such as commuting patterns are prone to changing over time.

- Economic modelling and the results from such models serve as a guide to the expected future economic growth of a region and its sub-regions. These forecasts are based on long-term trends of the economy and assumptions about how the economy may change over time. The results show what is expected to happen in the future if past relationships

and the assumptions built into the model hold. Such forecasts can be used as a starting point for informing policy as they provide a robust framework for considering the future and comparing the potential impact of alternative policies on economic performance over time. However they should be considered a best estimate and where possible be used with other available information.

Introduction

BACKGROUND

The East Midlands Development Agency (*emda*) published the Regional Economic Strategy (RES) in July 2006, the document which sets the framework for economic development in the region. The East Midlands Regional Assembly (EMRA) is undertaking a review of the Regional Spatial Strategy (RSS) which provides the broad development plan for the East Midlands and its sub-regions in the inter-related areas of housing, transport, energy and the environment. The final document will be published in 2008. There is a direct relationship between the two documents, with the RSS providing the guidance for policy on land by Housing Market Area (HMA) for housing and economic development.

As part of the review of the RSS, EMRA published *Options for Change* for consultation in October 2005. The document set out nine options for housing provision in the East Midlands. The options were combinations of three possible levels of housing provision (below trend, trend and above trend) and three methods of distributing the house build (current trends, urban concentration plus regeneration and strong urban regeneration). A preferred option emerged following consultation which focuses housing growth in urban areas and limits growth against trend elsewhere.

EMDA have commissioned Experian to assess the economic impact of the preferred option and an alternative population assumption, called the "Plus 5" option. The "Plus 5" option was included in the study to assess the impact of a more even distribution of population growth. The impact needs to be assessed in terms of differences in output and employment at the sub-regional level.

The alternative population projections derived from the preferred option are different to the baseline population projects used by Experian. The underlying population structure in terms of age and gender is very different which means that the results of this work are the result of having very different inputs at the start of the work.

The "Plus 5" option uses an adjusted version of the Experian baseline population as described in section 1.

In the following section of this report we review the preferred option and the "Plus 5" option in terms of changes to population and explain how the revised population differs from the baseline for the region and the sub-regions.

In section 2 we present the results of the modelling work.

In the final section of this report we offer a view on the appropriate use of economic modelling in informing decisions on housing provision and employment land, and the appropriateness of various housing options given the economic conditions in the region.

In appendix 1 we review the methodology used to assess the economic impact of the preferred and "Plus 5" options.

1 Alternative population assumptions

1.1 THE BASELINE POPULATION AND ODPM TREND

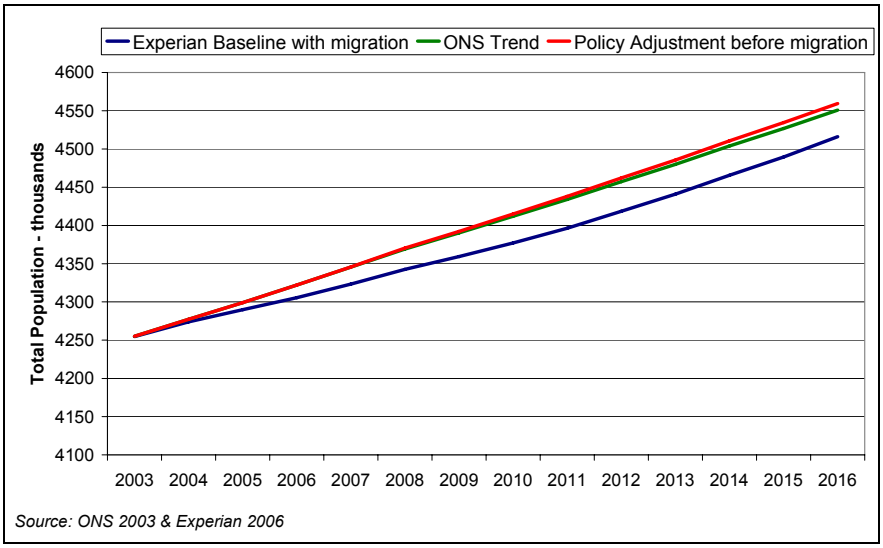
This project uses Experian's standard economic forecasts and population as the basis for comparison. The population assumptions underpinning Experian's standard forecasts are not the same as those for the ODPM trend in *Options for Change*.

Experian's standard forecasts incorporate ONS mid-year estimates to 2003 and 2003-based ONS sub-national projections aligned to national projections from the Government Actuary's Department (GAD). The Experian baseline population also includes policy-based adjustments based on planned housing developments at county level. As such, for the East Midlands, population in Northamptonshire is adjusted for the effects of the planned housing developments in the Milton Keynes and South Midlands (MKSM) Strategy. We assume that 50 per cent of the implied extra population, over and above that in the official projections, actually occurs[1]. Under this adjustment the local authorities affected are Corby, Kettering, Northampton and Wellingborough. Within our economic model itself regional and sub-regional population undergo a second adjustment which models the migration of people to areas of higher employment rates. However this migration adjustment is restricted, representing the economic constraints limiting migration.

Options for Change meanwhile made use of 2002 interim household projections from ODPM, itself based on 2003 ONS population projections. It was agreed with EMDA for the purposes of this project that the Experian baseline population and economic forecasts would be used as the comparison to the preferred option. This is to ensure consistency with forecasts that EMDA have previously published. Figure 1 shows the difference between the Experian baseline, the 2003 ONS trend population projections for the East Midlands and the policy adjustment made by Experian. The starting point for Experian population figures are ONS trend projections. These are then adjusted to take account of major development policies, such as MKSM. The policy adjusted population is fed into the economic model and is adjusted to take account of migration due to employment growth. The East Midlands experiences net out-migration as other regions have stronger employment growth in the long-run model. This is reflected in the difference between the baseline and ONS trend which is equivalent to 35,000 people by 2016.

[1] The assumption of 50 per cent of the implied additional population from MKSM is a reflection of the likelihood that the total planned development will come to fruition within the timeframe of these forecasts. A scenario which included the total impact of MKSM was included as part of the RES evidence base.

Figure 1: ONS trend, Experian baseline and policy adjusted population projections



1.2 THE PREFERRED OPTION

The preferred option which emerged following consultation focuses housing growth in urban areas and limits growth against ODPM trend elsewhere. Table 1 details the preferred option in terms of housing allocation at housing market area level (excluding Northamptonshire).

Table 1: Housing allocation at HMA level

HMA	Current Allocation (pa)	Current Built Rate (pa)	Preferred Option (pa)	ODPM Trend
Coastal Lincolnshire	755	960	940	1,435
Central Lincolnshire	1,155	1,504	1,830	1,826
Peterborough (Partial)	958	1,341	1,300	1,522
N/A/M (Nottingham Outer)	695	1,314	1,300	1,261
Northern (Sheffield/Rotherham)	895	1,352	1,520	1,522
Peak Dales & Park	430	479	420	609
Derby	1,810	1,668	1,770	2,130
Leicester and Leicestershire	3,034	3,114	3,790	3,783
Nottingham Core	1,965	1,764	2,370	2,087
TOTAL	**11,697**	**13,496**	**15,240**	**16,175**

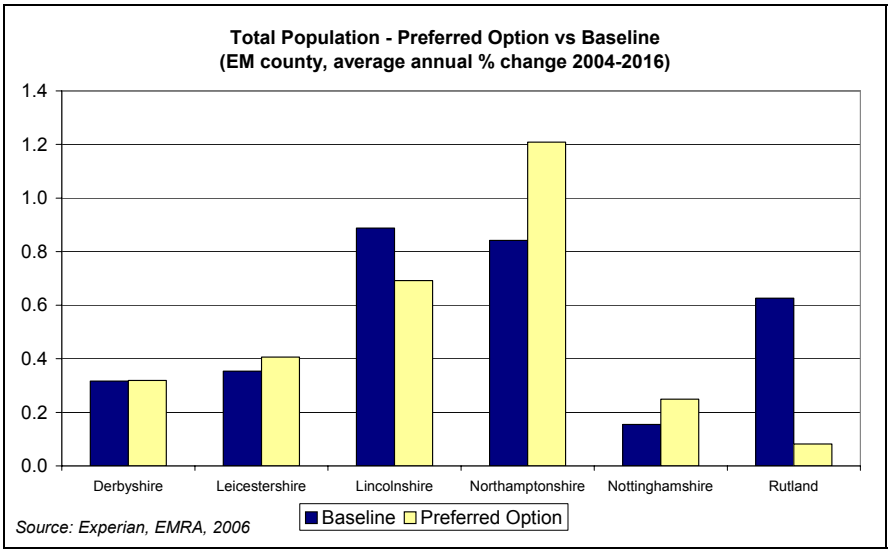
The preferred housing option has been translated into population by age (5 year cohorts) and gender by Anglia University on behalf of EMRA using the Chelmer Population and Housing model[2].

[2] The Chelmer Population and Housing Model is a demographic regional housing model developed by the Population and Housing Research Group (PHRG). Further information can be found on the website: http://www.anglia.ac.uk/ruskin/en/home/faculties/fst/research/phrg/chelmermodel.html

Overall the preferred option translates to an additional 36,000 people living in the East Midlands by 2016 above the baseline. However, the difference to the working age population which is the key to determining employment equates to just 4,000 additional residents in the region by 2016.

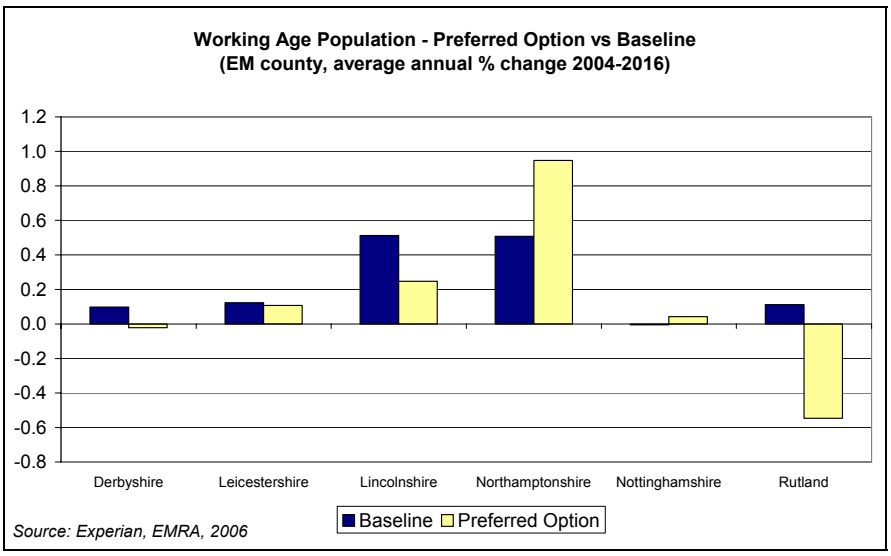
The change in both population and working age population is fairly minimal at regional level (equivalent to 0.8 per cent and 0.2 per cent of baseline population respectively). We would however expect more significant differences at the sub-regional level due to the spatial dimension of the preferred option. Figure 2 shows the average annual population growth of the baseline and the preferred option at county level. There are some clear differences, most notably stronger population growth in the urban areas of Northamptonshire and Nottinghamshire and weaker population growth in the rural areas of Lincolnshire, Rutland and Leicestershire under the preferred option.

Figure 2: Population growth at county level



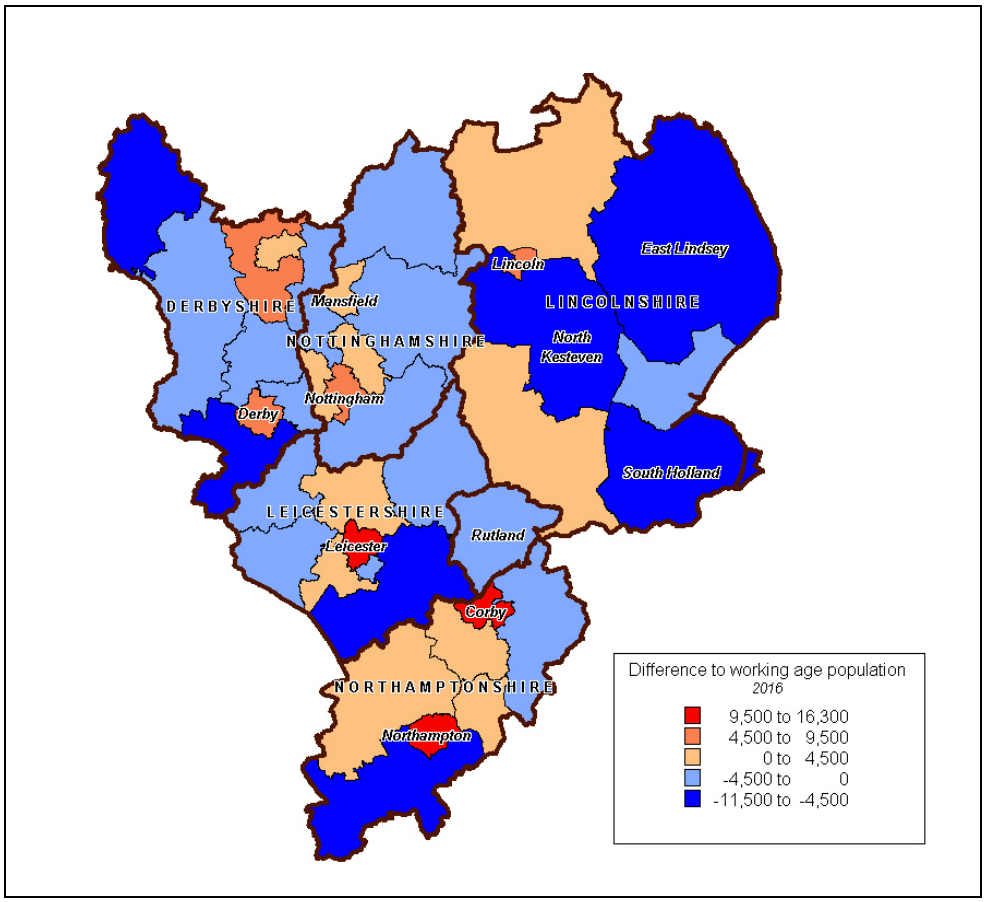
The growth of working age population is weaker than the growth in total population under both the baseline and the preferred option. However the growth in working age population is stronger in the preferred option for Nottinghamshire and Northamptonshire than under the baseline but Lincolnshire experiences weaker growth. Derbyshire and Rutland will experience a decline in working age people under the preferred option over the next 10 years compared to the baseline.

Figure 3: Working age population growth at county level



The county level figures conceal some of the changes occurring to population at district level. Map 1 shows the difference in working age population between the baseline and the preferred option in 2016 at district level. The red areas are those that will gain the greatest number of people of working age. Intuitively, the urban areas of Leicester, Northampton and Corby stand out as the areas that gain the most. The blue areas are those that will lose the greatest number of people of working age under the preferred option. The rural areas of Lincolnshire, Leicestershire and Derbyshire are most affected.

Map 1: Difference in working age population between the preferred option and the baseline in 2016



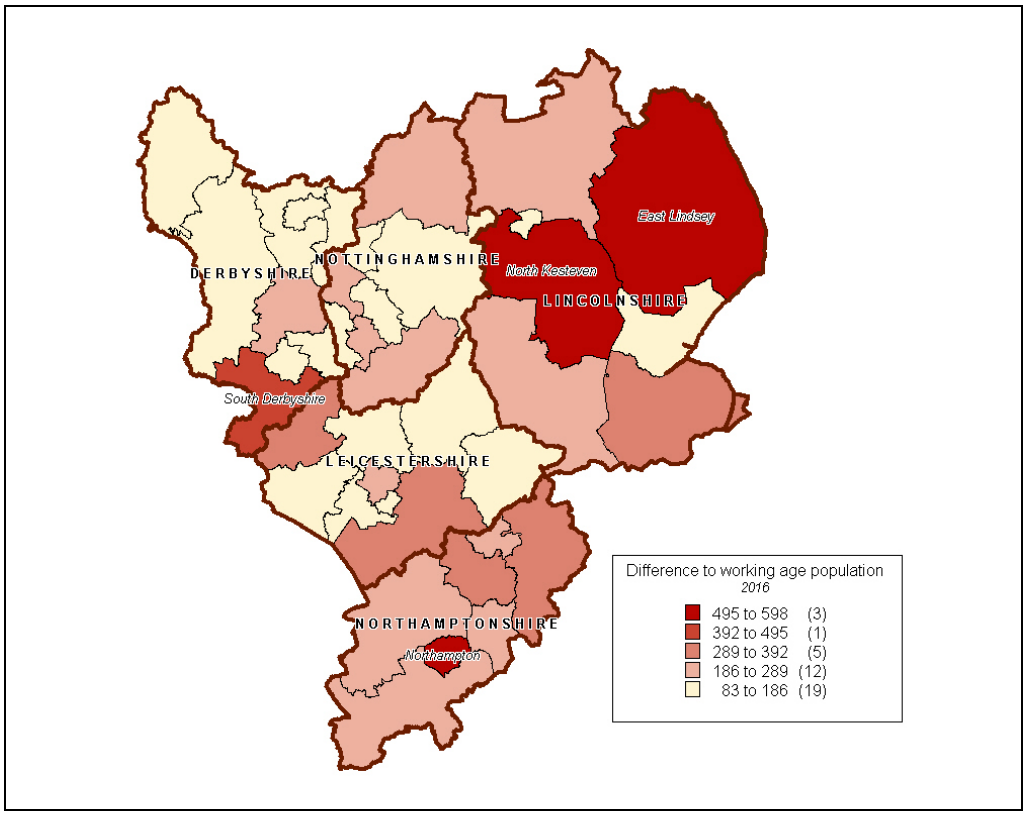
1.3 THE "PLUS 5" OPTION

The "Plus 5" option, instead of considering the impact of housing options, assumes population growth of 5 per cent above the (Experian) baseline growth rate in every year to 2016. The "Plus 5" option serves to show the impact of a more even distribution of an increase in population on the economic growth.

To adjust the population, total population growth in each year was made to be 5 per cent higher than the baseline growth rate. For example if population growth was 1 per cent per annum for an area in the baseline, then population growth would be 1.05 per cent per annum under the "Plus 5" option, The new population was then broken down by age band and gender for each local/unitary authority.

The changes to the population translate to an additional 15,000 people above the baseline by 2016 and 8,800 additional working age residents. Map 2 shows how many additional working people there will be in each district in 2016 according to the "Plus 5" option. Here the districts of East Lindsey and North Kesteven in Lincolnshire and Northampton accrue the greatest number of working age residents.

Map 2: Difference in working age population between the "Plus 5 option" and the baseline in 2016



2 Results of the modelling process

2.1 EMPLOYMENT AND OUTPUT UNDER THE PREFERRED OPTION

Re-running our economic model including the population for the preferred option provides an alternative set of output and employment figures. Table 2 provides a summary of the results at regional level.

Table 2: Preferred option, headline results

	2016 *Figures in thousands (except GVA)*			**Average Annual Growth % 2004 - 2016**	
	Baseline	**Preferred Option**	***Difference***	**Baseline**	**Preferred Option**
FTE Employment	1726	1727	*1.58*	0.29	0.30
Gross Value Added (million)	82049	82159	*109.86*	2.63	2.64
Total Population	4516	4552	*35.91*	0.46	0.52
Working Age Population	2696	2700	*4.15*	0.21	0.22
Source: Experian 2006					

The changes to the population result in 1,580 additional FTE jobs in the region by 2016. In terms of output this equates to an additional £110 million in 2016. In growth terms the additional population adds just 0.01 percentage points per year on to the growth path for both FTE employment and GVA. This suggests that the economic impacts of the population changes are fairly insignificant. Furthermore, this also highlights the limited impact of adding an additional 35,000 people to the regional population and demonstrates that by redistributing the population towards areas that are relatively unproductive and away from those that are more productive, will result in lower levels of economic growth for the region as a whole.

The results at county level will reflect the changes to county population (through changes to potential participation). An important indicator here is the working age population. If total population in an area increases significantly but the working age population remains relatively unchanged then employment change will be subdued. Employment in each county is also determined by the labour supply in surrounding areas and the volume of commuting between the areas. For these reasons one area may not gain as many jobs from an increase in population as another area given the same changes in population. Table 3 details the average annual growth of the counties in terms of output and full-time equivalent employment.

Table 3: County level average annual growth % 2004 – 2016

County	FTE		Gross Value Added	
	Baseline	Preferred Option	Baseline	Preferred Option
Nottinghamshire	0.12	0.17	2.45	2.49
Northamptonshire	0.66	1.05	3.06	3.44
Leicestershire	0.02	0.00	2.36	2.33
Lincolnshire	0.65	0.36	2.92	2.61
Derbyshire	0.22	0.10	2.55	2.43
Rutland	0.23	-0.04	2.27	1.97
Source: Experian 2006				

The preferred option has a significant impact on output and employment growth at county level. The majority of counties in the region experience a decline in employment and output growth compared to the baseline as a result of the changes to population. Employment growth in Lincolnshire and Derbyshire is more than halved and growth in Leicestershire becomes stagnant. Lincolnshire has been one of the success stories of the East Midlands economy over the last few years, returning the highest rates of both employment and output growth. Under the preferred option Lincolnshire is expected to lose momentum.

Derbyshire sees a reduction in employment of 5,800 FTEs relative to the base despite a small increase in population, caused by a fall in the working age population in the county. The same is true of Leicestershire. However the fall in Leicestershire employment compared to the base (1,000 FTEs) is high relative to the fall in working age population (1,200). This is as a result of falling working age population in Derbyshire adversely affecting the long-term supply of labour in Leicestershire. Economic growth in Leicestershire and Derbyshire has historically lagged behind the growth of the East Midlands and under the preferred option this trend is likely to continue into the future.

The boost to both total and working age population in Northamptonshire ensures that growth in FTE employment in the years to 2016 is increased by 0.4 per cent a year which is equivalent to an additional 15,800 jobs in 2016. Nottinghamshire also experiences a boost to employment and output growth. However the 2,500 increase in employment is less than one might expect given the extra 13,000 people. This is due to the change in labour supply being relatively muted, as indicated by an increase in working age population of only 3,900 people.

The preferred option was planned at housing market area (HMA) in terms of housing allocation as detailed in table 1 in the first section of this report. Northamptonshire was not included as part of this process because it falls within the MKSM area. The results of the modelling process for housing market areas are presented in table 4.

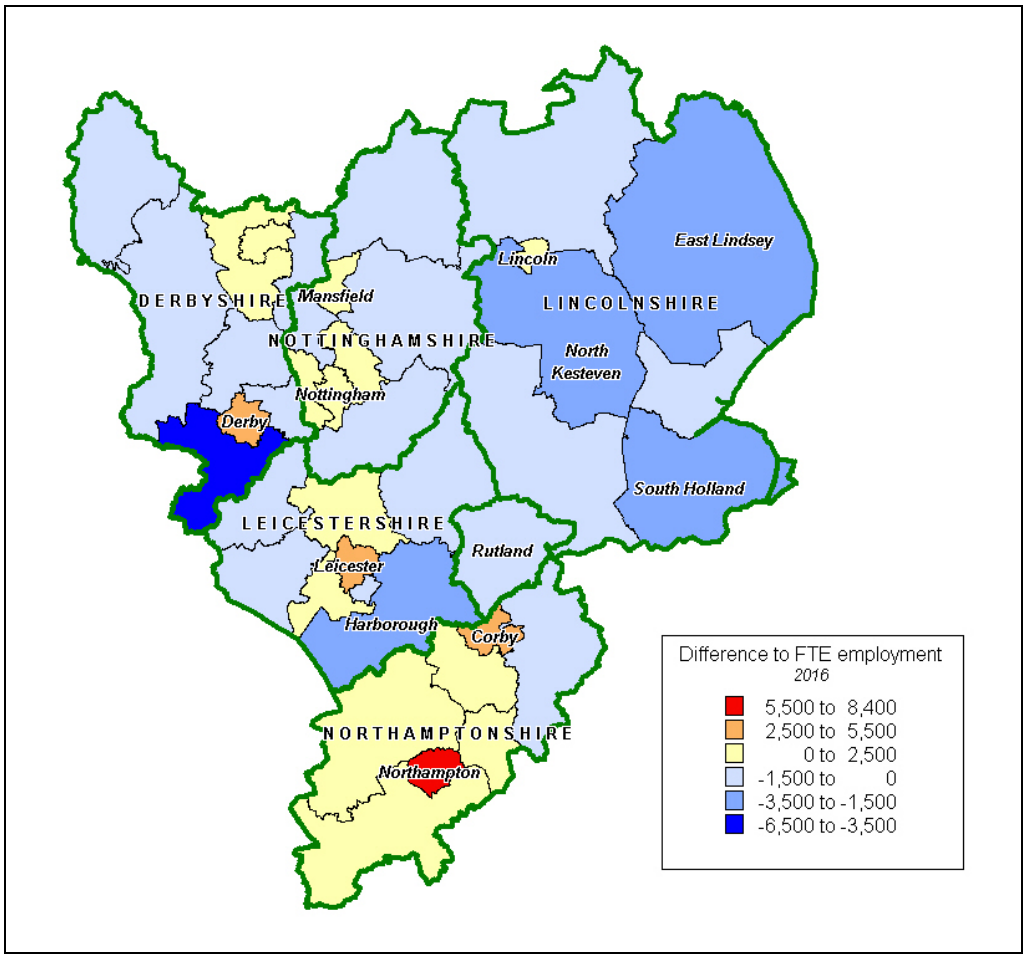
Table 4: HMA level average annual growth % 2004 – 2016

HMA	FTE		Gross Value Added	
	Baseline	Preferred Option	Baseline	Preferred Option
Coastal Lincolnshire	0.55	0.10	2.77	2.32
Central Lincolnshire	0.69	0.54	2.95	2.77
Peterborough (Partial)	0.61	0.29	2.90	2.56
Nottingham Outer	0.18	0.18	2.51	2.49
Sheffield/Rotherham	0.35	0.41	2.75	2.77
Peak, Dales & Park	0.19	-0.07	2.34	2.06
Derby	0.23	0.04	2.52	2.36
Leicester & Leicestershire	0.01	0.00	2.36	2.35
Nottingham Core	0.05	0.11	2.40	2.46
West Northants	0.74	1.19	3.13	3.55
North Northants	0.54	0.85	2.96	3.29
Source: Experian 2006				

On the whole, the performance of the majority of HMA's is weaker in terms of employment and output growth under the preferred scenario than under the baseline. The exceptions to this rule are Sheffield/Rotherham and Nottingham Core. These areas experience a marginal improvement in economic growth over the next 10 years. The other exceptions are the two Northamptonshire areas but these are not covered by the preferred option. Nottingham Outer and Leicester & Leicestershire experience little difference to growth under the preferred option. Employment under the preferred option in the Peak, Dales and Park is actually expected to contract over the next decade. Hardest hit however, are Coastal Lincolnshire, where employment growth is expected to be many times lower than under the baseline and Peterborough (Partial), where employment growth is below half the rate expected in the baseline.

The results at district level show that urban areas gain more than rural areas under the preferred option relative to the baseline. Map 3 shows the absolute difference in FTE employment in 2016 between the preferred option and the baseline at district level. The red and orange areas show where the most jobs have been gained against the baseline. The map clearly shows that outside of Northamptonshire and some of the urban centres that much of the region will have fewer FTE jobs relative to the baseline. Northampton stands out, having gained over 8,000 additional FTE jobs. Leicester, Corby and Derby also perform well. However, the rural areas of Lincolnshire, Derbyshire and Leicestershire are those that have fewer jobs in the preferred option relative to the baseline. South Derbyshire is most affected under the preferred option with a reduction of 6,500 full-time equivalents compared to the baseline by 2016.

Map 3: Difference in FTE employment between the preferred option and the baseline in 2016



2.2 EMPLOYMENT AND OUTPUT UNDER THE "PLUS 5" OPTION

Table 5 reports the headline results for the East Midlands under the "Plus 5" option.

Table 5: "Plus 5" option, headline results

	2016 *Figures in thousands (except GVA)*			Average Annual Growth % 2004 - 2016	
	Baseline	**Plus 5**	***Difference***	**Baseline**	**Plus 5**
FTE Employment	1,726	1,732	*5.7*	0.29	0.32
Gross Value Added (million)	82,049	82,323	*273.2*	2.63	2.66
Total Population	4,516	4,531	*15.0*	0.46	0.49
Working Age Population	2,696	2,705	*8.8*	0.21	0.23
Source: Experian 2006					

Under the "Plus 5" option, having more people of working age across the whole region results in a positive impact upon the East Midlands economy. The population growth translates to more than three times as many additional jobs as under the preferred option, 5,700 by 2016. In terms of output this leads to an additional £273 million in 2016, compared to just £110 million under the preferred option. The average annual growth rates for both output and employment are 0.03 percentage points above the baseline and 0.02 percentage points above the preferred option under the "Plus 5" option.

Table 6 shows that the counties expected to see greatest employment and output growth rates under the baseline also outgrow the other counties under the "Plus 5" option. The preferred option outperforms the "Plus 5" option marginally in Nottinghamshire and by some way in Northamptonshire, but in all other counties the "Plus 5" option leads to above baseline annual growth in both employment and output, where as the preferred option actually slows growth.

Table 6: County level average annual growth % 2004 – 2016

	FTE			Gross Value Added		
County	**Baseline**	**Preferred Option**	**Plus 5**	**Baseline**	**Preferred Option**	**Plus 5**
Nottinghamshire	0.12	0.17	0.14	2.45	2.49	2.47
Northamptonshire	0.66	1.05	0.70	3.06	3.44	3.10
Leicestershire	0.02	0.00	0.04	2.36	2.33	2.38
Lincolnshire	0.65	0.36	0.68	2.92	2.61	2.95
Derbyshire	0.22	0.10	0.24	2.55	2.43	2.57
Rutland	0.23	-0.04	0.26	2.27	1.97	2.30
Source: Experian 2006						

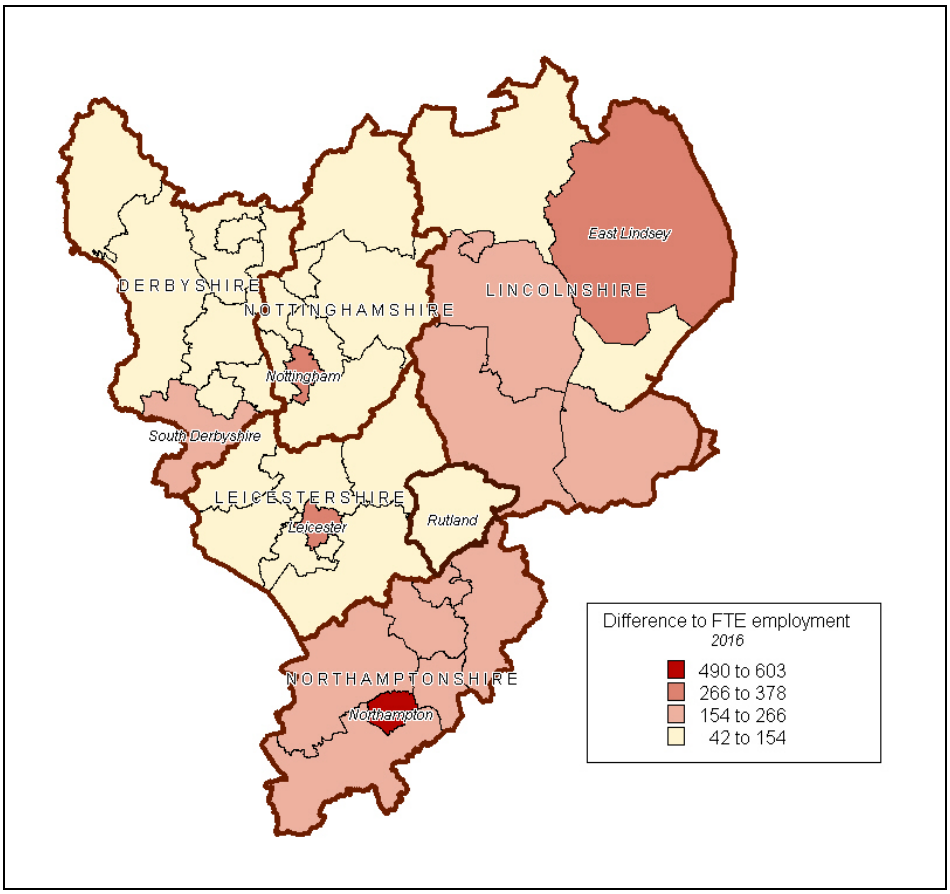
Looking at the effects by housing market area tells a similar story. By it's nature the "Plus 5" option leads to greater employment and output growth than the baseline across all HMA's. Excluding the two Northamptonshire areas not covered by the preferred option, Nottingham Core and Sheffield/Rotherham are the only areas where the preferred scenario outperforms the "Plus 5" option. The "Plus 5" option however results in slightly greater growth in Nottingham Outer and Leicester & Leicestershire but considerably stronger growth in all remaining HMA's.

Table 7: HMA level average annual growth % 2004 – 2016

	FTE			Gross Value Added		
HMA	**Baseline**	**Preferred Option**	**'Plus 5' Option**	**Baseline**	**Preferred Option**	**'Plus 5' Option**
Coastal Lincolnshire	0.55	0.10	0.59	2.77	2.32	2.81
Central Lincolnshire	0.69	0.54	0.72	2.95	2.77	2.99
Peterborough (Partial)	0.61	0.29	0.65	2.90	2.56	2.93
Nottingham Outer	0.18	0.18	0.21	2.51	2.49	2.53
Sheffield/Rotherham	0.35	0.41	0.37	2.75	2.77	2.76
Peak, Dales & Park	0.19	-0.07	0.20	2.34	2.06	2.35
Derby	0.23	0.04	0.25	2.52	2.36	2.54
Leicester & Leicestershire	0.01	0.00	0.03	2.36	2.35	2.38
Nottingham Core	0.05	0.11	0.06	2.40	2.46	2.42
West Northants	0.74	1.19	0.78	3.13	3.55	3.17
North Northants	0.54	0.85	0.58	2.96	3.29	3.01
Source: Experian 2006						

Map 4 shows the distribution of additional FTE jobs under the "Plus 5" option and clearly illustrates that additional employment resulting from the population changes is much more evenly distributed across the region than under the preferred option. However, Northampton stands out as gaining the most FTE jobs, reflecting the high relative employment rate in the area. Under the "Plus 5" option, because all counties gain in terms of population, changes to surrounding areas have less of an impact on any particular county and no counties lose jobs relative to the baseline.

Map 4: Difference in FTE employment between the "Plus 5" option and the baseline in 2016



3 Economic modelling, housing provision and employment land

3.1 HOUSING DEMAND AND EMPLOYMENT

Economic performance is a key driver of population change and income, both of which determine the demand for housing in an area. Explicit within the Experian model is an assumption that in the long-run increases in population will directly result in increased employment. The modelling exercise detailed in the previous sections of this report serves to demonstrate that economic growth in our model is also determined by underlying factors independent of population size such as infrastructure, qualifications and industrial structure. At a sub-regional level the relationships between small areas complicate the modelling process as people can commute between areas for work.

3.2 THE THEORETICAL APPROACH TO ECONOMIC MODELLING, HOUSING AND EMPLOYMENT LAND

There are two distinct approaches to using economic forecasts of employment and population for allocations of housing land and employment land: demand-side approaches and supply-side approaches. These two approaches broadly reflect the methods undertaken in the East Midlands region.

1. Demand-side approaches

A demand side approach takes as a starting point the expected forecasts for employment growth in a given area. These employment forecasts form the basis of estimates for:

- The number of additional jobs which when disaggregated by sectors relate to employment land-use classifications. This in turn underpins assumptions of employment density which are used derive estimates for requirements of employment land.
- The number of additional jobs which require additional residents in the area to fill those jobs. This in turn derives estimates of the housing units required to provide homes for the additional residents.

2. Supply-side approaches

A supply-side approach takes resident population forecasts for an area as a starting point and the average number of people expected to live within each household. These forecasts form the basis of estimates for:

- The number of housing units which are expected to be built. This supply-side approach often involves beginning with a prescribed policy view on the number of housing units to be built.
- The number of jobs which are expected to be required to employ the larger resident population.

3.2.1 Implications of the two approaches

In effect, the demand-side and supply-side approaches are driven by different assumptions and have different functions.

If a demand side approach is used to estimate housing growth, this needs to make assumptions about the relationship between jobs growth and population growth. The number of additional jobs is not equal to the additional number of people:

- Additional jobs may simply increase the employment rate of people already in the area, drawing on residents who are economically inactive or unemployed.
- Additional jobs may draw on people who are not residents in the area with workers commuting in from other areas.

Both of these effects mean that there can be jobs growth without population growth.

If a demand side approach is used to estimate employment land requirement, this needs to make assumptions about the relationship between jobs and employment land densities. This in itself is not straightforward as:

- Employment densities vary between sectors, within sectors and by location. For example, office space in urban centres may have higher densities than out-of-town business parks.
- Employment densities change over time. For example, in manufacturing locations, automation can mean fewer workers within the same floorspace.

In practice, estimates of employment land requirements are based on densities reported from official guidance and results of surveys – but there is no fixed relationship.

If a supply side approach is used to estimate housing growth, then this invariably makes assumptions about household size and composition. Assumptions and forecasts about the numbers of people who choose to live alone, in couples or in larger households can significantly alter the relationship between population forecasts and housing needs.

A supply side approach cannot be effectively used to estimate employment land needs. If population increases in an area then we would have to make a series of assumptions.

- Additional residents may not simply mean more jobs. For example, additional people in the area may retire, be economically inactive or unemployed.
- Additional residents may be employed outside of the area and commute from the area in which they live to another area.

Moreover, even if a supply-side approach can inform us of the number of people who live and work in an area – it cannot tell us the sectors they will work in and so cannot indicate need for employment land.

3.2.2 Bringing the two approaches together

Given the different nature of the two approaches, it should not be a surprise that there is potential for different forecasts for housing and employment land. This leaves a choice of integrating the two approaches or using separate approaches appropriately:

1. Integrating the two approaches

Experian's Regional Planning Service for all regions and local authority districts in the UK integrates forecasts for employment change and population change. This makes a series of assumptions based on evidence of established relationships and trends on employment rates, patterns of migration and patterns of commuting.

The effect of this is that future estimates of both employment and population are based on a consistent framework. Any derivations for future housing or employment land therefore at least begin from the same point.

2. Use separate approaches appropriately

The Greater London Authority (GLA) takes an approach of separating out employment and population projections in its development of the London Plan. That is:

- GLA Economics produces employment projections (the demand-side) based on long-term sector trends in London's economy. This forms the base for expected need for employment land.
- GLA Data Management and Analysis Group produces population and household projections (the supply-side) based on long-term demographic and migration trends. This forms the basis for future housing allocations.

This implicitly recognises that the relationship between employment growth and population growth is not fixed with evolving variables such as changing employment rates and changing commuting patterns.

3.3 HOW SHOULD FORECAST DATA BE USED TO INFORM EMPLOYMENT LAND/HOUSING STUDIES?

Economic forecasts are an important consideration for specifying housing and employment land allocation at regional and sub-regional level as they provide a starting point for considering where demand for land and housing is likely to occur in the future, as both are partly determined by economic, and more importantly, employment growth. Experian economic forecasts are derived from official historic statistics of activity, employment, incomes and spending at the UK, regional and sub-regional levels. The economic model uses this historic data together with a number of assumptions to produce forecasts of future economic growth based on what has happened in the past and what is expected to happen in the future given the conditions in the World, UK and regional economy.

Such forecasts serve to provide an understanding of the underlying structural trends, causal factors and relationships across the regional and sub-regional economy and as a result they provide a robust evidence base on which to test future scenarios and to consider the potential impact of any policy decisions. However these forecasts are what we expect to happen if past trends and the assumptions built into the model hold true in the future and are only a 'best guess' at the time of their estimation. The economy changes, and different versions of economic forecasts are likely to contain a different set of forecasts for a particular area because of changes in a view of the world, the inclusion of more recent data or revisions to official historic data. Such forecasts should therefore be used as a guide to the likely trends and should not be considered 'hard estimates' in any sense and should be used in conjunction with other knowledge and information about an area or industry available.

All economic models are subject to limitations based on the both the historic data and the assumptions used to build them. As a result, there is a danger in placing too much emphasis on the results of an economic model, particularly at lower geographical levels. This is particularly pertinent when considering the demand for housing and employment growth. The model may not capture some of the more complex relationships that occur between these variables at a local level, as where someone chooses to live and work is determined by many factors such as housing quality, community, privacy and environment as well as employment opportunities.

If the approach used to determine housing allocation in the region is purely quantitative this potentially has a number of limitations. Indeed, the type and size of housing will largely determine the age and gender of those that choose to accommodate it, which itself will have an impact upon economic growth. Furthermore the quality of the housing may also determine the characteristics of the people who move into the area. If these people are highly skilled then their employment rate is likely to be higher than average and thus increase employment in the area. In such a way, housing can theoretically be used as a policy lever. For example building flats is likely to attract a different household type than will a 4-bedroom detached or any type of social rented accommodation. This could be modelled but only pursuant to the numbers game (and would require forecasting occupational mix and assumptions as to the type and size of housing required by households in different occupations). This also creates another policy decision and one that can be potentially quite sensitive.

The results from the modelling exercise in this study allow the comparison of different population assumptions and show how these are expected to impact upon economic growth. However the results assume that the historic relationship between employment growth, labour market participation and commuting captured within the model remain true in the future. These relationships may change due to a number of factors including infrastructure (transport links) and economic development (relocation to out of town shopping centers etc). Indeed, the changes in population may, in reality just result in an increase in commuting flows between districts rather than muted employment growth. The modelling process used here however provides a framework in which to consider these alternative assumptions and what impact they may have.

Appendix A

Translating the revised population to economic growth

POPULATION

The starting point for the modelling work is the two sets of alternative population projections. The preferred option population numbers were provided by age and gender for 2001, 2006, 2011 and 2016. For modelling purposes these were interpolated to provide annual population by age and gender

CHANGES TO POPULATION AND LONG-TERM COUNTY MODELLING

Experian's long-term county modelling framework incorporates supply-side factors. These include labour supply, participation rates, labour force quality, infrastructure, population density and ethnic mix. Changes in the size and structure of the population will affect the supply of labour available. These factors influence the potential for economic growth and changes in employment in the East Midlands.

The revised population figures are used to estimate new long-term "potential participation" for each county. Potential participation is a measure of the propensity of people of different ages to enter the labour market. Potential participation rates are available by gender and age band (including people aged 65 and over). When applied to population levels this provides an estimate of all the people who could potentially participate in the labour market, or the theoretical maximum level of employment. The potential participation rates change over time to reflect social and administrative changes; for example more people in older age bands participating in the labour market in the future. Since the rates are by age band and gender, potential participation will reflect changes to the profile of the population over time.

Not everyone who can potentially participate in the labour market would do so in their county of residence. To account for commuting effects and the fact that employment within a county depends partly on what is happening elsewhere potential participation is weighted to derive workplace-based potential participation for each county.

Workplace-based potential participation is then applied to the employment rate for that county derived from the long-term modelling process. The supply-side model is then solved and drawn together with our short-term demand-side model (described in the next section) to produce employment and output at county level.

Supply-side modelling is generally accepted as being more reliable for forecasting the direction of an economy over the longer-term as the long-term variables change relatively slowly over time. Numerous economic models, including the HM Treasury's long-run fiscal projections, view long-term economic growth as a function of productivity and employment. Our long-term county model is consistent with this type of approach in that it uses demographics and the employment rate to predict long-run employment.

COUNTY AND DISTRICT (LA/UA) LEVEL FORECASTS

The Long-term County Model provides the long-term 2016 view of each county's economy based on supply-side factors. To model the short to medium term, demand-led econometric modelling is employed.

In broad terms, the historical performance of county economies is interpreted in terms of their share of the regional economy of which they are a part. In turn, the performance of the LAD areas is based on their share of their encompassing county. For each sector of the economy, equations are produced for output and employment that explain the observable relationship between these variables at the local and regional level.

The equations used for forecasting output in the production industries make use of this first level of modelling (i.e. they model the changes at the county and regional levels) without further refinements.

The equation used for the service industries are driven by a greater range of variables. The output equations for the service industries incorporate both population and intermediate demand (business-to-business) demand.

The construction sector is also treated slightly differently. Its equations are based upon those used to model the service industries, but instead of including a measure of intermediate demand, they incorporate data on investment spending by both service and production industries.

The models are solved to produce forecasts of output for each of the counties for each of the 30 industries. Again, in broad terms, if a county X has accounted for a steadily rising share of a sector P in region Y, then its share will continue to increase into the future. This applies whether, at the regional level, the sector is increasing or decreasing in size.

These calculations are executed for every sector and every county in a region. All totals must sum to regional totals. In turn, the calculated sub-county level totals must sum to county total.

The long-term supply-side and short-to-medium demand-side models are drawn together, and the whole process culminates with a set of county and sub-county level forecasts that are entirely consistent with the national and regional forecasts upon which it is based.