

1. INTRODUCTION

Skills Development Scotland (SDS) appointed Oxford Economics to provide labour market, sectoral, occupational and skills forecasts for Scotland, both nationally and regionally over the period to 2027. The forecasts provided are produced by Oxford Economics Local Authority District Forecasting Model. Results have been provided for Regional Outcome Agreement areas (ROAs), City Region Deal areas, local authorities as well as Scotland and the UK.

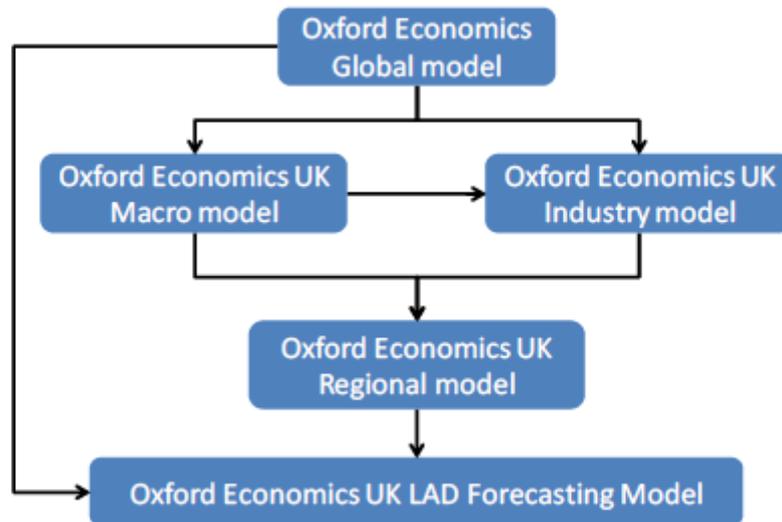
This technical note is intended to provide information on the methodology and data sources underpinning these forecasts.

2. MODEL OVERVIEW

LOCAL AUTHORITY DISTRICT FORECASTING MODEL

Oxford Economics Local Authority District Forecasting Model sits within the Oxford suite of forecasting models. This structure ensures that global and national factors (such as developments in the Eurozone and UK Government fiscal policy) have an appropriate impact on the forecasts at a local authority level. This empirical framework (or set of 'controls') is critical in ensuring that the forecasts are much more than just an extrapolation of historical trends. Rather, the trends in their global, national and sectoral forecasts have an impact on the local area forecasts. In the current economic climate this means most, if not all, local areas will face challenges in the short-term, irrespective of how they have performed over the past 15 years.

Fig. 1. Hierarchical structure of Oxford Economics' suite of models



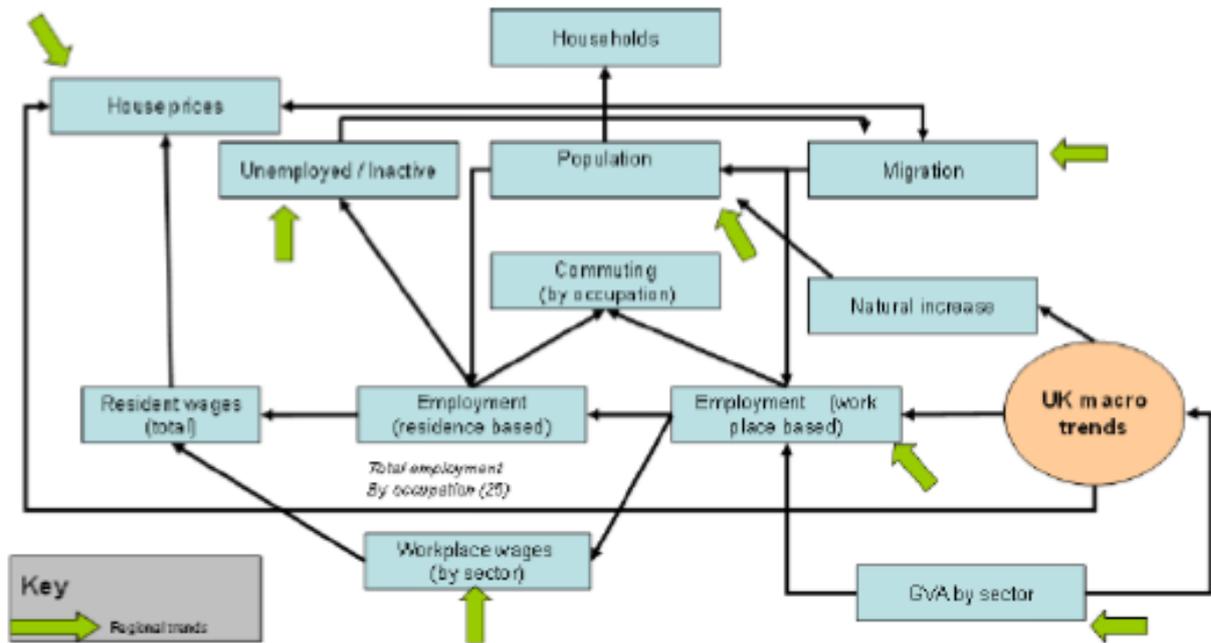
Their local forecasting model depends essentially upon three factors:

- National/regional outlooks – all the forecasting models we operate are fully consistent with the broader global and national forecasts which are updated on a monthly basis.
- Historical trends in an area (which implicitly factor in supply side factors impinging on demand), augmented where appropriate by local knowledge and understanding of patterns of economic development built up over decades of expertise, and
- Fundamental economic relationships which interlink the various elements of the outlook.

As with all Oxford Economics' models, their local authority model is economically driven, with all aspects of the economy interlinked. All their models are economically driven as they believe that this is the best way to estimate the future outlook for the area. Given changes in economic conditions drive labour market performance, which in turn affects migration patterns and housing demand / make-up, economic based forecasts are essential. For example, if employment or productivity changes in one sector, there are implications for all sectors of the economy through indirect (supply chain) and induced impacts. The employment creation will then put downward pressure on unemployment, while encouraging increased commuting into the economy, and making it a more attractive location for migrants. This would effectively drive up population and housing demand (and put more demand on public services).

The main internal relationships between variables are summarised in Figure 2. Each variable is related to others within the models. Key variables are also related to variables in the other Oxford Economics models.

Fig. 2. Main Relationships between variables



The model is constructed on an annual basis. Historic data for most variables has been collected for 20 or more years to provide a basis for estimating inter-relationships between variables and future trends. Forecasts are currently set up for the period up to 2027 consistent with existing available global, national and regional forecasts.

USING THE MODEL

The model provides projections on a 'policy neutral' basis. Unconfirmed, aspirational or policies at planning/development stage are not included. Though forecasts are built primarily around the economic relationships above, the use of local knowledge and published material on local development is required to augment the results of the formal modelling process.

The baseline forecasts reflect the UK decision to leave the European Union. This decision will inevitably have a marked impact on the future development of the UK and Scottish economies. On balance, Oxford Economics believe economic growth and job creation will be weaker in the short term than would be expected had the Referendum returned a 'remain' vote, mainly due to a significant retrenchment in business investment. However, they do not think the UK economy will be tipped into recession.

As with all forms of forecasting there are margins of error associated with the results which get larger over time. Furthermore the quality of data decreases as the geography gets smaller. Models of this form under current data quality levels are most helpful for identifying trends, growth rates and relativities

either across or within areas. The long term trends are therefore important and users are encouraged to use the time series information and not rely on 'point-in-time' estimates.

VARIABLES COVERED

The list below provides a summary of the variables provided.

- Employment;
- Occupational change;
- Broad industry and sectoral change;
- Total requirement including expansion and replacement demand;
- Employment by gender and status; and
- Demand for qualifications;

3. DATA SOURCES AND FORECAST APPROACH

DATA SOURCES AND FORECAST APPROACH

The section below sets out details of the data sources used as well as an overview of the Oxford Economics methodology.

3.1. Total employment

Total employment estimates have been provided on both a 1 digit and 2 digit basis. The results include employees in employment, the self-employed and Her Majesty's Forces, and are measured on a workplace basis. The results are fully consistent with Workforce Jobs (WFJ) data available from the Office for National Statistics (ONS). Total employment data is published for Scotland, however such information is not available for the local authorities. These will be constructed using the components below.

Note total employment is a jobs and not people measure (i.e. one person can have more than one job and would be counted more than once in this indicator).

Employees in employment: The Business Register and Employment Survey (BRES) is the starting point for constructing the employment forecasts. BRES is the most comprehensive source of employment data, both geographically and sectorally.

There are a number of steps in constructing regional employee jobs, due to changes in sectoral classifications across the various sources, and restrictions on data availability over particular periods of time. Initially, we take employee jobs data for each sector directly from the BRES over the years 2009-14, which reflects recent methodological changes to the BRES in accounting for working proprietors. This relates to September figures and is based upon SIC 2007 sectors. In 2008, levels of employee jobs are constructed by extrapolating back the trend in the old BRES. Data from the ABI and AES is used to construct the data back to 1991.

This constructed dataset is then controlled to the UK employee jobs series from WFJ, by applying sectoral adjustment factors which converts the data to annual average values (seasonally adjusted). This is measured on a workplace basis.

The starting point in producing total employment forecasts is the determination of workplace-based employees in employment in each of broad 19 SIC2007 based sectors consistent with the regional and UK outlooks. At local authority level some of the sectors are driven predominantly by population estimates, others by total employment in the area and the remainder relative to the regional performance (largely exporting sectors). All sectors are also influenced by past trends in the local area. Taken in totality, employment is cross referenced with a number of variables (including population, relative

performance across similar areas, historical cyclical performance and known policy) for checking and validation purposes. Where necessary, manual adjustments are made to the projected trends to reflect this validation process. The methods of sectoral projection are as follows, each of which are forecast based upon recent trends:

- Agriculture - share of Scotland
- Mining and quarrying - share of Scotland
- Manufacturing - share of Scotland
- Electricity, gas, & steam - share of Scotland
- Water supply; sewerage, waste management - share of Scotland
- Construction - location quotient based upon total employment
- Wholesale and retail trade - location quotient based upon consumer spending
- Transportation and storage - location quotient based upon consumer spending
- Accommodation and food service activities - location quotient based upon consumer spending
- Information and communication - share of Scotland
- Financial and insurance activities - share of Scotland
- Real estate activities - location quotient based upon total employment
- Professional, scientific and technical activities - location quotient based upon total employment
- Administrative and support service activities - location quotient based upon total employment
- Public administration and defence - location quotient based upon population
- Education - location quotient based upon population
- Human health and social work activities - location quotient based upon population
- Arts, entertainment and recreation - location quotient based upon consumer spending
- Other service activities - location quotient based upon consumer spending

Self-employment: Self-employment data for Scotland is taken from Workforce jobs (19 sector detail). The data is available by broad SIC2007 sector. Data for the local authorities is Census based (and scaled to the regional self-employed jobs estimates) and sectoral estimates are constructed using the employees in employment sectoral structure. The sectors are forecast using the growth in the sectoral employees in employment data and the estimates are scaled to the regional estimate of self-employment by sector.

The sectoral employee and self-employment estimates are aggregated along with data on employees in Her Majesty's Forces, (available down to local authority district level from Ministry of Defence), to arrive at total employment by 19 broad sector. We assume no change in the employee levels within Her Majesty's Forces over the forecast.

3.2 Employment by key sectors

The sector level data provided for employment described above has the benefit of aggregating to total employment. However, this sector breakdown does not allow a sufficiently precise examination of Scotland's key sectors. Such sectors are seen as being particularly important in helping to drive economic growth and competitiveness in the local area. And for that reason, it was necessary to undertake additional work to accurately measure the size and performance of these sectors.

Results for the following sectors have been provided (details of the definitions used as set out in RSA Insight Report, Appendix 2).

- Chemical sciences
- Creative industries
- Construction
- Energy
- Engineering
- Financial and business services
- Food and drink
- Health and social care
 - of which, Child day-care activities
- ICT/digital
- Life sciences
- Tourism

The key sector estimates have been derived using a sub-model, driven by and entirely consistent with the main model. The sub-model provides historical data and forecasts for workplace-based employment. It uses the BRES data to split the broad sector forecasts into their detailed sub-sectors to allow the construction of key sectors.

3.3 Employment by status and gender

The Business Register and Employment Survey (BRES) provides data on employment by status for Scotland and its local authority districts. Shares of part-time employees (which are trend forecasts linked to national projections) have been applied to the workplace total employment estimates described above. Full-time employment is simply total employment less the part-time employment. The forecasts are controlled to ensure consistency with national and regional forecasts.

Data on employment by gender is published for Scotland as part of ONS Workforce Jobs (WFJ) release. Shares of female employment (which are trend forecasts linked to national projections) are applied to the workplace employment estimates described above. Male total employment is simply the total of employment less female employment. Locally, employment by gender data is not published. Rather, we have applied the gender shares for Scotland adjusted to reflect the Census of Population to the employment forecast for each area.

3.4 Employment by industry and occupations

The Annual Population Survey (APS) provides data on employment by occupation for Scotland and its local authority districts. The forecasts are derived using a SIC/SOC matrix. The ratio of occupations within each sector for 2001 and 2011 is calculated from the Census. For all other years we use Labour Force Survey for Scotland. The share of each occupation by sector is forecast based upon trend, and are applied to the sectoral employment data for each local area, to give an estimate of occupations within each sector. The results are adjusted to reflect the APS data for each local area. The occupations by sector are then aggregated to give occupations by 25 minor occupation groupings. Therefore the overall economy occupational structure is heavily dependent upon sectoral composition and future trends can be largely explained by sectoral trends.

3.5 Employment by occupation and qualification

The Annual Population Survey (APS) provides data on employment by qualification for Scotland and its local authority districts. The forecasts are derived using a matrix of qualification by occupation calculated using the Labour Force Survey for Scotland. The share of each qualification category within each occupation is forecast, and is applied to the occupation employment data for each local area, to give an estimate of qualifications each occupation. The results are adjusted to reflect the APS data for each local area.

3.6 Expansion demand by occupation

Expansion demand refers to the net change in total employment by occupation over the forecast period and thus the results can be positive or negative. The results are presented for each of the 25 occupation minor groupings. Note: these results are people based.

3.7 Replacement demand by occupation

Replacement demand represents how many more people will be required at each level due to people leaving the workforce. There are many reasons why people leave the labour market - with retirement perhaps the prime example – and need to be replaced. Whilst replacing the vacant position creates additional labour demand, it has no net effect on total employment. Reasons for leaving employment include:

- Unemployment;
- Inactivity;
- Out migration;
- Retirement;
- Death; and,
- Leaving for another job in a different occupational group or sector.

This 'replacement' category is much larger than expansion demand and explains why even declining sectors such as manufacturing still require new staff / advertise vacancies. Leaver rates by occupation

are calculated from the Labour Force Survey for Scotland. These rates are applied across all geographies. Note: the replacement demand by occupation results are people based.

3.8 Total requirement by occupation

Replacement demand and expansion demand are summed to produce total occupation demand (people based).

3.9 Expansion demand by qualification

Expansion demand refers to the net change in total employment by qualification over the forecast period and thus the results can be positive or negative. The results are presented for each of the 6 SCQF qualification groupings. Note: these results are people based.

3.10 Replacement demand by qualification

The net occupation demand figures are applied to an occupation by highest level of qualification matrix to produce an estimate of the likely skills requirements over the forecast period. The matrix is generated using the Labour Force Survey. The data is filtered to select only those people who were in employment one year ago and who changed their job. A crosstabulation is run on this sample for each of the last three years and taking a three year average. Rather than use the current qualification structure of all employed people, the qualification structure of 'inflows' is used to try and capture the fact that entry requirements to occupations have increased over time. In other words, it is entirely possible that current corporate managers who are approaching retirement may have climbed up the career ladder without having any formal qualifications whereas, to become a corporate manager now will most likely require a degree or similar formal qualification. Note: the replacement demand by qualification results are people based.

3.11 Total requirement by qualification

Replacement demand by qualification and expansion demand by qualification are summed to produce net occupation demand by qualification (people based).

3.12 Expansion demand by industry

Expansion demand refers to the net change in total employment by industry over the forecast period and thus the results can be positive or negative. The results presented are jobs based for each of the 1 digit industries and key sectors.

3.13 Replacement demand by industry

Leaver rates by industry are calculated from the Labour Force Survey for Scotland. These rates are forecast and applied across all geographies. The number of leavers by 1 digit industry and apportioned to key sectors using employment shares from BRES. Note: the replacement demand by industry results are jobs based.

3.14 Total requirement by occupation

Replacement demand and expansion demand are summed to produce total demand by industry and key sector (jobs based).

3.15 Output (GVA)

GVA data by sector is published on a nominal basis by the Office for National Statistics for Scotland and the NUTS 3 regions. The local estimates are constructed using local sectoral employment, earnings and Scottish productivity by sector. They are then controlled to the NUTS3 data as published by National Statistics (which is the most detailed geographical breakdown available). At the local level, the GVA forecast is driven by sectoral employment in each area and Scottish productivity forecast adjusted by relative earnings. GVA within Scotland is also driven by Scottish sectoral employment and sectoral productivity relative to UK.

3.16 Output (GVA) by key sector

GVA forecasts by key sector are driven by key sector employment and local estimates of productivity adjusted by relative detailed sectoral earnings.

3.17 Productivity

Productivity is calculated as GVA per job.