

London labour market projections 2017



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Executive summary

This report presents updated employment projections for London by sector to 2041. The paper also provides updated bi-angulated employment projections for London boroughs.

The London total and sector projections are trend projections and estimate jobs in future years based on the historic productivity relationship between output and jobs, and assumed future output growth. London level employee and self-employment projections are also produced. Borough employee projections combine trend projections, and an assessment of employment site capacity of individual boroughs. This analysis has also considered borough transport accessibility. Borough self-employment projections derive from borough shares of London self-employment jobs.

The central projections estimate that employment in London will grow at an annual average rate of 0.78 per cent, equivalent to 49,000 jobs per annum, to reach 6.907 million in 2041. Similarly to the previous projections, jobs in the professional, real estate, scientific and technical sector is expected to grow strongly, accounting for over a third of the total increase expected in London to 2041. Strong employment growth is also expected in the administrative and support service, accommodation and food service, information and communication sectors, education and health sectors – collectively accounting¹ for nearly three fifths of the expected total London increase to 2041.

Boroughs with areas within the Central Activities Zone² account for 35 per cent of the annual projected growth in jobs, or 16,900 jobs per annum. The annual growth rate in jobs, however, is almost identical with that for London as a whole at 0.77 per cent. It is differences between boroughs which is more pronounced whether for those with an area in the Central Activities Zone, or for all boroughs in London. For example, in the central zone Kensington and Chelsea is one of the London boroughs with relatively low growth in jobs³, while Tower Hamlets has the strongest growth in absolute terms of all London boroughs. However, over the projection period all boroughs are expected to see a growth in their jobs numbers.

Like previous projections, the central projections in this paper use the latest employment data point (2016) from which to project. There has been extremely strong growth in employment in the past few years – much stronger than would have been expected given output growth (the so-called ‘productivity puzzle’). As more analysis is published on this conundrum and as the outlook for the UK economy continues to be unclear it is possible that there may be a new trend in output growth (compared to the historic trend used to derive the productivity relationship on which the projections are based) – the potential consequences are explored further in this paper.



The projections rely heavily on historic data. Data revisions may change the projections, other things being equal. Since the completion of the 2016 employment projections, ONS has revised upwards historic jobs estimates for London and sectors which provide the basis for the projections – this is because ONS extended its coverage in the business survey population. ONS has not yet fed these changes through to its borough historic jobs series. So, it has been necessary for GLA Economics to make provisional revisions to be consistent with the London and sector changes. ONS has announced further methodological changes. How and when these changes will be implemented remains unclear at the time of writing. They are, however, expected to have further impacts on the London total, sector and borough jobs histories. No attempt has been made to estimate the size of these anticipated changes, and incorporate them into the London projections.

1. Introduction

This report presents GLA Economics' updated medium-term projections of employment (jobs) in London, disaggregated by sector and by borough.

The London and sector projections are trend projections and estimate jobs in future years based on the historic productivity relationship between output and jobs, and assumed future output growth. London level employee and self-employment projections are also produced. Borough employee projections combine trend projections, and an assessment of employment site capacity of individual boroughs. This analysis has also considered borough transport accessibility. Borough self-employment projections derive from borough shares of London self-employment jobs.

This report begins with a brief overview of the methodology used and revisions in the underlying data on which the projections depend. It then presents the results for London as a whole and is followed by some sensitivity analysis. The results by sector, for boroughs, and for the Central Activities Zone (CAZ) and Northern Isle of Dogs (NIOD) follow.

2. Methodology and data revisions

Methodology

The medium-term trend-based projections in this paper use the same methodology as previous projections⁴ (the rationale for this methodology and further details can be found in *Box 1: Should the employment projections ‘jump off’ from the 2016 level of employment and Appendix A: Methodology for GLA Economics’ trend-based medium-term projections*). The London and sector projections are, again, based on the employee and self-employed components of ONS Workforce Jobs series⁵. The London employee and self-employment projections are constrained to the total for the London employment projections, as are the employment projections for individual sectors.

All medium-term trend-based projections are constructed by using the latest data point from which to project. Previous papers have highlighted a potential issue with this approach⁶ and this issue is explored again in this paper given the continuation of recent productivity trends (what has come to be known as the ‘productivity puzzle’).

In parallel with these projections GLA Economics has updated its more detailed jobs series for sector employee jobs with the latest data for 2015 so that it extends from 1998 to 2015⁷. This more disaggregated data on sector trends has been used to support judgements on productivity trends for London sector projections.

Borough employment projections (the sum of employee and self-employed projections) also use the same methodology as the 2016 projections. The borough trend employee projections use the ONS Business Register and Employment Survey series for data for the most recent years, and use the same methodology as for the London and sector medium-term trend-based projections. These are considered alongside workplace capacity projections (Appendix G explains methodology and results), and transport accessibility projections (Appendix H explains the methodology and results). As part of this update the borough transport accessibility study looked at trends from 2007-2015 between transport provision and jobs, but did not find evidence of how transport infrastructure constrained jobs growth. In the absence of such evidence the transport accessibility projections have not been used in the development of borough employee projections. As such, the final borough employee projections are comprised only of those based on trend and workplace capacity.

GLA Economics has developed a provisional preliminary, borough by sector data series from 1971-2015 (methodology explained below)⁸. It has used this data to help support judgements on borough employee trends. Notably, those boroughs with historically large and sustained professional service sectors, or boroughs where this sector was growing, were considered to have potential for relatively stronger growth. Also, boroughs with growth in education or health jobs were expected to continue to show jobs growth if there was corroboration in terms of historic and expected population growth⁹, as this might indicate increasing demand for local provision of these services.

Once borough employee trend (see section below on employment projections for London's boroughs) and capacity projections (as set out in Appendix G¹⁰) are constructed the two are combined to generate the final borough employee jobs projections as follows:

- Central London boroughs are assumed to be (a) at their capacity projections if trend projections are less than capacity; or, (b) at trend (if trend is less than capacity + 10%); otherwise, (c) at capacity + 10% (ie, where trend is more than capacity + 10%). The capacity is phased in to maintain the trend London employee jobs total. These areas have established employment centres reaping agglomeration economies, and so are likely to continue to be attractive. The boroughs meeting these criteria, and to which these rules apply on an individual basis, are either in more central parts of London, have some area in the Central Activities Zone, or contain the Northern Isle of Dogs. They are: Camden, City of London, Hackney, Hammersmith and Fulham, Islington, Kensington and Chelsea, Lambeth, Southwark, Tower Hamlets, Wandsworth, and Westminster
- The projections for Croydon and Newham give equal weighting to trend and capacity projections. This is because these boroughs have significant plans for additional employment space capacity which could change the attractiveness of the area (bearing in mind that projections are based on historic attractiveness) as a place for new jobs. However, as these areas are either not yet fully established as employment centres or have not shown growth in recent years, there remains some uncertainty about the pace at which additional capacity would be taken up.
- Borough projections for the remaining outer boroughs are set equal to their trend-based estimates. In other words, future jobs growth is not assumed to be constrained by employment site capacity. Part of the rationale for this is that there has been a significant volume of applications to convert employment space to residential use, and so there is flexibility in the use of premises that have gained prior approval for change of use in these boroughs. This is expected to continue in managing the competing pressures of commercial and residential land use.

To generate employment projections, borough self-employment projections are combined with these employee projections. The self-employment borough projections are constructed following a number of stages:

- First, the historic trend (2004 to 2016) in each borough's share of London self-employed jobs was analysed (using data from the Annual Population Survey, ONS). For most boroughs there were no statistically significant¹¹ changes in the shares (at the 95 per cent confidence interval)¹². As a result, and given sampling variability, the average share over the last three years was taken as the expected share in 2041¹³;
- These shares were then assumed to be reached in a linear manner (to ensure a smooth transition) from their 2016 share and these were then applied to the projections of self-employed jobs in London as a whole.

The main projections are to 2041, while projections published on London Datastore are to 2050. London level and sector projections apply the same methodology for the period to 2050 as for the period to 2041. This is not possible for borough employment projections as it is not reasonable to identify planning developments over the longer time frame, and so produce meaningful workplace capacity projections. Instead the bi-angulated borough employee jobs growth rate for 2016-41 is applied to boroughs for the period and the total constrained to the projection for London employee jobs. Borough self-employment jobs are held at 2041 shares, and applied to London self-employment jobs total. For this reason, the extended projections to 2050 should be treated with some caution.

Data Revisions

GLA Economics utilises available ONS data for the historic data series it uses for the employment projections. It is routine for ONS to update its series in the light of new information or analysis. GLA Economics updates its series accordingly. Appendix F explains the ONS changes to historic data in detail. The section below highlights the changes with the most significant implications for the data series used in the employment projections.

The last year of data in the previous projections (published in 'London Labour Market Projections 2016' paper) was 2015¹⁴. Alongside these projections GLA Economics extended the back series for London and sector employment, and borough employees, to 1971. The series for borough self-employment went back to 2004 as before.

These projections use the latest data to 2016¹⁵. London and sectors data comes from the Workforce Jobs series. The most notable change is that ONS has revised upwards historic London total employee jobs estimates by around 0.5% a year on average. This is because ONS extended its coverage in the business survey population to include single Pay As You Earn (PAYE)-based, or PAYE non-VAT, businesses¹⁶. To update the London and sector jobs series back to 1971 GLA Economics has developed separate employee and self-employment series, which has incorporated some minor methodological changes to the back series published in 2016.

ONS has not yet updated borough employee figures in BRES to reflect the change in the coverage of the business population. The increment is unlikely to be equivalent in proportionate terms across boroughs because there are relatively more PAYE non-VAT businesses in some sectors than others. So, GLA Economics has attempted to estimate a borough employee jobs increment for PAYE non-VAT businesses. For this it produced a borough by sector series from 1971-2015 (the methodology for which is explained below), from which for each sector it is possible to estimate for each year a borough's share of that sector's jobs. The next step is to derive the total sector employee jobs increments of PAYE non-VAT businesses for each year (from the Workforce Jobs series), apply the borough's share, and sum over sectors to estimate the increment for each borough.

The borough by sector series is experimental. It has been developed using the technique of Iterative Proportional Fitting:

- Initial borough by sector estimates come from BRES for 2009-15, Annual Business Inquiry for 1998-2008, Annual Employment Survey for 1991, 1993, 1995 and 1997, and Experian data for other years back to 1971¹⁷
- For each year individual sector numbers for each borough are then calibrated to employee sector totals estimated for the historic GLA London jobs series. The borough totals from these estimates are subsequently calibrated to the estimated historic employee borough totals. This process continues until borough by sector estimates sum to both London employee sector totals and London borough employee totals¹⁸

ONS has announced that it wishes to change the calibration regime in BRES to include calibration for business sizebands, and this may further affect employee job estimates for London, sectors and boroughs for 2009 onwards. ONS has not yet done this work, and in the absence of any detailed indication of its effects GLA has not incorporated any allowance for it into the GLA jobs series.

The next BRES release is due in September 2017 at which point ONS expects to publish:

- Provisional employee jobs data for 2016 for all businesses including PAYE non-VAT businesses but not separately identifying jobs totals for them – this is the change which has been made to the Workforce Jobs series
- Revised employee jobs data 2015 for all businesses including PAYE non-VAT businesses, and separately identifying them

This will enable like-for-like comparisons of 2014 and 2015 results for businesses not including PAYE non-VAT businesses, and like-for-like comparisons of 2015 and 2016 results. 2014 and 2016 results will not be comparable on a like-for-like basis. Data for 2014 and earlier years will not include a jobs estimate for PAYE non-VAT businesses. All the published figures will be for the existing calibration regime. The incorporation of business sizeband calibration will follow in a future annual BRES release.

Changes to the historic data

Since trend-based projections rely heavily on historic data, changes in, and additional years, of historic data will cause changes in the projections. The previous section explained that there have been some significant data revisions since the publication of the last set of employment projections. Along with forecast errors, appreciating data revisions is thus critical to understanding the projections and why they can change over time. Specifically, the projections rely on estimates of historic productivity in London – or output (GVA) divided by employment. The proportionate change to employment and GVA estimates have varied across years, and this will affect the modelled historic productivity trend.

Tables 1 and 2 show how the most recent historical employment and output (GVA) data compares to those that formed the basis of the projections in the ‘London Labour Market Projections’ paper¹⁹.

The source of the historic employment data remains the ONS WFJ series for data from 1996 onwards combined with GLA Economics’ estimates for earlier years (as presented in the 2016 report). As Table 1 shows the revision in the jobs history has been relatively small, ranging from 12,000 (in 2009) to 43,000 (in 2015) or from 0.23 per cent (in 2012) to 0.77 per cent (in 2015).

At borough level there has been significant year-on-year employee jobs change between 2014 and 2015 for City of London, Hillingdon, and Hounslow. Year-on-year employee jobs in the City of London increased by 38,000, or by 9.5 per cent, and in Hounslow they increased by 22,000, or by 15.9 per cent, while in Hillingdon they decreased by 22,000, or by 10.7 per cent. Appendix F looks into the reasons for these changes.

The estimates for London’s real (inflation adjusted) output is based on a number of national statistics and uses the same calculation methodology as for the 2016 projections, and explained in the accompanying report. It is also the methodology that GLA uses for sub-regional output analyses²⁰.

Table 1: Total London employment – previous and revised data

Employment (000s)	Current estimates	Estimates in previous projections	Absolute difference (new less old)	Percentage difference
1971	4,579	4,553	26.2	0.58%
1972	4,546	4,520	25.9	0.57%
1973	4,529	4,504	25.7	0.57%
1974	4,439	4,414	25.0	0.57%
1975	4,371	4,347	24.5	0.56%
1976	4,281	4,257	24.0	0.56%
1977	4,231	4,208	23.8	0.56%
1978	4,279	4,255	24.0	0.56%
1979	4,337	4,313	24.4	0.57%
1980	4,313	4,289	24.2	0.56%
1981	4,199	4,177	22.0	0.53%
1982	4,109	4,087	22.2	0.54%
1983	4,080	4,059	20.9	0.51%
1984	4,134	4,112	21.7	0.53%
1985	4,166	4,145	21.3	0.51%
1986	4,126	4,104	22.0	0.54%
1987	4,226	4,202	23.7	0.56%
1988	4,305	4,281	23.7	0.55%
1989	4,324	4,301	23.0	0.54%
1990	4,252	4,230	22.2	0.52%
1991	4,051	4,030	20.8	0.52%
1992	3,894	3,875	19.3	0.50%
1993	3,840	3,820	19.5	0.51%
1994	3,936	3,915	21.1	0.54%
1995	4,000	3,978	21.3	0.53%
1996	3,973	3,953	19.8	0.50%
1997	4,110	4,090	20.0	0.49%
1998	4,295	4,278	16.3	0.38%
1999	4,459	4,442	17.0	0.38%
2000	4,629	4,610	19.0	0.41%
2001	4,652	4,634	18.0	0.39%
2002	4,582	4,565	17.8	0.39%
2003	4,602	4,588	14.3	0.31%
2004	4,579	4,565	13.3	0.29%
2005	4,682	4,666	15.8	0.34%
2006	4,732	4,717	14.5	0.31%
2007	4,788	4,772	16.3	0.34%
2008	4,928	4,911	16.5	0.34%
2009	4,823	4,811	11.8	0.24%
2010	4,815	4,802	12.8	0.27%
2011	4,894	4,882	11.8	0.24%
2012	5,092	5,081	11.5	0.23%
2013	5,242	5,221	21.3	0.41%
2014	5,466	5,433	33.0	0.61%
2015	5,581	5,538	42.8	0.77%
2016	5,683			

Source: Workforce Jobs, ONS and GLA Economics estimates.

Table 2: Total London output – previous and revised data

GVA index (1971=100)	Current estimates	Estimates in previous projections	Absolute difference (new less old)	Percentage difference
1971	100.0	100.0	0.0	0.00%
1972	103.5	103.4	0.1	0.07%
1973	109.2	109.1	0.0	0.04%
1974	104.0	103.9	0.1	0.08%
1975	103.7	103.6	0.2	0.15%
1976	103.4	103.4	0.1	0.05%
1977	103.8	103.9	-0.1	-0.08%
1978	107.7	107.7	0.0	0.01%
1979	111.0	110.9	0.1	0.10%
1980	107.1	106.8	0.2	0.23%
1981	104.9	104.6	0.3	0.29%
1982	101.7	101.5	0.2	0.21%
1983	105.1	104.8	0.2	0.23%
1984	105.0	104.7	0.3	0.27%
1985	111.9	111.6	0.4	0.33%
1986	120.3	119.9	0.4	0.34%
1987	127.5	127.4	0.2	0.13%
1988	135.2	135.1	0.0	0.00%
1989	139.1	139.0	0.1	0.07%
1990	140.7	140.4	0.3	0.22%
1991	140.1	139.6	0.5	0.34%
1992	141.0	140.7	0.3	0.24%
1993	147.0	146.9	0.1	0.09%
1994	149.6	149.7	-0.1	-0.03%
1995	150.7	150.8	-0.0	-0.03%
1996	155.9	156.1	-0.2	-0.15%
1997	160.4	160.6	-0.2	-0.12%
1998	170.0	169.9	0.1	0.04%
1999	178.1	177.0	1.1	0.62%
2000	192.4	192.0	0.4	0.18%
2001	195.9	195.5	0.4	0.20%
2002	195.8	195.4	0.4	0.19%
2003	200.9	201.5	-0.6	-0.31%
2004	205.2	206.1	-0.9	-0.45%
2005	219.0	221.2	-2.2	-0.99%
2006	221.9	224.2	-2.2	-1.00%
2007	237.3	238.2	-0.9	-0.37%
2008	241.4	243.8	-2.4	-0.97%
2009	230.9	233.0	-2.1	-0.90%
2010	237.3	238.2	-0.9	-0.38%
2011	249.9	253.0	-3.0	-1.19%
2012	257.4	260.4	-3.0	-1.15%
2013	261.2	270.0	-8.8	-3.24%
2014	277.0	286.2	-9.2	-3.23%
2015	283.7	298.0	-14.2	-4.78%
2016	294.5			

Source: GLA Economics estimates

As Table 2 shows there have been some relatively large changes in the estimates of London's real GVA in the years from 2003 onwards. Prior to this the largest difference is 1999 when the 2017 estimate of growth compared to 1971 was 1.1 percentage points higher or a difference of 0.6% compared with the 2016 estimate. For the years since 2003 the 2017 estimates of output growth have been below 2016 estimates. The size of the difference has fluctuated but at 2011 it was 3.0 percentage points lower (a difference of 1.2%), rising to 8.8 percentage points in 2013 (a difference of 3.2%), 9.2 percentage points in 2014 (also a difference of 3.2%), and 14.2 percentage points in 2015 (a difference of 4.8%)²¹.

ONS provides a series of reasons for the changes up to 2014²²:

- Changes to the treatment of owner-occupied imputed rent
- The inclusion of the Crossrail business rates supplement
- Subsidies on production have been regionalised independently for the first time in the same way as the processing of taxes on production
- Changes in the treatment of public sector industries

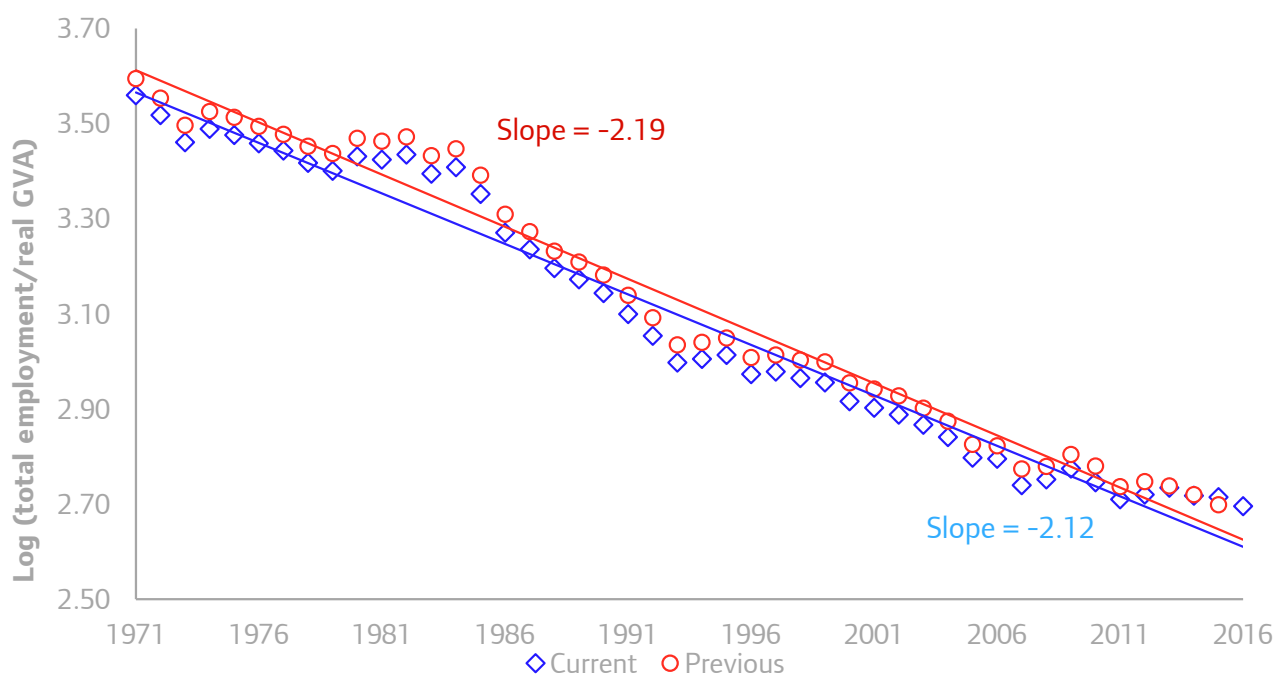
The cumulative impact of the employment and output revisions is explored in the next chapter.



3. Total London employment projections

As mentioned above, the projections rely on historic productivity (output divided by employment). Figure 1 shows the logged ratio of employment to output (the inverse of productivity) for London-wide employment underlying both the current and previous projections. The chart also includes a fitted local regression curve to highlight the historic trend. As a log, the negative gradient is equal to the output growth that would be required to maintain stable employment i.e. a gradient of -1.0 suggests that an annual output growth of 1.0 per cent would maintain zero employment growth.

Figure 1: Log of total employment as a proportion of total output growth in London – current and previous estimates (1971-2015/16)



Source: GLA Economics

Figure 1 shows that the impact of the revised historic output and employment estimates is to both reduce the historic productivity levels in all years and reduce the productivity trend growth over time. In other words, the revised history suggests that productivity in each year was lower than previously estimated and (given a less steep fitted regression curve for the most recent historic estimates – which can also be seen by the fact that the magnitude of revision diminishes over time) that over time productivity grows at a slightly slower rate such that the output growth needed to maintain zero employment growth is lower (2.12 per cent compared to the previously estimated 2.19 per cent). Similarly, the revision implies that for a given output growth in the future the employment required will be higher should this new long-run productivity trend continue (as opposed to the pre-revised trend).

Figure 1 also shows that, in most years, productivity is close to trend (where trend is represented by the fitted regression line) with it moving closely around trend depending on the economic cycle.

Recently, however, productivity growth continues to diverge from trend. Since 2011 growth in employment has been exceptionally strong compared to output growth. This recent trend in productivity has been puzzling many respected organisations and economists and its implication for the projections in this paper is explored further in Box 1.

In order to generate long-run employment projections for London GLA Economics combines an output growth assumption with a projected productivity trend (the latter of which is based on the observed historic productivity trend).

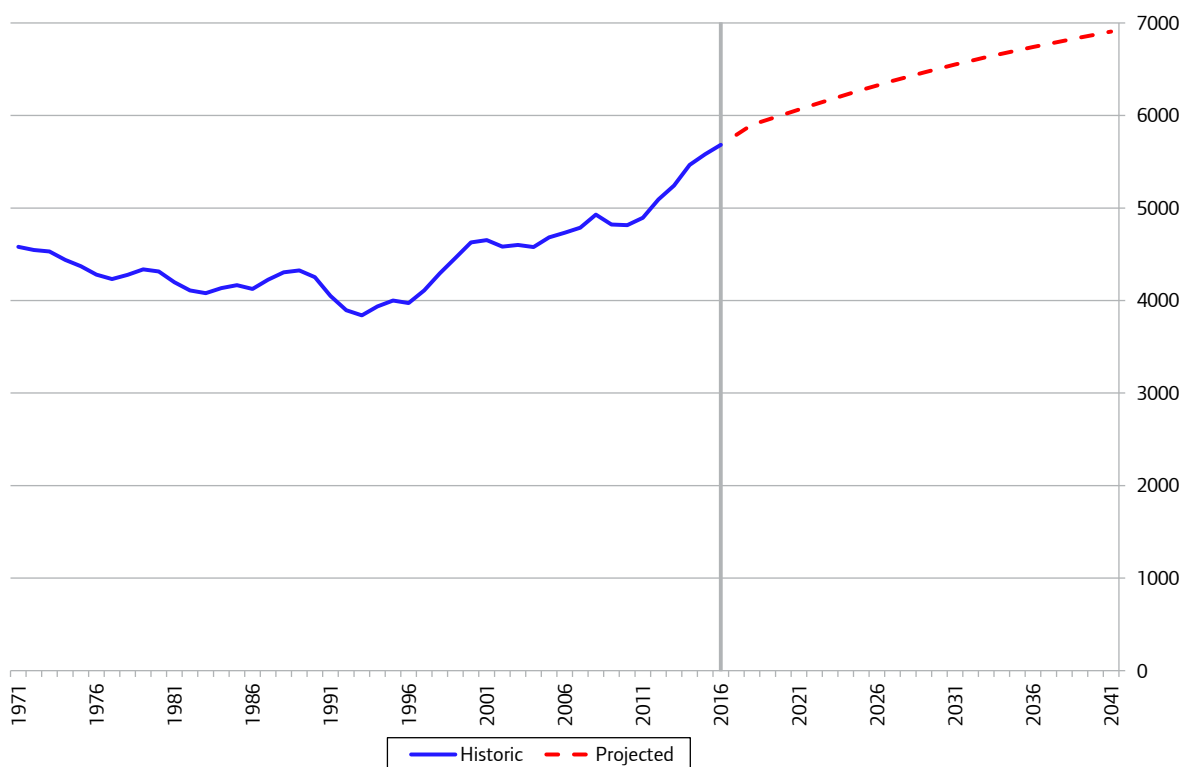
The Office for Budget Responsibility (OBR) has revised downwards its GDP growth forecast for the rest of the decade to an average of 2.1 per cent a year, and 2.0 per cent in 2021. This is consistent with what the OBR estimates for the UK's long-term output potential²³. GLA Economics is forecasting average London GVA growth of around 2.5 per cent a year to 2018²⁴, consistent with the historic trend for growth of the London economy to be faster than the national trend. These projections therefore take output growth of 2.5 per cent to 2018, and thereafter growth declining at an exponential rate towards 2.0 per cent.

The productivity trend used for the medium-term employment projection to 2018 is the trend from 2007 to 2016, and the trend used for later years of the projection is the trend from 1993 to 2016. In the medium-term productivity growth is expected to maintain its current low trend, but this is expected to improve over the longer term.

The results of the projection are presented in Figure 2. The projections estimate that employment in London will grow by an annual average rate of 0.78 per cent, equivalent to 49,000 jobs per annum, to reach 6.907 million in 2041²⁵.

Figure 2: Historic and projected employment in London (thousands), 1971-2041

'000 jobs



Source: GLA Economics

Box 1: Should the employment projections ‘jump-off’ from the 2016 level of employment?

The trend methodology used to construct the projections in this paper is based on the premise that a variable’s history includes the effects of everything that has driven it. In other words, to get to its current level, employment has been impacted by economic growth, population, migration, changes in sectoral growth, technology, working practices and so on. The relationship between all these drivers and employment is implicit in the historic employment data.

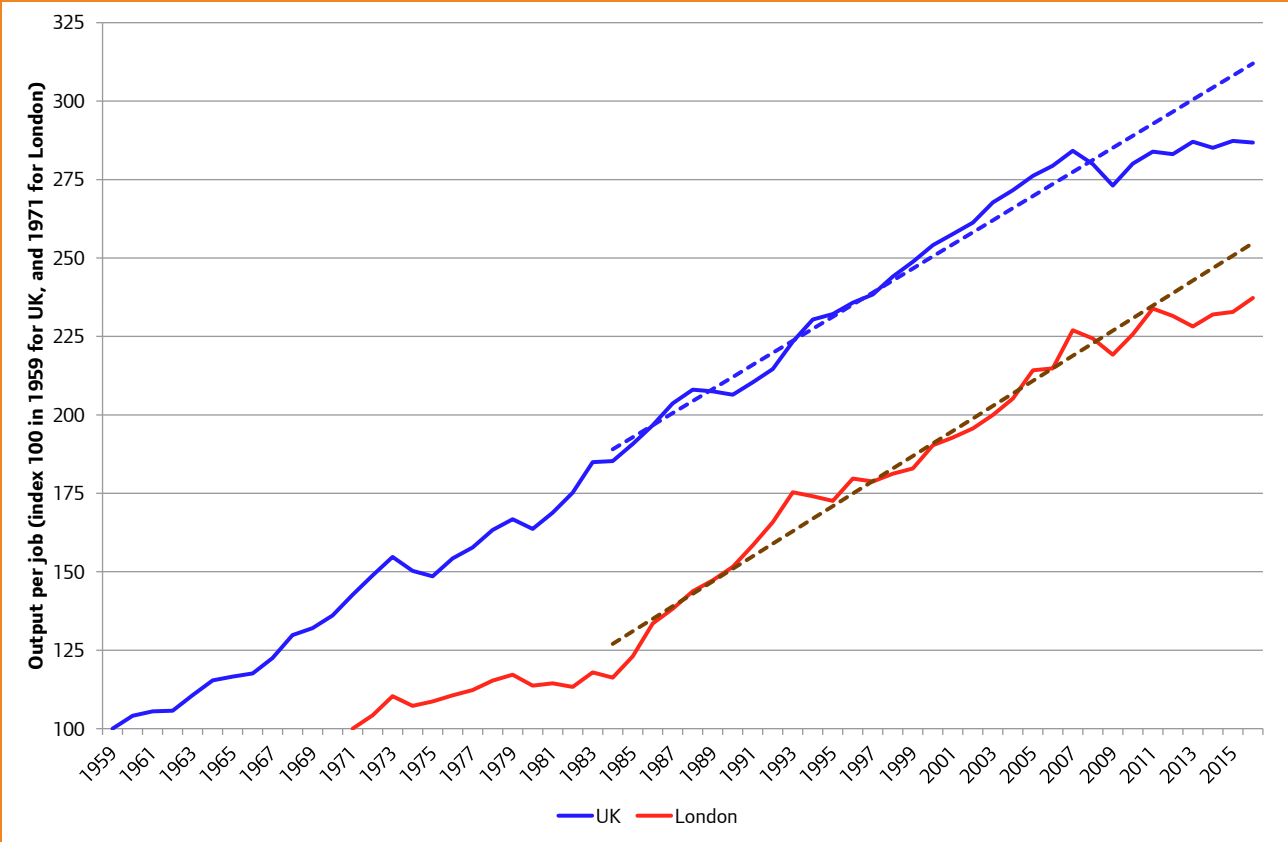
Although, as many other forecasters do, it is possible to look at each of these drivers individually to assess their impact and model them individually, there are likely to be so many drivers that attempting to model them would likely only partially explain the history. Moreover, to model the drivers requires an understanding of the drivers of those drivers that results in a myriad of variables each supposedly impacting on employment. For example, if international migration is thought to affect employment then it is necessary to consider what affects international migration (so things like conditions in the individuals’ home country, relative output growth, cost of travel and so on). It is then necessary to be able to say how these factors are likely to change in 20 years, or so, time, such that the employment projections also depend heavily on these necessary underlying assumptions. This approach may be reasonable when considering what employment may be in the short-term. However, the further into the future one goes the greater the compound error is likely to be on the forecasts for the drivers of employment. The cumulative effect of this across all the drivers can then raise doubts as to the reliability of the future employment estimates that are dependent on them.

The trend-based methodology that GLA Economics adopts is arguably a reasonable approach so long as (a) the variable is not random (in other words, it follows a relatively stable path) and, (b) future shocks or structural changes do not differ in magnitude to those in the past. Applying this to productivity (which is used as the basis for our projections given the mathematical relationship between employment and output whereby Δ in employment = Δ in output – Δ in productivity), as can be seen in Figure 1, productivity is not a random variable and has historically followed a trend. Regarding structural changes, this is ultimately a point of judgement. Whilst Figure 1 does not suggest clearly structural changes in the productivity trend for London, especially as there have been other periods both above and below trend, there have been questions as to whether more recently the trend in productivity is reflective of a new trend/structural change.

In the five years since 2011 alone, employment has grown by 16.1 per cent, which equates to an annual average growth rate of 3.0 per cent or 158,000 jobs per year. This contrasts starkly to a total growth of 6.9 per cent, or an annual average growth rate of 0.2 per cent or 7,900 jobs per year, over the 40-year history from 1971 to 2011. At the same time, however, in the five years since 2011 output in London has grown by an average annual rate of 3.0 per cent, which compares to the estimated 2.3 per cent per annum experienced between 1971 and 2011.

The impact of these relative changes in employment and productivity growth is, perhaps, particularly stark when looking at productivity over the long run and over a number of economic cycles (see Figure A). To support this comparison Figure A includes trendlines for London and UK productivity growth for 1984-2011 (and extended to 2015).

Figure A: Productivity in London and the UK over the long-run



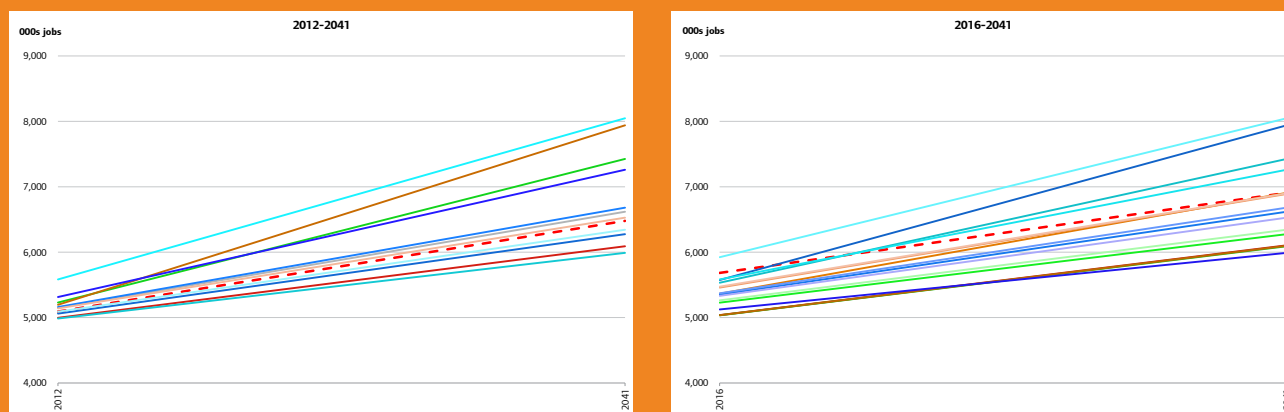
Source: ONS and GLA Economics

What is striking, particularly at a national level, is that productivity growth has remained at a low rate since the 2008 recession, and has not recovered to long-run trends. The length of this period of low productivity growth is the basis for OBR making the judgement that productivity growth may not recover to historic rates. GLA Economics has made a similar judgement in the construction of these employment projections.

The recent exceptional growth in employment raises the question of where the GLA Economics projections should start from – or the year from which they should ‘jump off’. This is something that the projections have previously considered (see, for example, Working Paper 38 page 6) but has become an increasingly important issue with the recent productivity trend. So the question of what the jumping-off point for the projections should be comes down to whether the 2016 level of employment is representative of an ‘on-trend’ point in the economic cycle, and if not, what year is?

To understand this better GLA Economics looked at a series of economic commentators to see when they estimated the economy to be on trend. The corresponding employment levels in these periods were then trended to produce a range of on-trend employment projections (see Appendix B for further details). In the balance of that work, 2012 appears to be the last year that London’s employment was ‘on-trend’. This can also be seen by looking at Figure B. The various solid lines show a range of potential on-trend employment levels through to 2041. The dotted red lines show how GLA Economics employment projections would sit within that range if they jump-off the on-trend 2012 estimate of employment (left hand) and if they jump-off the 2016 employment estimate (right hand).

Figure B: Performance of GLA Economics employment projections starting from different base years compared to a range of estimated on-trend projections



Source: GLA Economics

As Figure B shows, the projections which use the latest employment data point to jump off from are likely to start above the existing estimates of trend, and be at the upper end of the majority of other estimates in 2041 suggesting projected levels of employment in 2041 that may be on the high side in comparison to trend.

However, estimates of output gaps and trend points in the economy are notoriously difficult to estimate and the likely future long-run path of productivity remains unclear. This is an area that GLA Economics, alongside others, continue to monitor closely. Given productivity has previously diverted from the trend line (albeit perhaps not as much) (see Figure 1), that the projections assumes a decline in long-term output potential, and productivity growth in the recent past has been higher in London than nationally, and the remaining uncertainty, then the London jobs projection does not look unreasonable. Nonetheless, as the situation evolves, GLA Economics will continue to monitor the situation and review their methodology.

4. Sensitivity testing

Given the recent employment performance (see Box 1) and future economic uncertainty, a number of alternative employment projection scenarios have been produced as a means of sensitivity testing the central scenario. These are based on alternative assumptions for the key underlying assumption in the 'central' projections presented in the previous chapter, and are summarised in Table 3. For context, the table also includes summary information on the historic employment growth experienced in London (1979, 1989 and 2001 were years when employment was at a peak²⁶, and 1977, 1983, 1993 and 2004 were years when employment was at a trough), something which is key to put these alternative scenarios into wider context.

Table 3: Summary results from alternative assumptions

	2041 employment level (millions)	Per annum projected growth (2016-2041)	
		average %	level
Historic 1971 to 2016	-	0.48	24,530
Historic 1971 to 2012	-	0.26	12,510
Historic 1977 to 2016	-	0.76	37,220
Historic 1977 to 2012	-	0.53	24,590
Historic 1979 to 2016	-	0.73	36,380
Historic 1979 to 2012	-	0.49	22,880
Historic 1983 to 2016	-	1.01	48,580
Historic 1983 to 2012	-	0.77	34,900
Historic 1989 to 2016	-	1.02	50,320
Historic 1989 to 2012	-	0.71	33,370
Historic 1993 to 2016	-	1.72	80,140
Historic 1993 to 2012	-	1.50	65,910
Historic 2001 to 2016	-	1.34	68,720
Historic 2001 to 2012	-	0.82	39,980
Historic 2004 to 2016	-	1.82	92,040
Historic 2004 to 2012	-	1.34	64,190
Central growth assumption (medium term 2.5% pa, falling off to 2.0% pa)			
Central scenario, 2016 jump-off	6.91	0.78	48,960
2012 jump-off	6.48	0.78	45,920
High growth assumption (medium term 3.0% pa, falling off to 2.5% pa)			
2016 jump-off	7.80	1.28	84,780
2012 jump-off	7.46	1.28	81,080
Low growth assumption (medium term 2.5% pa, falling off to 1.5% pa)			
2016 jump-off	6.32	0.43	25,500
2012 jump-off	5.93	0.43	23,920

Note: 2041 employment levels have been rounded to the nearest 10,000; percentages have been rounded to the nearest 2 decimal places, and the per annum projected growth in employment numbers to the nearest 10.

One of the fundamental assumptions underpinning the projections is regarding the long-run annual rate of output growth in London. Under the 'central' scenario GLA Economics assumes a medium-term growth rate of 2.5 per cent per annum over the period to 2018, declining exponentially to 2.0 per cent per annum over the longer term. In the recent past the UK output growth rate has been higher than for the UK. The longer-term rate is consistent with what bodies such as the Office for Budget Responsibility assume for the UK's long-run output growth rate. As such, it assumes that London grows at the same rate as the UK in the long run – if a higher growth rate was assumed for London this would suggest that in the very long run the size of London's economy would overtake the UK (something that is clearly not possible). On the other hand, an output growth rate for London that is lower than that for the UK would suggest that London's share of the UK's output tends to 0 per cent in the very long run (something which is not very likely).

To test the sensitivity of the projections to the assumed output growth rate, the model has been re-run under different assumptions for the medium and long-term growth rates. In the high scenario, the medium-term assumption is 3.0 per cent per annum GVA growth rate in London. Indeed, between 1981 and 2016 this is the estimated average annual growth in London's output (see Table 2²⁷). The high long-term assumption is 2.5 per cent per annum GVA growth rate in London, consistent with what had previously been the OBR assumption for long-term output growth potential. The low scenario maintains in the medium term the growth rate assumption of the central scenario of 2.5 per cent to 2018. It assumes in the longer term a 1.5 per cent per annum GVA growth rate. This recognises the downside uncertainty in the future output potential for the UK economy.

Under the high assumptions of medium-term output growth of 3.0 per cent per annum and long-term output growth of 2.5 per cent per annum, and with employment projected off from the 2016 level, employment grows at 1.28 per cent per annum – this is higher than the annual growth rate seen in employment from all years in the 1970s, 1980s, and 1990, to 2016 and lower than the annual growth rate seen from all years in the 1990s onwards to 2016, including for the reported period of 2001-16. By 2041, employment in this scenario is projected to reach 7.80 million – equivalent to an additional 84,780 jobs per annum. This level of employment in 2041 is 13.0 per cent higher than under the 'central' scenario.

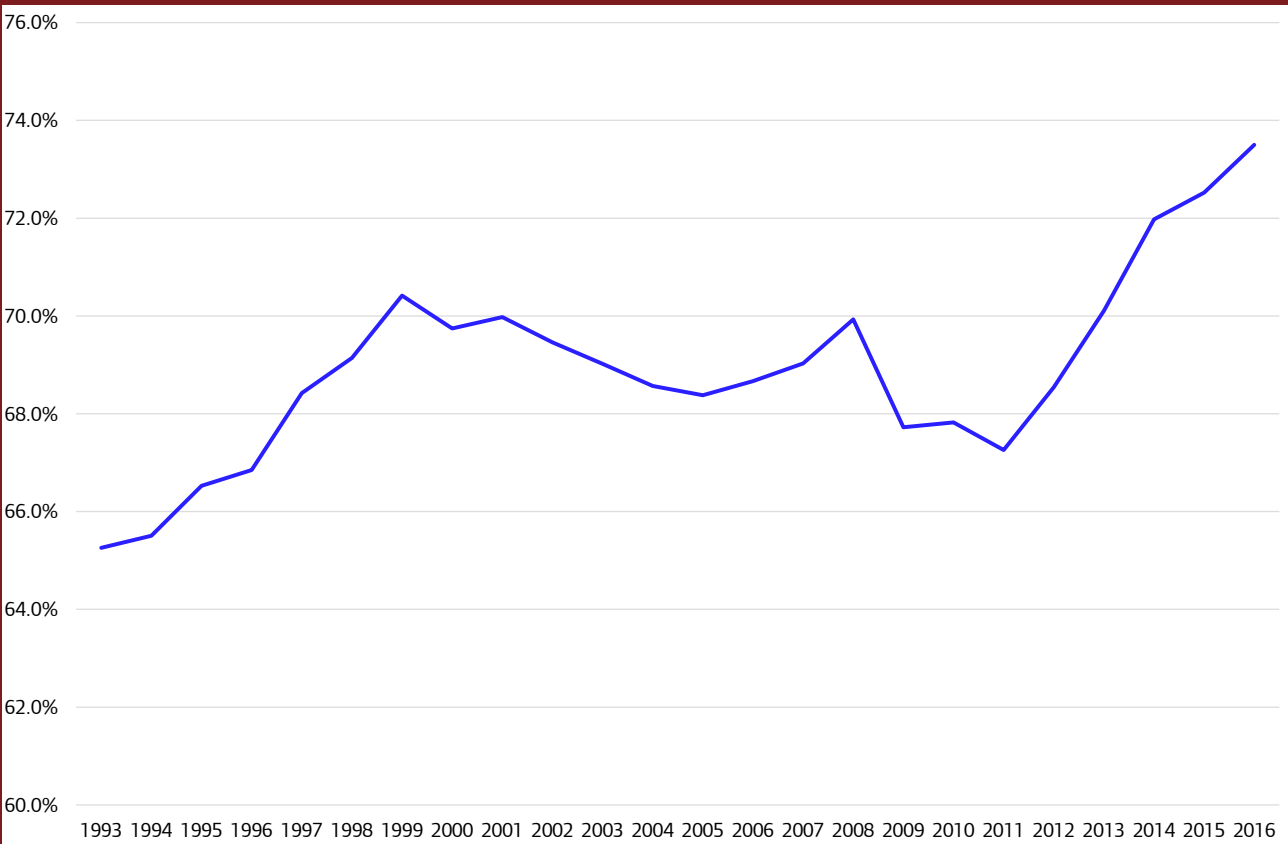
Under the low assumptions (with medium-term growth of 2.5 per cent per annum and long-term output growth of 1.5 per cent per annum), and with employment projected off from the 2016 level, employment grows only at 0.43 per cent per annum, equivalent to 25,500 jobs. By 2041 employment is estimated to reach 6.32 million under this scenario – 8.5 per cent lower than under the central scenario.

Another necessary assumption regarding these projections is in which year the projections should start (see Box 1). Table 3 presents summary numbers behind the scenario of projecting from the 2012 employment level in Box 1. It also presents the results of combining the alternative 2012 jump-off year with the high, central, and low output growth scenarios above. Under a high output growth scenario employment is estimated to grow to 7.46 million by 2041 – this is 8.0 per cent (or 0.56 million) above the central scenario (and 2016 jump off point) presented in this paper.

Box 2: An alternative method of estimating future employment in London?

In 2003 GLA Economics considered an alternative methodology to estimate long-run employment (Working Paper 4: Long-term Employment Projections for London, GLA Economics). The methodology employed is repeated here - using projections of the population and the employment rate - to see what it may suggest for employment levels in 2041. Under this alternative model the assumption is made to hold the employment rate constant. Some may argue that results from such a model present a potential underestimate because, for example, of the likely impact from changes in the state pension age and abolition of the compulsory retirement age. However, such impacts would need to be balanced against factors that may reduce the employment rate, such as the raising of the participation age for young people. Nonetheless, given the complexity of the labour market, arguments suggesting the long-run employment rate may move in either direction, and the historic trends in London's employment rate (see Figure C) this could be considered a reasonable alternative approach against which to benchmark the central projections in this paper.

Figure C: London's historic 16-64 working age employment rate



Source: Annual Population Survey, ONS

Under this alternative methodology (for which further details, including data sources, are provided in Appendix C) jobs in London are estimated to reach 6.42 million in 2041 – representing an average annual increase of 0.49 per cent, or an additional 29,540 jobs per annum. This estimate lies within the range of those in the sensitivity testing. Indeed, as this alternative method is based on the working age population it may be considered a cautious alternative, but nonetheless suggests that the jobs projected seems reasonable (particularly when balanced against the latest GLA 2016-based population projections).

5. Employment projections for London's sectors

Sector level projections for London are constructed using the same trend-based methodology as is used for London's total employment in the previous chapter. The data for employment across sectors comes from the same data sources for 1971-2016, with the productivity measure used being sector employment over London GVA. Table F1 reports changes to the historic employee jobs data series at a sector level since publication of the last report²⁸.

Charts showing the logged employment over London output for each sector are presented in Appendix D.

GLA Economics has used the more detailed jobs series for 1998-2015²⁹ to inform sector judgements. This series provides data on sub-sector trends which elucidate whether there are trends not apparent in sector level data. For example, for finance, employees in financial service activities (SIC64) had been falling before stabilising, while employee numbers for auxiliary activities (SIC66) had been rising before stabilising. The judgement made is that there is no strong influence on trends either up or down, and that employment should continue rising if gently. Similarly for manufacturing, employee numbers for sub-sectors can change year-on-year but there is little evidence of a trend in growth in any sub-sector, and so the judgement made is that employment will continue to decline gently.

As a final step to producing sector employment projections the results across sectors are constrained to the London total projections above to reconcile them.

Table 4 shows the trends identified to use in projecting for each of the sectors as well as summary information on the resultant projections. Figures 3a and 3b show the projected employment levels.

Similar to previous projections, jobs in the professional, real estate, scientific and technical sector are expected to grow strongly, accounting for over a third of the total increase expected in London to 2041. Strong employment growth is also expected in the administrative and support service, accommodation and food service, information and communication sectors, education and health sectors – collectively accounting for nearly three fifths of the expected total London increase to 2041.

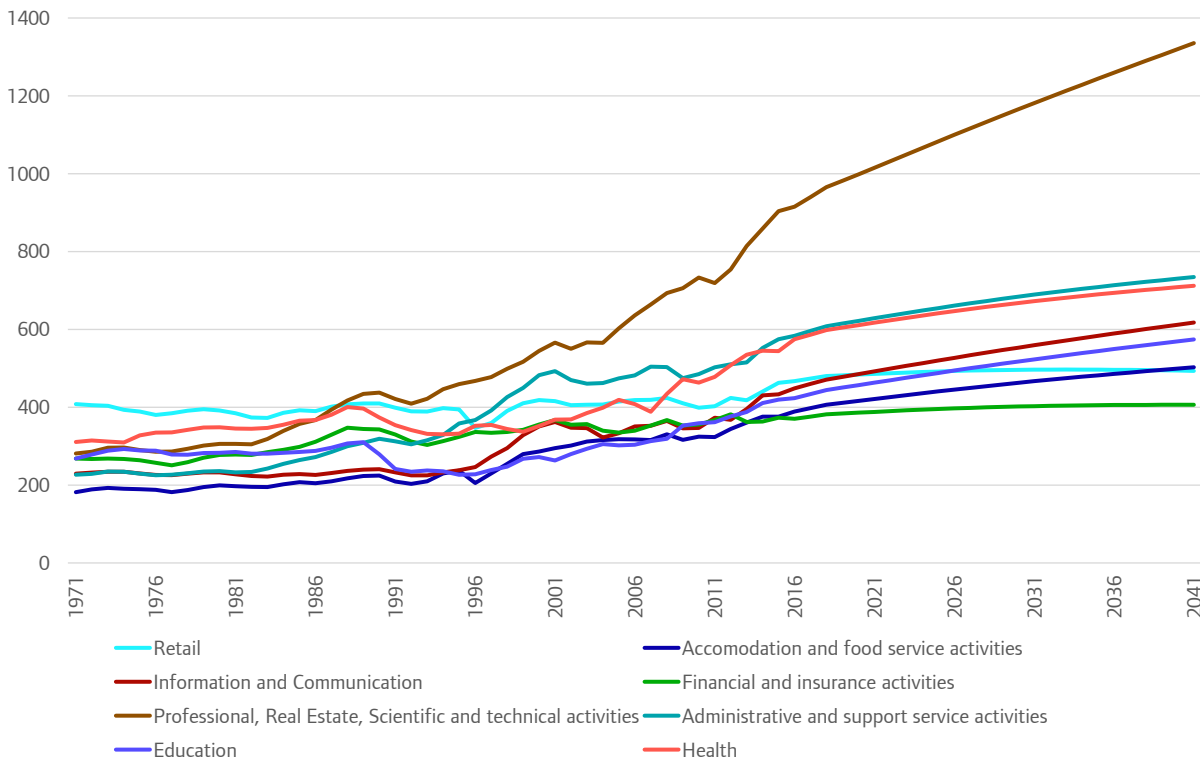
On the other hand, employment in primary and utilities, manufacturing, wholesale, transportation and storage, and public administration and defence sectors are all expected to continue to decline over the period to 2041.

Table 4: Summary of trends used and results for sector employment projections

	Trend for projections to 2041	Long term output growth required for stable employment	Employment growth per annum with projected London output growth	Annual average growth in jobs with projected London output growth
Primary & utilities	1/2 trend from 1984 to 2016 1/2 trend from 2003 to 2016	3.7%	-1.0%	-260
Manufacturing	1/2 trend from 2008 to 2016 1/2 trend from 2009 to 2016	4.7%	-1.8%	-1840
Construction	from 1993 to 2016	1.1%	0.8%	2470
Wholesale	7/10 trend from 1993 to 2015 3/10 trend from 2010 to 2015	3.4%	-0.8%	-1430
Retail	3/5 trend from 1981 to 2016 2/5 trend from 2007 to 2016	1.7%	0.2%	1060
Transportation and Storage	1/2 trend from 1984 to 2016 1/2 trend from 2002 to 2016	2.9%	-0.4%	-1120
Accommodation and food service activities	1/2 trend from 1999 to 2016 1/2 trend from 2013 to 2016	0.6%	1.0%	4550
Information and Communication	2/5 trend from 1984 to 2016 3/5 trend from 1999 to 2016	0.4%	1.3%	6750
Financial and insurance activities	from 1976 to 2016	1.5%	0.4%	1440
Professional, Real Estate, Scientific and technical activities	7/10 trend from 1984 to 2016 3/10 trend from 2015 to 2016	0.0%	1.5%	16820
Administrative and support service activities	1/10 trend from 1971 to 2016 9/10 trend from 1999 to 2016	0.8%	0.9%	6040
Public Administration and defence	3/5 trend from 1995 to 2016 2/5 trend from 2015 to 2016	2.8%	-0.4%	-750
Education	1/2 trend from 1984 to 2016 1/2 trend from 1990 to 2016	0.4%	1.2%	6030
Health	3/4 trend from 1984 to 2016 1/4 trend from 1990 to 2016	0.8%	0.9%	5490
Arts, entertainment and recreation	from 1996 to 2016	0.4%	1.2%	2940
Other services	from 1998 to 2016	1.3%	0.5%	770
Total London Employment	medium term (2016 to 2018) from 2007 to 2016 long term (2019 to 2041) from 1993 to 2016	0.9%	0.8%	48960

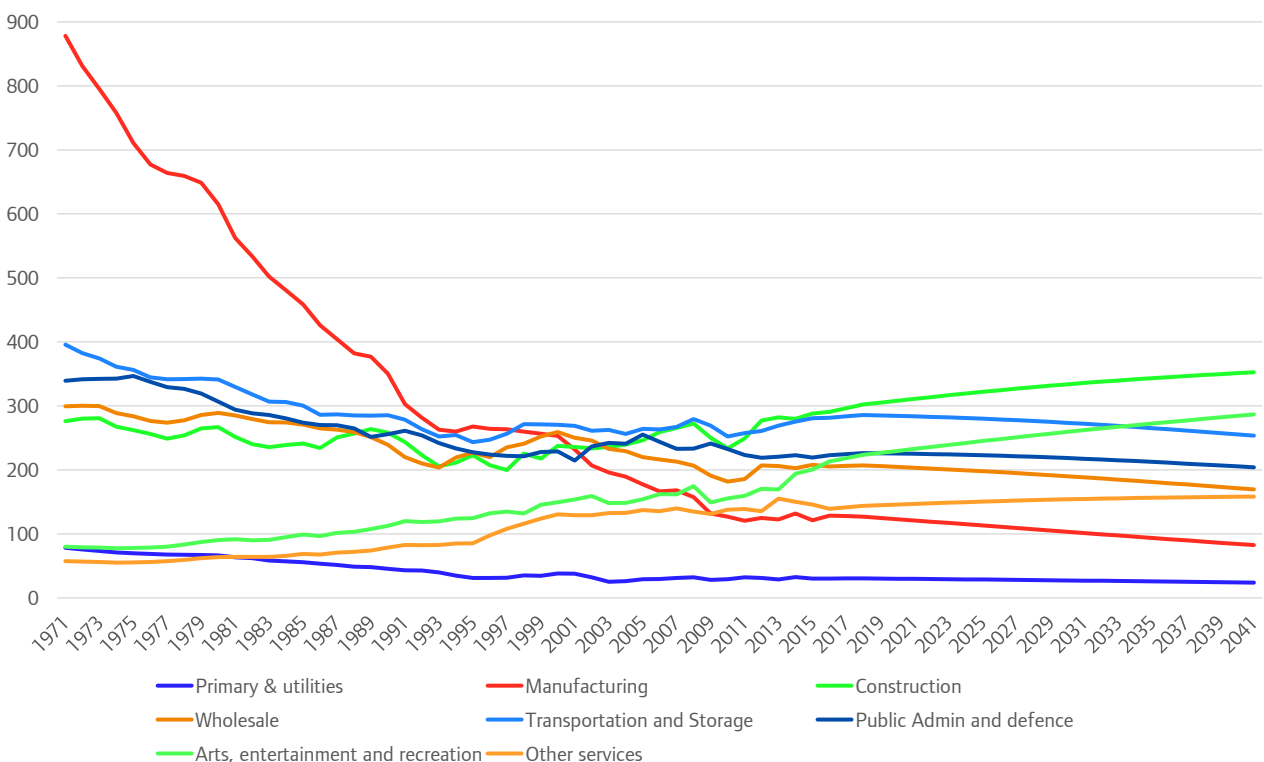
Notes: Medium term output growth rate is 2.5%, and long-term output growth rate is 2.0%
Numbers may not add due to rounding

Figure 3a: Historic and projected employment ('000s) in London's largest sectors, 1971 to 2041



Source: GLA Economics

Figure 3b: Historic and projected employment ('000s) in London's smaller sectors, 1971 to 2041



Source: GLA Economics

6. Employment projections for London's boroughs

This chapter sets out GLA Economics' updated borough employment projections.

As set out in the 'Methodology & data revisions' section of this paper, the borough projections are done in two parts: employee and self-employed estimates are constructed separately. In order to do this it is necessary to first project estimates of each at the London level. This is done using the same trend-based methodology and the same output growth assumption as is employed for London's total employment, with the results constrained to the projections of London's total output presented above. The weights placed on the historic productivity trends for employee and self-employed jobs and the summary of the results are presented in Table 5.

Table 5: Summary of trends used and results for London employee and self-employed projections

	Trend for projections to 2041	Employment growth per annum with projected London output growth	Annual average growth in jobs with projected London output growth
Employee jobs	2/5 trend from 1984 to 2016 3/5 trend from 2004 to 2016	0.67%	35,970
Self-employed jobs	from 1989 to 2016	1.48%	12,990

Note: percentages have been rounded to the nearest 2 decimal places, number to the nearest 10.

There are three sets of borough employee projections: trend projections, methodology and results explained below; employment sites capacity projections³⁰ (see Appendix G); and, transport accessibility employment projections (see Appendix H). Each set of projections is constrained to the London employee jobs projection.

To project the trend-based employee jobs by borough, again, the methodology applied is first to analyse the historic trends of employee jobs by borough against London GVA (the corresponding charts are presented in Appendix E). Depending on the characteristics of the historic productivity trends in each borough a judgement is made on the trends that are most likely to direct future developments (ignoring transport and workplace capacity constraints). The results are then constrained to the total London-wide employee job projections (as estimated above) using the borough projection proportions.

The trends identified to use in projecting employees for each borough are presented in Table 6, as is a summary of results.

Table 6: Summary of trends used for borough employee projections

	Trend for projections to 2041	Employee growth per annum with projected London output growth	Employee change from 2016 to 2041 with projected London output growth
Barking and Dagenham	1/4 trend from 1996 to 2015 3/4 trend from 2009 to 2015	0.13%	70
Barnet	3/5 trend from 1981 to 2015 2/5 trend from 2009 to 2015	0.32%	420
Bexley	1/5 trend from 1981 to 2015 4/5 trend from 2005 to 2015	0.40%	300
Brent	7/10 trend from 1981 to 2015 3/10 trend from 2006 to 2015	0.18%	210
Bromley	3/4 trend from 1971 to 2015 1/4 trend from 2010 to 2015	0.35%	380
Camden	from 1981 to 2015	0.74%	2800
City of London	1/10 trend from 1981 to 2015 9/10 trend from 1990 to 2015	0.79%	3850
Croydon	3/5 trend from 1971 to 2015 2/5 trend from 2013 to 2015	-0.01%	-10
Ealing	1/2 trend from 1981 to 2015 1/2 trend from 2006 to 2015	0.06%	80
Enfield	2/5 trend from 1971 to 2015 3/5 trend from 1993 to 2015	-0.09%	-100
Greenwich	2/5 trend from 1981 to 2015 3/5 trend from 2001 to 2015	0.34%	280
Hackney	1/4 trend from 1989 to 2015 3/4 trend from 2001 to 2015	0.59%	690
Hammersmith and Fulham	from 1971 to 2015	0.54%	780
Haringey	1/4 trend from 1991 to 2015 3/4 trend from 2006 to 2015	0.29%	200
Harrow	1/4 trend from 1981 to 2015 3/4 trend from 2005 to 2015	-0.01%	-10
Havering	3/4 trend from 1993 to 2015 1/4 trend from 2007 to 2015	0.23%	180
Hillingdon	from 1971 to 2015	0.46%	900
Hounslow	4/5 trend from 1981 to 2015 1/5 trend from 1995 to 2015	0.49%	840
Islington	from 1981 to 2015	1.15%	2990
Kensington and Chelsea	3/5 trend from 1981 to 2015 2/5 trend from 2004 to 2015	0.46%	630
Kingston-upon-Thames	from 1971 to 2015	0.00%	0
Lambeth	2/5 trend from 1981 to 2015 3/5 trend from 1996 to 2015	0.39%	630
Lewisham	7/10 trend from 1996 to 2015 3/10 trend from 2007 to 2015	0.18%	130
Merton	from 1981 to 2015	0.34%	280
Newham	3/10 trend from 1981 to 2015 7/10 trend from 1995 to 2015	0.82%	900
Redbridge	from 1986 to 2015	0.60%	500
Richmond-upon-Thames	from 2002 to 2015	0.72%	640
Southwark	3/5 trend from 1981 to 2015 2/5 trend from 2004 to 2015	1.39%	3790
Sutton	from 1978 to 2015	0.13%	90

	Trend for projections to 2041	Employee growth per annum with projected London output growth	Employee change from 2016 to 2041 with projected London output growth
Tower Hamlets	from 2013 to 2015	1.85%	6460
Waltham Forest	1/4 trend from 1984 to 2015 3/4 trend from 1996 to 2015	0.43%	310
Wandsworth	3/5 trend from 1981 to 2015 2/5 trend from 2007 to 2015	0.37%	450
Westminster, City of	1/10 trend from 1981 to 2015 9/10 trend from 2000 to 2015	0.80%	6310
All London Employees	2/5 trend from 1984 to 2016 3/5 trend from 2004 to 2016	0.67%	35970

The next stage is to combine the borough trend employee projections with the borough workplace capacity employee projections to reach the borough bi-angulated employee projections. The 'Methodology & data revisions' section explains the methodology employed, and why the transport accessibility projections have not been included in this process.

As mentioned above, borough total employment projections are constructed in two parts –employee projections, and estimates for self-employed jobs. The methodology for the latter is set out in the 'Methodology & data revisions' section. The full set of projections is on London Datastore.

Table 7 presents a summary of the final borough trend-based employment estimates (self-employed plus employee jobs).

Table 7: Summary of borough employment projections

	Employment growth per annum with projected London output growth	Employment change from 2016 to 2041 with projected London output growth
Barking and Dagenham	0.44%	270
Barnet	0.69%	1190
Bexley	0.67%	590
Brent	0.39%	550
Bromley	0.55%	740
Camden	0.91%	3820
City of London	0.95%	5630
Croydon	0.36%	530
Ealing	0.40%	650
Enfield	0.38%	480
Greenwich	0.67%	670
Hackney	1.24%	1800
Hammersmith and Fulham	1.60%	2960
Haringey	0.68%	640
Harrow	0.28%	250
Havering	0.44%	420
Hillingdon	0.66%	1410
Hounslow	0.70%	1390
Islington	0.76%	2030
Kensington and Chelsea	0.45%	710
Kingston-upon-Thames	0.19%	180
Lambeth	0.52%	990
Lewisham	0.65%	580
Merton	0.76%	750
Newham	1.95%	2890
Redbridge	0.80%	800
Richmond-upon-Thames	0.85%	970
Southwark	0.89%	2850
Sutton	0.31%	260
Tower Hamlets	1.84%	6840
Waltham Forest	0.72%	630
Wandsworth	0.58%	870
Westminster, City of	0.45%	3630
London total	0.78%	48960

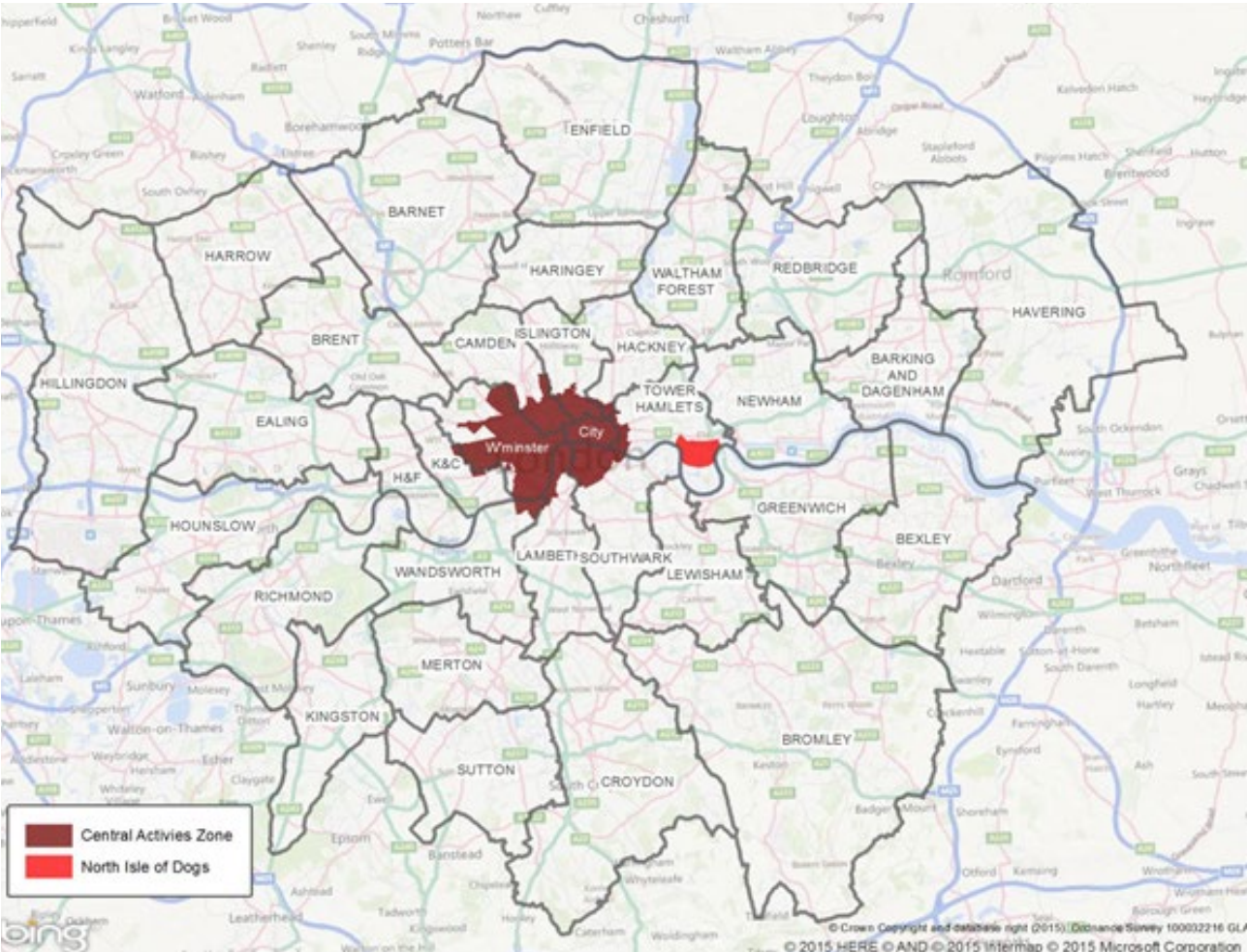
Note: Numbers may not add due to rounding

7. Employment projections for London’s Central Activities Zone and Northern Isle of Dogs

The Central Activities Zone (CAZ) contains a unique cluster of vitally important activities including central government offices, headquarters and embassies, and a large concentration of high value adding business activity. This clustering also occurs in the Northern Isle of Dogs³¹ (NIoD). These two areas are thus of strategic importance to the GLA.

The CAZ and NIoD cover portions of the London boroughs of Camden, Hackney, Islington, Kensington and Chelsea, Lambeth, Southwark, Tower Hamlets, Wandsworth, and Westminster, as well as the total area of the City of London. Map 1 shows the geographic location of these two policy areas.

Map 1: Location of CAZ and NIoD



Source: GLA Economics and Crown copyright

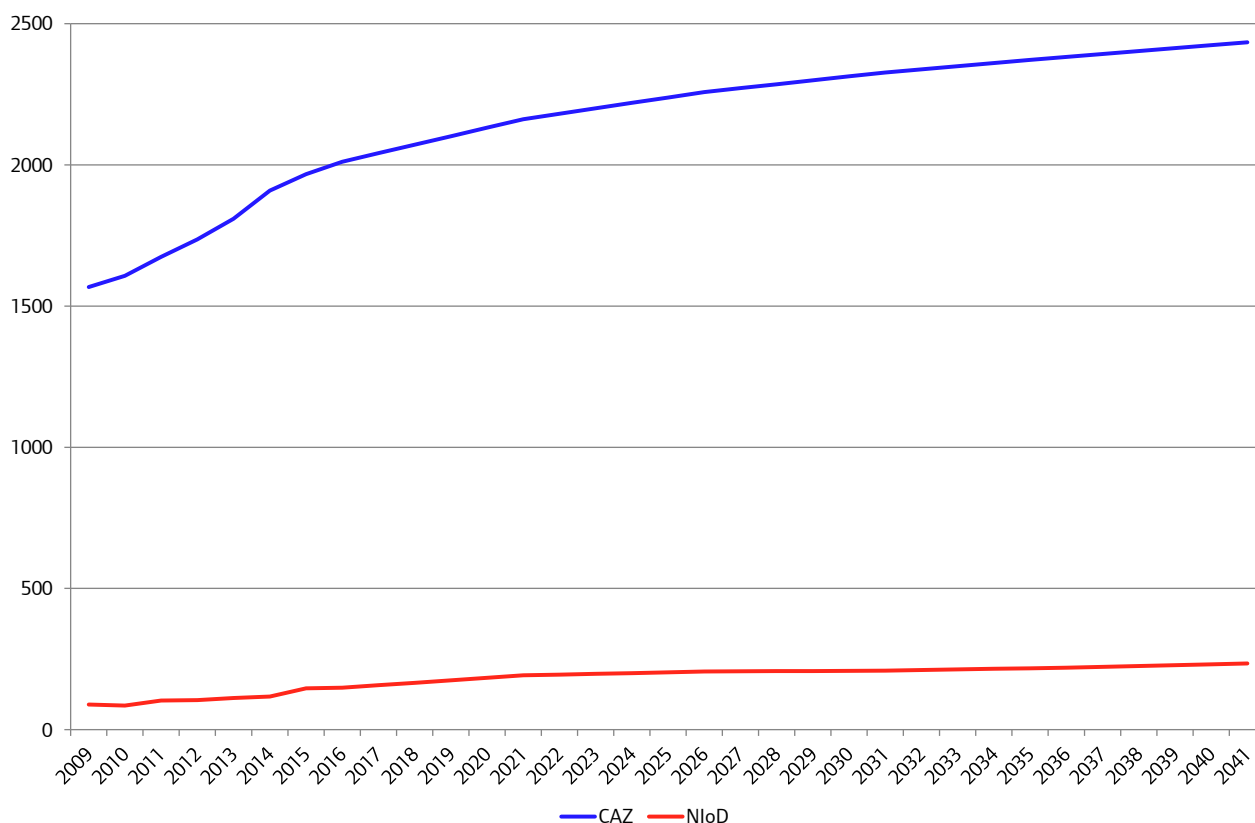
In order to construct projections for these policy areas GLA Economics firstly applies the share of CAZ and NIoD land that lies within a lower-super output area (LSOA) to the estimate of employee jobs in that LSOA (using data from BRES, ONS). In order to estimate the proportion of boroughs' jobs that falls within the policy areas, the policy area employee estimates in each LSOA is then summed across each borough and divided by BRES employee jobs estimates for the borough.

BRES 2009-2014 data uses the classification of LSOAs based on Census 2001, while the BRES 2015 data uses the LSOA classification from Census 2011. The share of CAZ jobs in boroughs across years is similar, although the estimated proportion of jobs in Tower Hamlets in NIoD increases from around 40 per cent to 50 per cent between 2014 and 2015. It appears that the new LSOA classification maps onto NIoD more accurately, and so attributes jobs more accurately as being in NIoD.

This is done for each of the years for which data is available (2009 to 2015). These proportions are then applied to the bi-angulated borough total employment estimates for 2009 to 2015 whilst the 2015 proportion is applied to the borough projections from 2016 onwards.

The results are presented in Figure 4 and summarised in Table 8.

Figure 4: Historic and projected employment in CAZ and NIoD ('000s), 2009-2041



Source: GLA Economics

Table 8: Summary of CAZ and NIoD employment projections

	Employment growth per annum with projected London output growth	Employment change from 2016 to 2041 with projected London output growth
CAZ	0.77%	16920
NIoD	1.84%	3430

Appendix A: Methodology for GLA Economics' trend-based medium-term projections

Box 1 considers the rationale for the trend-based methodology GLA Economics employs for its medium-term projections. Below is the algebra underlying the model:

Starting with a simple production function:

$$Y = ALe^{\beta t} \quad (1)$$

where Y is output and L is employment.

It is assumed that in the medium term the rate of growth of potential output is given by:

$$Y_{\text{trend}} = Y(0)e^{\gamma t} \quad (2)$$

The main paper explains that in the medium term the rate of growth of potential output in London is 2.5%, ie, $\gamma = 0.025$ and that in the long term the rate of growth declines exponentially to 2%.

In the absence of constraints³², in the medium term actual output is assumed to be equal to potential. So (1) can be re-written as:

$$Y(0)e^{\gamma t} = ALe^{\beta t} \quad (3)$$

and solving for the potential level of demand for employment, subsuming the constant terms $Y(0)$ and A as appropriate into a single term, $k1$.

$$L_{\text{trend}} = k1 e^{(\gamma - \beta)t} \quad (4)$$

This is the level of employment which would enable the trend rate of growth to be sustained.

The parameter β is not however time-invariant in the model. Instead, historical data is used to inform a linear function for projecting β into the future.

Appendix B: Methodology for producing a range of on-trend employment projections

As mentioned in Box 1, GLA Economics looked at a number of economic commentators to see when they estimated the UK economy to be on trend to produce a range of possible on-trend employment projections. Specifically, GLA Economics looked at the output gap estimates from the following organisations:

- European Commission (EC):
 - Hodrick-Prescott (HP) filter based estimates
 - Production function based estimates
- IMF
- OECD
- Office for Budget Responsibility (OBR)

These estimates were then assessed using three methodologies to try to attain employment levels which correspond to the economy being on-trend. These three methods were:

1. Taking the on-trend years (and employment in those corresponding years) as those where the estimated output gap changed sign between two consecutive years and taking the year where the absolute value of the estimated gap is closest to zero,
2. Taking the on-trend year as all those where the absolute value of the estimated output gap is less than or equal to 0.5 per cent,
3. Combining the resulting years from the two methods above.

Once the year's corresponding to the three methods above had been collated the corresponding employment in those years was selected and interpolated to generate estimates for in-between years. Finally, a line of best fit was applied to these and projected forward. Outlier trends from the results were then excluded.

In addition to the estimates generated from the methodology above, two additional estimates were created using historic employment data alone. The first of these took both the peak and trough levels of employment over time and interpolated between them (i.e. interpolated between each peak to peak employment level and each trough to trough employment level separately). A line of best fit was then applied through each and forecasted forward and the average of the two lines was taken. The second estimate took the average between the interpolated peak to peak and trough to trough lines before a line of best fit was applied and projected forward.

Appendix C: Further information on an alternative method of estimating future employment in London

The methodology for the alternative method of estimating future employment works as follows:

Let J_{IK} = Jobs in location I filled by people from location K.

and $G(x)$ = growth of the variable x

Then, with the subscripts (L) denoting London and (N) denoting locations outside London,

London's employment on a residence basis is given by:

$$E_L = J_{LL} + J_{NL} \quad (1)$$

Similarly London's employment on a workplace based (J_L) basis is given by:

$$J_L = J_{LL} + J_{LN} \quad (2)$$

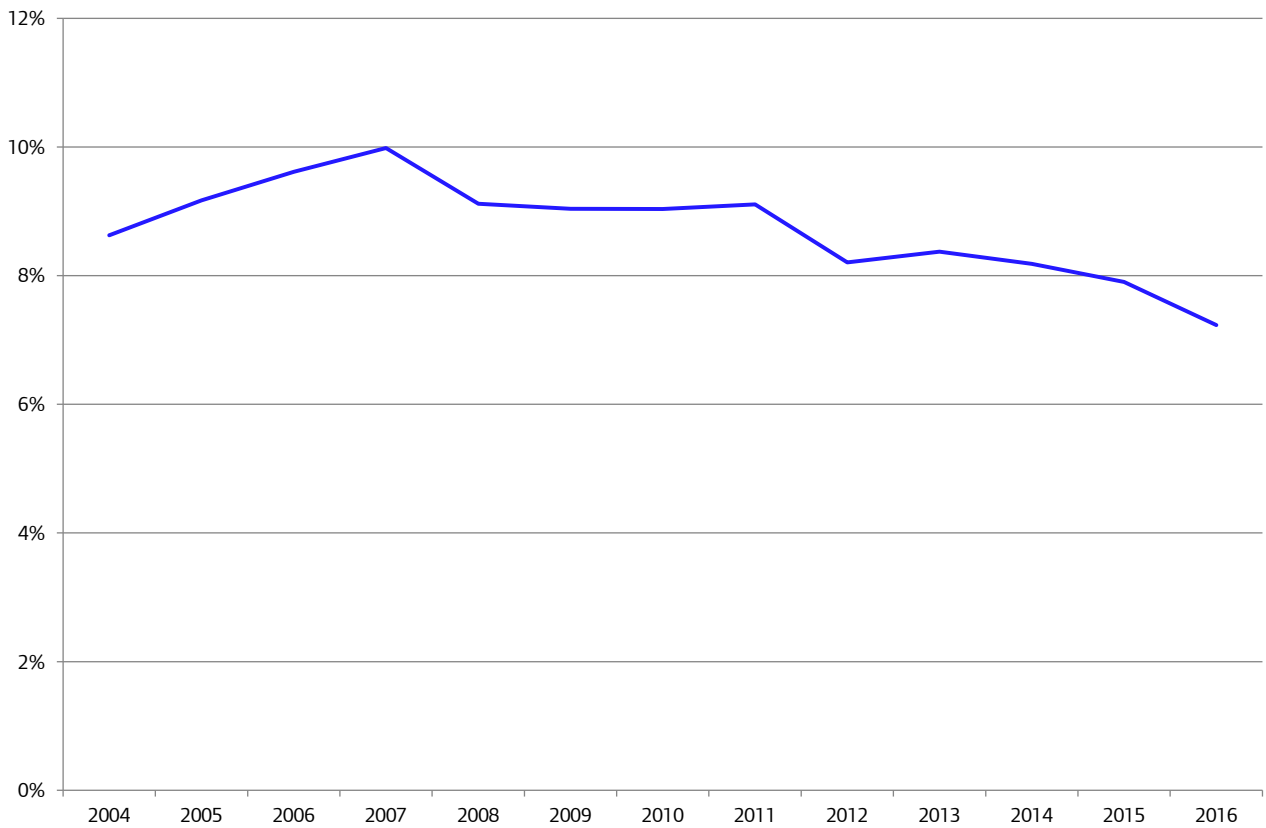
Now $G(E_L) = G(J_{LL}) = G(J_{NL})$ (3), if J_{LL}/E_L is constant over time. This is equivalent to saying that J_{NL}/E_L is also constant over time, i.e. the proportion of Londoners employed who fill jobs out of London is constant. Figure C1 shows that the share of jobs filled by Londoners working outside of London (out-commuting) has been relatively constant, although it appears to have declined slightly in the recent history³³.

Similarly $G(J_L) = G(J_{LL}) = G(J_{LN})$, (4) if J_{LL}/J_L or equivalently J_{LN}/J_L is constant over time. Note J_{LN}/J_L is the proportion of jobs in London that are filled by non-Londoners commuting into London. Figure C2 shows the share of jobs in London filled by those in-commuting. Again, apart from a slight dip in 2005, this share has indeed been relatively constant over time.

If both equations (3) and (4) above hold it follows that since both $G(E_L)$ and $G(J_L)$ equal $G(J_{LL})$ then $G(E_L)$ and $G(J_L)$ are also equal to each other. That is that the growth in employment in London on a workplace basis is equal to the growth in employment in London on a residence basis.

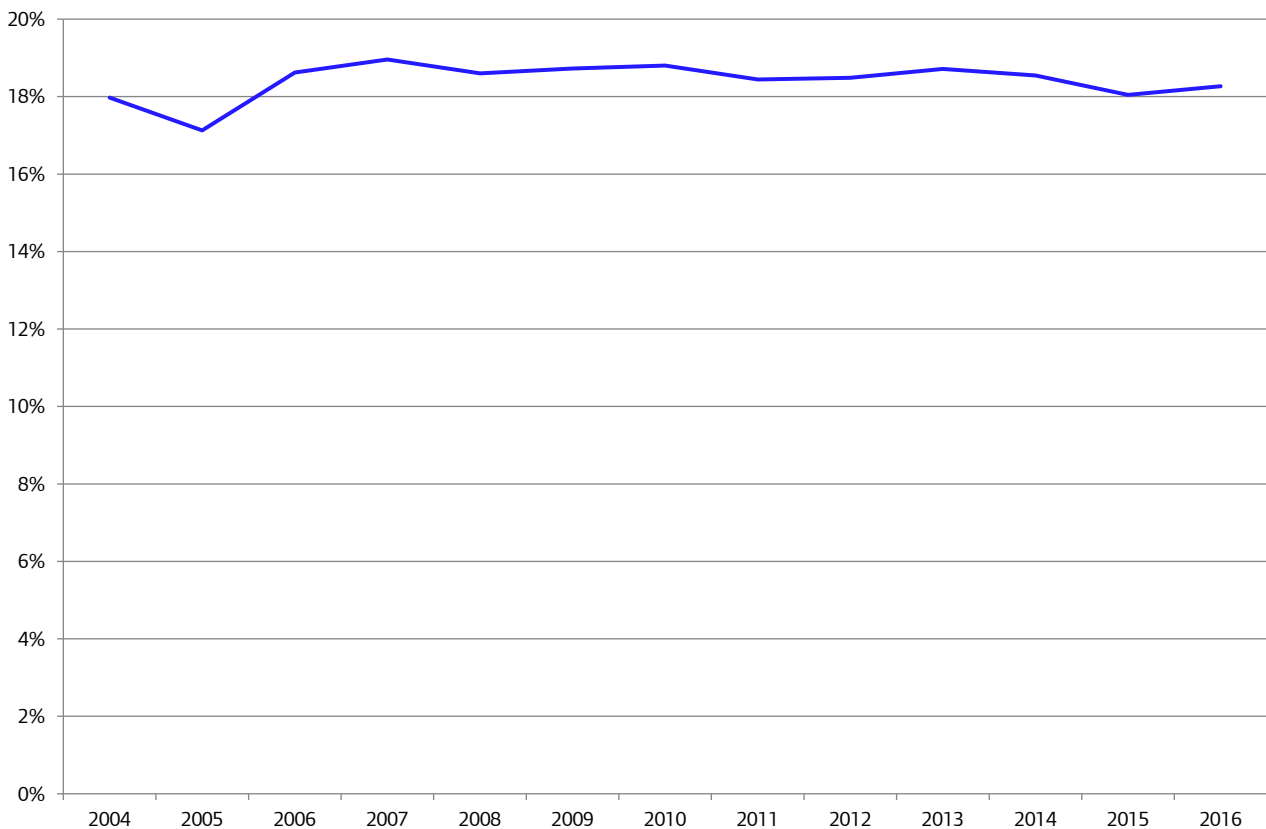
In other words, employment in London on a workplace basis can be estimated by estimating employment in London on a residence basis. The latter itself can be estimated by applying a projected employment rate to projections of London's population. For this, the working age employment rate is assumed as the average, 68.9%, of annual employment rates for 1993-2016. This is then applied to the working age population projection from the GLA 2016 round of demographic projections (trend-based population projections, long-term migration scenario)³⁴. Since the employment estimate has been confined to the working age population alone the results from this methodology may be considered a cautious alternative.

Figure C1: Jobs not in London filled by working age Londoners as a proportion of all working age people employed in London



Source: APS, January-December, ONS

Figure C2: Share of jobs in London filled by working age non-Londoners in-commuting



Source: APS, January-December, ONS

Appendix D: Historic sectoral employment charts

Figure D1: Log of primary and utilities employment as a proportion of total output in London, 1971-2016

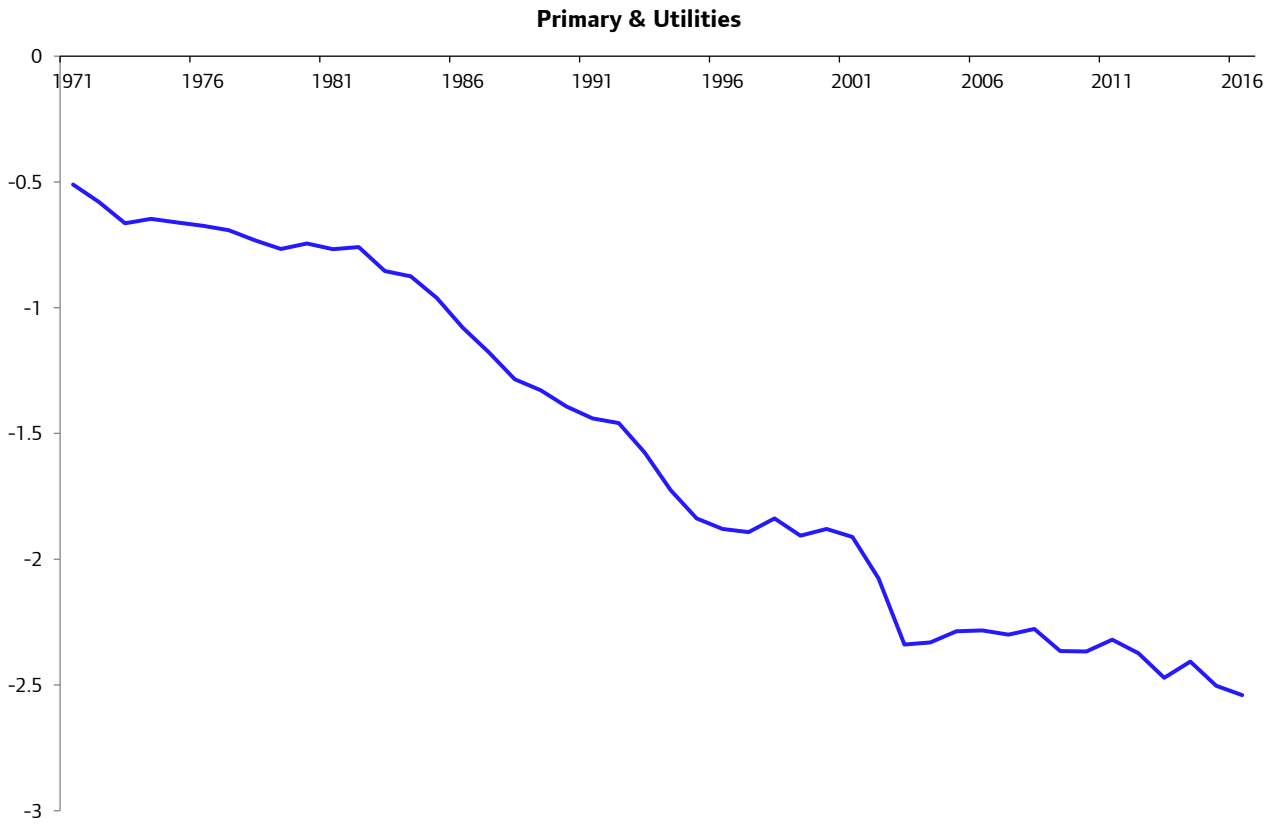


Figure D2: Log of manufacturing employment as a proportion of total output in London, 1971-2016

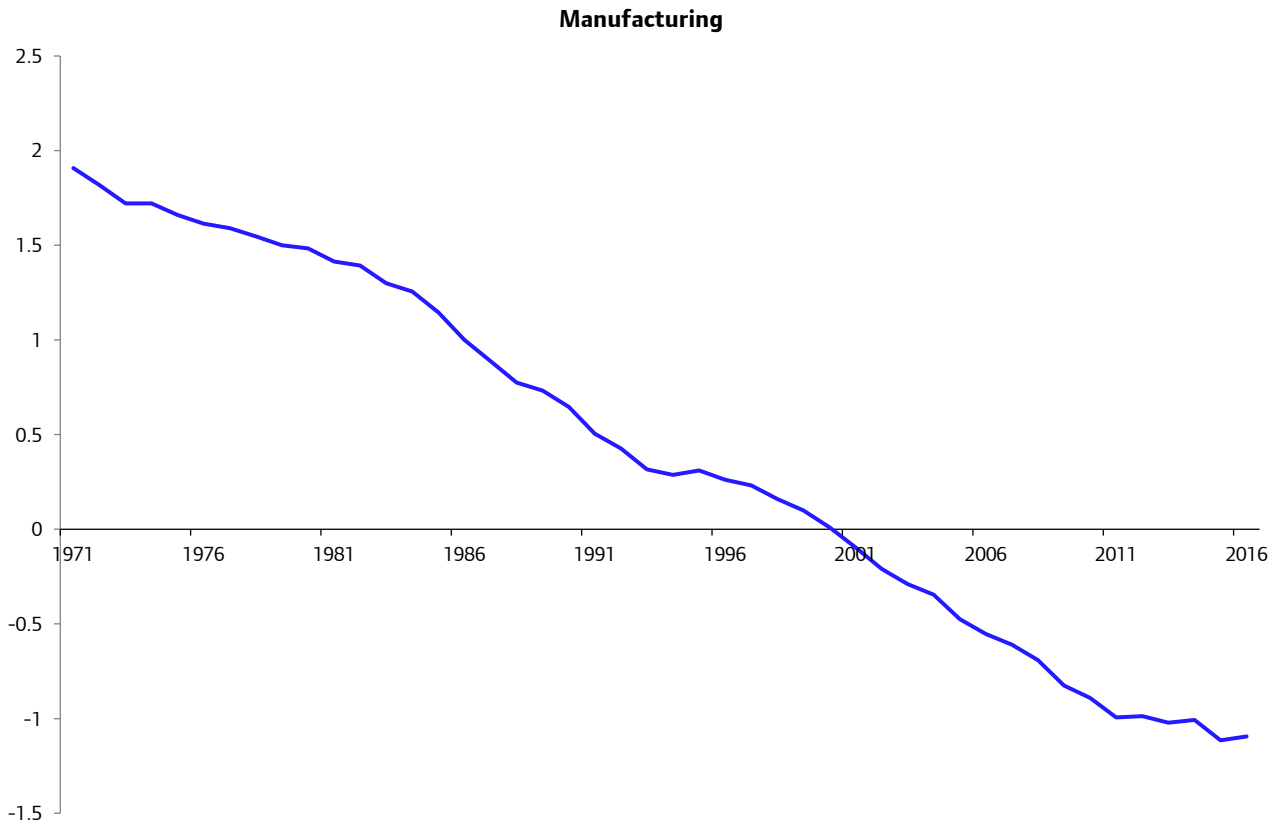


Figure D3: Log of construction employment as a proportion of total output in London, 1971-2016



Figure D4: Log of wholesale employment as a proportion of total output in London, 1971-2016

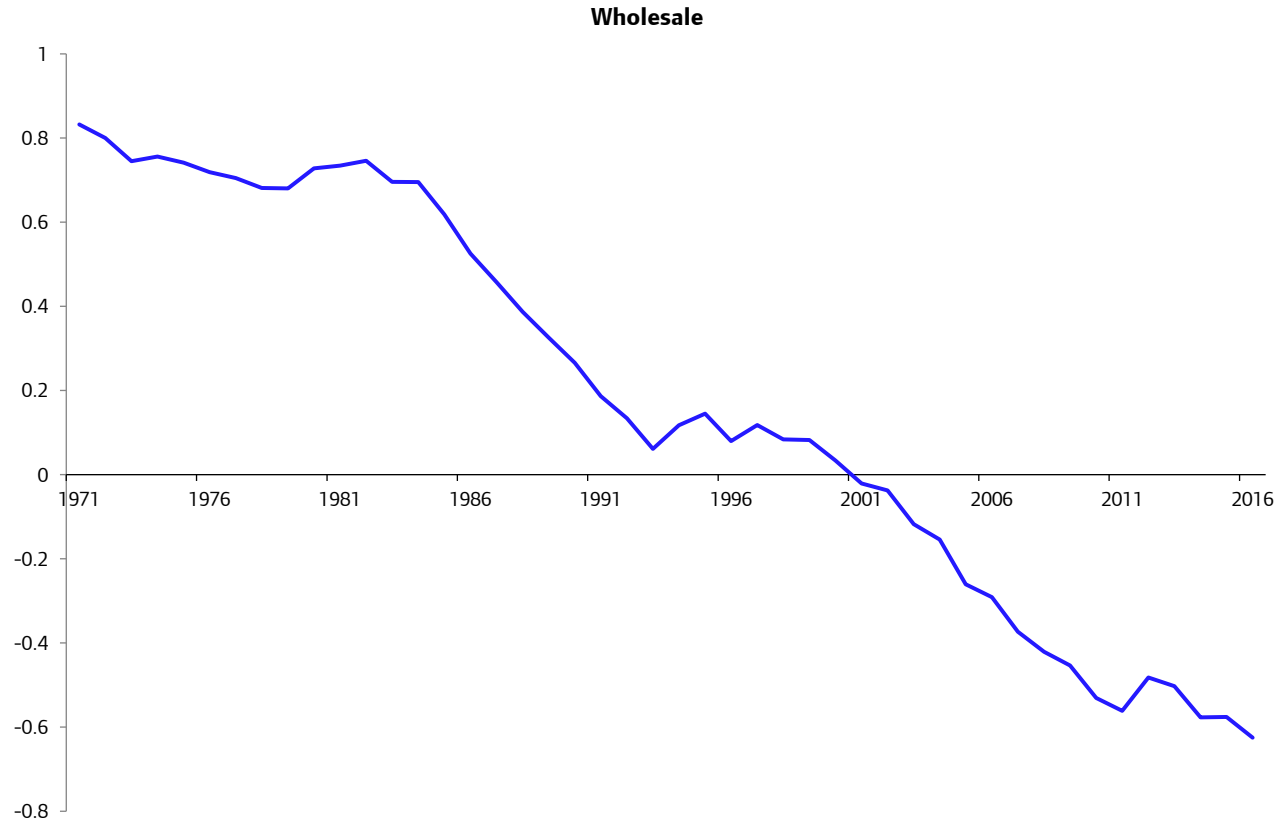


Figure D5: Log of retail employment as a proportion of total output in London, 1971-2016

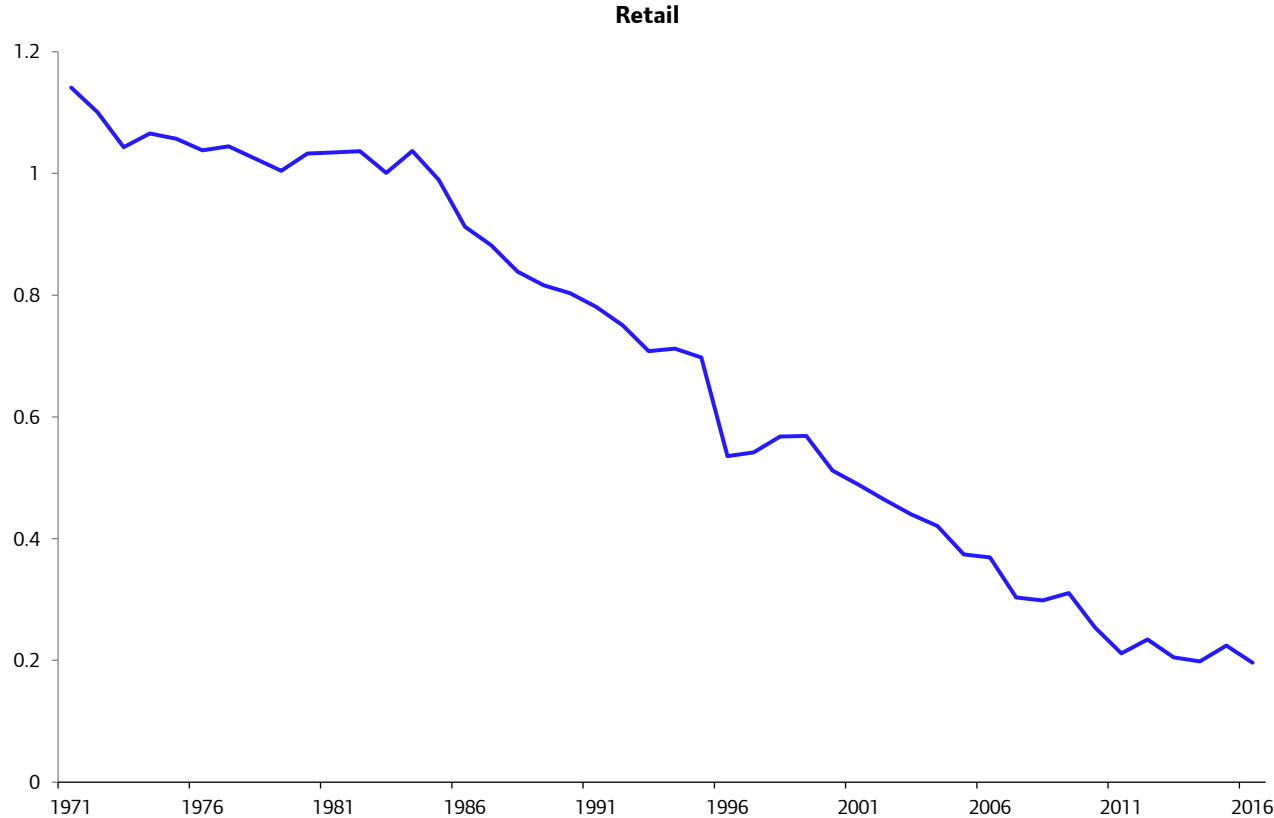


Figure D6: Log of transport and storage employment as a proportion of total output in London, 1971-2016

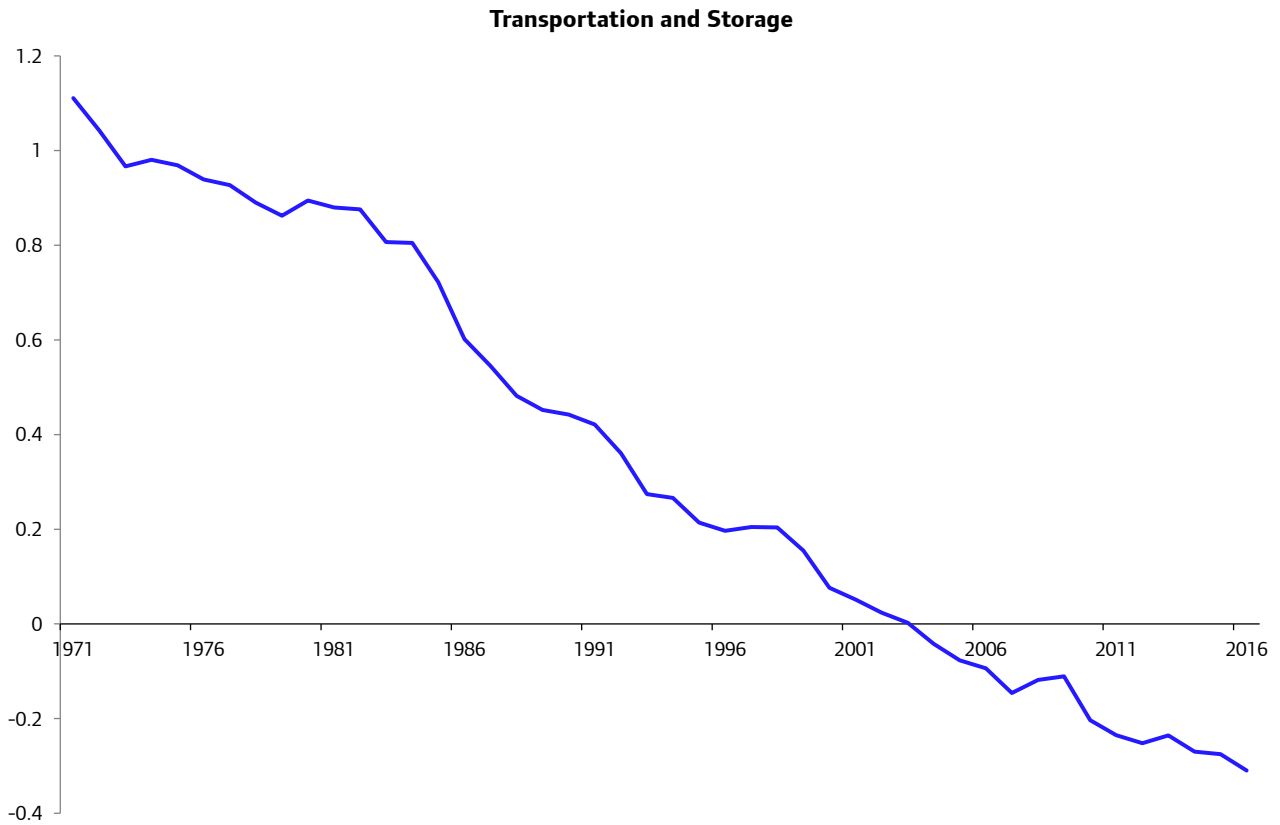


Figure D7: Log of accommodation and food service activities employment as a proportion of total output in London, 1971-2016

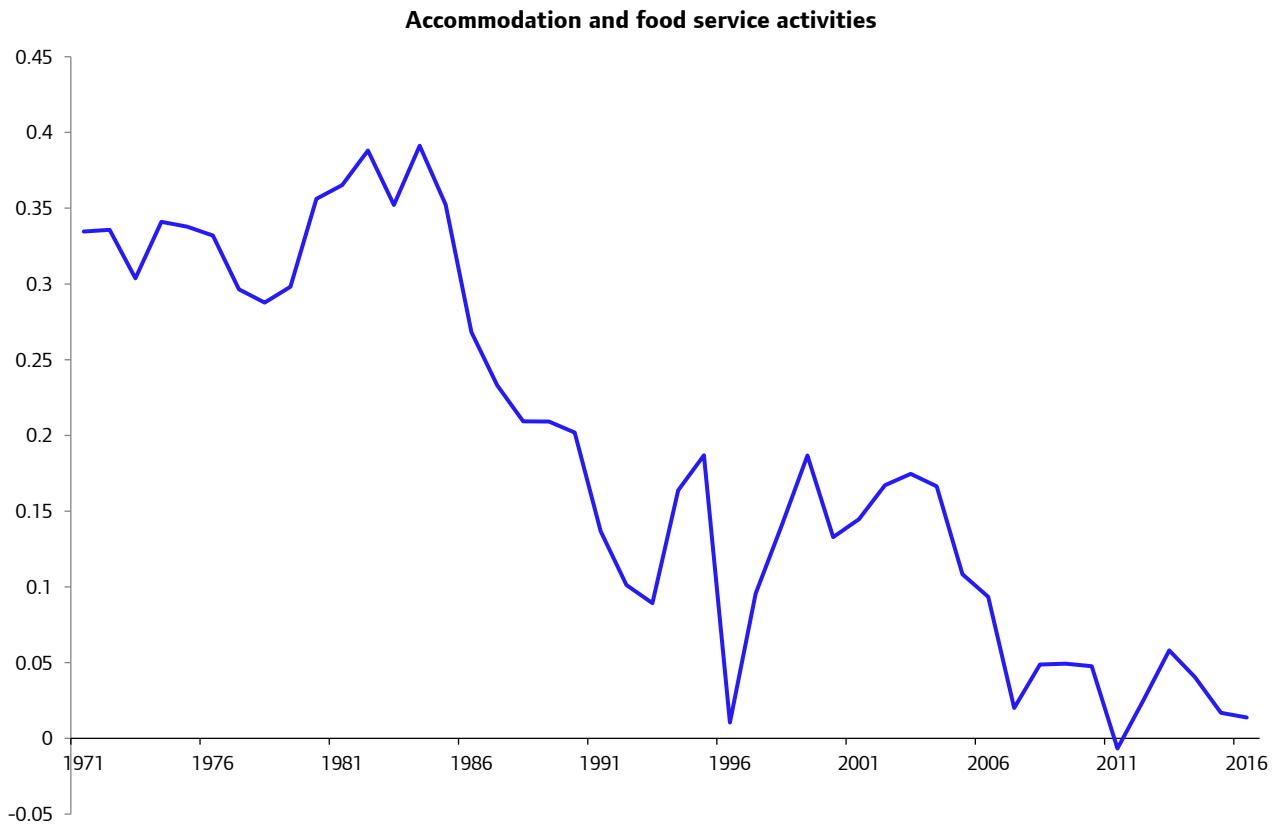


Figure D8: Log of information and communication employment as a proportion of total output in London, 1971-2016

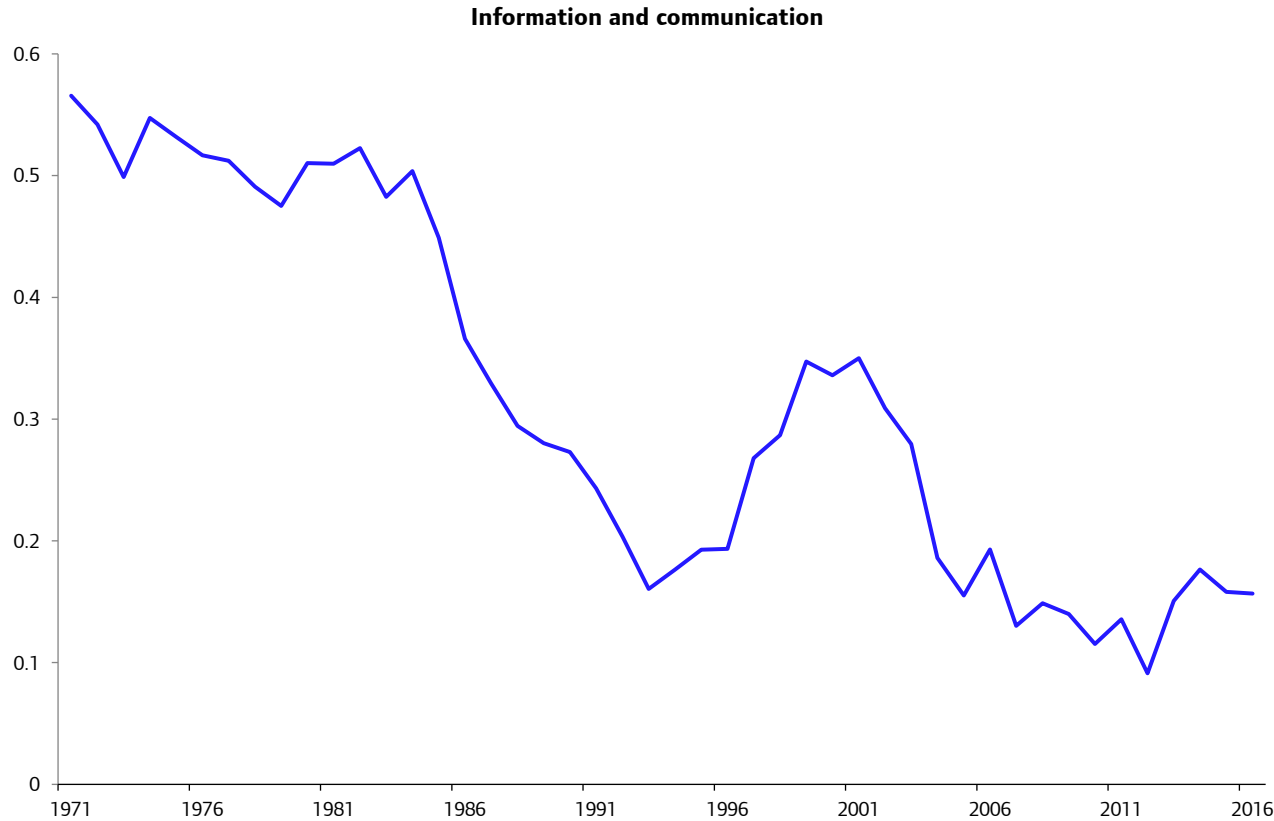


Figure D9: Log of financial and insurance activities employment as a proportion of total output in London, 1971-2016

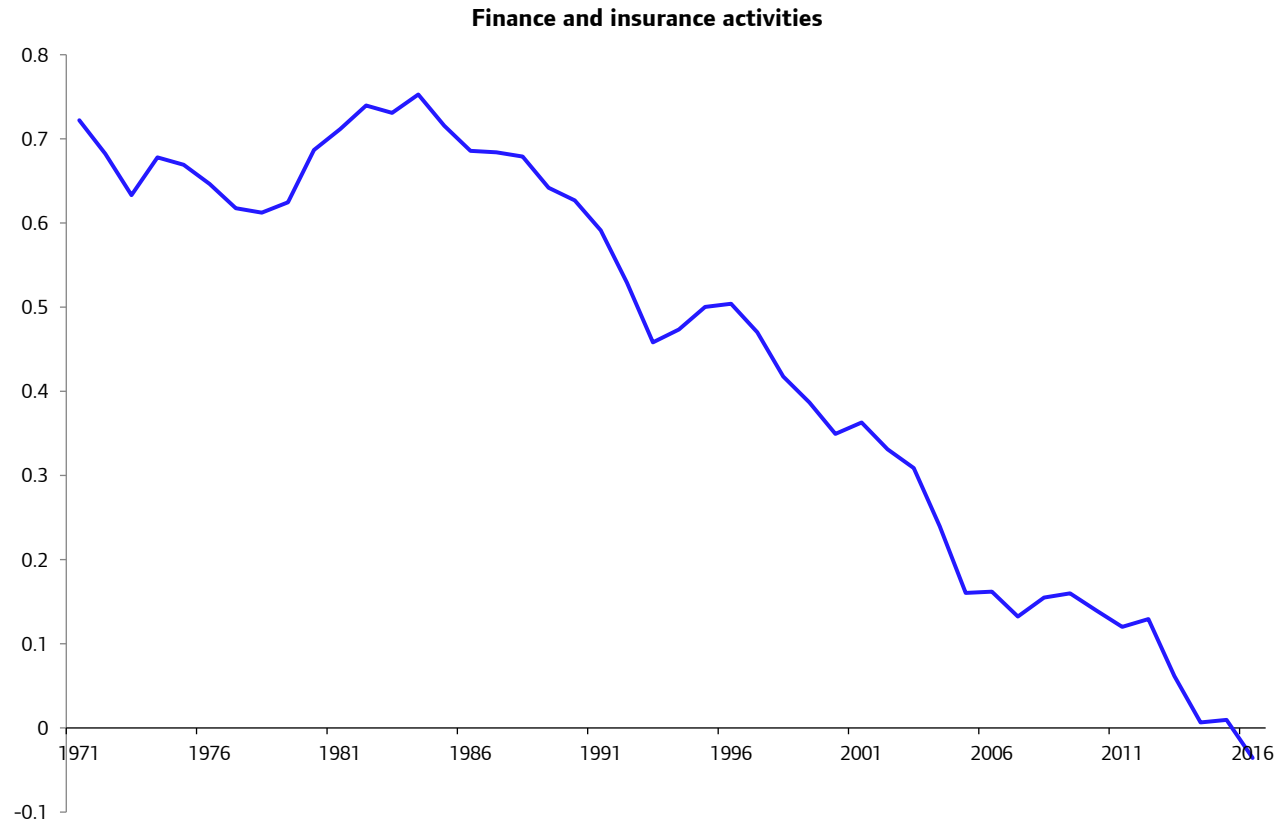


Figure D10: Log of professional, real estate, scientific and technical activities employment as a proportion of total output in London, 1971-2016

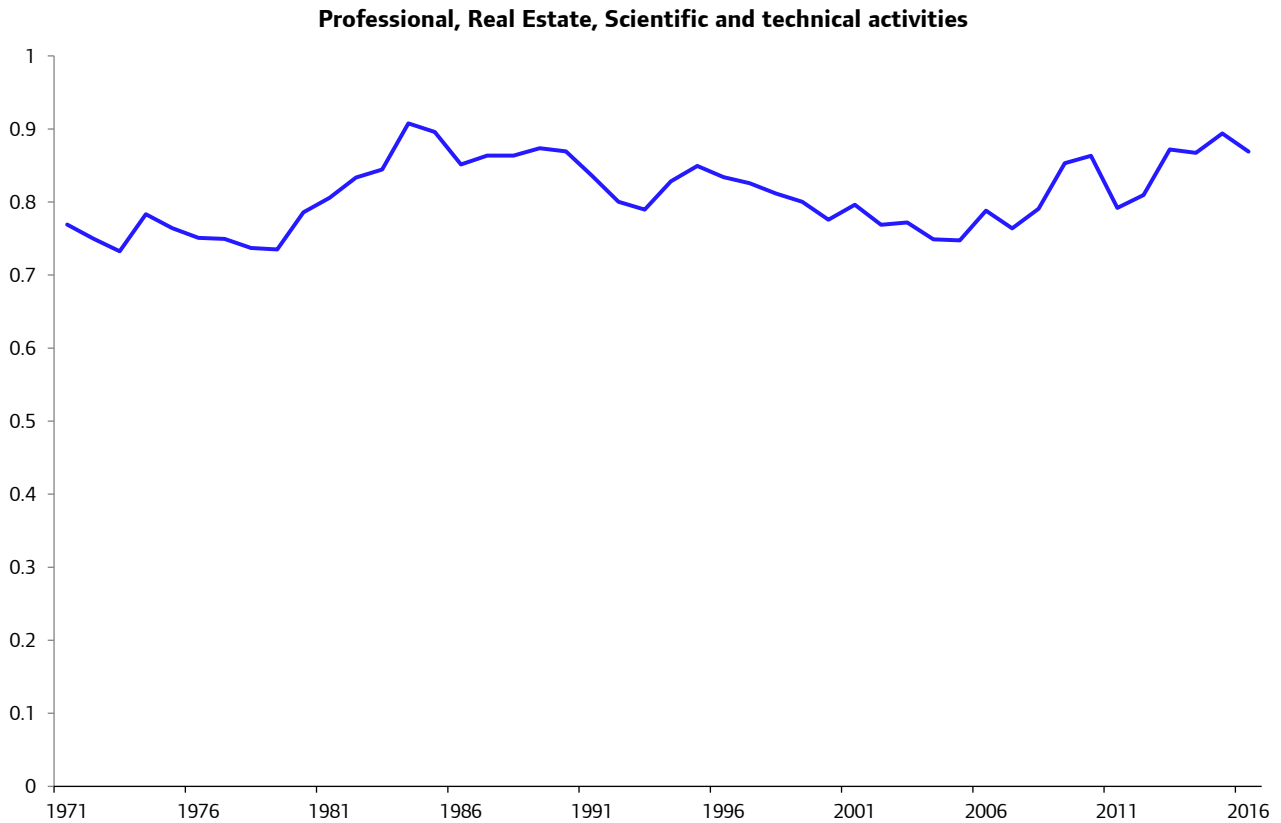


Figure D11: Log of administrative and support service activities employment as a proportion of total output in London, 1971-2016

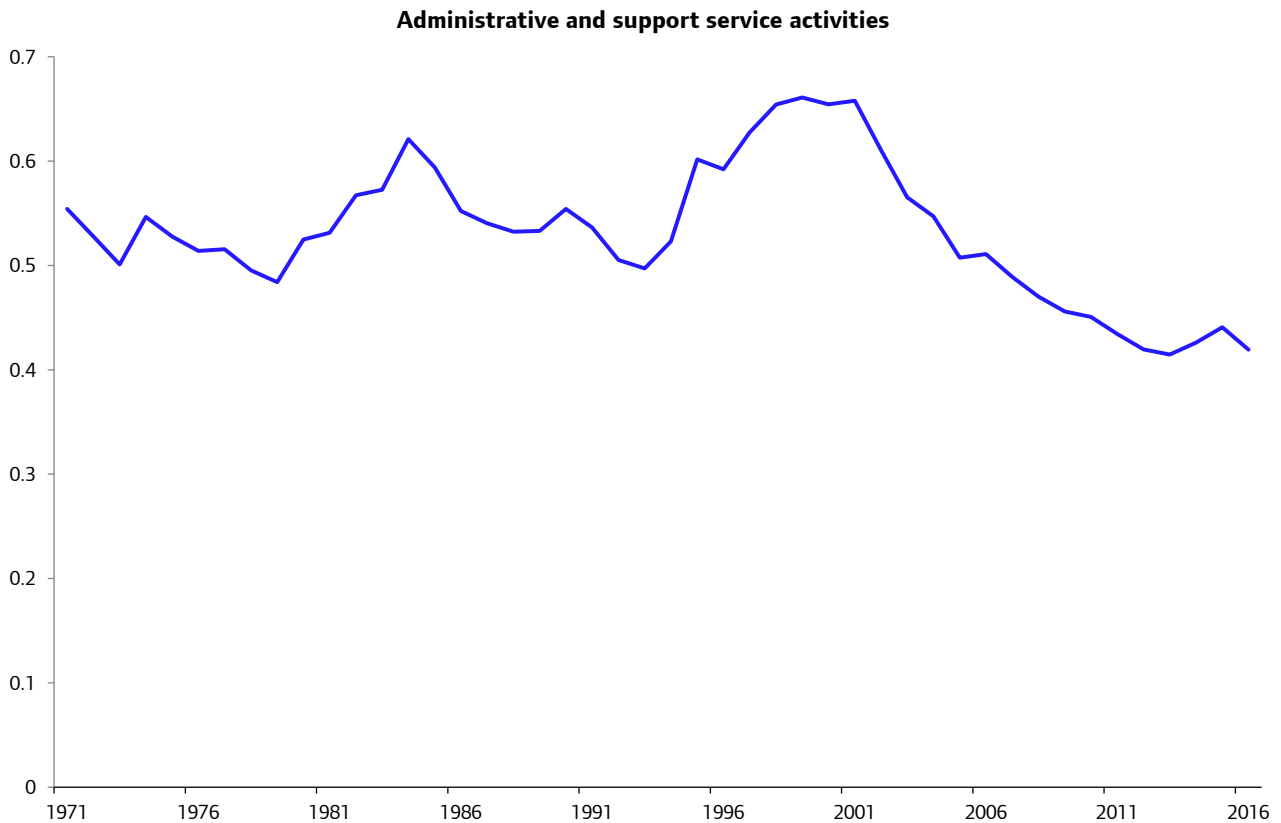


Figure D12: Log of public administration and defence employment as a proportion of total output in London, 1971-2016

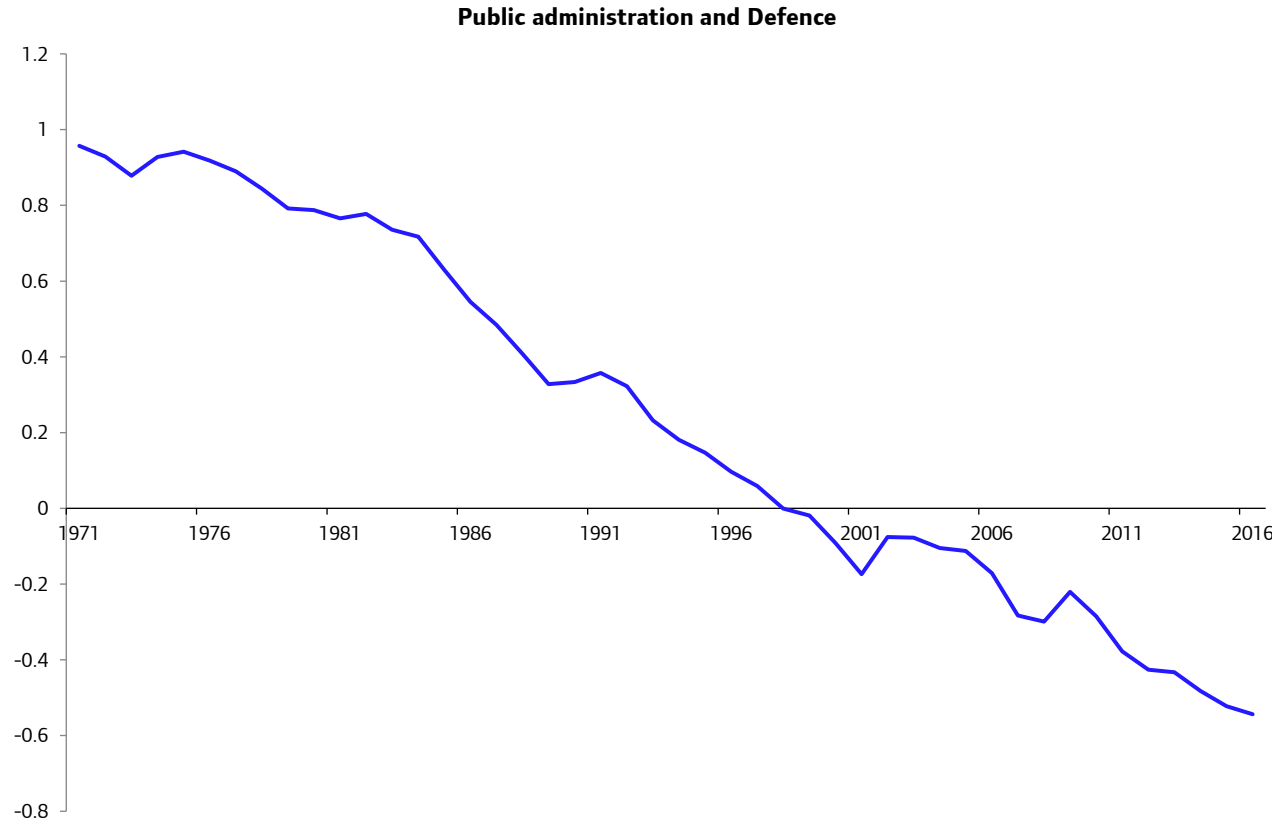


Figure D13: Log of education employment as a proportion of total output in London, 1971-2016

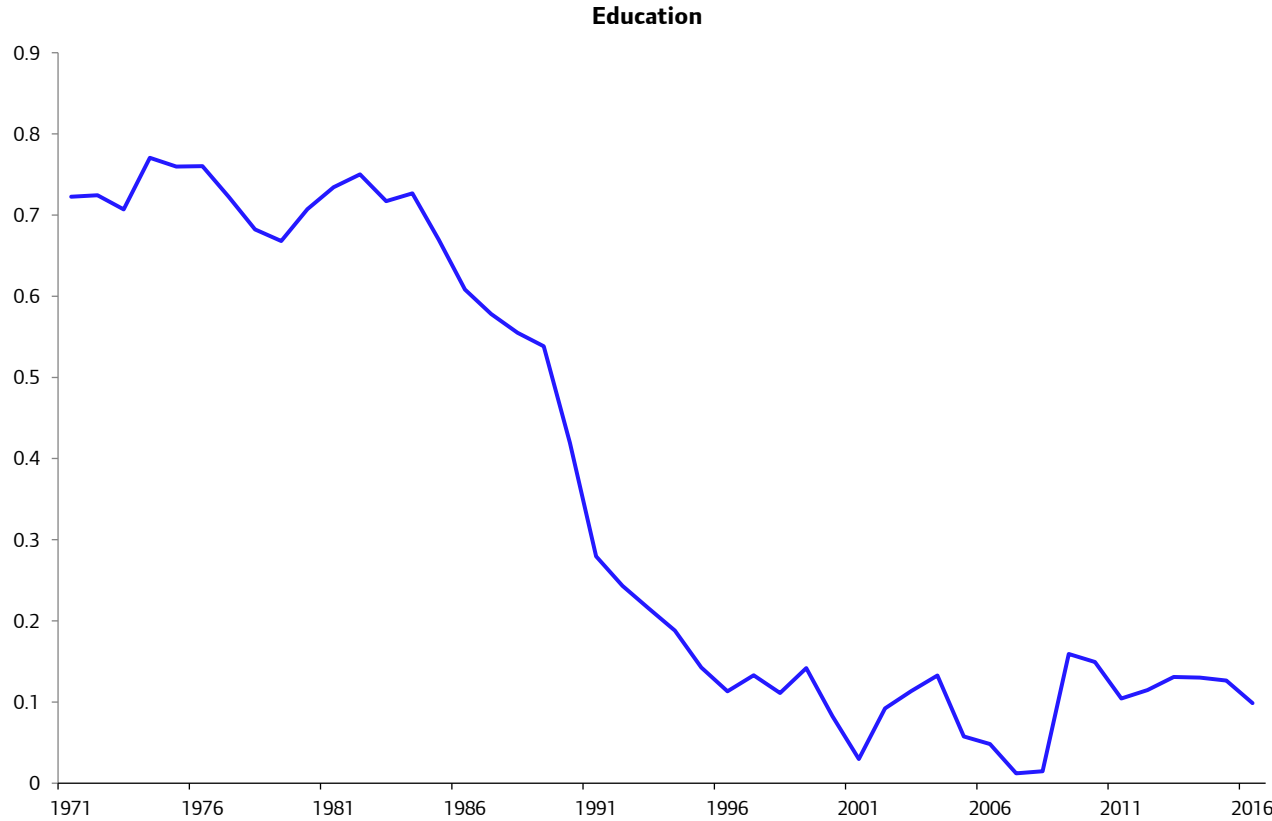


Figure D14: Log of health employment as a proportion of total output in London, 1971-2016

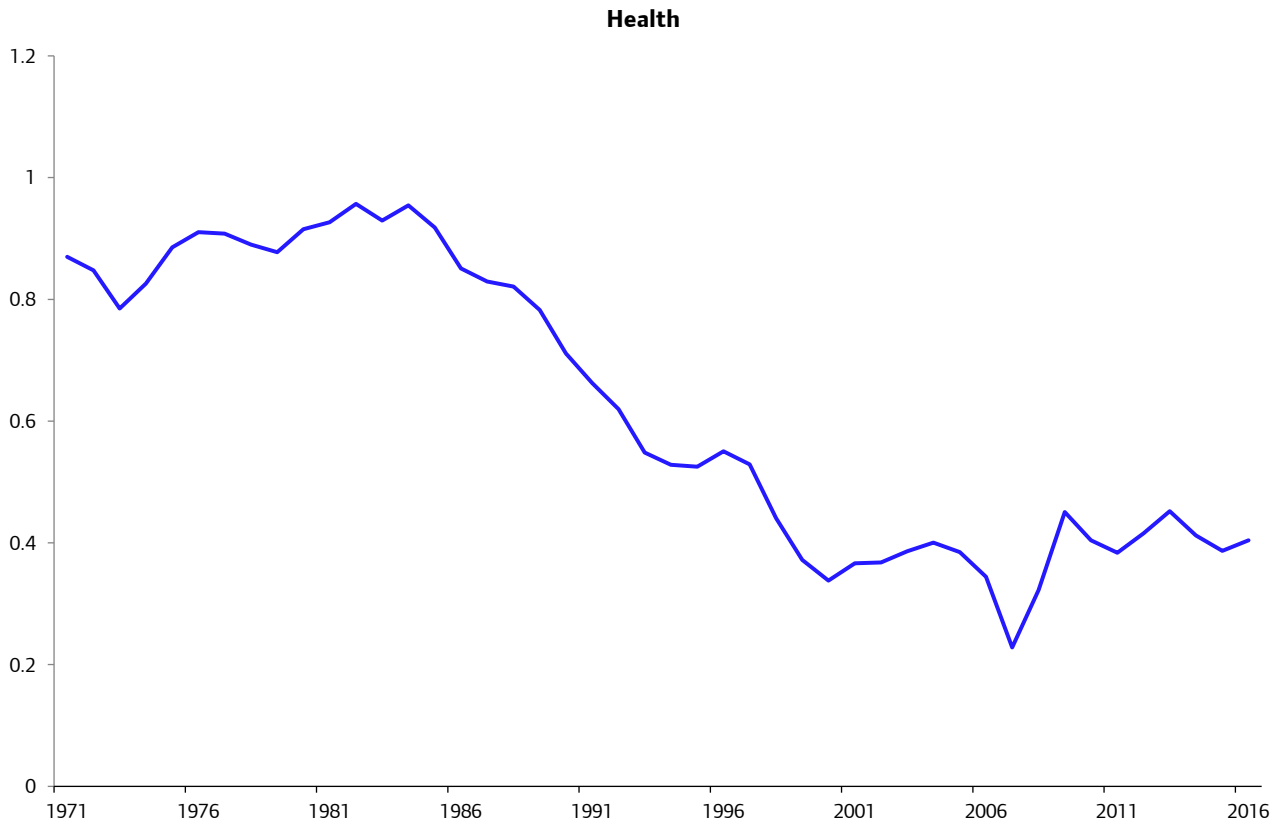


Figure D15: Log of arts, entertainment and recreation employment as a proportion of total output in London, 1971-2016

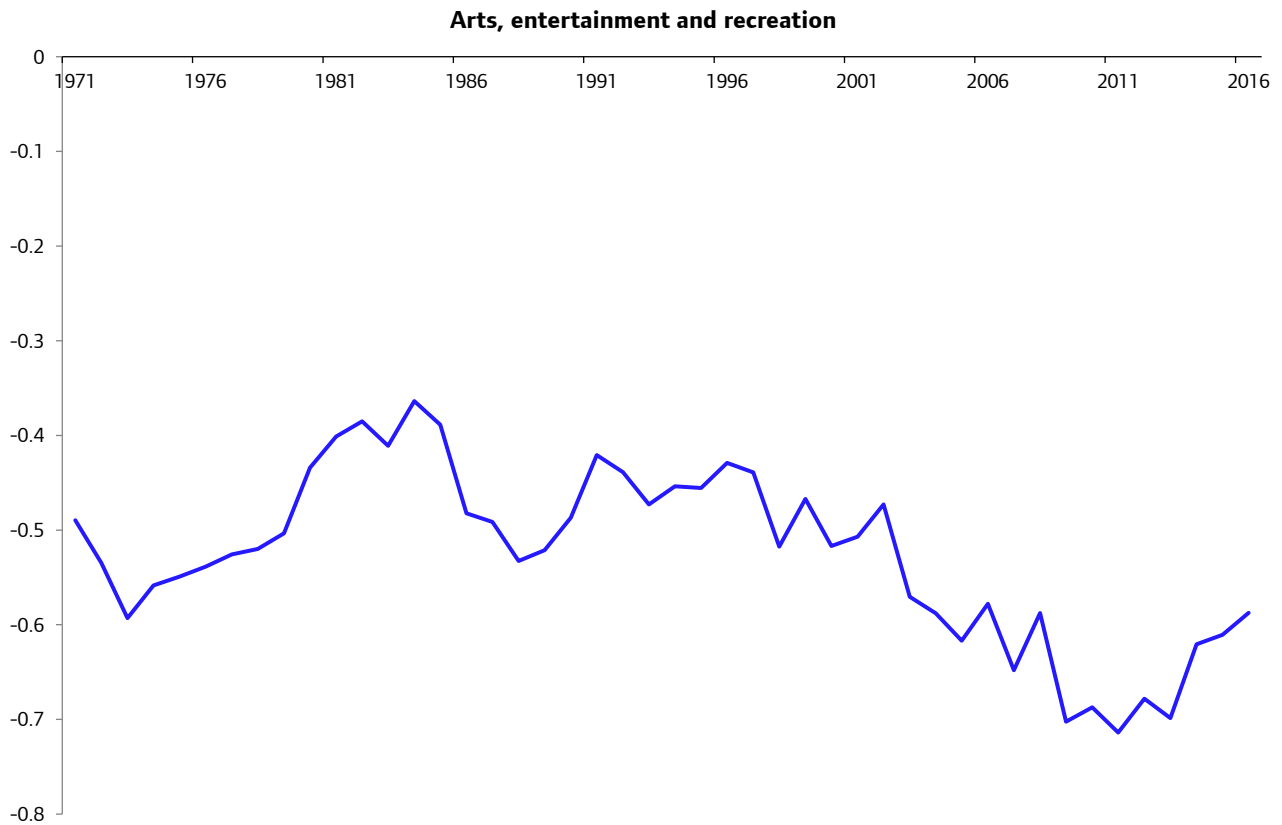
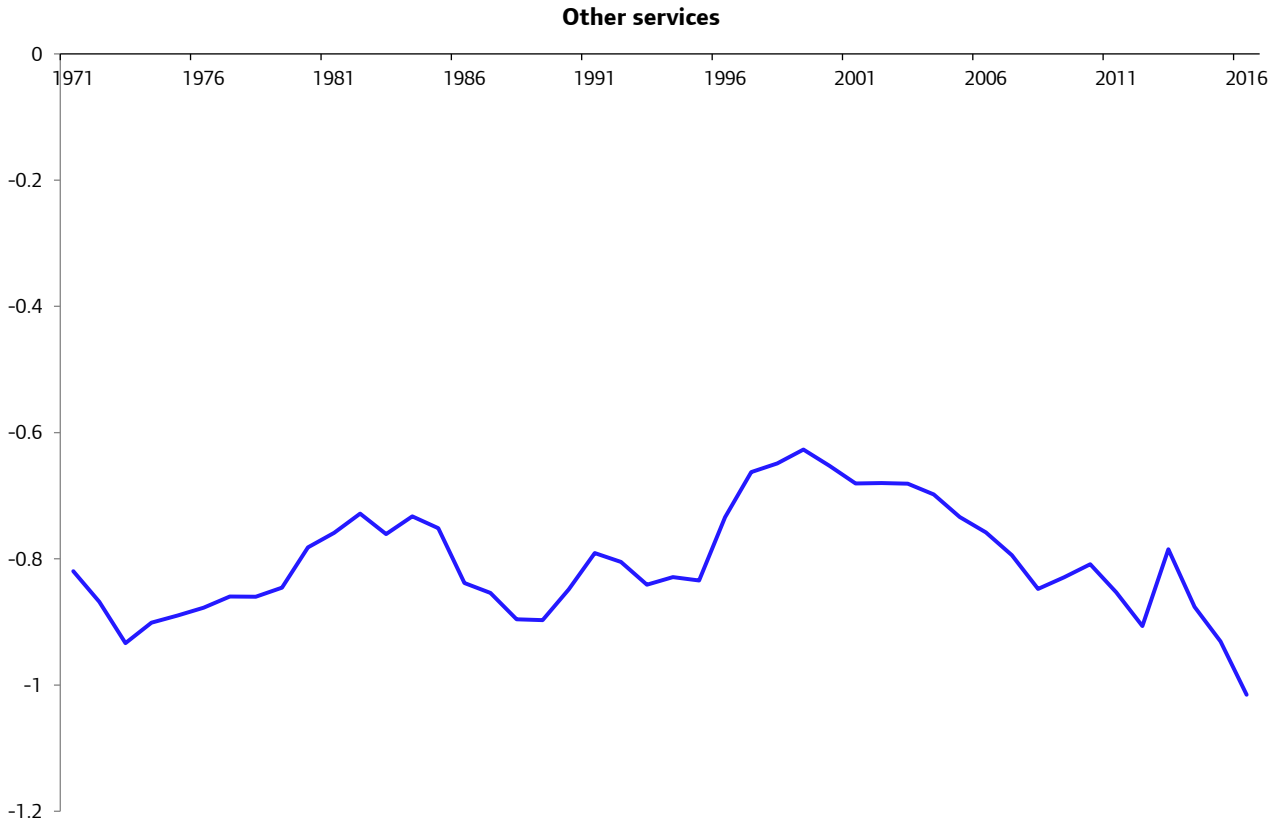


Figure D16: Log of other services employment as a proportion of total output in London, 1971-2016



Appendix E: Historic borough employment charts

Figure E1: Log of Barking & Dagenham employees as a proportion of total output in London, 1971-2015

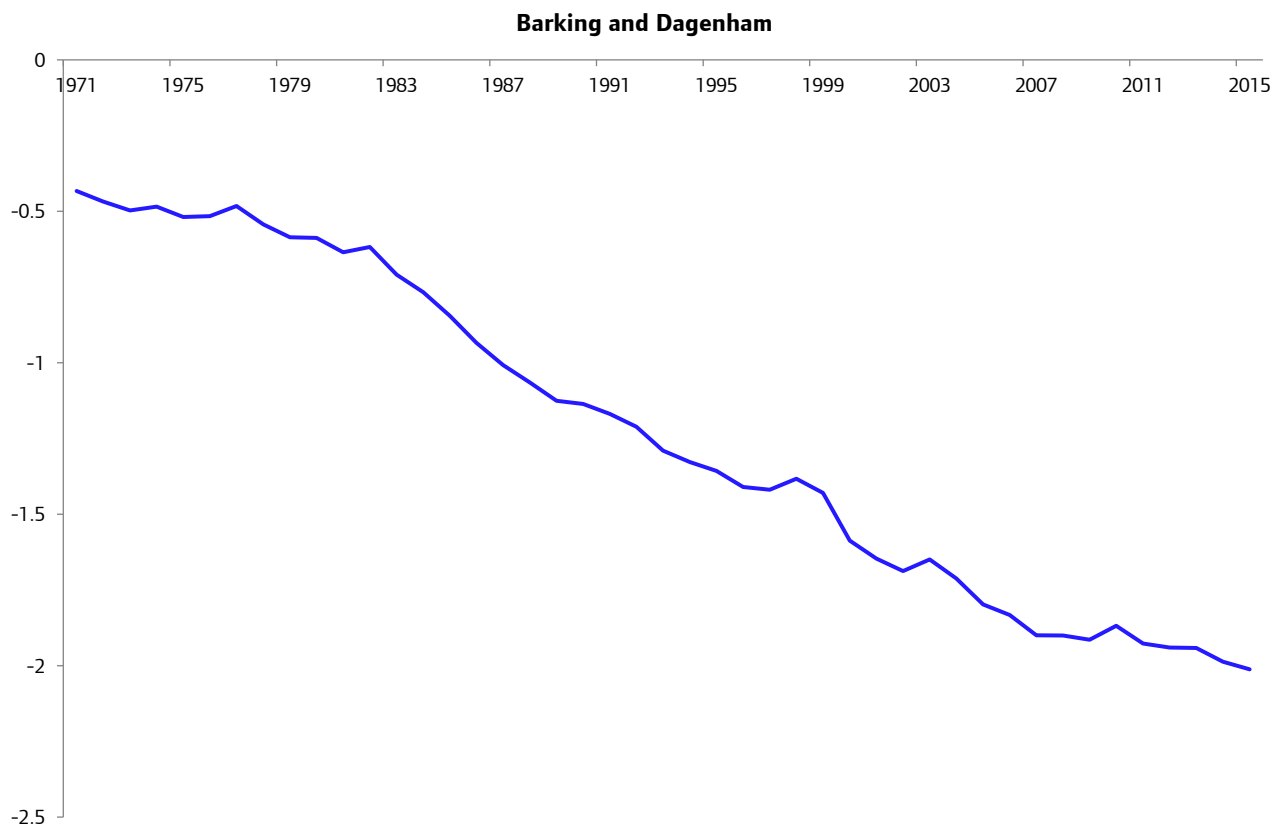


Figure E2: Log of Barnet employees as a proportion of total output in London, 1971-2015

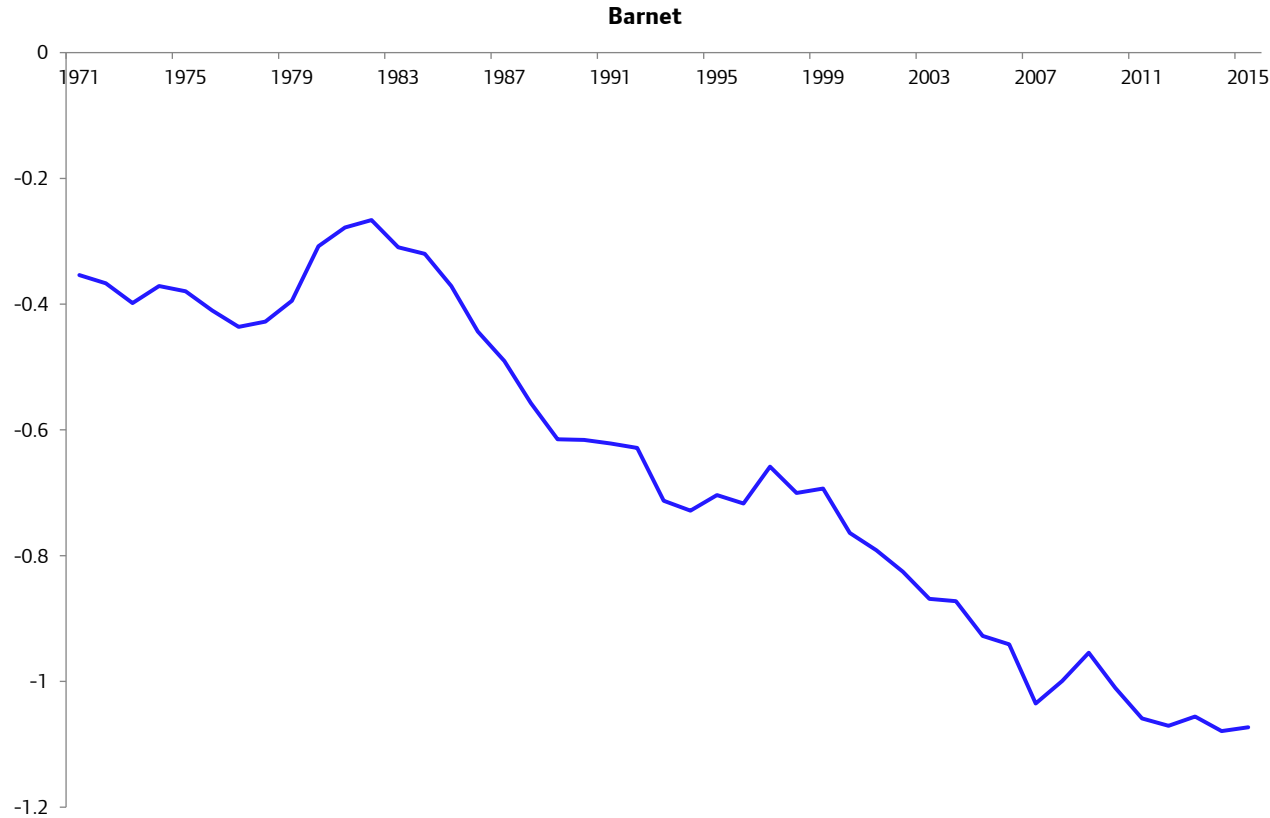


Figure E3: Log of Bexley employees as a proportion of total output in London, 1971-2015

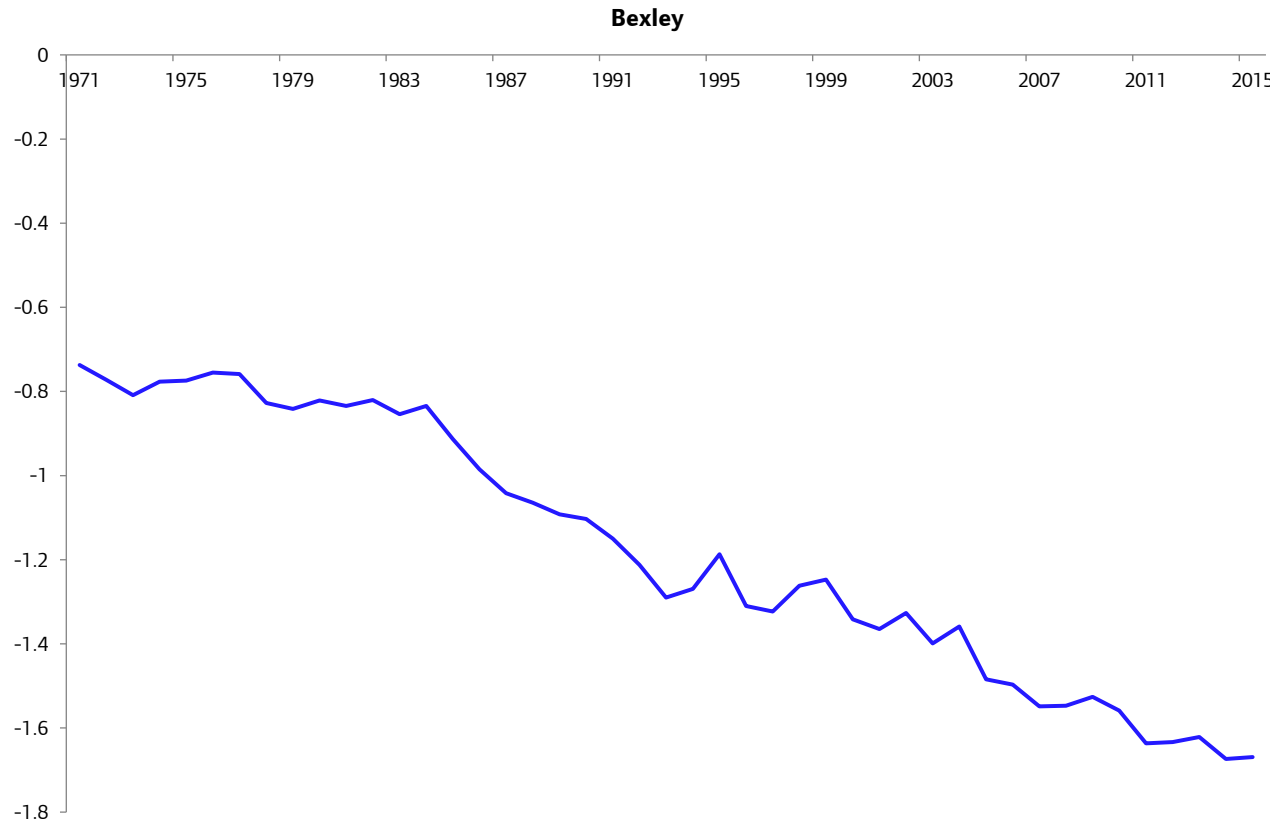


Figure E4: Log of Brent employees as a proportion of total output in London, 1971-2015

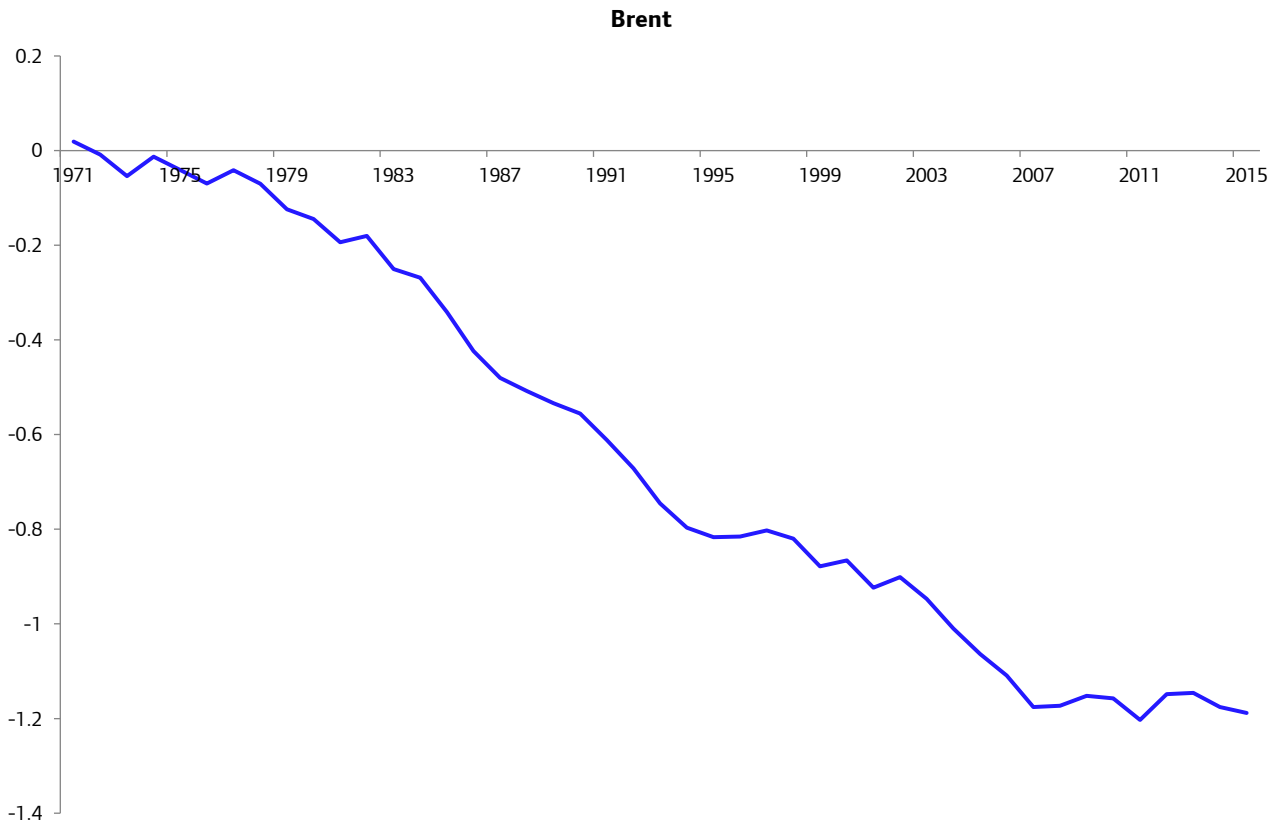


Figure E5: Log of Bromley employees as a proportion of total output in London, 1971-2015

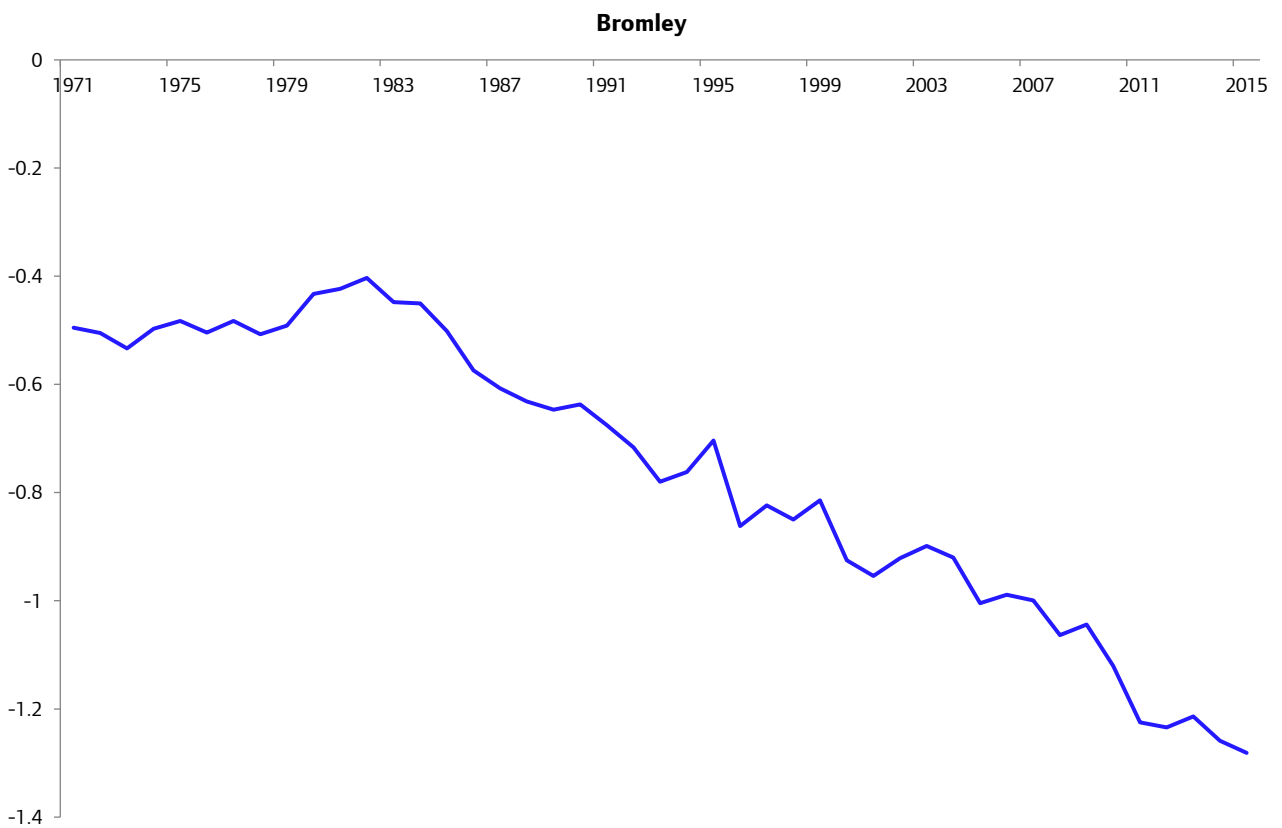


Figure E6: Log of Camden employees as a proportion of total output in London, 1971-2015

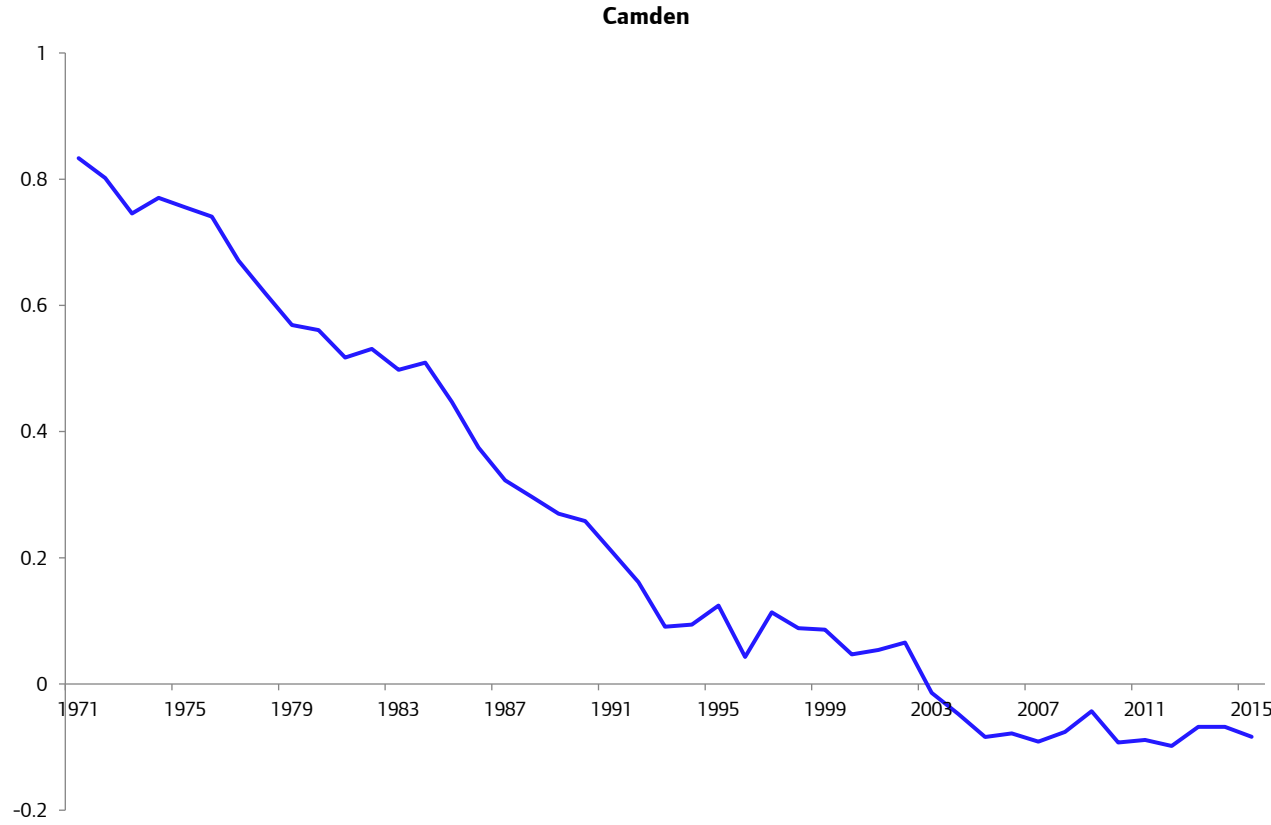


Figure E7: Log of City of London employees as a proportion of total output in London, 1971-2015

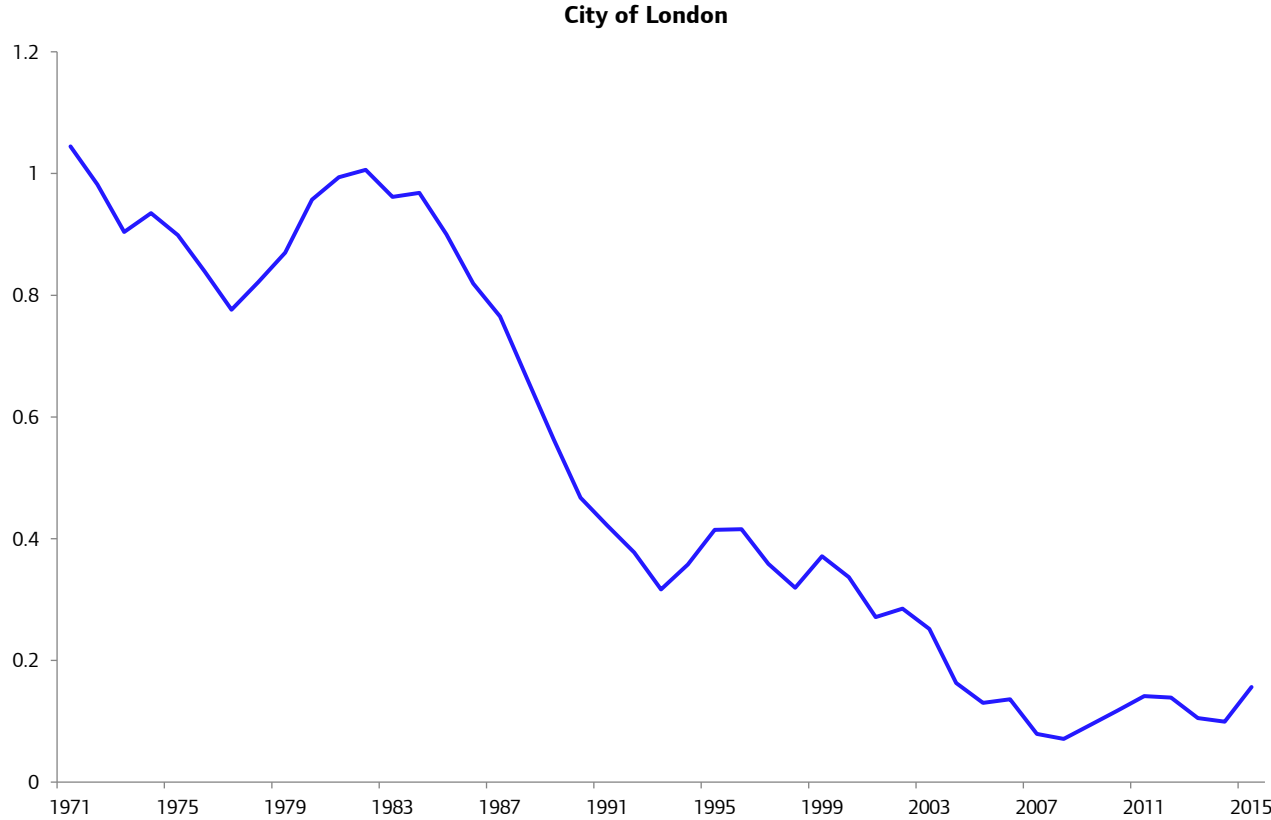


Figure E8: Log of Croydon employees as a proportion of total output in London, 1971-2015

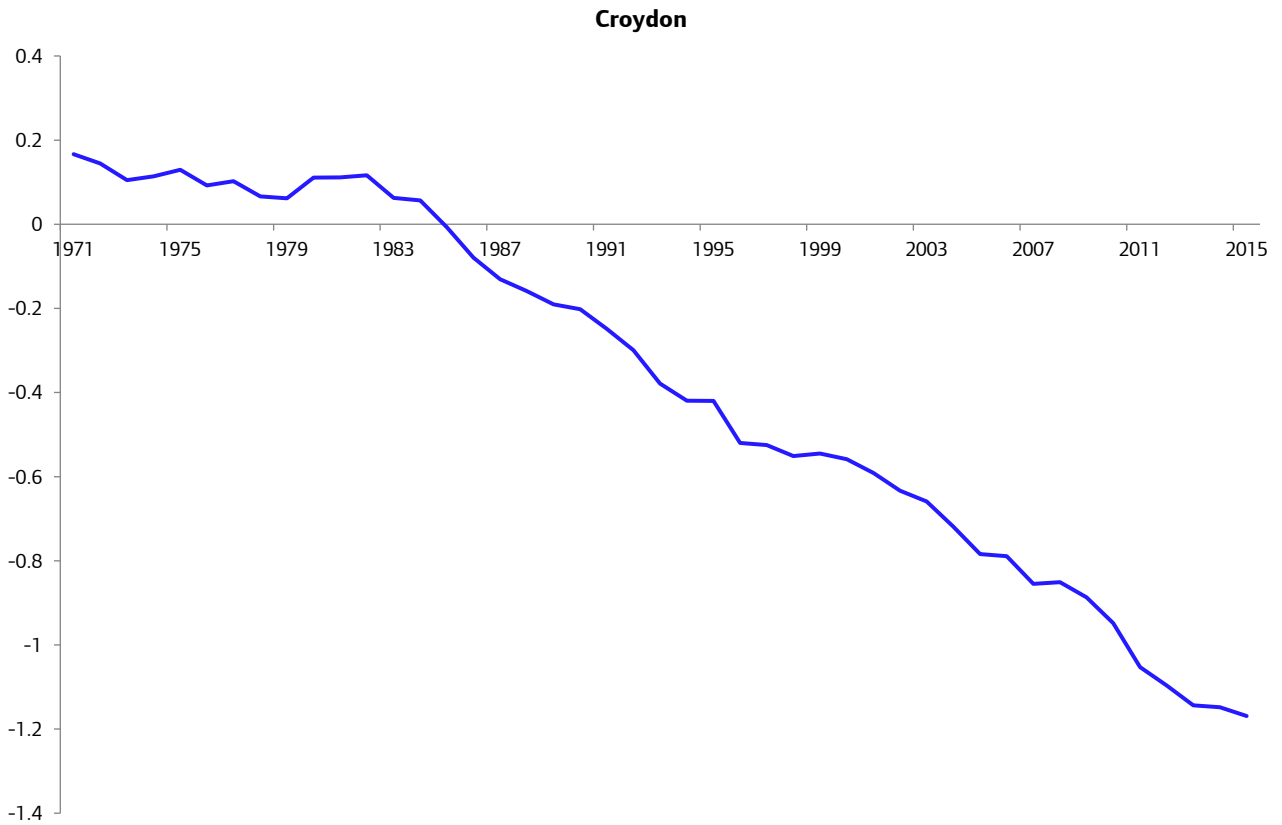


Figure E9: Log of Ealing employees as a proportion of total output in London, 1971-2015

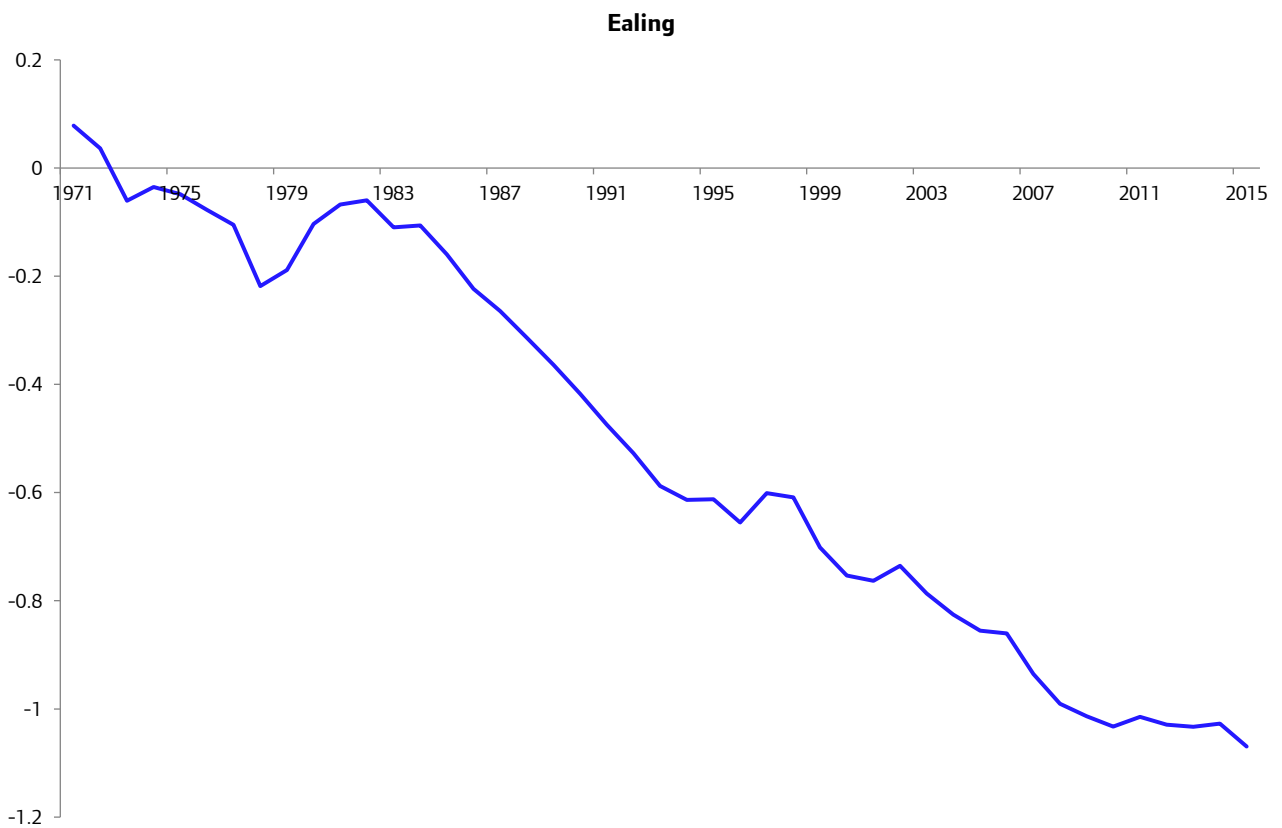


Figure E10: Log of Enfield employees as a proportion of total output in London, 1971-2015

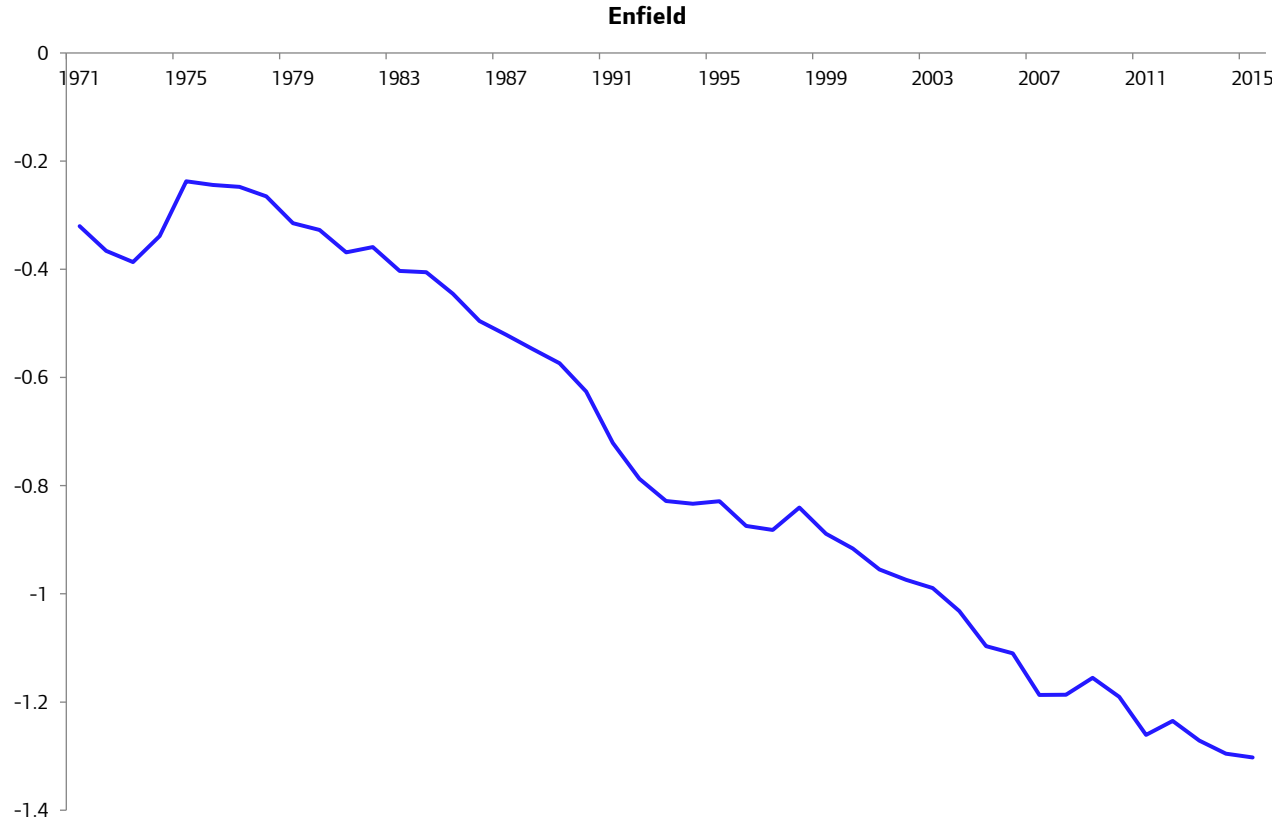


Figure E11: Log of Greenwich employees as a proportion of total output in London, 1971-2015

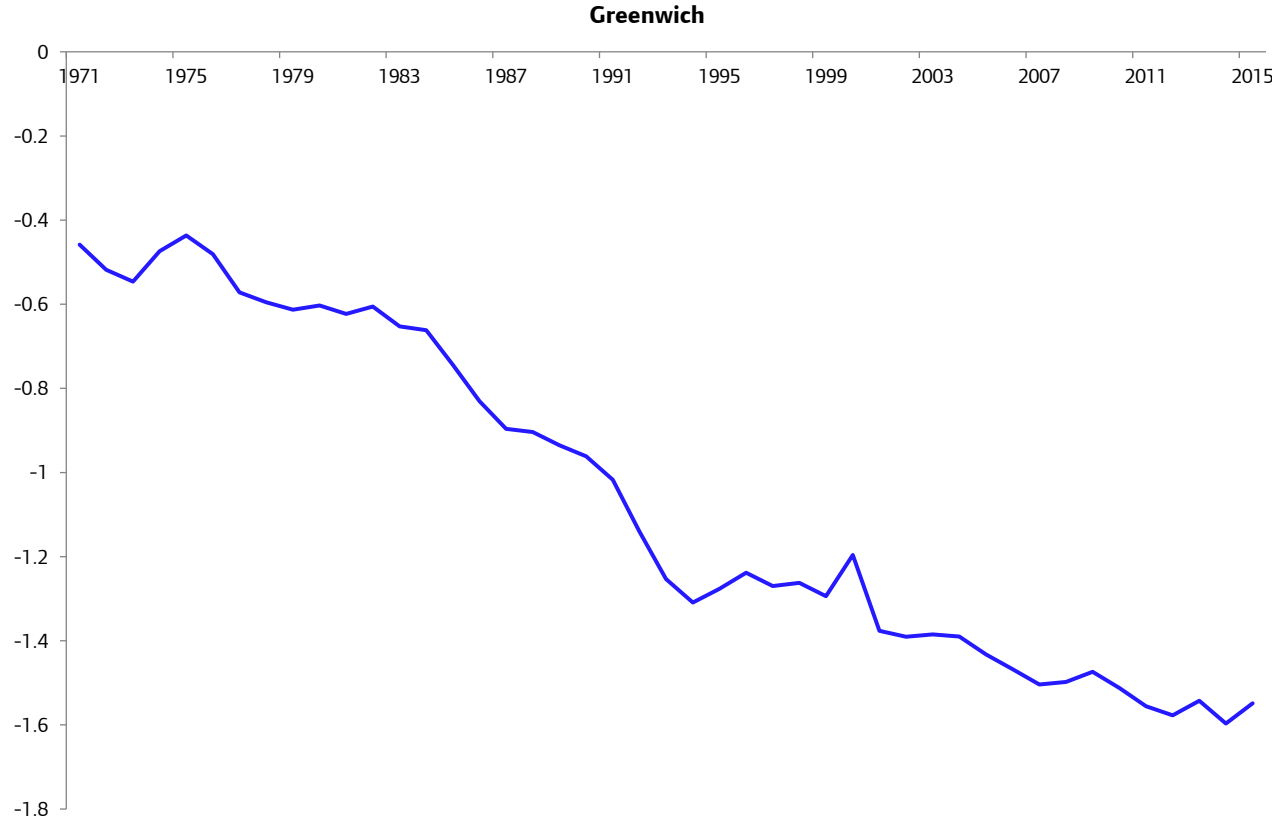


Figure E12: Log of Hackney employees as a proportion of total output in London, 1971-2015

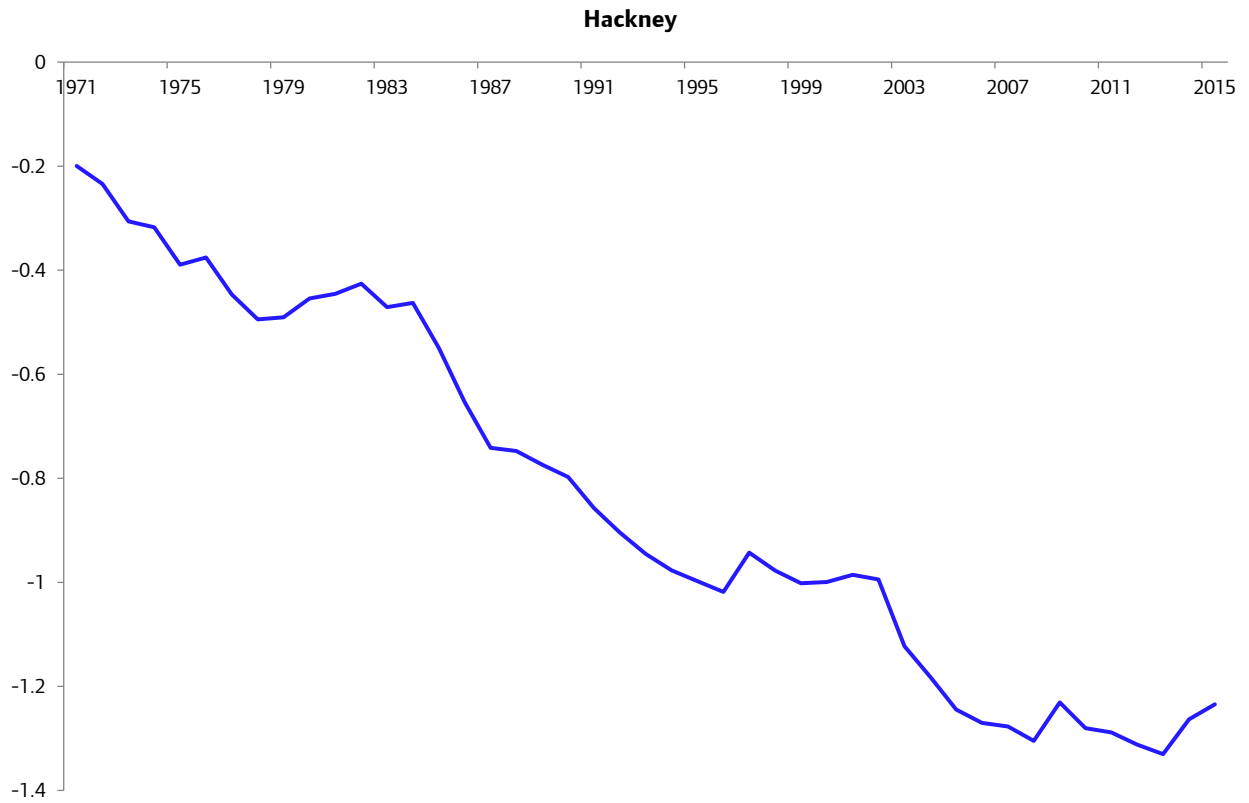


Figure E13: Log of Hammersmith and Fulham employees as a proportion of total output in London, 1971-2015

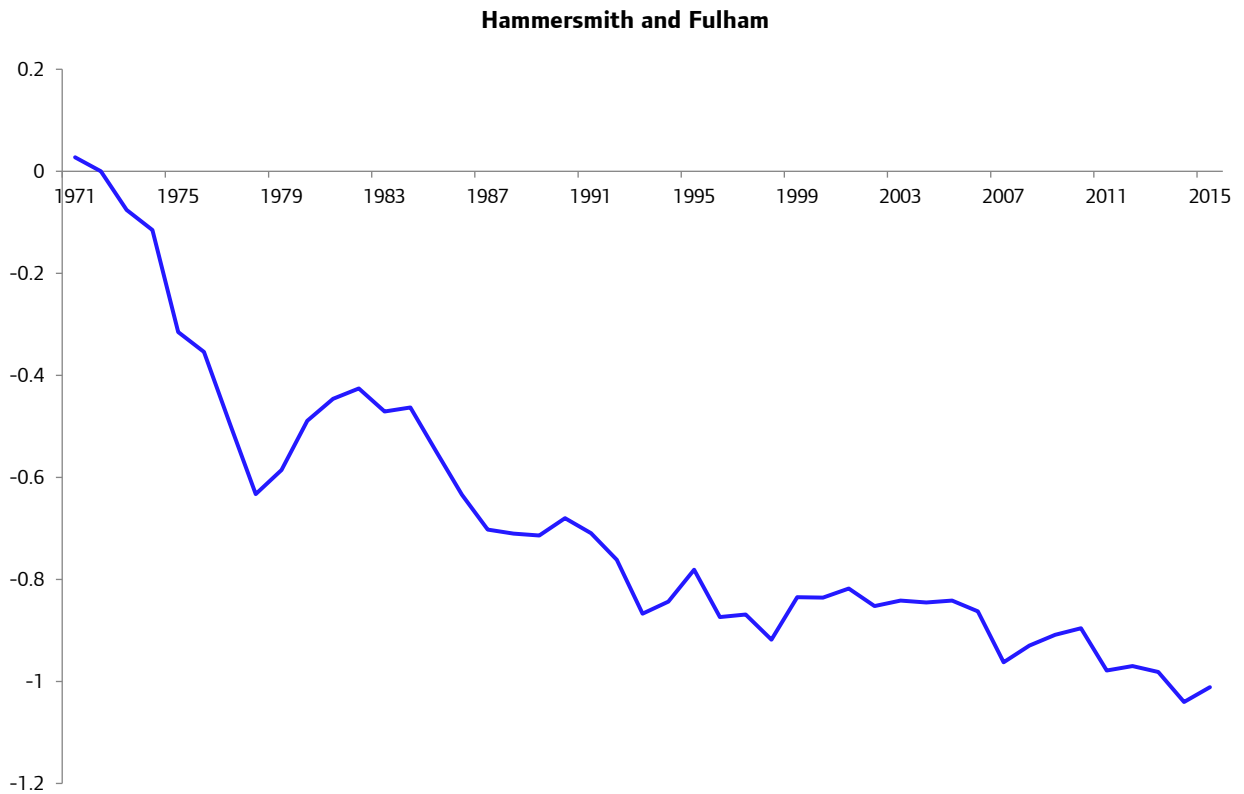


Figure E14: Log of Haringey employees as a proportion of total output in London, 1971-2015

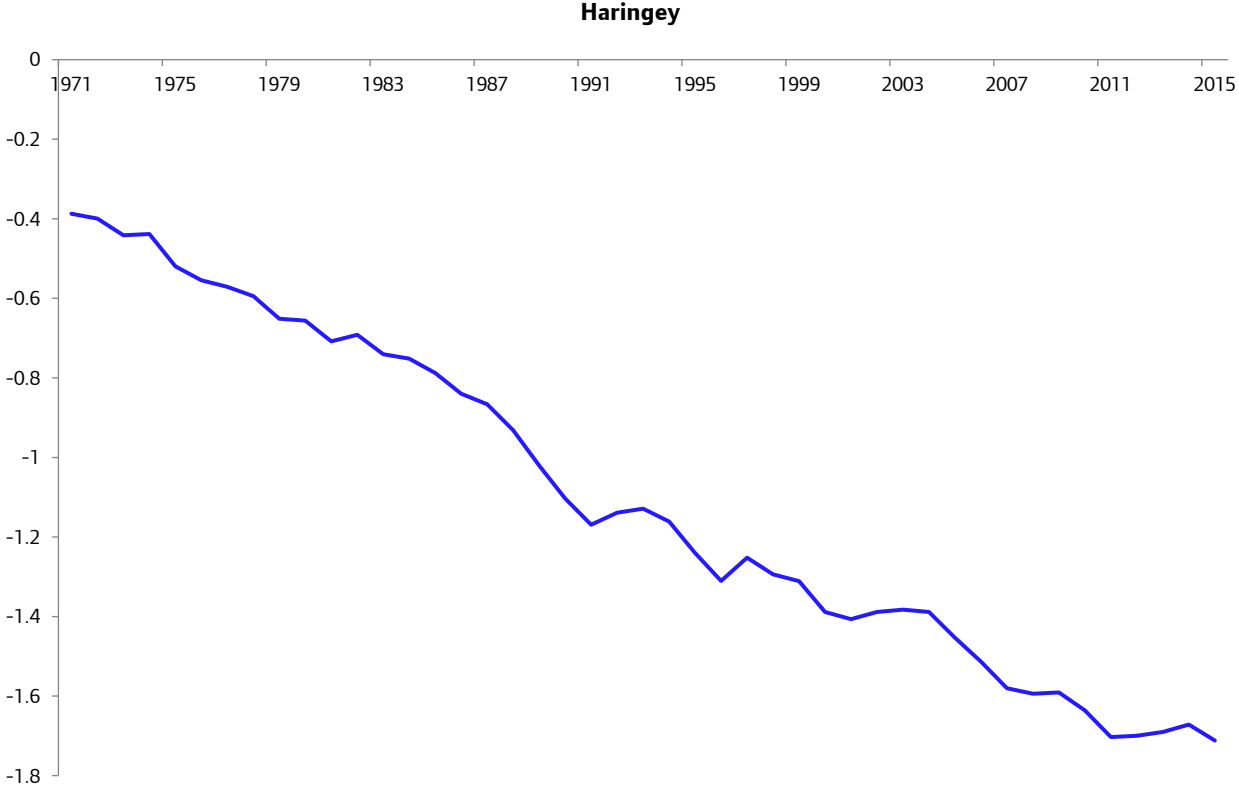


Figure E15: Log of Harrow employees as a proportion of total output in London, 1971-2015

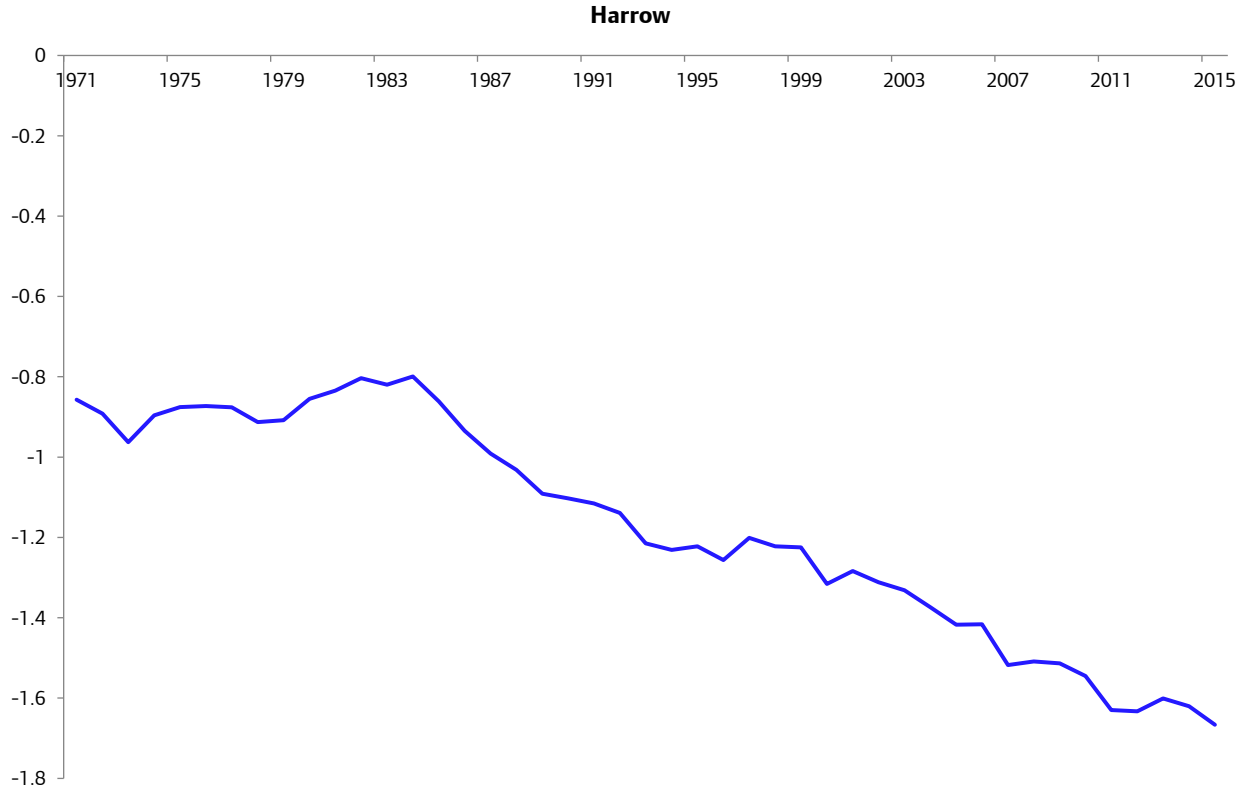


Figure E16: Log of Havering employees as a proportion of total output in London, 1971-2015

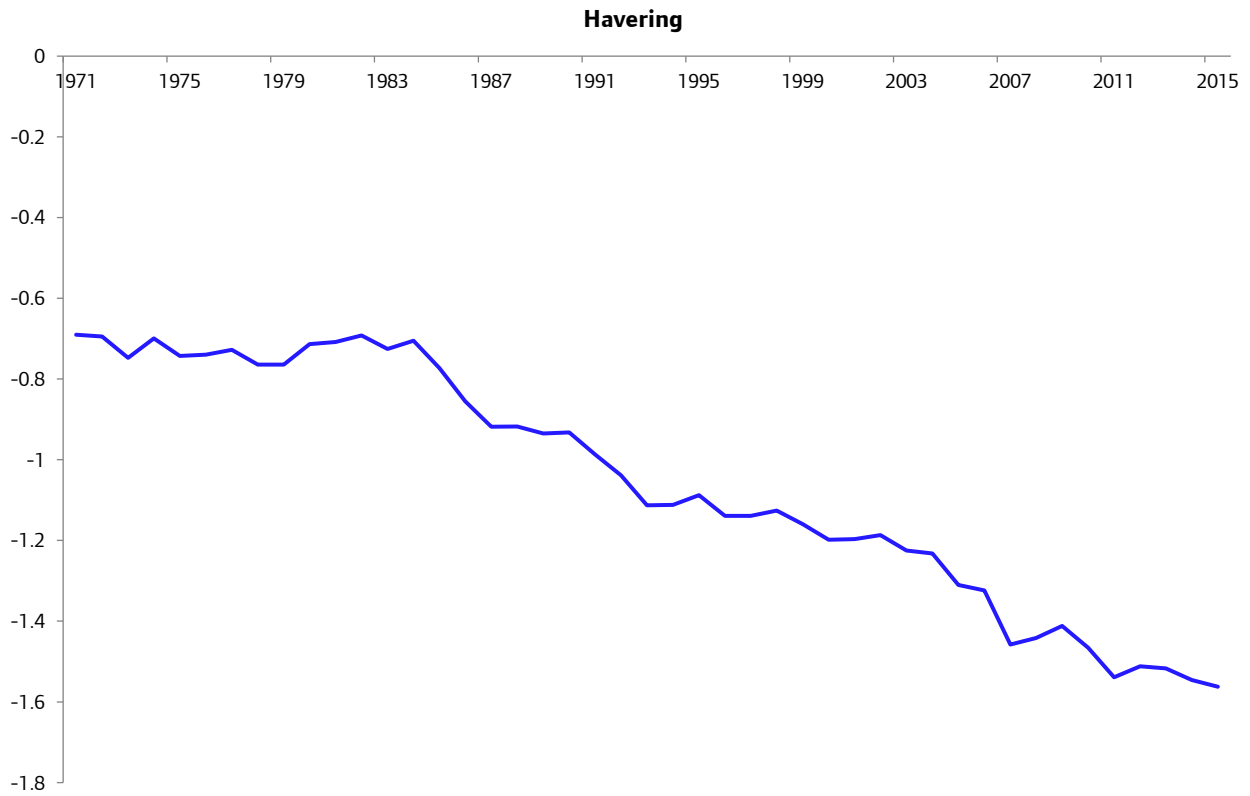


Figure E17: Log of Hillingdon employees as a proportion of total output in London, 1971-2015

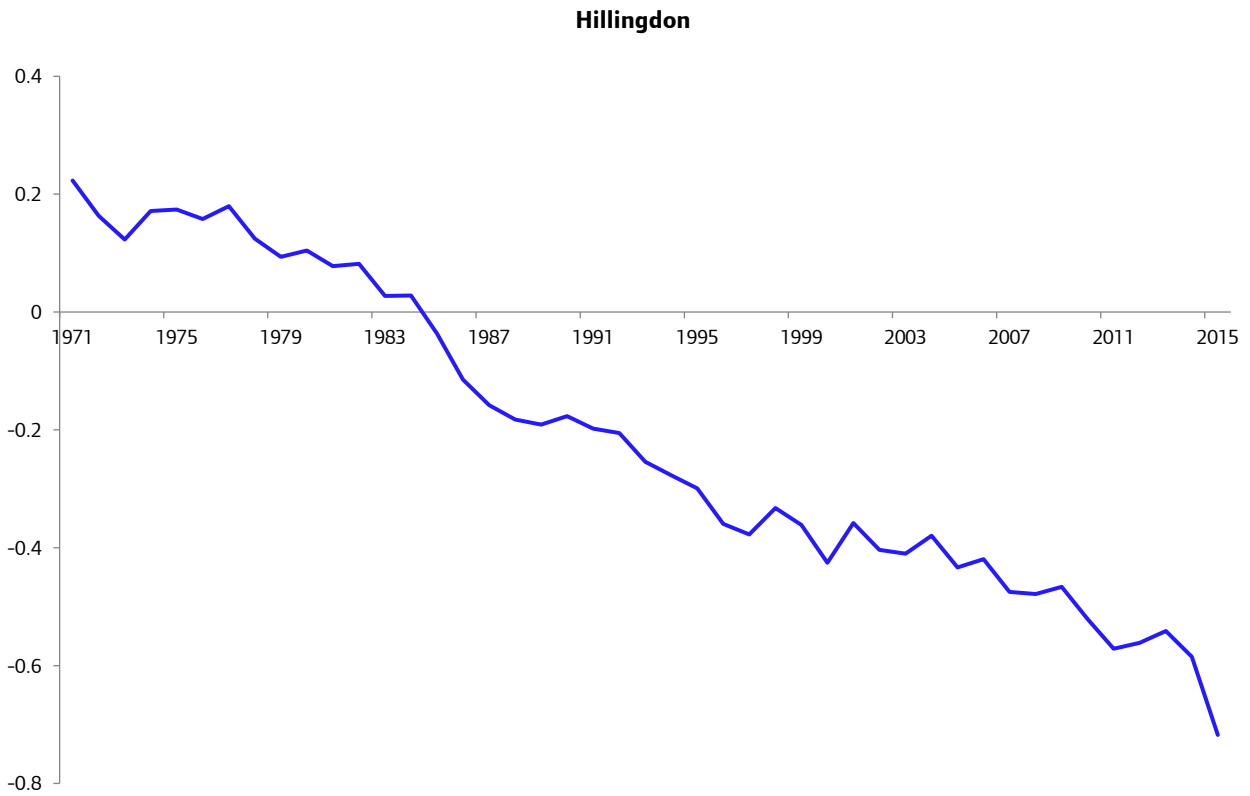


Figure E18: Log of Hounslow employees as a proportion of total output in London, 1971-2015

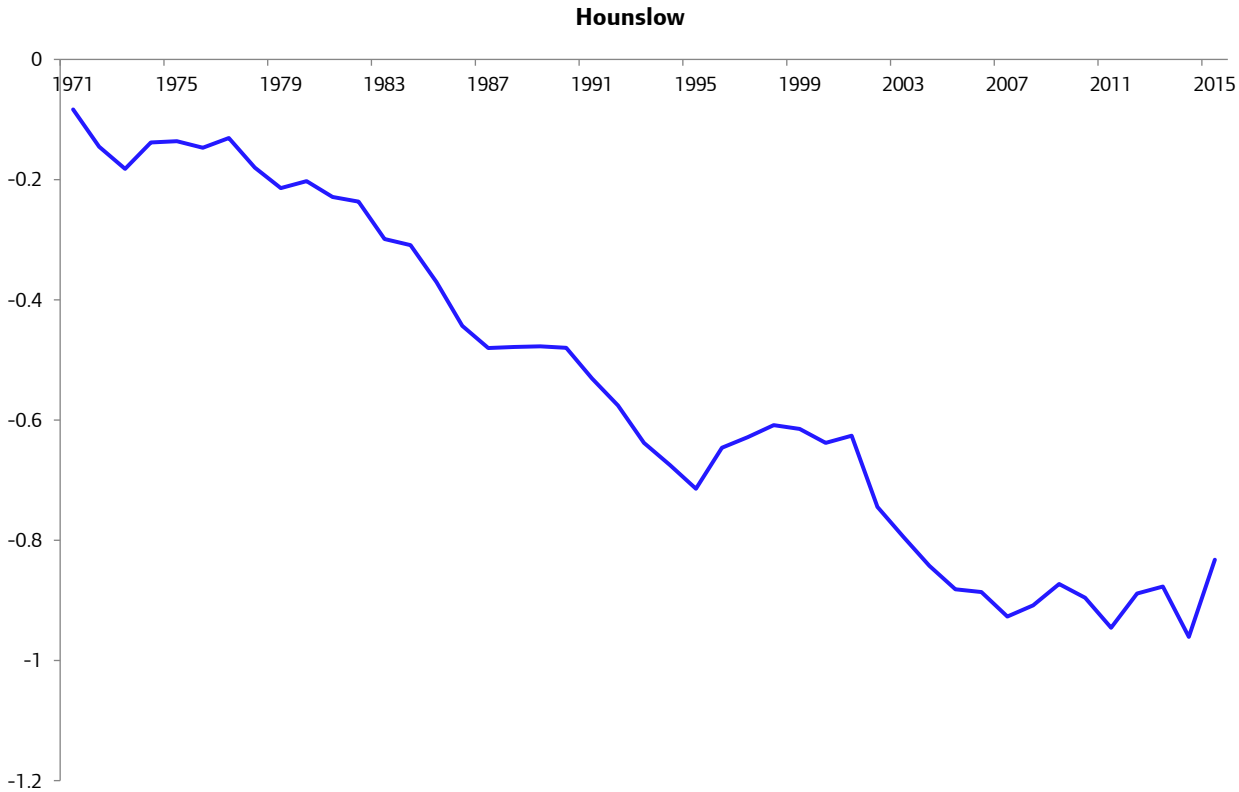


Figure E19: Log of Islington employees as a proportion of total output in London, 1971-2015

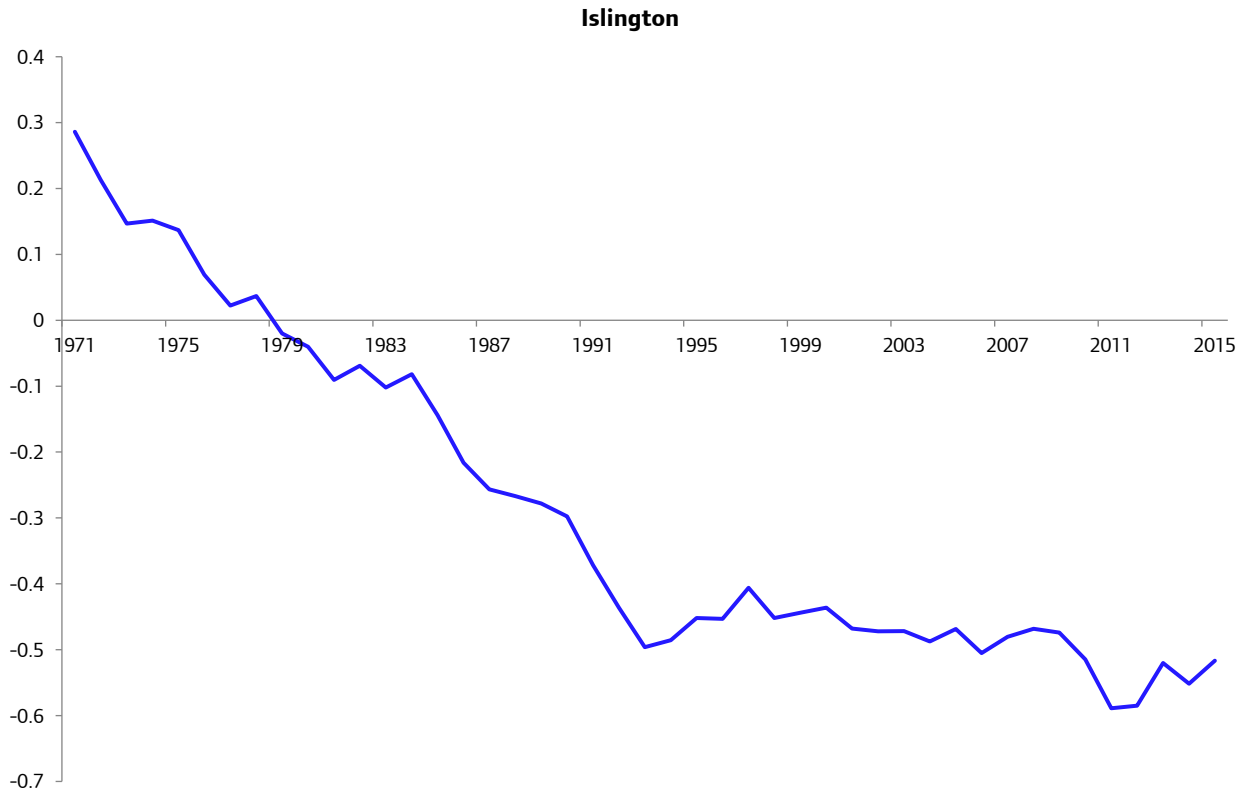


Figure E20: Log of Kensington and Chelsea employees as a proportion of total output in London, 1971-2015

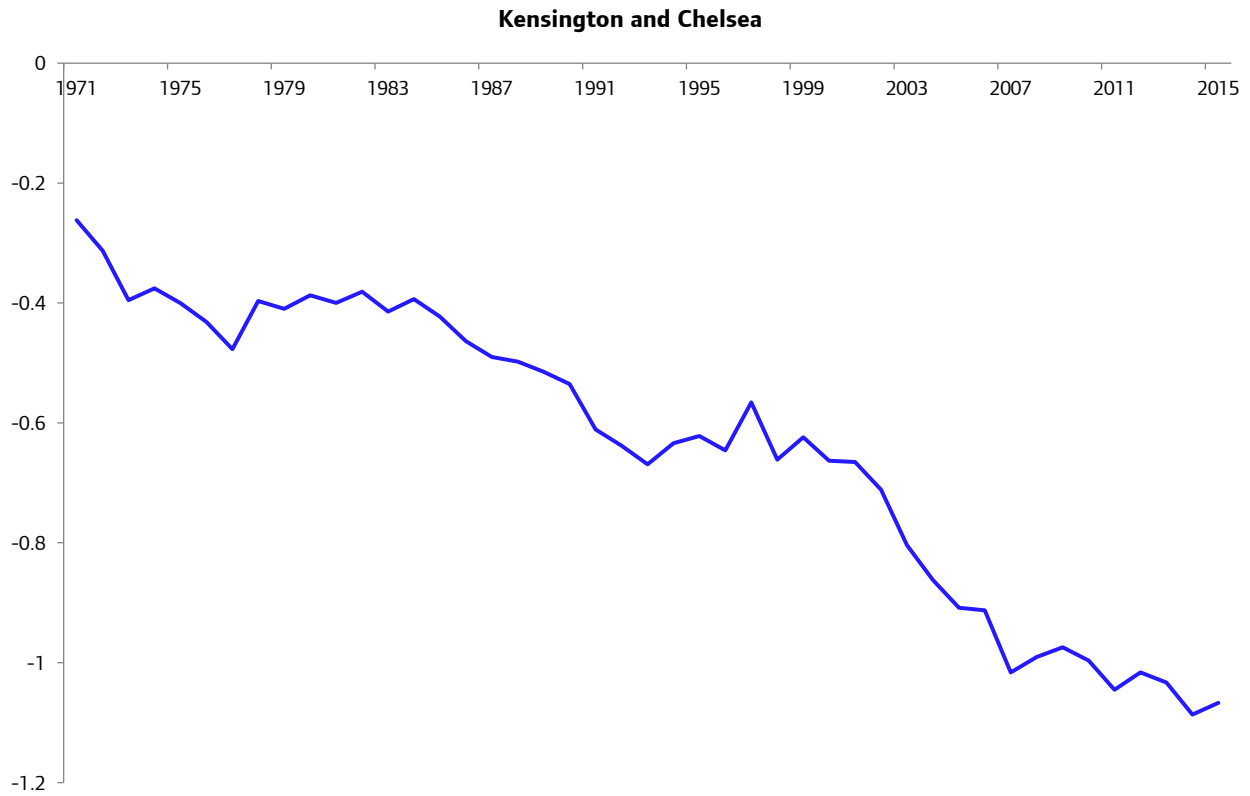


Figure E21: Log of Kingston upon Thames employees as a proportion of total output in London, 1971-2015

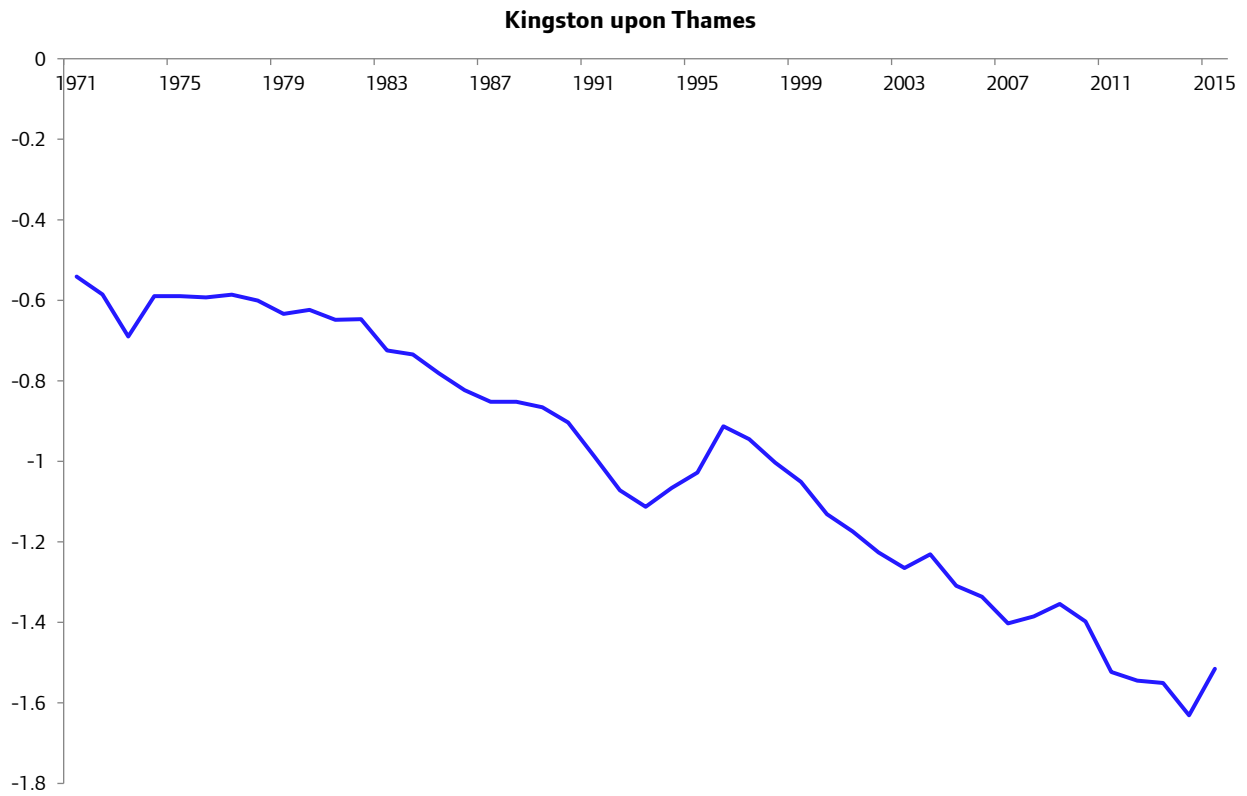


Figure E22: Log of Lambeth employees as a proportion of total output in London, 1971-2015

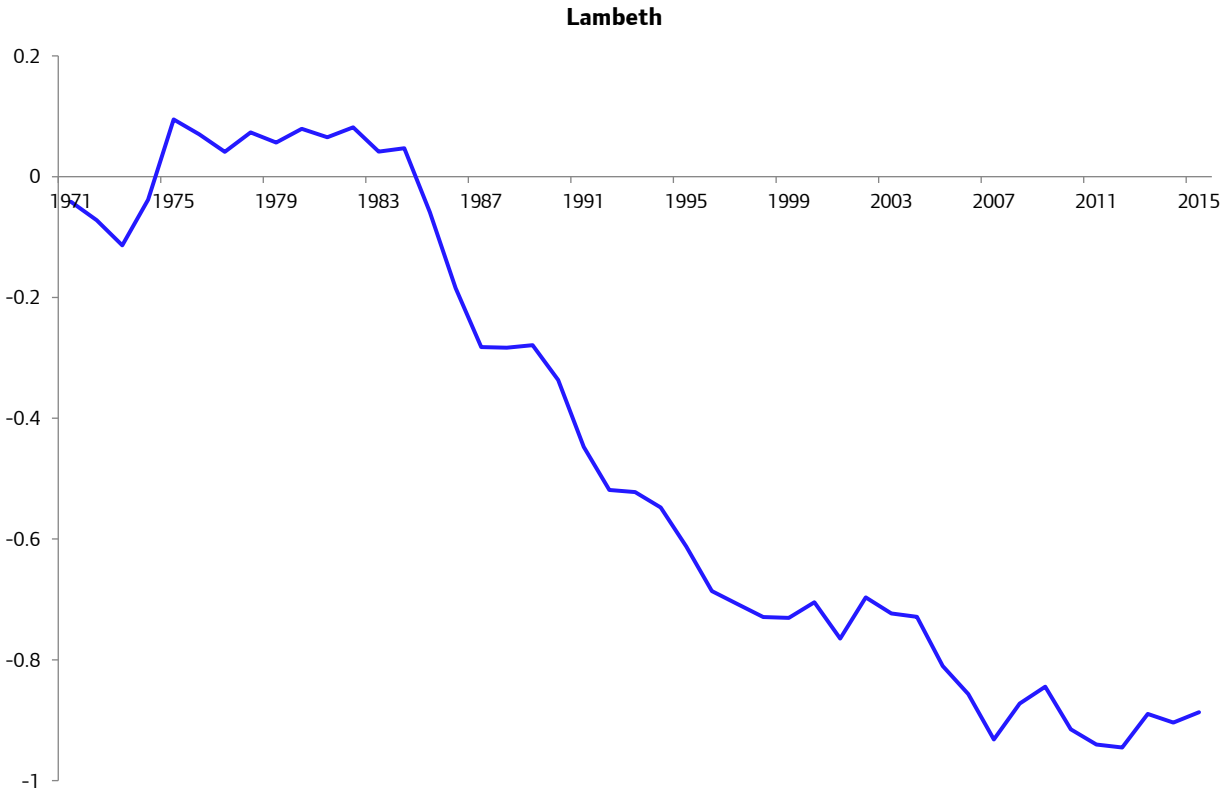


Figure E23: Log of Lewisham employees as a proportion of total output in London, 1971-2015

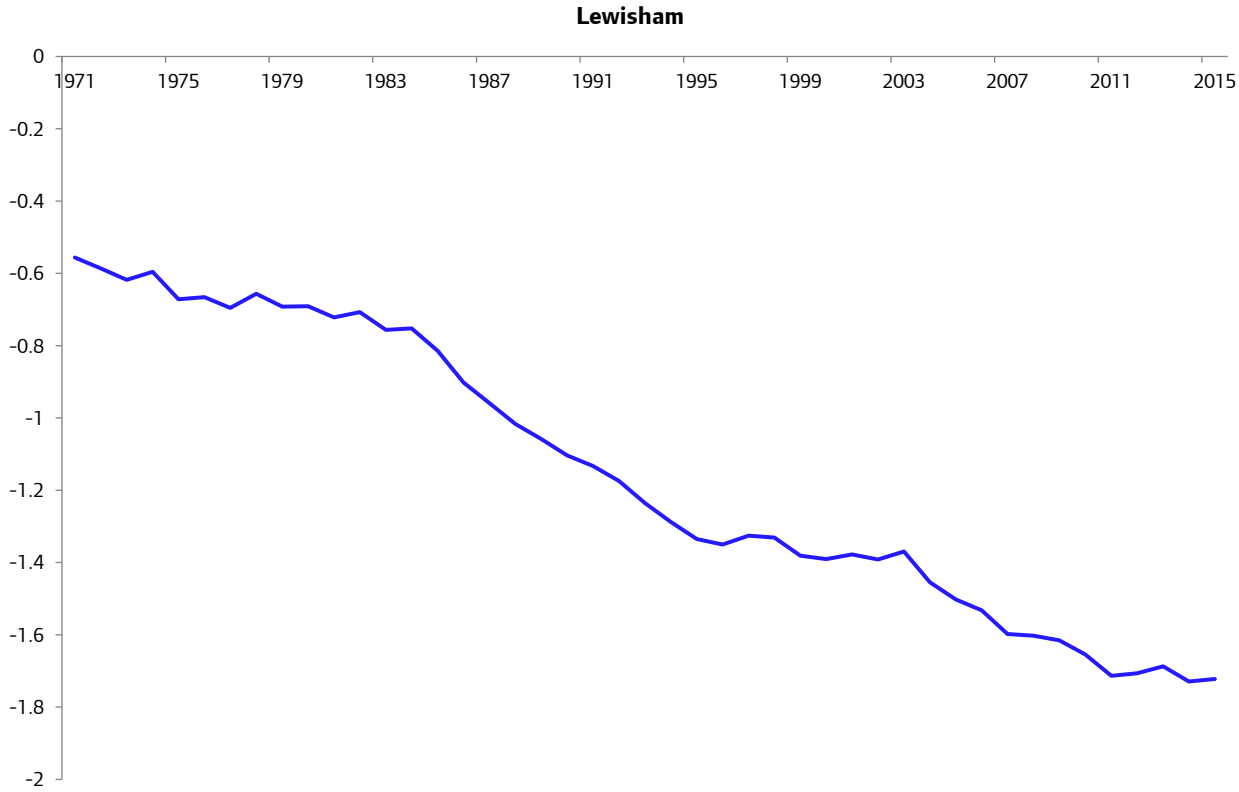


Figure E24: Log of Merton employees as a proportion of total output in London, 1971-2015

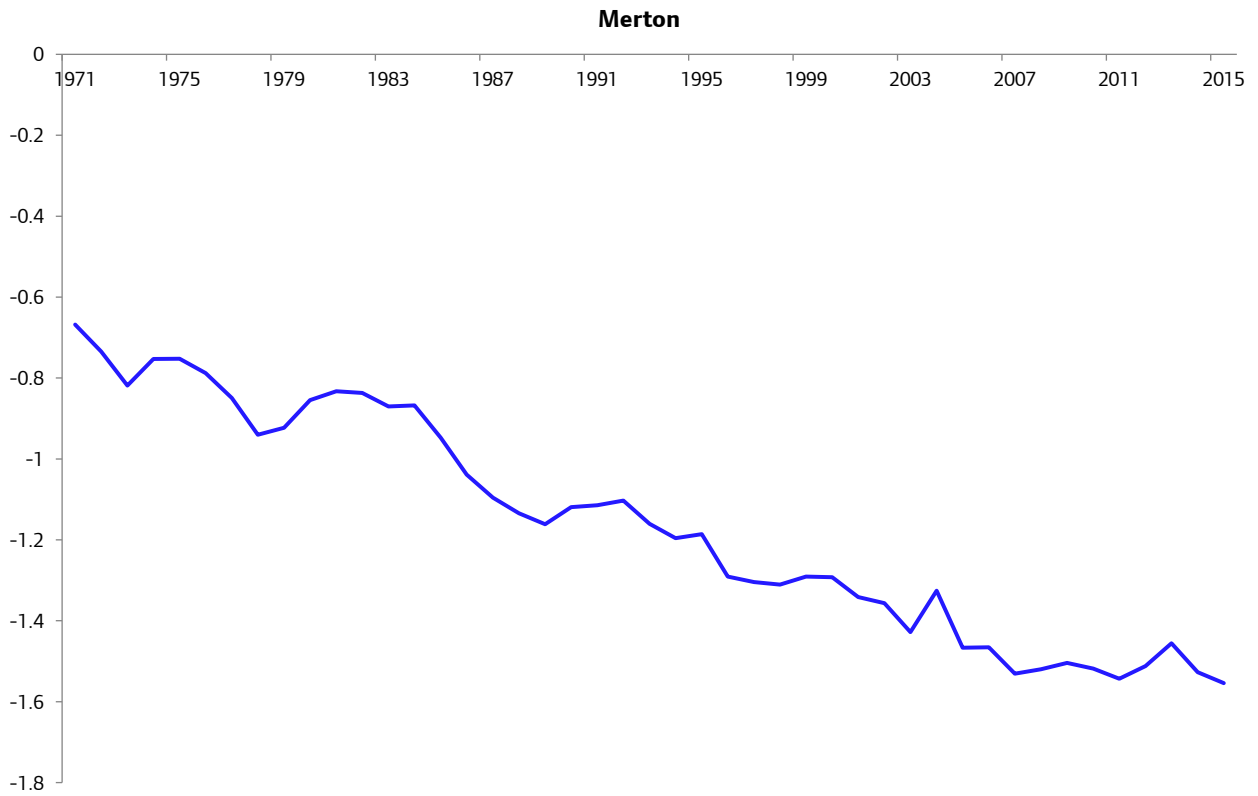


Figure E25: Log of Newham employees as a proportion of total output in London, 1971-2015

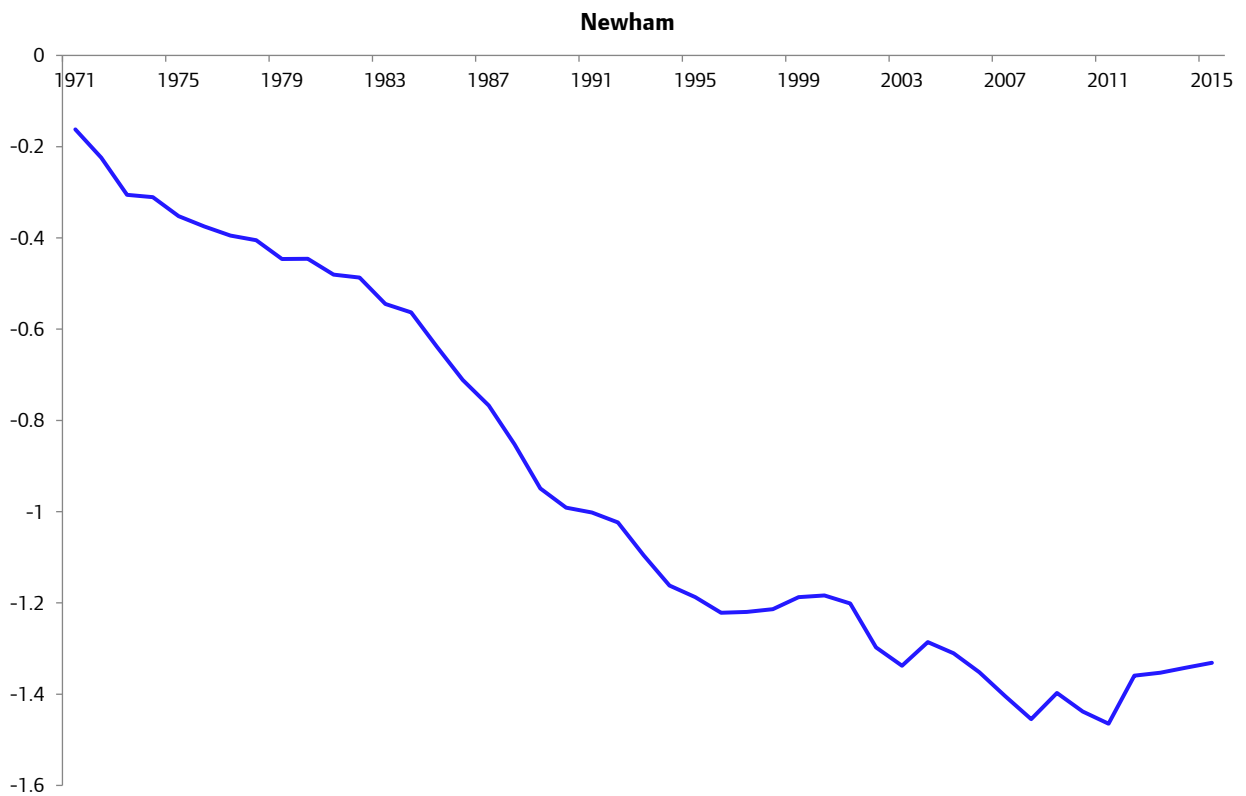


Figure E26 Log of Redbridge employees as a proportion of total output in London, 1971-2015

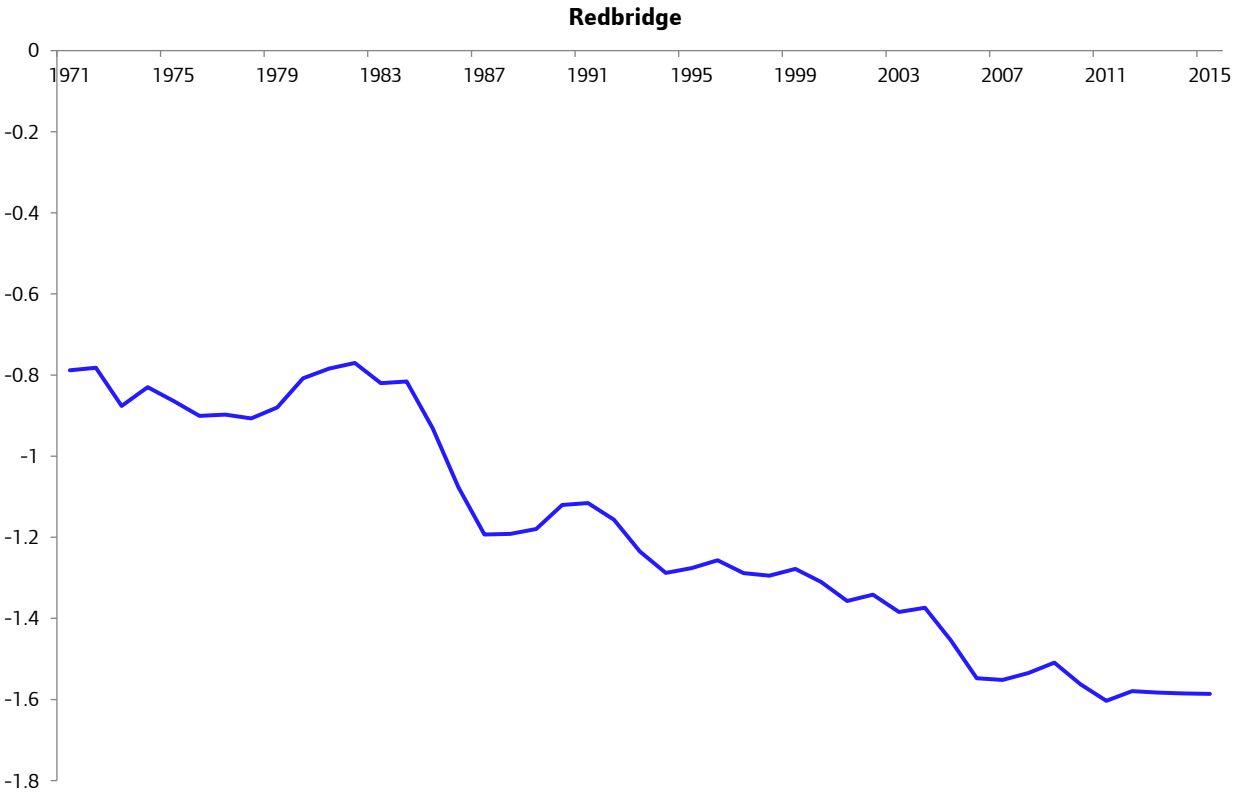


Figure E27: Log of Richmond upon Thames employees as a proportion of total output in London, 1971-2015

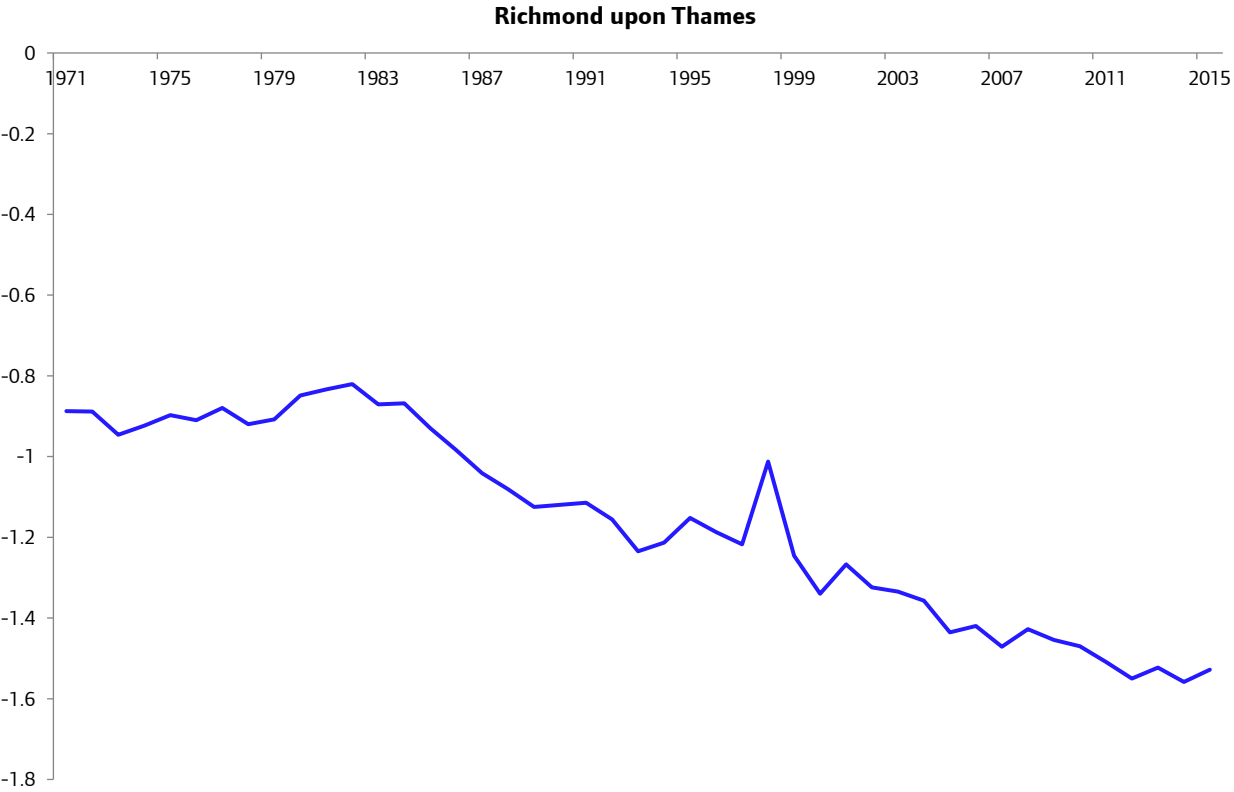


Figure E28: Log of Southwark employees as a proportion of total output in London, 1971-2015



Figure E29 Log of Sutton employees as a proportion of total output in London, 1971-2015

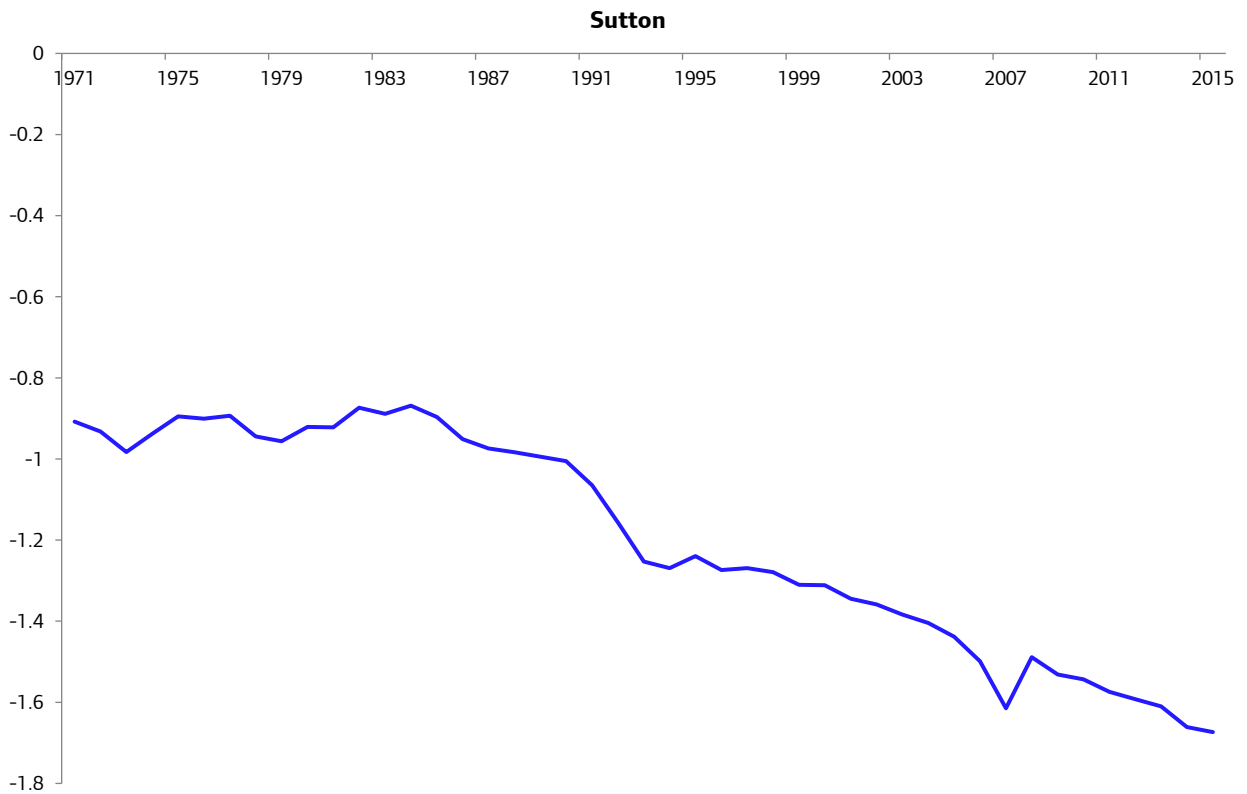


Figure E30: Log of Tower Hamlets employees as a proportion of total output in London, 1971-2015

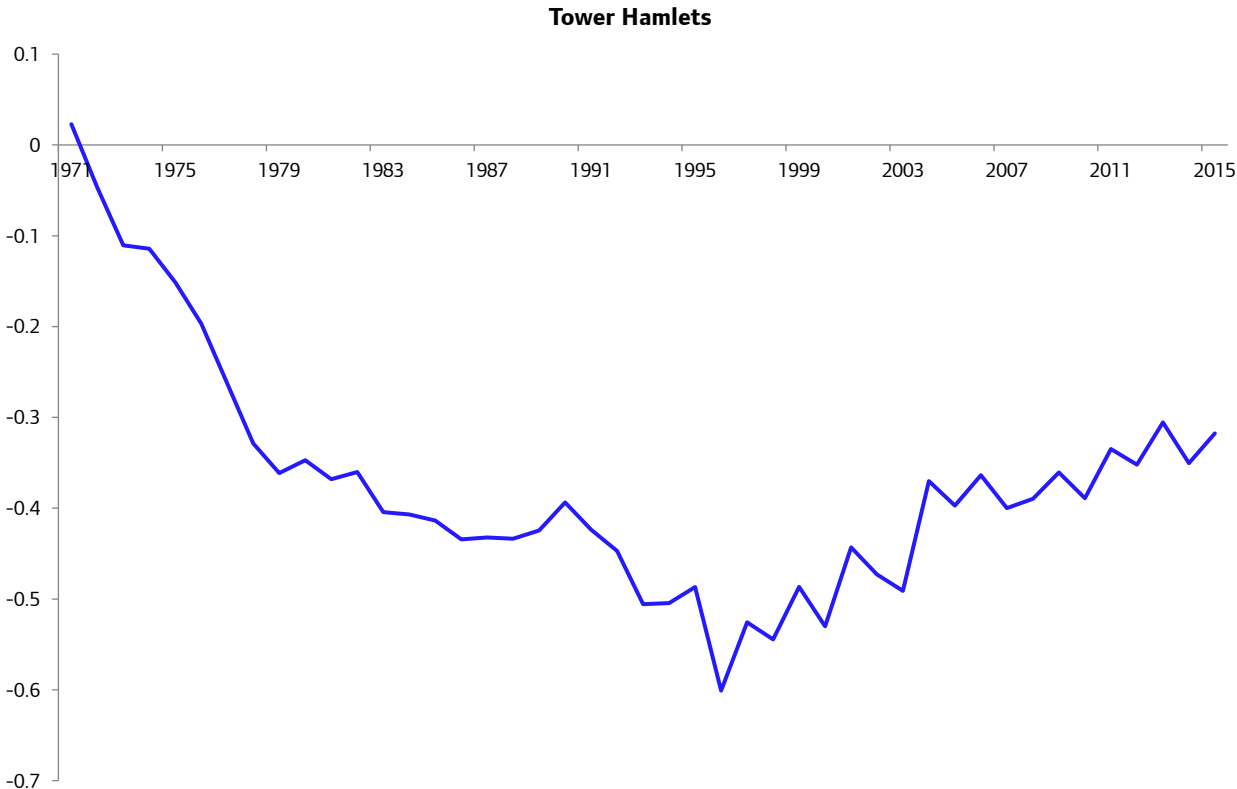


Figure E31: Log of Waltham Forest employees as a proportion of total output in London, 1971-2015

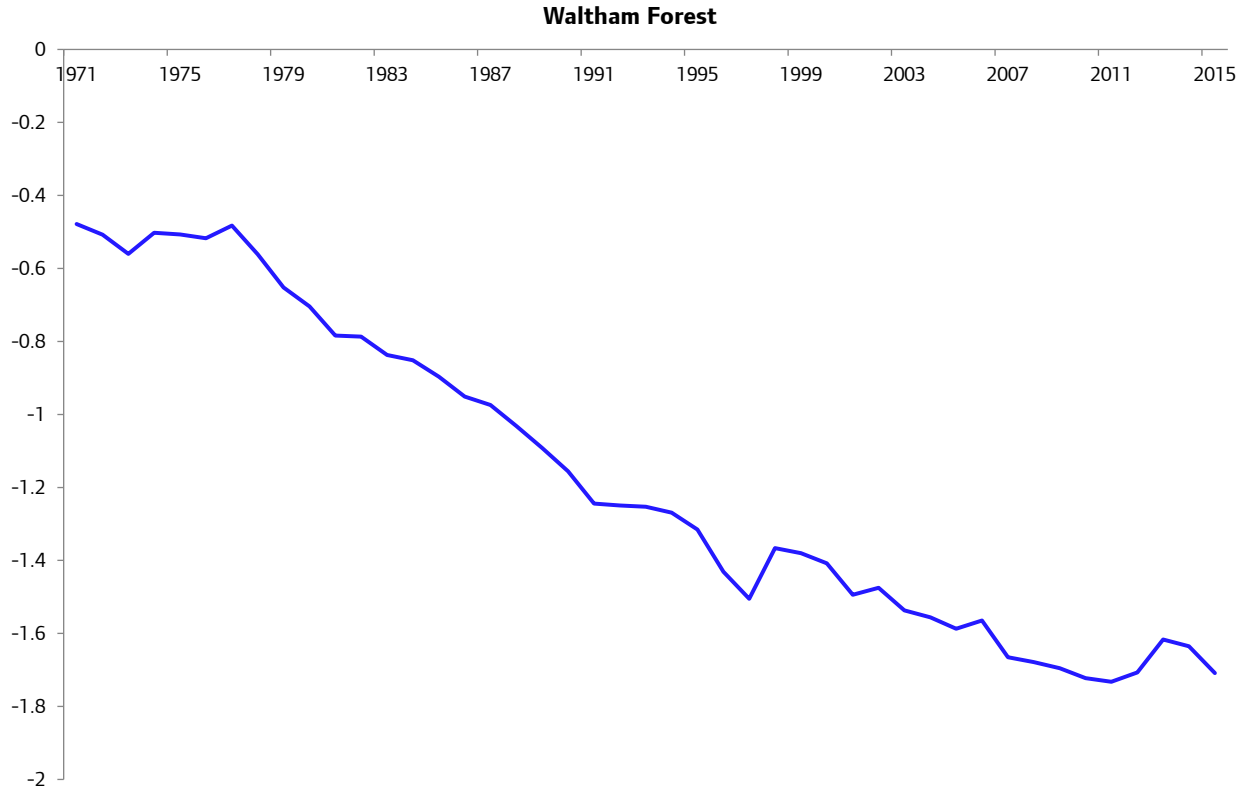


Figure E32: Log of Wandsworth employees as a proportion of total output in London, 1971-2015

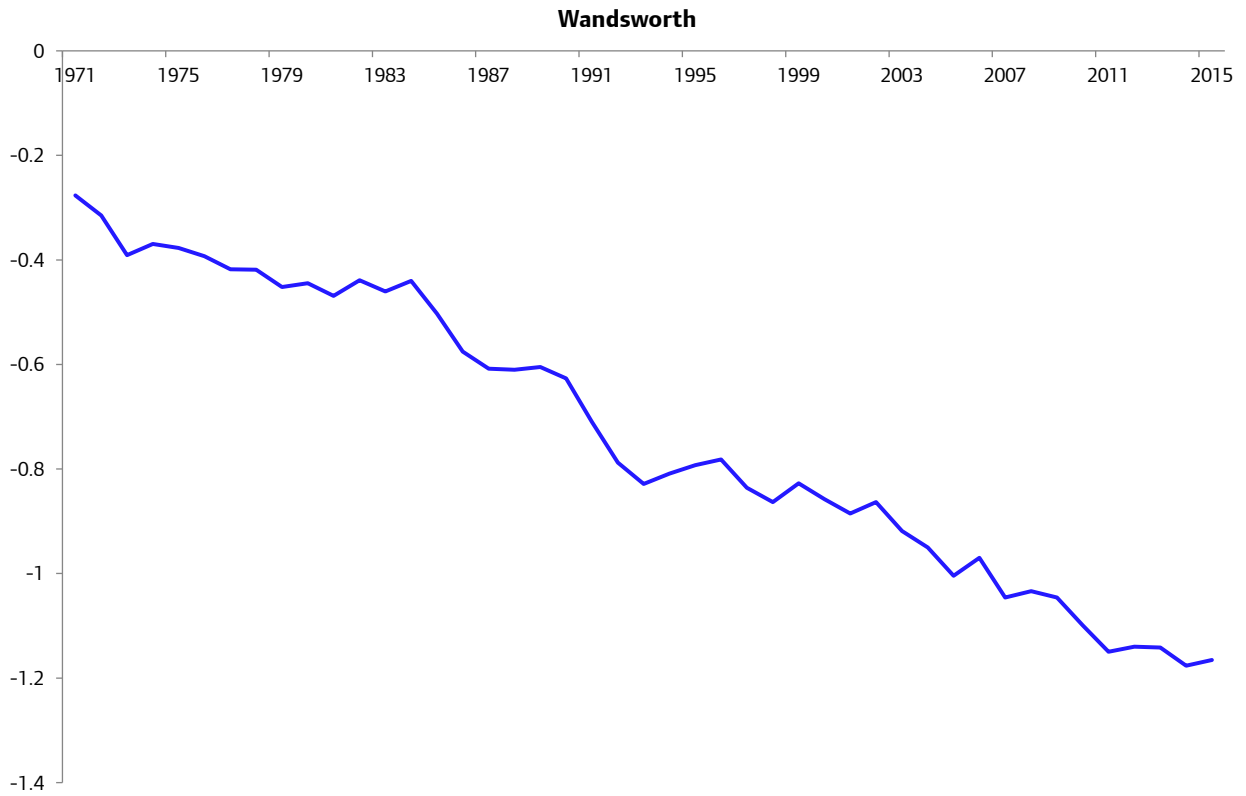
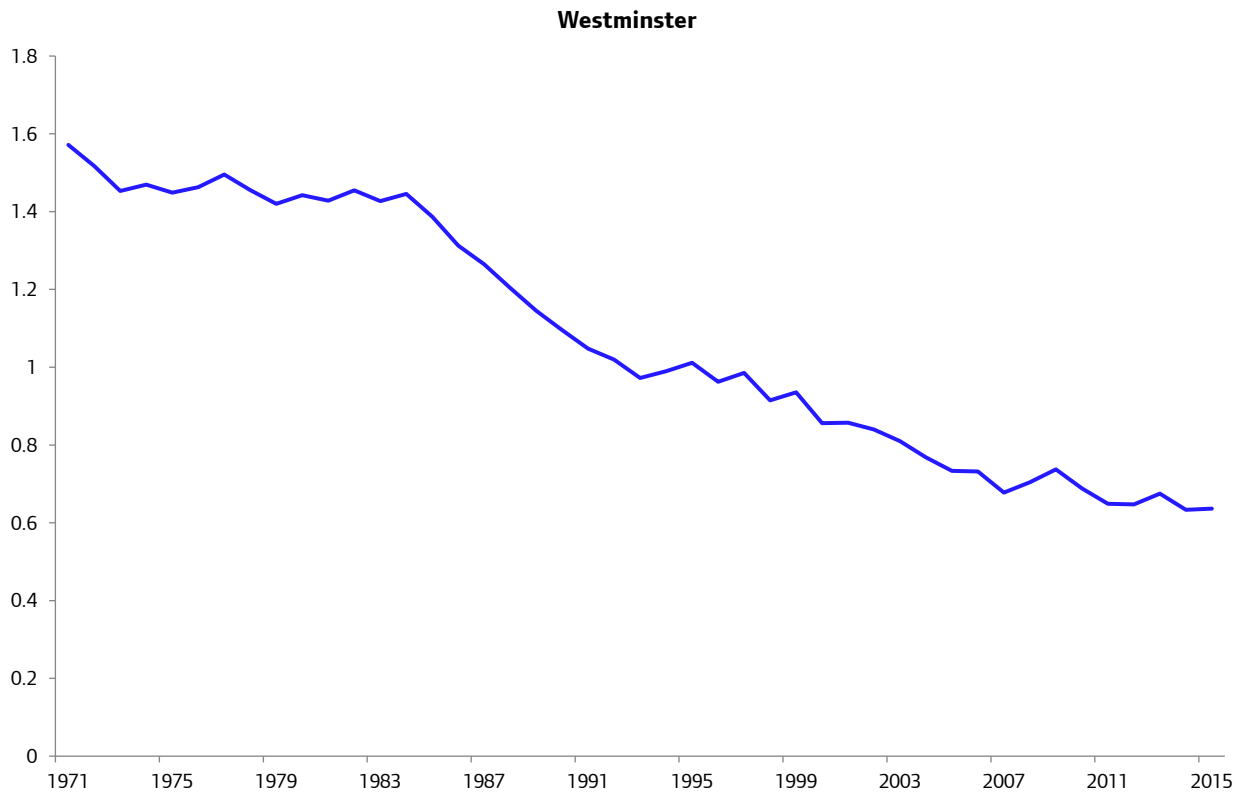


Figure E33: Log of Westminster employees as a proportion of total output in London, 1971-2015



Appendix F: Data revisions to GLA London Job Series

This Appendix explains in more detail changes to ONS data series, what has been announced, what has been implemented, and what this means for the GLA London jobs series.

The GLA London jobs series has developed from a number of ONS surveys and series over the years. This is set out more fully at Appendix 7 of London Labour Market Projections 2016. The series and surveys which ONS updates, and which GLA uses are:

- The Workforce Jobs (WFJ) series is a composite series, which incorporates data from a number of surveys³⁵ including BRES, and the Labour Force Survey, see below, which are also used in their own right for the GLA London jobs series. WFJ provides employment, and self-employed jobs for London and sectors back to 1996, and for employee jobs for London and sectors back to 1981. This forms the London jobs series from these years onwards. The GLA London jobs series back to 1971 projects backwards these series. Since the 2016 London Labour Market Projections the ONS series has been updated to reflect extended coverage of the business survey population to include a new population, PAYE non-VAT paying businesses, and there has been a corresponding uplift in employee jobs. Accordingly GLA has extended this uplift back to 1971.
- The Business Register and Employment Survey (BRES) provides the borough share of employee jobs for 2009–15. Outputs from this survey have not as yet been updated to reflect the extended coverage of the business survey population, and so GLA has made an adjustment for this in its series. Second, there are boroughs which have significant year-on-year changes in jobs numbers between 2014 and 2015 which may be a consequence of BRES survey reporting practices rather than changes in the location of jobs. Third, ONS has announced that it wishes to adopt a new calibration regime for the BRES series to incorporate business sizeband. There is no timetable as yet for implementation, and it will not be complete in time for the next release of BRES data in September 2017. This change, when implemented, might affect borough shares of employee jobs, and components of the Workforce Jobs series which use BRES, including London employee jobs and London sector jobs.
- The Labour Force Survey (LFS) provides the borough share of self-employed jobs for 2004–16³⁶. This year the estimates after 2011 have been updated to be consistent with the latest population estimates. This has also been incorporated into the current WFJ self-employment series, and so the GLA London jobs series.

Changes to the Workforce Jobs series

The June 2016 Workforce Jobs data release included an uplift across all years of the ONS published back series³⁷. This was because the ONS coverage of the Standard Business Survey Population was extended to include a population of solely Pay As You Earn (PAYE) based businesses, or more specifically PAYE based businesses which do not pay VAT. This improvement in coverage has been estimated to increase the UK business survey population by around 100,000, with a corresponding increase in employee jobs. This does not affect self-employment estimates.

The December 2016 Workforce Jobs data release refined the methodology to uplift the series, and reduced the size of the uplift³⁸. At this time ONS made a number of other changes to the WFJ series. The other change that affected the annual employee jobs back series was changes to the numbers of health sector employees from revisions to NHS employment.

In February 2017 ONS published a series of regional uplift factors for detailed sector jobs³⁹. This is the starting point for GLA Economics to derive sector employee jobs uplift factors for 1971-81. GLA Economics has considered other backcasting approaches. Regression of the series of increments for London employee jobs, with London employee jobs or increments at a UK level are both statistically significant, but it has been preferred to maintain consistency with the ONS approach, and use a set of uplift factors on the previous series for 1971-1980.

ONS does not publish a detailed sector jobs series, and did not publish annual aggregated sector level uplift factors. GLA Economics has developed a more detailed jobs back series to 1998, so detailed sector data is not available back to 1971 on which to apply the published uplift factors. Instead it is possible to consider implied uplift factors from published Workforce Jobs series, and compare this with annual aggregated sector level uplift factors using the GLA more detailed jobs series. Table F1 provides the results.

Table F1: Employee jobs uplift factors, various years from Workforce Jobs and more detailed jobs series

	ONS Workforce Jobs series March 2017/March 2016				GLA more detailed jobs series
	1981-2014	1981-1990	1981-1998	1998-2014	1998-2014
Primary & utilities	0.60%	1.25%	0.79%	0.33%	0.07%
Manufacturing	0.72%	0.78%	0.76%	0.69%	0.71%
Construction	0.91%	1.00%	0.94%	0.86%	0.95%
Wholesale	1.15%	1.00%	1.07%	1.24%	0.43%
Retail	0.26%	0.30%	0.29%	0.23%	0.40%
Transportation and Storage	0.19%	0.16%	0.19%	0.21%	0.28%
Accommodation and food service activities	0.71%	0.60%	0.62%	0.80%	0.76%
Information and Communication	0.21%	0.17%	0.16%	0.26%	0.21%
Financial and insurance activities	0.01%	0.03%	0.03%	-0.02%	0.04%
Professional, Real Estate, Scientific and technical activities	0.89%	0.85%	0.86%	0.94%	1.05%
Administrative and support service activities	1.80%	1.83%	1.82%	1.79%	1.70%
Public administration and defence	0.07%	0.24%	0.13%	-0.01%	0.00%
Education	0.11%	0.13%	0.11%	0.10%	0.23%
Health	-1.35%	0.21%	-0.04%	-2.78%	0.37%
Arts, entertainment and recreation	0.29%	0.22%	0.37%	0.23%	0.32%
Other services	4.32%	4.75%	4.61%	3.99%	4.15%
All sectors	0.47%	0.58%	0.57%	0.37%	0.69%

Source: GLA Economics calculations

For the majority of sectors the uplift factors imputed from versions of the Workforce Jobs series for 1998-2014 are similar to that estimated from the more detailed jobs series for 1998-2014⁴⁰. It is also the case that the uplift factors are relatively stable over time for individual sectors with the exceptions of primary & utilities, and health. The differences over time will be driven by changes in the sub-sector

composition of jobs. To allow for this the sector uplift factors used for the London jobs series 1971-80 are the imputed ONS WFJ employee uplift factors for 1981-90.

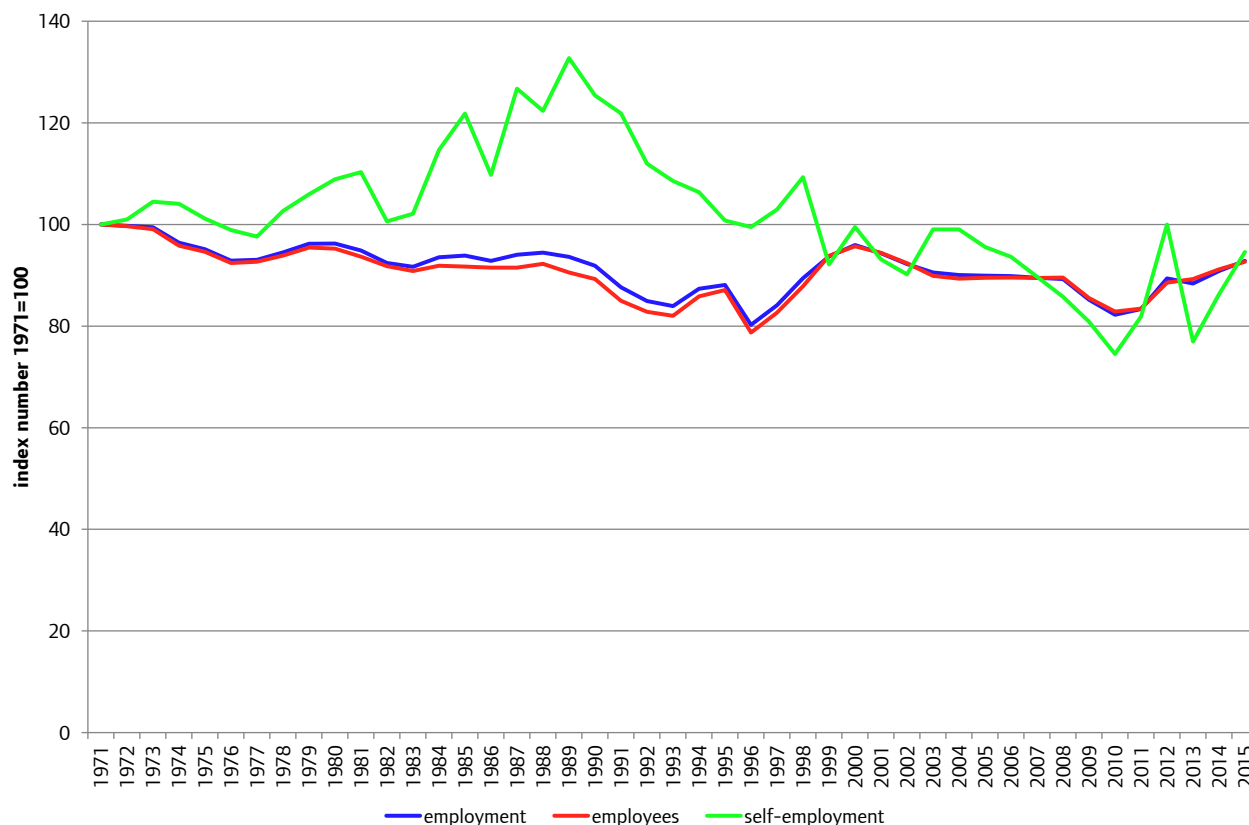
Across the period 1981-2014 the uplift factor to employee jobs is less than half a per cent (0.47%). This is what needs to be applied to borough employee jobs to include the VAT paying non-PAYE business in the underlying business population. This increment is unlikely to be the same across boroughs because the distribution of sectors is not the same across boroughs. Boroughs which have a relatively higher proportion of the sector other services are likely to have a relatively higher uplift factors. The experimental GLA Economics borough by sector series provides a means to estimate uplift factors for boroughs which reflects the sector composition of employment in boroughs. This adjusts the proportions of London employee jobs across boroughs, and means that the published proportions on London Datastore differ slightly from ONS BRES estimates.

GLA Economics published an experimental London job series back to 1971 in 2016 with the London Labour Market Projections. This methodology has been reviewed and two changes have been made to the sector employment series. This has been done because of the need to have separate employee and self-employment job series so that an employee job uplift can be applied to include PAYE non-VAT paying businesses.

The derived self-employment jobs series for primary and utilities, and public administration and defence included negative values of up to 1,500 for 1971 to 1995. Previously this had been considered immaterial as the sector employment estimates were the best possible with the available data. With the need for separate employee and self-employment series for analysis the values for self-employment have been set to zero, and employee jobs reduced by this absolute value to maintain the same level of sector employment. In each affected year this is less than 0.5% of public administration employment, and 2.2% of employment in primary and utilities.

Second, the 2016 back series for the wholesale and retail sectors had been developed as a single series as this is the basis on which ONS publishes its main statistics. The split into the separate GLA sectors of wholesale and retail had been done at the level of employment, but not for employees or self-employment. The wholesale-retail employment series (without PAYE non-VAT paying businesses) has remained unchanged. GLA Economics has explored a number of options to produce separate splits for employees and self-employment. While employees account for most of employment, and so the trend in employee and employment numbers are similar, this is not the case for the estimated trend in self-employment – see Figure F1. A similar pattern can be seen for UK level numbers which ONS publishes back to 1959.

Figure F1: Wholesale-Retail jobs series 1971-2015 for business population excluding VAT paying non-PAYE businesses



Source: GLA London Jobs series

In addition to its main publications ONS does make available wholesale and retail splits for the employment, employee jobs, and self-employment back to 1996⁴¹. The adopted approach has been to backcast to 1971:

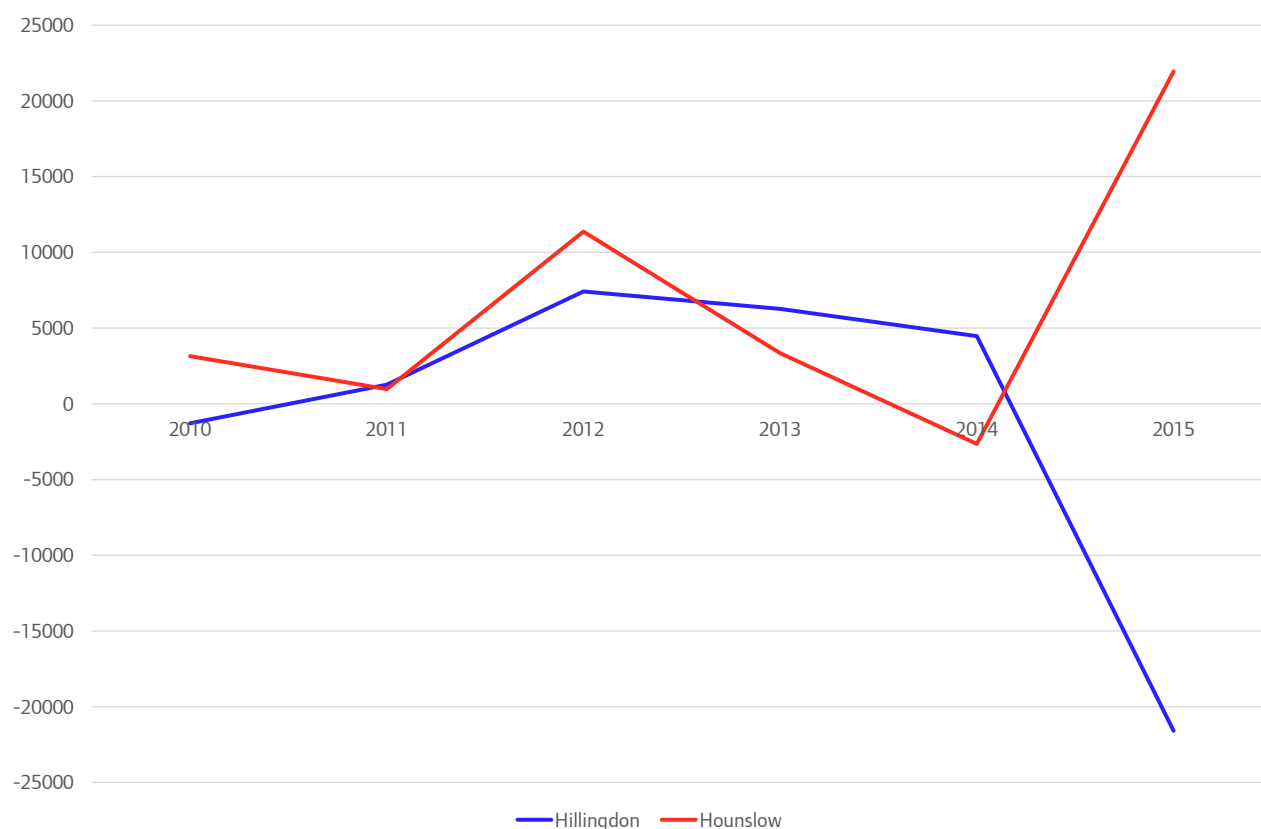
- Wholesale employee jobs as a share of wholesale employment, and similarly for retail employee jobs, and constrain the totals to the estimated series for wholesale-retail employee jobs
- Wholesale and retail shares of self-employment jobs for wholesale and retail

This captures most closely the trends in the aggregate series, and produces wholesale and retail back series most in line with the trends of ONS data for the more recent period.

Changes to the Business Register and Employment Survey series

There have been some significant changes for City of London, Hillingdon, and Hounslow for employee jobs reported in BRES for 2014 and 2015. These may not in all cases reflect changes in the location of jobs. The BRES data collection process is for a reporting unit in an enterprise to provide data for a number of local units, or businesses. The numbers provided to ONS depend on the processes followed by the reporting unit, and while ONS ensures they follow certain guidelines how this is done may not be consistent year-on-year. One specific reason for differences is that there may have been a shift in the attribution of field staff between local units. In some instances, for example where a business goes into receivership and there are staff across a range of locations they may be attributed to a head office.

Heathrow airport is located in Hillingdon, while many jobs which support the airport are also in Hounslow. Figure F2 reports the year-on-year changes in borough employee estimates for these two boroughs. The changes seen between 2014 and 2015 are predominantly in transportation.

Figure F2: Year-on-year change in reported employee numbers for Hillingdon and Hounslow

Source: ONS BRES

With the provision of a new set of BRES figures ONS also updates slightly figures for the previous year, most recently 2014. The updated estimates for London were 1.08% higher than in the original publication. The updated 2014 figures at a borough level provide the basis for borough employee figures without the PAYE non-VAT paying businesses employee jobs.

In September 2017 ONS will update BRES 2015 estimates, and will include the figures for 2015 with and without PAYE non-VAT paying businesses. As noted in the main text GLA Economics has estimated the impact at borough level using an experimental borough by sector series to reflect that the sector composition of boroughs differs. This only relates to the increment in the business population which corresponds to an increase of less than 0.5% at the London level in 2015.

ONS is currently developing new employee estimates by employment sizeband from BRES⁴². This potentially will have a more significant impact on estimates of the distribution of jobs across London as the improved methodology affects the entire estimate for borough employee jobs, and not a part of the population. The change to the BRES methodology will bring it more into line with the survey it succeeded, the Annual Business Inquiry, so this change once implemented should not affect the GLA jobs series prior to 2009.

In December 2016 ONS published estimates of the change in 2015 employee estimates by business sizeband for regions, and sectors⁴³. Table F2 summarises the impact for London by business sizeband. It estimates that there will be an increase in employee jobs in London of 0.3%, with an increase for some employee sizebands, and a decrease for other sizebands.

Table F2: Impact on employee numbers of BRES business sizeband re-calibration, London 2015, comparison with published figures

Business sizeband	Change in total employee numbers
0-9 employees	5.5%
10-49 employees	-4.1%
50-249 employees	1.8%
250+ employees	-0.3%
All businesses	0.3%

Source: Office for National Statistics

Applying these changes at a borough level (allowing for the distribution of business sizes in each borough) there would be an increase in jobs for all boroughs. It would be less than the London increase for CAZ boroughs, and the increase for each outer borough would be higher than the London increase, if not uniformly across boroughs. Actual borough increases will also depend on the relative composition of sectors, and ONS has only estimated the sector impact of change at a national level for 2015. ONS has not provided estimates of impacts for 2009-14, and the published estimates do not include PAYE non-VAT paying businesses. As the available information is very limited GLA Economics has not attempted to make any explicit allowance for this change at this point in the GLA jobs series.

Appendix G: London employment sites capacity projections

Appendix H: Transport accessibility employment projections

London Employment Sites Database 2017, CAG Consultants

Transport Accessibility and Development Density, Volterra Partners, 2017

These reports are available electronically alongside this report on the GLA [website](#)

Endnotes

- 1 Including the Professional, real estate, scientific and technical sector.
- 2 The CAZ covers portions of the London boroughs of Camden, Hackney, Islington, Kensington and Chelsea, Lambeth, Southwark, Tower Hamlets, Wandsworth, and Westminster, as well as the total area of the City of London.
- 3 Both in terms of absolute numbers, and growth rate.
- 4 At [London labour market projections 2016 | London City Hall](#) and on [London Datastore](#).
- 5 Annual averages, excluding sectors T (activities of households as employers; undifferentiated goods and services producing activities of households for own use) and U (activities of extraterritorial organisations and bodies).
- 6 See, for example, GLA Economics 'Working Paper 38: Employment projections for London by sector and trend-based projections by borough', p.6.
- 7 The data is available on [London Datastore](#).
- 8 The data is available on [London Datastore](#).
- 9 At [Population Projections – London Datastore](#).
- 10 Note that estimates for borough self-employment trends are deducted from employment site workplace capacity projections to produce employee level workplace capacity projections. The latter is then combined with the borough employee trend projections.
- 11 A statistical significant change/difference suggests that the change is (within a probability of likelihood or confidence interval) a true result rather than a random one caused by sampling variability (changes in the underlying sample). For example, a statistically significant change at the 95% confidence interval suggests that if the sample was re-run 100 times then in 95 of those times a difference would still be observed.
- 12 For a very small number of boroughs there were statistically significant changes. This is particularly true for the City of London where its share has more than doubled over the decade to 2016 such that in 2016 it accounted for 11.9 per cent of the London total.
- 13 Projecting forward trends in the shares was also considered, however this resulted in some boroughs having what appears to be an unreasonable share of the London total in 2041 (particularly given the number of years over which a statistically significant change in their trend is apparent).

- 14 The historic data for borough employees was 2014.
- 15 The historic data for borough employees was 2015.
- 16 ONS explains this in its December 2016 revisions note [Revisions to workforce jobs: Dec 2016 - Office for National Statistics](#).
- 17 Appendix 7 of the 2016 London Labour Market Projections discusses these data sources, and how they have been used to develop the GLA London jobs series to 1971. Data from these sources is also available at a borough by sector level, which is why it has been used as a starting point for this analysis. This raw data cannot be used to provide borough by sector estimates because ONS revisions to data have had different impacts at sector and borough level.
- 18 Although the GLA London jobs series has been developed using the sources for the borough by sector series there has to be a process of data fitting because ONS revisions to data have had different impacts at sector and borough level. Appendix 7 of the 2016 London Labour Market Projections discusses these revisions.
- 19 GLA Economics, London Labour Market Projections 2016.
- 20 See [Regional, sub-regional and local GVA estimates for London, 1997-2015 | London City Hall](#).
- 21 The 2016 estimate for 2015 was a GLA estimate, as is the 2017 estimate for 2016. The 2017 estimate for 2016 is derived from ONS statistics.
- 22 The first three changes have been made to both the income and production measures of GVA. More information on the income measure is available from the ONS at [Regional gross value added \(income approach\), UK - Office for National Statistics](#) and GLA Economics at [Regional, sub-regional and local GVA estimates for London, 1997-2015 | London City Hall](#). All changes affect the production method which is used to exclude the effects of inflation in year-on-year comparisons, and ONS provides more information at [Regional gross value added \(production approach\), UK - Office for National Statistics](#).
- 23 See the OBR's 'Economic and Fiscal Outlook', March 2017: [Economic and fiscal outlook – March 2017 - Office for Budget Responsibility](#).
- 24 See [London's Economic Outlook, Autumn 2016](#).
- 25 The 2016 projections estimated that employment in London will grow by an annual average rate of 0.76 per cent, equivalent to 46,000 jobs per annum, to reach 6.748 million in 2041.
- 26 1971 is the first year of the GLA London Jobs series.
- 27 Apparent from comparison of index numbers for output. The index number for 1981 is 104.9, and for 2016 it is 294.5, a growth of 181% over a 35-year period.
- 28 The scale of changes to the historic self-employment jobs series has been small, and only for the most recent years.
- 29 The data is available at [London Datastore](#), and has been updated to include the latest data for 2015. An explanation of the methodology is available at [Working Papers 65, 66: London's sectors: detailed jobs data & method | London City Hall](#). The one change is that there are separate employee jobs totals for the wholesale and retail sectors, and sub-sectors are shares of these sectors rather than a single sector for wholesale and retail combined.

- 30 These are employment projections from which borough level self-employment projections are deducted to obtain employee projections.
- 31 An area that contains Canary Wharf.
- 32 Strictly speaking, it is implicitly assumed that whatever constraints may have existed in the past continue into the future. Hence it is any additional constraints which are relevant.
- 33 Although this slight change, in itself, should be treated with caution as it may simply be due to sampling variability.
- 34 Available at [Population Projections – London Datastore](#).
- 35 Short Term Employment Surveys (STES), and Quarterly Public Sector Employment Survey (QPSES) are also sources for the Workforce Jobs series.
- 36 See [Percentages of self-employment jobs in London boroughs, 2004 to 2016 - Office for National Statistics](#).
- 37 ONS explains this in its June 2016 revisions note [Revisions to workforce jobs - Office for National Statistics](#).
- 38 ONS explains this in its December 2016 revisions note [Revisions to workforce jobs: Dec 2016 - Office for National Statistics](#).
- 39 [Employee Jobs PAYE based uplift factors - March 2016 - Office for National Statistics](#).
- 40 The notable exception is health for which there were Workforce Jobs revisions from health administrative data not incorporated in the survey data sources of BRES and the Annual Business Inquiry which form the basis for the GLA more detailed jobs series.
- 41 The most recent data is at [Employee and self-employed jobs in divisions of industry section G in the Greater South East, 1996 to 2016 - Office for National Statistics](#).
- 42 See, for example, ONS Economics Review January 2016 which mentions this work in a footnote at the end of that document.
- 43 See [Incorporation of employment sizeband into the calibration weighting methodology for BRES - Office for National Statistics](#).



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