PUSH Economic Development Strategy
Preferred Growth Scenario

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Contents

1. Introduction

This report sets out the results of econometric modelling undertaken by Oxford Economics, in partnership with DTZ to inform the PUSH Economic Development Strategy Update.

This report is part of a suite of documents which also includes:

- Economic Development Strategy
- Economic Development Evidence Base
- Headline Sustainability Assessment
- Key Sites in South Hampshire

This paper provides analysis of the preferred growth trajectory adopted by PUSH. In settling on this trajectory a number of scenarios were developed. The outputs of these scenarios have been tested through close working of DTZ, Oxford Economics, the PUSH project steering group and other PUSH forums. In particular these have been tested for credibility and realism, political acceptability and ambition. This has led to a preferred trajectory for the PUSH economy which encapsulates the ambition and aspiration of PUSH. It is this alternative trajectory which PUSH has developed its Economic Development Strategy to work towards. It sets out a more sustainable future for the sub-region economically, socially and environmentally.

1.1 Preferred Scenario Foundations

The Economic Development Evidence Base includes analysis of the baseline projections for the sub-region in light of the recession. This identified challenges for the sub-regional economy, particularly in terms of lower employment rates and persistently higher levels of unemployment into the medium and long term. PUSH is committed to securing a strong and prosperous future for South Hampshire. In response to the challenges evident in the baseline PUSH, in conjunction with Oxford Economics and DTZ, has developed a preferred alternative growth trajectory.

At its heart, this alternative future is built on using the assets of the sub-region to underpin growth, and to ensure the residents of the sub-region can participate in a more prosperous future. This is manifested in:

- An increase in the number of jobs to help reduce unemployment and increase the employment rate as a result of support for key sectors, boosting innovation and ensuring a highly skilled workforce;
- Prioritising investment in workforce and skills development to ensure the resident workforce is well placed to access employment opportunities in the sub-region and avoid the need for employers to have to recruit as many workers from outside the area;
- Boosting productivity to raise GVA through higher levels of skills and innovation, particularly driven by our priority sectors;
- Ensuring our cities fulfil their potential as drivers of sustainable and high value growth for the sub-regional economy, whilst tackling the disadvantage and deprivation which is present in parts of the cities and elsewhere in South Hampshire.

The Economic Development Strategy outlines our priority sectors, particularly those where we have a competitive advantage, an existing strength and opportunities to build on our assets to deliver growth. Our preferred growth trajectory is founded on boosting productivity and employment growth in these sectors and on the investment in skills and workforce development to reduce the need for some of the in-migration projected within the baseline. This investment in skills and workforce engagement and development is also central to our ambition to tackle deprivation and disadvantage, ensuring all can participate in a brighter future.

1.2 Modelling Assumptions

Set out below is a summary of the assumptions used in the modelling of the preferred growth trajectory.

Productivity

- 10% productivity uplift to all sectors of the economy. Productivity is assumed to rise across the economy given skills initiatives, higher levels of innovation and extra competition from growth in priority sectors.
- 20% productivity uplift to priority sectors. In addition to the general uplift to productivity, it is assumed that new or additional jobs in priority sectors have further boosts to productivity to reflect higher levels of support in terms of skills and innovation.

Employment

- 0.4% per annum uplift to employment in priority sectors to reflect inward investment activity and higher levels of skills and innovation support.

Migration

- 2% per annum reduction in baseline inward migration to PUSH area as a result of increased resident skills, workforce engagement and facilitation of residents into work.
- 75% reduction in nominal migrant levels for 'above baseline' employment to reflect prioritisation of skills investment and workforce development to enable residents to access employment opportunities.

Multiplier Impacts

- The results of adjusted assumptions flow through the model to reflect the connections within the economy, leading to multiplier impacts in the sub-region.
- This leads to increased employment but dampens the effects of uplifts to productivity levels as stimulated employment growth is biased towards lower productivity sectors.

Strategy Impact Phasing

- The impact of assumptions is phased over time to reflect the phasing in of the refreshed Economic Development Strategy, its peak impact and move towards steady stage in the medium term. The greatest impact is timed to fit with the strongest period of the recovery.

2011	2012	2013	2014	2015	2016	2017	2018	2019	2020+
70%	85%	100%	100%	100%	75%	75%	50%	50%	25%

1.3 Uncertainty and Risk

The future projections contained within this report have been developed in the wake of a severe recession which has spanned much of the globe, not just the UK economy. New data has been emerging throughout the time period when these projections were developed. As far as is possible, the projections within this report take account of the latest releases of data including Oxford Economics' Spring 2010 update to its forecasting models.

However, whilst the UK has emerged from recession there is still much uncertainty as to the exact patterns of future growth at a UK level, not least at a regional and sub-regional level. At any time, developing projections and forecasts is an imprecise science, and in reality, more of an art. At the current time the challenges are greater.

The results therefore need to be understood in this context. For the most part, the modelling exercise has been performed to indicate broad directions of travel and to identify important issues that need to be reflected in the Economic Development Strategy setting process. However, for the purposes of some of PUSH's activities there is a need to proceed on the basis of absolute numbers. The results of this modelling exercise have been used in this regard but it is accepted from the outset that there will need to be close monitoring and review.

1.4 Analysis Period

The previous PUSH Economic Development Strategy was developed to align with the South East Plan period 2006-26. For this exercise analysis has been developed to allow comparison with this period and provide some indication of longer term trends to 2031. For the most part, the period 2026-2031 includes the extension of long term trends that are already evident within the modelling from 2021 onwards.

1.5 Oxford Economics Model

Appendix 1 sets out further details on the Oxford Economics model which has been used to develop the projections set out in this report.

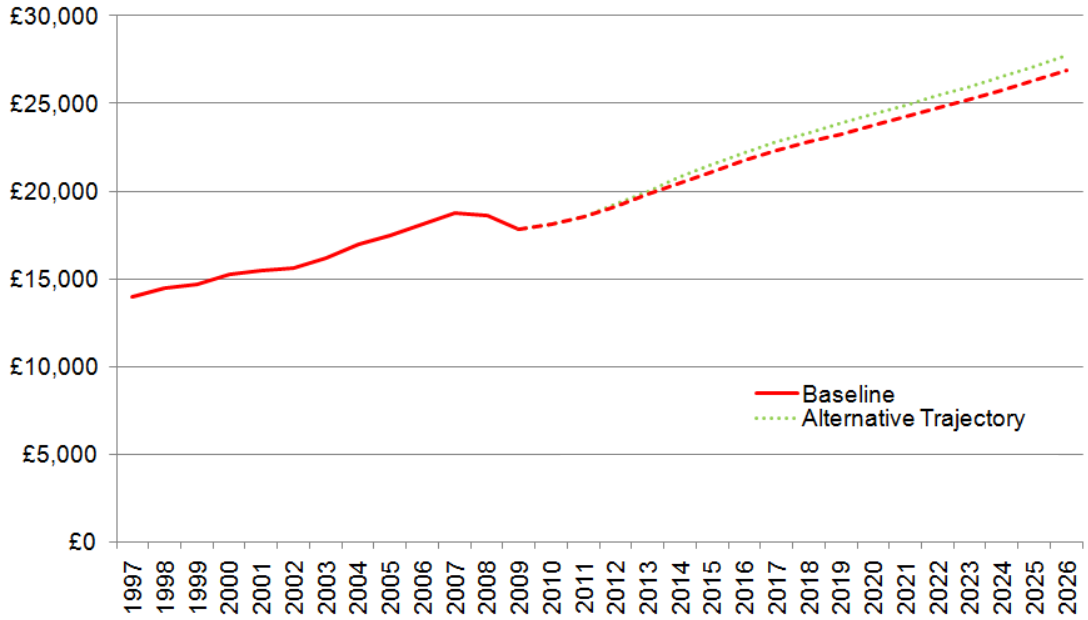
2. Headline Economic Performance

This chapter sets out analysis of the headline economic performance required within the PUSH preferred growth strategy. This is set against the baseline projections for the sub-region.

2.1 GVA

The combined effect of the preferred scenario assumptions is an increase in GVA when compared to the baseline projections as illustrated in figure 1.

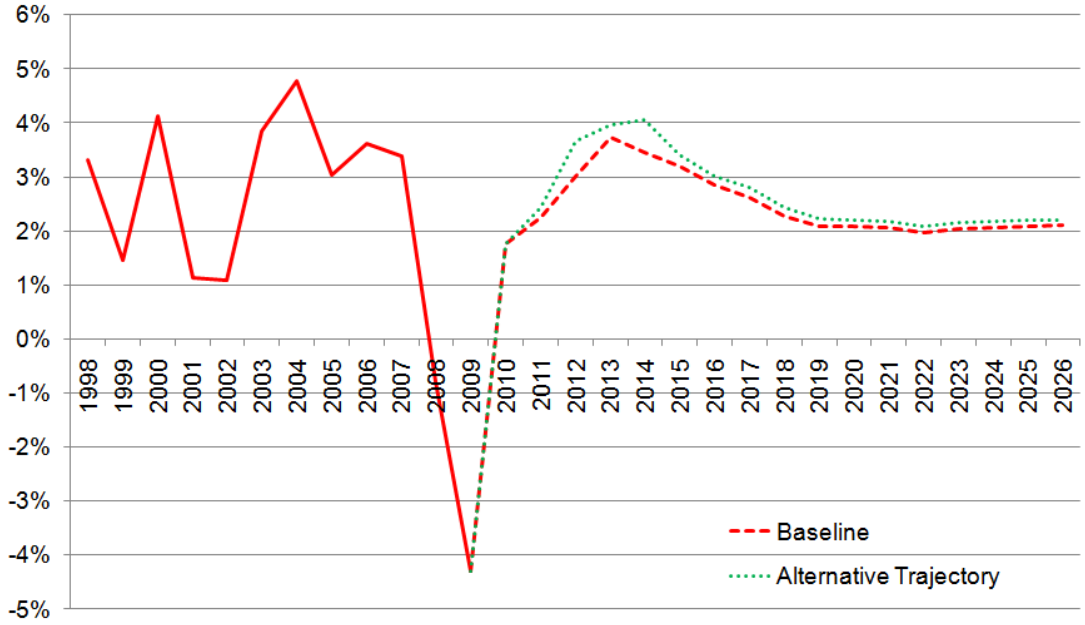
Figure 1: Total GVA for PUSH Area – Baseline and Preferred Scenario



Source: Oxford Economics

The increase in total GVA arises from slightly higher growth rates (figure 2), particularly as the Economic Development Strategy actions take effect in the mid 2010's and through a slight uplift in the longer term growth rate for the PUSH area as a result of higher level skills, productivity and labour force engagement.

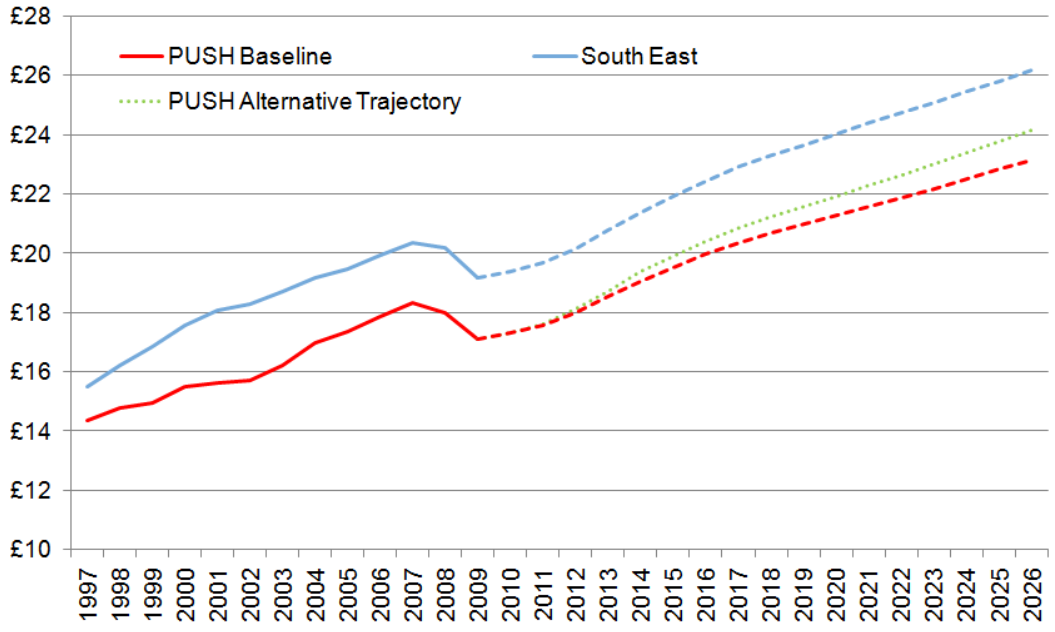
Figure 2: GVA Growth Rate for PUSH Area – Baseline and Preferred Scenario



Source: Oxford Economics

The substantial investment in skills and workforce development as well as supporting residents to access the jobs created in the sub-region will reduce the total projected population by around 10,000 as a result of the reduced requirement for inward migration. Higher GVA combined with a lower population leads to higher levels of GVA per capita across the sub-region which will begin to close the performance gap between South Hampshire and the South East, from the current 11% to 7% by 2026 as shown in figure 3.

Figure 3: GVA per Capita PUSH Area Baseline and Preferred Scenario Compared to South East (000's)

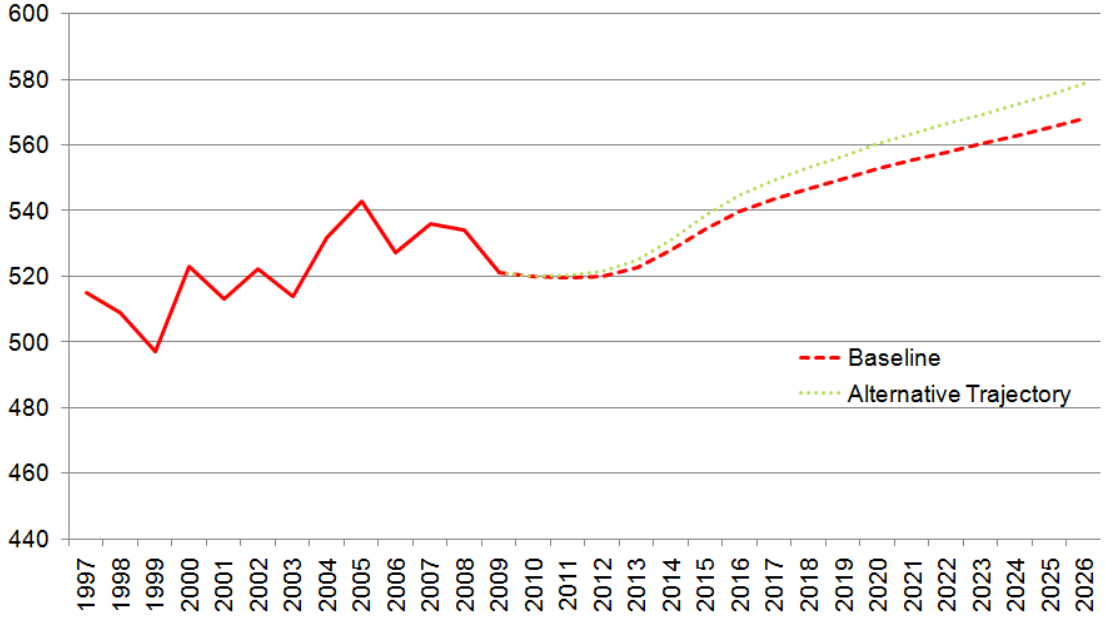


Source: Oxford Economics

2.2 Employment and Labour Market

A key element of the preferred scenario is a higher level of employment to create opportunities for our residents. Figure 4 shows our ambition with an additional 10,000 jobs over the period 2006-26.

Figure 4: Total Employment - PUSH Area Baseline and Preferred Scenario (000's)



Source: Oxford Economics

This increased level of employment and reduced population will boost our employment rate and reduce the level of unemployment in the sub-region by 3,500 compared to the baseline.

2.3 Key Indicator Summary

Figure 5 provides a direct comparison of the key indicators for the preferred scenario over the period 2006-26 compared against the baseline trajectory. As noted previously, there are uncertainties around the absolute numbers, but this comparison clearly illustrates the direction of travel which is aspired to in terms of:

- A higher level of GVA generated in the economy;
- More rapid increase in GVA per capita, closing the performance gap with the South East;
- Increasing the level of employment and the employment rate to ensure more residents of South Hampshire can participate and benefit from economic growth; and
- Higher levels of productivity growth.

Figure 5: Key Indicators for the PUSH Area Preferred Growth Scenario and Baseline (2006-26 unless otherwise stated)

	Preferred Scenario	Baseline
GVA Growth	+£9.6bn	+8.7bn
GVA Growth Rate (CAGR)	2.1%	2.0%
GVA per Capita Change	+£6,400	+£5,300
GVA per Capita Gap - PUSH vs South East (2026)	7%	12%
Employment	+51,200	+41,300
Employment Rate (2026)	75.9%	72.7%
Employment Rate Change	+0.8% points	-2.4% points
Productivity Growth (CAGR)	1.7%	1.6%

Source: Oxford Economics

3. Detailed Analysis

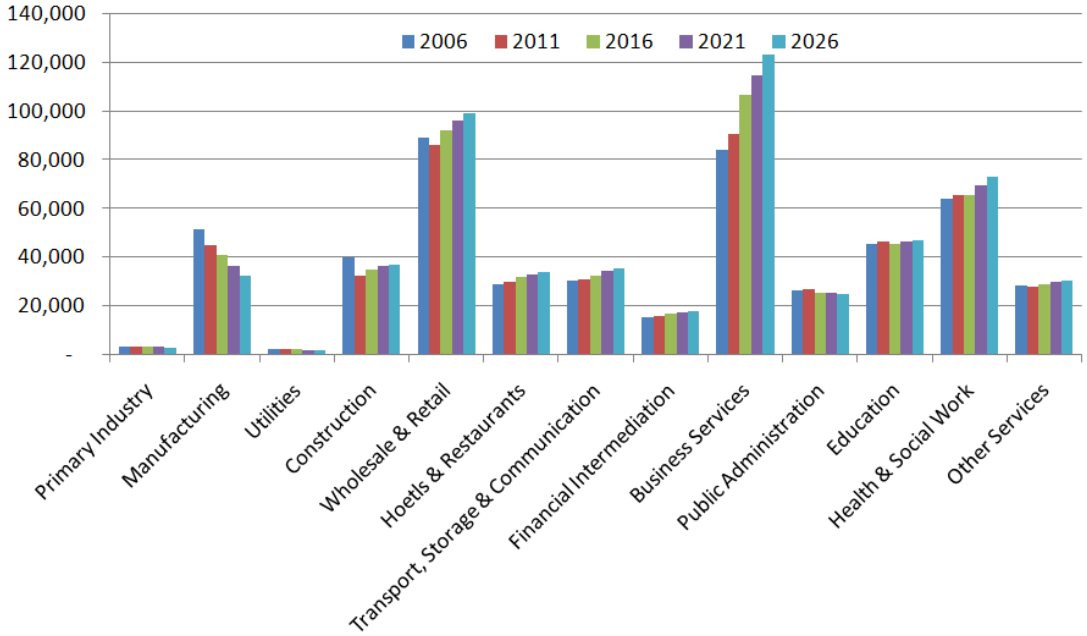
This chapter sets out further details of the preferred scenario based on the Oxford Economics model in terms of the sectoral performance, occupations, skills requirements, housing and employment floorspace. Further data is available in Appendix 2 to accompany this analysis.

3.1 Sectors

Figure 6 below shows the employment projections for broad sectors of the economy. The data which sits behind this chart is included at Appendix 2 Figure A1. The chart clearly shows the impact on some sectors of the recession (in particular manufacturing, construction and retail). The construction sector fails to recover its employment to pre-recession levels by 2026. In all instances the chart shows net changes in employment. There will be substantial churn of jobs in the period which will stimulate demand for labour from across the workforce.

The major trends in employment shifts are relatively unsurprising. There is a projected decline in employment in the manufacturing sector and continued shift towards business services. Employment in public administration and education is projected to be fairly flat as a result of cuts in public expenditure. However, the health sector will continue expand, particularly driven by an expanding and aging population.

Figure 6: Employment by Broad Sector in the PUSH Area 2006-26



Source: Oxford Economics

Figure 7 provides more detail on the sub-sectoral breakdown of business services employment growth projected for the period 2006-26. All sub-sectors show fairly strong growth in percentage terms. IT, R&D and Professional Services are projected to increase by 14,600 jobs in total.

Figure 7: Business Services Sub-Sectoral Projected Employment Growth

Sector	2006-26 Employment Change	2006-26 % Employment Growth
Real Estate & Related	3,200	52%
Renting of Equipment & Machinery	900	37%
IT	3,600	30%
R&D	1,200	50%
Professional Services	9,800	43%
Labour Recruitment (including agency personnel)	9,400	51%
Cleaning & Security	5,900	47%
Other Business Services	5,100	59%

Source: Oxford Economics

Advanced manufacturing activities in South Hampshire, including marine and aerospace have been identified as a major strength of the sub-region (see Evidence Base report). There are high concentrations of employment, the sectors generate high levels of GVA per worker and there is specialist skills and knowledge in the businesses and universities of the area. However, manufacturing employment is projected to decline. Why therefore is advanced manufacturing such an important sector for PUSH.

Firstly, it should be remembered that the data on which any forecasting is undertaken has limits. One of the most significant limits is an inability to strip out advanced elements of manufacturing. As a result, the data can mask losses in lower value activity, which outweigh gains in higher value activity. Secondly, whilst there will undoubtedly be pressures on the manufacturing sector in a globalised economy, the projections reinforce the need for PUSH to prioritise action to support this section of the economy to protect high quality, high value jobs and seek to reverse the projected trends wherever possible. Thirdly, whilst the net change in employment may not show growth there will be substantial churn in the workforce. There is evidence of skills shortages and succession challenges related to an aging workforce coupled with young people favouring employment routes away from engineering related activities which pose risks to the sector. Fourthly whilst the manufacturing sector is projected to experience net decline in employment terms, there are significant productivity gains projected. Figure 8 includes data on GVA per worker derived from the Oxford Economics model. This shows that GVA per worker in the manufacturing sector is will sit behind only utilities and financial intermediation by 2026 with a 96% growth over the period 2006-26. This highlights the importance of supporting the advanced manufacturing sector in the sub-region. The transport equipment manufacturing sub-sector which incorporates aerospace and marine manufacturing exhibits even higher levels of GVA per worker than the manufacturing average, reaching almost £110,000 per worker by 2026.

The importance of the business services sector is also a highlight, given the very large projected employment gains coupled with relatively high GVA generation. The Transport & Communication sector also demonstrates high levels of GVA per worker coupled with employment growth on which PUSH needs to capitalise.

Figure 8: Broad Sectors –GVA per Worker and Employment 2006-26

	GVA per Worker 2026	GVA per Worker Change 2006-26	% Change	Employment Change 2006-26	% Change
Primary Industry	£16,471	-£1,800	-10%	-100	-3%
Manufacturing	£91,058	£44,600	96%	-18,600	-36%
Utilities	£202,967	£56,900	39%	-500	-22%
Construction	£37,353	£7,200	24%	-3,000	-8%
Wholesale & Retail	£37,447	£10,300	38%	10,100	11%
Hotels & Restaurants	£17,063	£100	0%	5,300	18%
Transport & Communication	£61,475	£19,700	47%	4,900	16%
Financial Intermediation	£114,385	£52,000	83%	2,500	16%
Business Services	£59,312	£20,500	53%	38,800	46%
Public Administration	£41,389	£2,200	6%	-1,800	-7%
Education	£25,457	£700	3%	1,300	3%
Health & Social Work	£27,260	£5,200	24%	9,100	14%
Other Services	£27,419	-£600	-2%	2,200	8%

Source: DTZ based on Oxford Economics

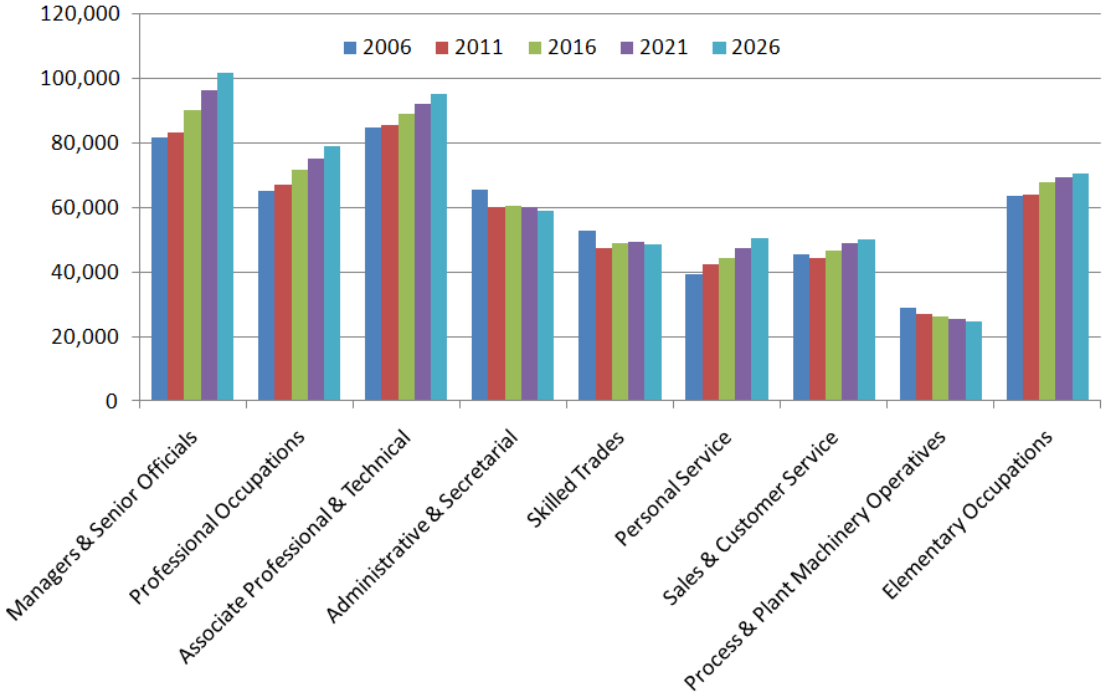
Further detail on sectoral employment and GVA is provided at Appendix 2.

3.2 Occupations

The previous sub-section considered the sectoral changes projected in the economy. This section looks at the employment data in terms of occupations. Figure 9 indicates the shifts in occupations over the period 2006-26. In absolute terms there is growth in nearly all occupational groupings. The only groups with a projected net decline in the number of employees are Administrative & Secretarial, Skilled Trades and Process & Plant Machinery Operatives. These declines are largely driven by losses as a result of the recession which are not recovered. The most significant gains are in higher order occupations, particularly Managers & Senior Officials.

The data which sits behind this chart is included in Appendix 2.

Figure 9: Employment by Occupation in the PUSH Area 2006-26



Source: DTZ based on Oxford Economics

3.3 Skills

The two data tables below show the projected spread of workplace skills within the PUSH area for five year intervals. The first shows projections for absolute numbers of workers by skills levels. The second illustrates the relative share workers in each level.

Figure 11 shows that in all but the 'no qualifications' category there will be an increase in the demand for workers in each skill level. However, by far the largest area of growth is in the NVQ 4/5 category, representing the highest level of skills. It should be remembered that the table shows the 'net' change in skills levels, and does not capture replacement demand. As a result, there will be much greater flows within in each skills category.

Figure 11: Workplace Skills Requirements – Absolute Numbers - in the PUSH Area

	2006	2011	2016	2021	2026	2006-26
NVQ 4/5	164,500	177,600	196,300	214,100	230,400	65,900
NVQ 3	67,800	65,600	67,800	69,400	69,800	2,000
NVQ 2	160,200	155,100	160,200	163,700	165,300	5,100
NVQ 1	81,500	80,300	83,500	85,800	87,100	5,600
No Quals	53,400	41,800	37,000	30,600	25,900	-27,500
Total	**527,400**	**520,400**	**544,800**	**563,600**	**578,600**	**51,200**

Figures may not sum due to rounding

Source: Oxford Economics

When considering the relative shares of employment across the skill levels (Figure 12) this again shows the shift away from no qualifications towards the highest qualification levels. However, there is no reduction in NVQ level 1 and only slight falls in the proportions of NVQ 2 and 3.

Figure 12: Workplace Skills Requirements - % Share - in the PUSH Area

	2006	2011	2016	2021	2026	2006-26
NVQ 4/5	31%	34%	36%	38%	40%	9% points
NVQ 3	13%	13%	12%	12%	12%	-1% points
NVQ 2	30%	30%	29%	29%	29%	-2% points
NVQ 1	15%	15%	15%	15%	15%	0% points
No Quals	10%	8%	7%	5%	4%	-6% points

Source: Oxford Economics

Figure 13 shows similar data for resident workforce skills. This differs slightly from workplace skills as many higher skilled employees already in-commute to the sub-region. This dataset is more comparable with data produced within the Annual Population Survey, however, as a result of the modelling process, it is not perfectly comparable.

The scale of the challenge is very similar, with a 9% point increase in the proportion of the workforce with the highest level of qualifications, equivalent to around 66,000 additional working age people. However, whilst this projected shift in the skills base of the workforce may appear challenging, recent performance shows that South Hampshire is already moving positively towards this. The Evidence Base report identifies the more rapid upskilling of the workforce at all levels from NVQ 2 and above when compared to the South East with a more rapid fall in the proportion of the workforce with no qualifications. This reflects the existing efforts of PUSH to invest in skills development of the workforce. There is also a natural element to this change as a higher proportion of young people go to university. These highly qualified youngsters will replace those leaving the workforce who do not necessarily have formal qualifications.

Figure 13: Resident Workforce Skills - % Share - in the PUSH Area

	2006	2011	2016	2021	2026	2006-26
NVQ 4/5	28%	32%	34%	36%	37%	9% points
NVQ 3	23%	21%	21%	21%	20%	-3% points
NVQ 2	24%	25%	25%	24%	24%	0% points
NVQ 1	17%	16%	15%	15%	15%	-2% points
No Quals	8%	6%	5%	4%	4%	-4%points

Source: Oxford Economics

3.4 Population and Housing

Figure 14 presents the population and dwelling projections within the preferred scenario. This takes account of policy activity to reduce the level of inward migration. This shows a growth in the total population of around 133,000 over the period 2006-26 and an associated requirement for additional dwellings of circa 74,000.

Dwelling requirements projections are reliant on assumptions around occupancy rates and household formation. As a result of the credit crunch it is unlikely that the pattern of falling household size assumed in many models will be delivered to the same extent. This is likely to be influenced further by the removal of minimum density targets for new development and the movement of the development market away from the dominance of apartments/flats within development schemes which is suited to higher occupancy levels. In fact, research by Centre for Cities for PUSH identified the need to increase the proportion of family/executive housing across the sub-region.

Figure 14: Population and Dwellings

	2006	2011	2016	2021	2026	2006-26
Population	1,014,900	1,054,700	1,087,600	1,118,300	1,148,000	133,100
Dwellings	430,000	445,000	467,000	487,000	504,000	circa 74,000

Figures may not sum due to rounding

Source: Oxford Economics

Monitoring of progress over the period since 2006 indicates that targets for housebuilding in the first five-year period are likely to be achieved, despite the downturn which will place a requirement for less than 60,000 homes for the remainder of the period to 2026.

3.5 Employment Floorspace

A separate report on issues related to sites and premises across South Hampshire has been prepared using the economic projections for the preferred scenario as a basis for assessing future requirements. As a result, this report does not include analysis of future employment floorspace requirements.

3.6 Long Term Trends 2026-2031

Post 2026 the projections indicate a continuation of many of the identified trends in the economy. In particular:

- Continued growth in the economy leading to improvements in GVA and higher levels of employment;
- Stabilisation of the GVA per capita gap with the South East at around 7%;
- Further improvements in the employment rate to 79%;
- Continued growth in the population and requirements for additional housing to support both growth and ongoing demographic shifts;
- A continuation of the sectoral, occupational and skills shifts as the economy moves towards knowledge and service based activities.

When comparing against the baseline the projections indicate that achieving a more sustainable pattern of growth in the period to 2026, in particular delivering higher levels of employment and investing in the resident workforce to reduce the need for inward migration to meet skills demand, will lay foundations for more sustainable patterns of growth in the longer term. This includes higher levels of employment creation as a result of a more productive economy and lower levels of required housing growth as the resident population is better able to meet employer requirements.

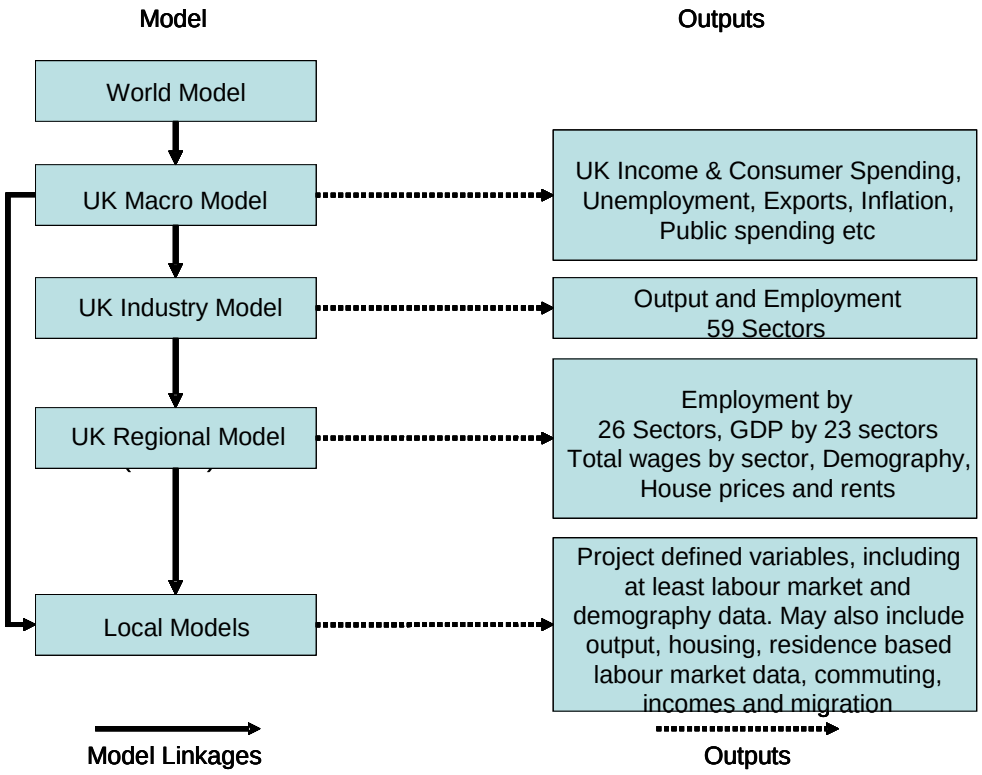
However, when considering this long term view, it must be remembered that uncertainty is greater. Between now and 2026 there is likely to be at least one further recession. There are likely to be major changes in working patterns, the socio-political context, technology and possibly environment, many of which are unforeseen. The world of today is very different to that of 20 years previous in terms of the use of technology, the mobility it has afforded and the ever increasing speed of globalisation. The implications of climate change will be better understood and the global league table of economies may look very different to today's. It is therefore vital that the EDS is regularly reviewed and the evidence base refreshed to take account of those changes that are anticipated, and ensuring flexibility to respond to those that aren't.

Appendix 1: Oxford Economics Forecasting Model

World, UK macro and industry models

Oxford Economics' models are run in conjunction with the complete suite of economic models, each of which is integrated with the other models. Oxford Economics' UK macro model is itself fully integrated with Oxford Economics' world model. The UK regional model is then fully integrated with the UK macro model. This means that regional forecasts reflect a range of global economic developments.

Figure 1: Oxford Economics hierarchy of economic models



UK regional model

Oxford Economics' regional model was originally developed by Graham Gudgin (who became Director of the NIERC in 1985) while at the University of Cambridge. In 1985 the multi-regional model (MRM) became the basis for the UK's first regional industrial forecasting service. Oxford Economics produce a report on the economic outlook for the UK regions twice a year. The model currently forms the basis of a fully-fledged regional forecasting service and services a range of clients including major UK organisations both public and private.

The geographical scope of the MRM encompasses the twelve Government Office Regions of the UK. The model is industrially disaggregated. For each region, employment projections on the SIC92 are made for 26 industries. GVA estimates both on a residence and workplace basis, also on the SIC92, are made for 23 industries. Total employment by occupation is also available by 25 occupation

classifications. Other economic and demographic indicators projected include unemployment, the labour force, population, average earnings, personal income and consumers' expenditure.

The MRM regionalises UK forecasts of employment, output, the personal sector and the labour market. The major link between the OE models and MRM is at the level of individual industry output and employment forecasts from the UK industry model. Other variables, such as non-oil GVA growth, personal disposable income and consumers' expenditure, are fed in directly from the UK macro model. The integrated forecasting system also has the capacity to incorporate the regional effects of alternative scenarios for world economic activity and UK competitiveness including the UK's position relative to other European economies.

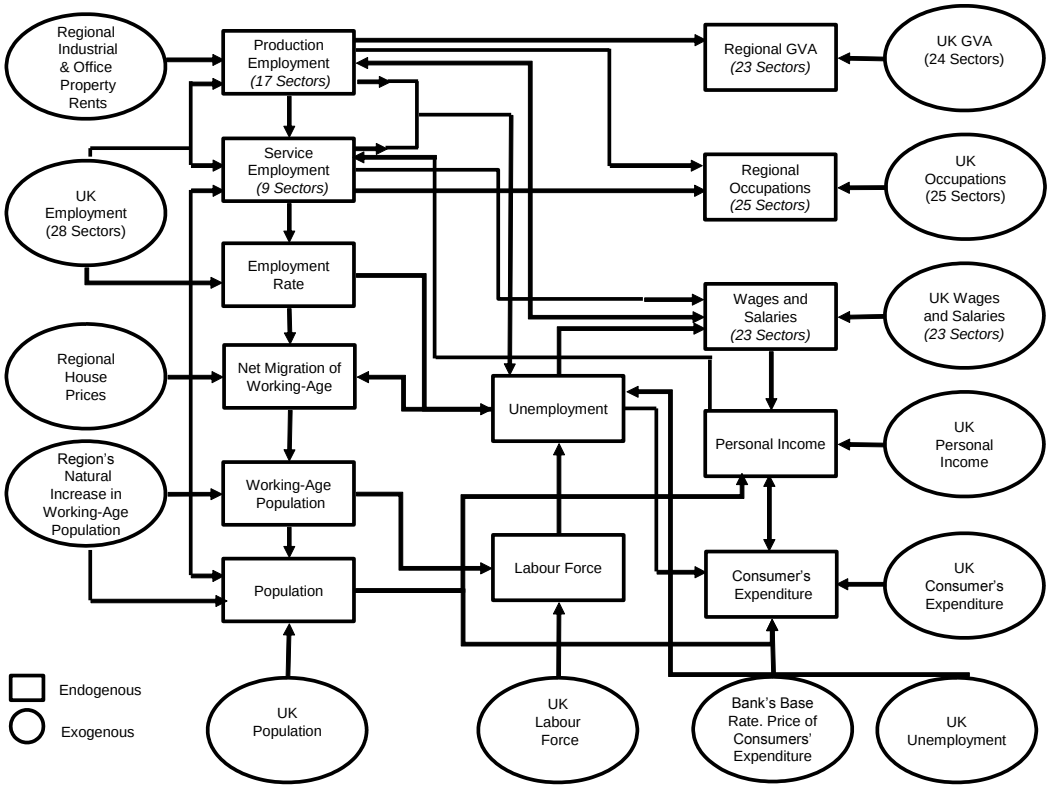
Each of the UK variables becomes an argument in the various regional model equations. The relation between the MRM and the OE models is thus not merely a mechanical imposition of constraints; it ensures that the projections are fully consistent with a coherent macro-economic background. Further quantifiable alterations in the UK national or international context can be 'cascaded down' through the OE models to the MRM and their regional implications traced out. A number of standard Warwick Bureau tests such as a one pence drop in income tax etc have been applied to the MRM and resultant short- to medium-term simulation/forecasts compared to our competitors (Hunt et al, 1996). MRM regional impacts, although evidencing a degree of difference in size of impact across regions compared to our competitors, were completely within a priori expectations.

The MRM is a highly simultaneous system with well-articulated feedback links between labour supply, population growth, employment demand and personal incomes. The chart below sketches the various modules of the regional model. Average earnings depend on regional labour market conditions and this enhances the simultaneity between the labour market and the income and spending modules.

The detailed attention paid to regional labour markets in the MRM is a distinguishing feature of the model. Regional labour markets in the MRM are permitted to adjust through a variety of mechanisms, including migration and participation. This is important. The fact that the MRM features a significant degree of simultaneity between each region's share of economic activity, and its supply of labour and population levels ensures that the system captures some of the important complexities of the real world. Research also suggests that regional econometric models ought to pay particular attention to labour markets, partly because migration responses are a key element underlying regional differences in population growth, and hence in interregional shifts in demand. In a comparison of alternative approaches to regional econometric modelling, Taylor (1982) found that a simultaneous structure within which regional labour market conditions affect levels of population, employment and income significantly improves model accuracy by comparison with simpler, recursive models using an export-base approach.

Output and employment in each region are projected at a detailed level of industrial disaggregation. The sectoral composition of output and employment is a factor of perennial interest in the analysis of regional economic performance. This is because, even within highly integrated nation-states such as the UK, individual regions evolve different industrial structures.

Figure 2: Oxford Economics UK multi-regional model



The behavioural equations of the system are estimated on time-series data and incorporate causal influences. For example, the equations for manufacturing include such determinants of inter-regional competitiveness as relative earnings and relative industrial property rents as well as a measure of the effectiveness of regional policy. We currently find a number of important links between industrial property rental values and the level of economic activity, particularly in the South East. This is clear for the manufacturing sector. We also find relative average earnings to have significant effects, independent of demand indicators such as personal incomes, in the equations for private sector service industries in some regions, most notably in the South East. Thus, the MRM implicitly models regional location patterns, both for industries and people. This means that, for a given macro-economic scenario, the projected regional growth rates are influenced by regional patterns in competitiveness indicators such as earnings. Regional variations in population movements resulting from projected migration flows also have a strong influence on the forecasts.

Because of the way in which labour markets are modelled, the MRM combines elements of both top-down and bottom-up approaches. It is a top-down model in so far as the projections for employment and output are constrained to agree with pre-determined national totals, though employment and output projections also depend heavily on local factors as outlined in the previous paragraph. The model is `bottom-up' in the sense that the supply of labour in each region is completely endogenous, that is, determined wholly within the model. UK projections for the working-age population are partly dependent on migration and obtained by adding up the regional projections. The separation of population growth into its components of change, that is, natural increase and net migration, is also recommended by Taylor (1982).

The MRM also incorporates well-established trends, including especially the urban-rural shift. This refers to the gradual movement of jobs and people away from the conurbations and into less urbanised and less congested areas. The urban-rural shift of manufacturing activity away from large urban areas to more rural locations has been shown to be a key influence on the regional geography of employment growth in the UK (Fothergill and Gudgin, 1982; Fothergill, Kitson and Monk, 1985; Townsend, 1993; Gudgin, 1995). Underlying the urban-rural shift in the UK is the influence of land supply as a constraint on development. In densely populated and congested urban areas, scarcity of land constrains local producers, particularly in periods of fast growth when the need to expand is sharpest. Land constraints have the effect of diverting activity to less constrained rural locations where land is more readily available. The role of land supply as a constraint on development means that economically strong regions, such as the South East of England, can appear to be moderate or average performers on measures of relative employment or output growth. Thus, the urban-rural shift can disguise a region's inherent strength since supply constraints bite more deeply and more quickly in the more dynamic but congested regions.

The urban-rural shift is implicitly modelled in the MRM by the inclusion of time trends, which capture the secular tendency towards decentralisation from congested highly urbanised regions, and also by the inclusion of relative industrial property rentals. The inclusion of the latter variable means that the MRM has the capacity to capture the cyclical element of the urban-rural shift. Rapid growth in aggregate demand increases the pressure on industrial space. Since the supply of industrial property in urban areas is inelastic in the short run, quantity constraints can curtail growth. Due to data limitations, the model does not pick up these quantity constraints directly, but depends on movements in property rentals. Such movements signal the existence of excess capacity demand in property markets during periods of rapid output growth.

The MRM captures regional variations in cyclical behaviour through other mechanisms besides property rentals. This is because the model determines migration and participation (and hence labour supply growth) simultaneously with employment demand and also because the model pays attention to regional variations in prices of factor inputs including average earnings in addition to industrial property rentals. Regional deviations in the movement of factor prices typically emerge as a result of regional differences in the balance between supply and demand.

Regional output growth for each sector in the MRM is projected by applying forecast employment to projected UK productivity in the sector, with a fixed adjustment for relative regional productivity calculated from historical data. This reverses the more usual formulation in economic models in which output levels determine employment demand. The primary reason for adopting the employment-led approach in the MRM is that regional employment data are more reliable than the published regional GVA estimates. Further, they are available on a timelier basis with considerably shorter lags in the publication of data. Finally, employment data are generally available for longer time periods thus facilitating more precise estimation of the coefficients in the econometric equations. Indeed, regional GVA data for individual manufacturing industries are not published prior to 1978. This greatly constrains the estimation of a sectorally disaggregated system of demand equations. OE's approach is not at all unusual in regional econometric modelling (cf. Bolton, 1985, for examples of US models which adopt the same approach for much the same reasons). It is also preferable in a forecasting context to use the more reliable and accurate measures. Since we constrain our sectoral output and employment forecasts to national controls, what is really required are forecasts of regional differentials in growth rates. In the UK context, employment data are quite simply the more reliable indicator of the regional pattern in economic activity in individual sectors.

Appendix 2: Additional Data Tables

This appendix contains detailed data tables to accompany the analysis of the preferred scenario.

Employment Data

Figure A1: Employment by Broad Sector – Absolute Numbers - in the PUSH Area

	2006	2011	2016	2021	2026	2006-26
Primary Industry	3,100	3,300	3,200	3,100	3,000	-100
Manufacturing	51,200	45,100	40,900	36,500	32,600	-18,600
Utilities	2,300	2,300	2,100	1,900	1,800	-500
Construction	40,000	32,600	35,100	36,600	37,000	-3,000
Wholesale & Retail	89,000	86,200	92,100	96,000	99,100	10,100
Hotels & Restaurants	28,800	29,800	31,800	33,000	34,100	5,300
Transport & Communication	30,400	30,700	32,600	34,200	35,300	4,900
Financial Intermediation	15,400	15,700	16,800	17,500	17,900	2,500
Business Services	84,200	90,700	106,400	114,400	123,000	38,800
Public Administration	26,500	26,700	25,300	25,300	24,700	-1,800
Education	45,600	46,300	45,500	46,500	46,900	1,300
Health & Social Work	63,800	65,500	65,500	69,600	72,900	9,100
Other Services	28,400	27,700	29,000	30,000	30,600	2,200
Total	**508,600**	**502,700**	**526,300**	**544,600**	**559,000**	**50,400**

The figures in this table exclude HM Forces and those on Government Schemes. Therefore the total will be slightly lower than those shown elsewhere in this report.

Figures may not sum due to rounding

Source: Oxford Economics

Figure A2: Employment by Broad Sectors – % Share - in the PUSH Area

	2006	2011	2016	2021	2026	2006-26
Primary Industry	1%	1%	1%	1%	1%	0%
Manufacturing	10%	9%	8%	7%	6%	-4%
Utilities	0%	0%	0%	0%	0%	0%
Construction	8%	6%	7%	7%	7%	-1%
Wholesale & Retail	17%	17%	17%	18%	18%	0%
Hotels & Restaurants	6%	6%	6%	6%	6%	0%
Transport & Communication	6%	6%	6%	6%	6%	0%
Financial Intermediation	3%	3%	3%	3%	3%	0%
Business Services	17%	18%	20%	21%	22%	5%
Public Administration	5%	5%	5%	5%	4%	-1%
Education	9%	9%	9%	9%	8%	-1%
Health & Social Work	13%	13%	12%	13%	13%	0%
Other Services	6%	6%	6%	6%	5%	0%

Source: Oxford Economics

GVA Data

Figure A3: GVA by Broad Sectors – £m - in the PUSH Area

	2006	2011	2016	2021	2026	2006-26
Primary Industry	100	0	0	0	0	-100
Manufacturing	2,400	2,200	2,600	2,800	3,000	600
Utilities	300	300	300	300	400	100
Construction	1,200	1,000	1,100	1,300	1,400	200
Wholesale & Retail	2,400	2,400	2,900	3,300	3,700	1,300
Hotels & Restaurants	500	400	500	500	600	100
Transport & Communication	1,300	1,400	1,700	1,900	2,200	900
Financial Intermediation	1,000	1,100	1,500	1,800	2,000	1,000
Business Services	3,300	3,900	5,100	6,100	7,300	4,000
Public Administration	1,000	1,000	1,000	1,000	1,000	0
Education	1,100	1,100	1,100	1,200	1,200	100
Health & Social Work	1,400	1,500	1,700	1,900	2,000	600
Other Services	800	700	800	800	800	0
Total	1,400	1,400	1,700	1,900	2,100	700

Source: Oxford Economics

Figure A4: GVA by Broad Sectors – % Share - in the PUSH Area

	2006	2011	2016	2021	2026	2006-26
Primary Industry	1%	0%	0%	0%	0%	-1%
Manufacturing	13%	12%	12%	11%	11%	-2%
Utilities	2%	2%	1%	1%	1%	0%
Construction	7%	5%	5%	5%	5%	-2%
Wholesale & Retail	13%	13%	13%	13%	13%	0%
Hotels & Restaurants	3%	2%	2%	2%	2%	-1%
Transport & Communication	7%	8%	8%	8%	8%	1%
Financial Intermediation	6%	6%	7%	7%	7%	2%
Business Services	18%	21%	23%	24%	26%	8%
Public Administration	6%	5%	5%	4%	4%	-2%
Education	6%	6%	5%	5%	4%	-2%
Health & Social Work	8%	8%	8%	8%	7%	-1%
Other Services	4%	4%	4%	3%	3%	-2%

Source: Oxford Economics

Occupational Data

Figure A5: Workplace Occupations – Absolute Numbers - in the PUSH Area

	2006	2011	2016	2021	2026	2006-26
Managers & Senior Officials	81,800	83,300	90,200	96,200	101,700	19,900
Professional Occupations	65,200	67,100	71,600	75,200	78,900	13,700
Associate Professional & Technical	84,700	85,300	88,900	92,200	94,900	10,200
Administrative & Secretarial	65,600	59,900	60,400	60,200	59,100	-6,500
Skilled Trades	52,700	47,400	48,800	49,100	48,400	-4,300
Personal Service	39,400	42,300	44,300	47,300	50,300	11,000
Sales & Customer Service	45,500	44,300	46,600	48,700	50,200	4,700
Process & Plant Machinery Operatives	28,900	26,800	26,200	25,400	24,500	-4,400
Elementary Occupations	63,700	63,900	67,700	69,300	70,600	6,900
Total	**527,400**	**520,400**	**544,800**	**563,600**	**578,600**	**51,200**

Figures may not sum due to rounding

Source: Oxford Economics

Figure A6: Workplace Occupations – % Share - in the PUSH Area

	2006	2011	2016	2021	2026	2006-26
Managers & Senior Officials	16%	16%	17%	17%	18%	2%
Professional Occupations	12%	13%	13%	13%	14%	1%
Associate Professional & Technical	16%	16%	16%	16%	16%	0%
Administrative & Secretarial	12%	12%	11%	11%	10%	-2%
Skilled Trades	10%	9%	9%	9%	8%	-2%
Personal Service	7%	8%	8%	8%	9%	1%
Sales & Customer Service	9%	9%	9%	9%	9%	0%
Process & Plant Machinery Operatives	5%	5%	5%	5%	4%	-1%
Elementary Occupations	12%	12%	12%	12%	12%	0%

Figures may not sum due to rounding

Source: Oxford Economics