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Methodology – London's sectors: more detailed jobs data

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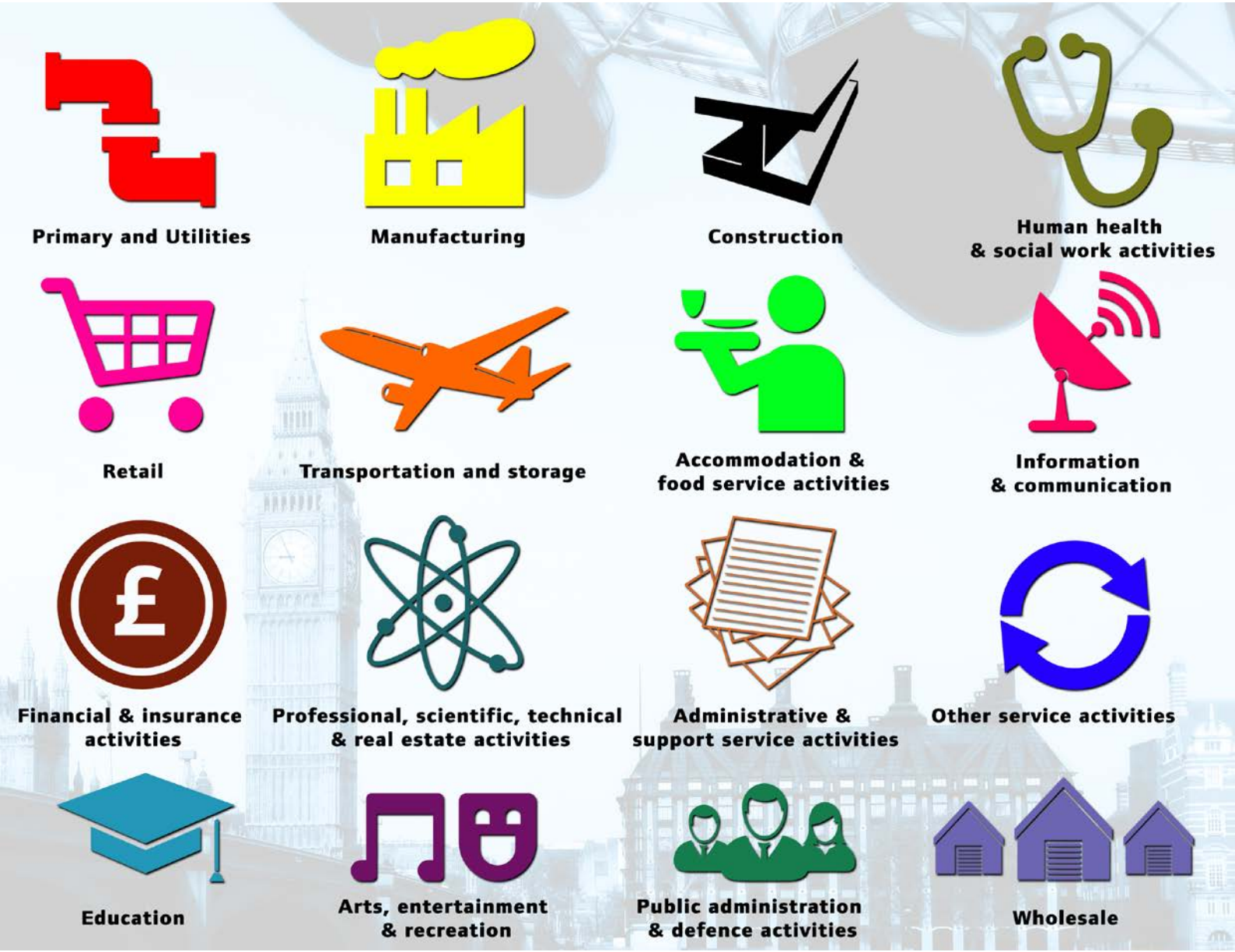

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1: Data sources, and definitions

Understanding the history and drivers of jobs in London forms a key part of the economic evidence base required to help inform effective policies for London. Unfortunately, there are no official statistics providing a consistent or detailed time series of jobs at a detailed industrial level for the capital. This work aims to address this information gap with this part setting out the data sources used and part 2 setting out the methodology employed.

Data sources

The methodology to create a consistent and detailed time-series of jobs draws on a number of official data sources. The 'key' dataset for this work is the high-level industry employee and self-employed elements of Workforce Jobs series. This is combined with detailed industry level business survey data for employee jobs from a number of official surveys[1]. Table 1 summarises the structure of data in the Standard Industrial Classification (SIC) and how this report refers to the data.

Table 1: An example of Standard Industrial Classification structure

Section	Division	Group	Class	Sub-class	
K	**FINANCIAL AND INSURANCE ACTIVITIES**				
	64	**Financial service activities, except insurance and pension funding**			
		64.1	**Monetary intermediation**		
			64.11	Central banking	
			64.19	Other monetary intermediation	
				64.19/1	Banks
				64.19/2	Building societies

In order to produce a consistent time series of the official business survey datasets, some modelling has been necessary. The underlying assumptions are outlined in the methodology part of this paper.

The availability of data and the years that are covered tend to vary by data source and impose some challenges on the analysis. This section aims to outline the different data sources used in this paper starting with the section level Workforce Jobs data before moving on to describe the business survey data used to create more detailed industry level analysis. All of the data sources used are official statistics from the Office for National Statistics (ONS).

Workforce Jobs (WFJ), 1996 - 2013

Workforce Jobs (WFJ)[2] series is the measure used for jobs by industry (as advised by the ONS).

Defining workforce jobs

Workforce jobs in this analysis relate to the number of jobs in London, whether or not they are taken by London residents. In essence, the figures discussed here refer to jobs located in

[1] It is important to note that the business survey data used in this analysis excludes the self-employed and does not therefore provide a complete picture of trends in London's labour market. Self-employment data are included in the amended BRES methodology but is limited to people that are registered for VAT or Pay-As-You-Earn (PAYE) schemes. Prior to BRES, self-employed people were not included in the business survey data sets.

[2] The Office for National Statistics, Revisions to Workforce Jobs, December 2013.

London not employees living in London; this difference is important as some people may have more than one job.

Workforce Jobs are defined as follows:

Workforce jobs = employee jobs + self-employed jobs + HM Forces + Government supported trainees

In London, employee and self-employed jobs account for over 99 per cent of the total Workforce Jobs. Historically, GLA Economics have excluded HM Forces and Government supported trainees from their analysis and for consistency these components are not included in the time series presented here.

A complete regional Workforce jobs series consisting of both employee and self-employed jobs were introduced in July 2010, with the earliest data point for London available for 1996. The WFJ data presented in this paper cover 1996 to 2013 and are based on the 4-quarter annual (calendar year) average in each of the industry sectors.

In the analysis, Section G (consisting of Wholesale and Retail Trade, repair of motor vehicles) is split into two sectors, 'Retail' and 'Wholesale' (footnote: "Retail" is defined as Division 47; "Wholesale" is defined as Divisions 45 and 46). The estimates for apportioning out employment to 'Retail' and 'Wholesale' for 1996-2013 has been based on a data request from the ONS (footnote: Labour market ad hoc data, 'Proportion of London jobs in SIC2007 Section G that are in Division 47, 1996-2013', ONS January 2015), whilst the definition used for data covering 1984 to 1995 is based on the methodology employed in Working Paper 52: London's jobs history – a technical paper[3].

Employee Jobs, 1984 – 1995

Prior to 1996, all regional Workforce jobs data by industry published by the ONS relates to employee jobs only[4] and these data are available until 1984. To demonstrate trends in jobs at the section level (employee and self-employed jobs) in London since 1984, this paper draws on some of the modelled self-employed jobs data from a previous GLA Economics analysis, Working Paper 52[5] (WP52), which bridges the gap in self-employed jobs data between 1984 and 1996.

Self-employed Jobs, 1984 and 1995

For the missing self-employed jobs component for 1984 to 1995, WP52 utilised additional Labour Force Survey (LFS) self-employment data.

1994 and 1995

Self-employment main and second jobs were derived from the LFS using record level micro-data available to researchers under licence arrangements. These record level data that were originally on SIC 1992 basis were converted on to SIC 2007 basis using a weighted correlation matrix[6].

[3] The Greater London Authority, Working Paper 52: London's jobs history – a technical paper, December 2011.
[4] The Office for National Statistics, Workforce Jobs - Quality and Methodology Information, November 2010.
[5] The Greater London Authority, Working Paper 52: London's jobs history – a technical paper, December 2011.
[6] The weighted correlation matrix provides guidance on the weighting between codes in SIC 2003 and SIC 2007.

1984 to 1993
LFS self-employment main and second jobs were derived from micro-data. However, given that no conversion between Standard Industrial Classification (SIC) 1980 and SIC 2007 exist the sector shares over time were derived by applying a linear regression to the existing data.

Availability of more detailed industry level self-employed jobs data limits the potential for this paper to extend the analysis beyond section level Workforce Jobs data. Annual Population Survey (APS), which began in 2004, is a survey of households in Great Britain and provides information on self-employed jobs but data would be limited to a period between 2004 and 2012[7]. In addition, the sample size used to compile self-employed jobs by industry is small and results on self-employed jobs by detailed industry level should be treated with caution. Therefore these results are not covered here.

Business survey data
Workforce jobs data enable high-level analysis of the industry sections in London; however, in order to develop a better understanding of the 'sub-sectors' driving the 'headline' trends we use business survey data. However, these data cover employee jobs only, and so the sub-sector analysis has been constrained to these only. Over time there have been a number of changes to the official business surveys. Due to data/information constraints it has not been possible to create a consistent time series beyond the two most recent business surveys (the Business Register and Employment Survey (BRES) and its predecessor the Annual Business Inquiry/1 (ABI/1)).

Business Register and Employment Survey (BRES) 2008 - 2013
The Business Register and Employment Survey (BRES) is the recommended source of information on employment by detailed geography and detailed industry. BRES is an annual business survey that collects employment information at a local unit level from businesses across the UK for each site that they operate. The data are collected in September from a sample of around 80,000 businesses (covering approximately 500,000 local units) and BRES data are available from 2008 to 2013[8]. The survey sample is weighted up to represent the British economy covering all sectors[9]. The estimates are based on a sample survey and are therefore subject to sampling error. The ONS publishes quality information on the employee estimates and coefficient of variation (CV) and standard errors[10] are available to users.

According to the ONS, employee estimates for London at the 4-digit SIC level are subject to an average of 20 per cent coefficient of variation. Adjusting the time series data for methodological changes in the business surveys by using one year's worth of data (in some cases two years' worth) can amplify the potential inaccuracy of the time series data. For example, if the CV in 1998 was 20 per cent, and these data are adjusted by an adjustment factor that has a 20 per cent CV itself, then the CV for the figure in 1998 is even higher.

[7] Furthermore, in the 2004 APS dataset, the variable identifying location of second job is missing and the location of main job is used as a proxy.
[8] Methodology for BRES changed in 2011 when the treatment of working owners was amended creating a discontinuity between 2010 and 2011; therefore, a consistent data series only covers years 2009 to 2013.
[9] Office for National Statistics, BRES Quality and Methodology Information, February 2013.
[10] The actual sampling error for employee estimates is unknown but it is possible to calculate the typical error that is likely to occur, also known as the standard error. Standard error of each of the employee estimates enables us to assess how close our estimate is from the actual number of employees in London. When the standard error is low, we can be more confident that our employee estimate is close to the true number of employees in each of the sectors in London.

Change from the Annual Business Inquiry/part 1 (ABI/1) to BRES (2008)

In 2008, the transition to BRES[11] resulted in improved employee jobs estimates. The previous business survey ABI/1 collected employee information at the reporting unit level (i.e. in most cases this would mean at the head office level) that was aggregated to produce national estimates. Regional estimates were obtained by apportioning these national estimates on to regions. In contrast, BRES collects data at the local unit/workplace level and calculates national and regional estimates by aggregating these local unit data on to regional and national level removing the potential inaccuracies arising from the apportioning method.

The move from ABI/1 to BRES resulted in several improvements in the business survey data but resulted in a discontinuity in the time series[12]. The ONS has analysed the extent of this discontinuity in Great Britain in a paper 'Discontinuity analysis of the move from the Annual Business Inquiry to the Business Register Employment Survey' quantifying the impact of the questionnaire change on employee estimates in Great Britain, and how the shift from ABI/1 to BRES affects the employee estimates on a regional and industry basis.

According to the ONS analysis, in 2008 the London employee estimate based on BRES data is approximately 84,000 or around 2 per cent higher than the estimate based in ABI/1. This is the largest discrepancy in employee job estimates in absolute terms across all Government Office Regions[13].

[11] The first phase of improvements associated with the introduction of BRES was implemented in 2006 when changes to ABI/1 were introduced.

[12] The key changes affecting the survey were: Questionnaire design in the main affecting the data accuracy of smaller businesses; sample design with stratification by SIC division and by employment size bands; changes to how validation and quality assurance takes place; change in the way employment information was collected resulting in improved regional and industrial breakdowns. For further information, see The Office for National Statistics, Discontinuity analysis of the move from the Annual Business Inquiry to the Business Register Employment Survey, December 2010.

[13] In percentage terms, the discrepancy between the two survey methodologies is the largest in the North East.

Table 2: Difference in employee estimates between ABI/1 and BRES in London by industry

SECTION LEVEL (1-DIGIT)	Published	Published	Value	%
Industry Section level	ABI SIC 2007 2008	BRES SIC 2008 2008	Difference 2008	Difference 2008
A : Agriculture, forestry and fishing	1,500	1,400	-100	-6.7%
B : Mining and quarrying	3,300	3,300	0	0.0%
C : Manufacturing	122,400	131,100	8,700	7.1%
D : Electricity, gas, steam and air conditioning supply	6,600	6,800	200	3.0%
E : Water supply; sewerage, waste management and remediation activities	16,300	15,400	-900	-5.5%
F : Construction	140,500	149,400	8,900	6.3%
G : Wholesale and retail trade; repair of motor vehicles and motorcycles	565,500	566,000	500	0.1%
H : Transportation and storage	236,900	236,900	0	0.0%
I : Accommodation and food service activities	302,900	311,900	9,000	3.0%
J : Information and communication	295,100	308,400	13,300	4.5%
K : Financial and insurance activities	333,200	349,200	16,000	4.8%
L : Real estate activities	79,200	75,600	-3,600	-4.5%
M : Professional, scientific and technical activities	473,000	495,700	22,700	4.8%
N : Administrative and support service activities	451,400	451,700	300	0.1%
O : Public administration and defence; compulsory social security	223,500	222,900	-600	-0.3%
P : Education	313,200	313,700	500	0.2%
Q : Human health and social work activities	387,700	387,700	0	0.0%
R : Arts, entertainment and recreation	114,300	117,500	3,200	2.8%
S : Other service activities	102,100	107,800	5,700	5.6%
Column Total	4,168,600	4,252,400	83,800	2.0%

Source: Annual Business Inquiry/Part 1 (ABI/1) and Business Register and Employment Survey (BRES), ONS.

Looking at the difference in the employee estimates by industry in London (Table 2), the greatest discrepancy is in the Professional, scientific and technical activities sector (driven by changes to division 70: Head offices and management consultancy activities), with BRES estimates around 22,700 higher (or 4.8 per cent) than ABI/1 employee estimates. The second most significant discrepancy is in Financial and insurance activities (driven by division 66: Activities auxiliary to financial services and insurance activities) with the BRES estimate around 16,000 higher than ABI/1 estimates for employee jobs (equivalent to around a 4.8 per cent difference).

These industry differences for London are broadly in line with the national estimates[14]; a more detailed discussion of the impact of the survey change from ABI/1 to BRES in London is included in the analysis by GLA Economics outlined in Current Issues Note 30[15].

Change in the treatment of working owners in BRES (2011)
Since the introduction of BRES in 2008, the treatment of working owners changed in 2011 and as a result of this time series data before 2011 is based on a different methodology than the data from 2010 onwards.

Before the change in methodology, directors of limited companies often classified themselves as working owners, which is not consistent with HM Revenue & Customs classification of these people as employees for tax purposes. In 2010, the ONS modified the BRES questionnaire to be consistent with the tax-related definition, which resulted in a disconnect in the data of around 100,000 employees in London in 2010 - equivalent to around a 2.6 per cent difference in

[14] Discontinuity analysis of the move from the Annual Business Inquiry to the Business Register Employment Survey, ONS.
[15] GLA Economics, Current Issues Note 30: The new Business Register Employment Survey: Changes in London's jobs, 2008 and 2009 compared.

employee jobs estimates between the old and new BRES methodology as demonstrated by the ONS analysis[16] (Table 3 is an extract from this ONS work). The difference in the number of employee jobs estimates between the two methodologies was the greatest in London by region in both absolute and proportional terms. Across London's industry sectors, the discontinuity resulting from the methodology change in 2010 was greatest in absolute terms in the Professional, scientific and technical activities sector, around 23,100 employee jobs, with the new BRES section level estimate approximately 4.7 per cent higher than estimates based on the old methodology. The difference in the Information and communication section was also considerable, equivalent to around 15,500 employees or 5.2 per cent.

Table 3: Discontinuity in the BRES data by industry in London

SECTION LEVEL (1-DIGIT)	Old Method		New Method		Value		% difference	
Industry	BRES SIC 2007		BRES SIC 2007		Difference		Difference	
Section level	2009	2010	2009	2010	2009	2010	2009	2010
A : Agriculture, forestry and fishing	1,000	700	1,000	700	0	0	0.0%	0.0%
B : Mining and quarrying	2,200	1,900	2,200	2,000	0	100	0.0%	5.3%
C : Manufacturing	110,200	106,900	112,900	110,000	2,700	3,100	2.5%	2.9%
D : Electricity, gas, steam and air conditioning supply	5,500	5,700	5,500	5,700	0	0	0.0%	0.0%
E : Water supply; sewerage, waste management and remediation activities	14,400	17,500	14,400	18,300	0	800	0.0%	4.6%
F : Construction	126,800	126,800	135,500	139,100	8,700	12,300	6.9%	9.7%
G : Wholesale and retail trade; repair of motor vehicles and motorcycles	537,600	517,300	547,800	529,500	10,200	12,200	1.9%	2.4%
H : Transportation and storage	217,500	214,000	219,100	215,100	1,600	1,100	0.7%	0.5%
I : Accommodation and food service activities	292,200	295,000	295,900	298,200	3,700	3,200	1.3%	1.1%
J : Information and communication	277,800	295,900	292,100	311,400	14,300	15,500	5.1%	5.2%
K : Financial and insurance activities	315,400	324,700	319,400	327,600	4,000	2,900	1.3%	0.9%
L : Real estate activities	89,900	81,900	94,300	92,000	4,400	10,100	4.9%	12.3%
M : Professional, scientific and technical activities	491,600	491,200	509,000	514,300	17,400	23,100	3.5%	4.7%
N : Administrative and support service activities	402,600	433,800	407,200	445,200	4,600	11,400	1.1%	2.6%
O : Public administration and defence; compulsory social security	223,000	237,800	223,000	237,800	0	0	0.0%	0.0%
P : Education	335,500	336,000	336,300	338,000	800	2,000	0.2%	0.6%
Q : Human health and social work activities	416,600	397,900	418,000	399,500	1,400	1,600	0.3%	0.4%
R : Arts, entertainment and recreation	102,600	108,300	103,400	110,100	800	1,800	0.8%	1.7%
S : Other service activities	104,400	110,000	106,400	112,100	2,000	2,100	1.9%	1.9%
Total	4,066,800	4,103,300	4,143,400	4,206,600	76,600	103,300	1.9%	2.5%

Source: Business Register and Employment Survey (BRES).

Details on how this discontinuity has been addressed are outlined in part 2.

Annual Business Inquiry/1 (ABI/1) 1998 - 2008

Annual Business Inquiry/1 (ABI/1), the predecessor to BRES, was the official employer survey from 1998 to 2008 providing detailed employee estimates by industry. Over its 10-year period, the ABI/1 data were affected by four changes: there were two changes in the Standard Industrial Classification (SIC)[17] in 2003 and, in 2007, a change in the treatment of head offices within the data, and a methodological change in 2006. The changes in the Standard Industrial Classification are discussed separately in the next section.

Standard Industrial Classification (SIC) changes over time

A Standard Industrial Classification (SIC) was first introduced in the UK in 1948 for use in classifying business establishments and other statistical units by the type of economic activity in which they are engaged. The classification provides a framework for the collection, tabulation,

[16] Office for National Statistics, Working owners discontinuity in the Business Register and Employment Survey (BRES), December 2012.
[17] UK Standard Industrial Classification, ONS.

presentation and analysis of data, and its use promotes uniformity. Over time new products, processes and industries emerge and for that reason the Standard Industrial Classification (SIC) system needs to be updated periodically. Modelling work covered by this paper is affected by two changes in SIC; one in 2003 and a more comprehensive revision in 2007.

Change from the Standard Industrial Classification (SIC) 1992 to SIC 2003 (2003)
Changes to NACE, the European Union's classification system for economic activities, were published in January 2003 that required the UK to introduce an update to the Standard Industrial Classification (SIC). As a part of the introduction of SIC 2003 framework, the national sub-classes and classes were revised.

As a result of the change from SIC 1992 to SIC 2003, business survey data for some industry sectors at the sub-class level were missing data between 1998 and 2002. This discontinuity[18] in these industry codes arose mainly from codes being split into several SIC 2003 codes. However, in some cases the change in the economic or industry structure was the key driver of disconnect between the methodologies or SIC frameworks.

One of the more significant changes from SIC1992 to SIC 2003 was in the treatment of head offices. Under the SIC 1992 framework, head offices were classified to the principal activity of the enterprise to which they belonged e.g. employment in the head office of a manufacturing company would be classified as employment within manufacturing, even though they did not engage in any manufacturing activities[19]. Under the SIC 2003 system these employees would be classified separately into a new single code "7415: Management activities of holding companies". Statistics derived from enterprise-level data are not significantly affected by this change but data based on local units (i.e. individual sites of enterprises), such as regional data, can be more affected by this reclassification[20] This analysis takes account of this change in the reclassification of head offices and the adjustment is described in part 2.

In order to ensure a consistent and uninterrupted time series, it was necessary to model data for the 25 affected SIC codes for the period between 1998 and 2002. Details of the affected codes are provided in Table 4 and information on the modelling work will follow in the methodology section of this document.

[18] Discontinuity in this case refers to a change in the way industry level information is classified, which in turn implies that the change in definitions between the two SIC frameworks results in missing information in some industry sub-classes.
[19] Economic Statistics and the Standard Industrial Classification (SIC) 2003.
[20] The scale of this change following the reclassifications of head offices and its impact on local units and employment is further outlined as a part of the ONS analysis included in 'Economic Statistics and the Standard Industrial Classification (SIC) 2003'

Table 4: All affected codes at 4-digit level

2123 : Manufacture of paper stationery
2125 : Manufacture of other articles of paper and paperboard not elsewhere classified
2941 : Manufacture of portable hand held power tools
2942 : Manufacture of metalworking machine tools
2943 : Manufacture of other machine tools not elsewhere classified
4011 : Production of electricity
4012 : Transmission of electricity
4013 : Distribution and trade in electricity
4021 : Manufacture of gas
4022 : Distribution of gaseous fuels through mains
5184 : Wholesale of computers, computer peripheral equipment and software
5185 : Wholesale of other office machinery and equipment
5186 : Wholesale of other electronic parts and equipment
5187 : Wholesale of other machinery for use in industry, trade and navigation
5510 : Hotels
7221 : Publishing of software
7222 : Other software consultancy and supply
7415 : Management activities of holding companies
7481 : Photographic activities
7485 : Secretarial and translation services
7486 : Call centre activities
9001 : Collection and treatment of sewage
9002 : Collection and treatment of other waste
9003 : Sanitation, remediation and similar activities
9305 : Other service activities not elsewhere classified

Source: Annual Business Inquiry/part 1 (ABI/1)

Change from the Standard Industrial Classification (SIC) 2003 to SIC 2007

In 2007, there was a significant change in the SIC and this change was particularly relevant for London as it resulted in a greater breakdown of Business Services data, an important sector for London's economy. Not only is the service sector better captured by SIC 2007, a number of new sections were included into the new structure[21].

Working Paper 52 by GLA Economics published in 2011 outlined how these changes in SIC affected the total employee estimates at a section level between the two surveys, and for convenience, Table 5 summarises these differences.

[21] UK Standard Industrial Classification of Economic Activities 2007 (SIC 2007), Structure and explanatory notes, ONS.

Table 5: Differences in employee estimates by sector between SIC 2003 and SIC 2007

ABI SIC 2003 in 2008			ABI SIC 2007 in 2008		
	Sections	**Employees**		**Sections**	**Employees**
A	Agriculture, hunting and forestry	4,500	**A**	Agriculture, forestry and fishing	1,500
B	Fishing	0			
C	Mining and quarrying	3,300	**B**	Mining and quarrying	3,300
D	Manufacturing	178,200	**C**	Manufacturing	122,400
E	Electricity, gas and water supply	6,900	**D**	Electricity, gas, steam and air conditioning supply	6,600
			E	Water supply; sewerage, waste management and remediation activities	16,300
F	Construction	122,500	**F**	Construction	140,500
G	Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	570,900	**G**	Wholesale and retail trade; repair of motor vehicles and motor cycles	565,500
H	Hotels and restaurants	303,000	**I**	Accommodation and food service activities	302,900
I	Transport, storage and communications	307,400	**H**	Transportation and storage	236,900
			J	Information and communication	295,100
J	Financial Intermediation	331,900	**K**	Financial and insurance activities	333,200
K	Real estate, renting and business activities	1,116,200	**L**	Real estate activities	79,200
			M	Professional, scientific and technical activities	473,000
			N	Administrative and support service activities	451,400
L	Public administration and defence; compulsory social security	223,500	**O**	Public administration and defence; compulsory social security	223,500
M	Education	309,600	**P**	Education	313,200
N	Health and social work	390,400	**Q**	Human health and social work activities	387,700
O	Other community, social and personal services activities	300,300	**R**	Arts, entertainment and recreation	114,300
			S	Other service activities	102,100
P	Activities of private households as employers and undifferentiated production activities of private households	0	**T**	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	0
Q	Extraterritorial organisations and bodies	0	**U**	Activities of extraterritorial organisations and bodies	0
	Total	4,168,600		**Total**	4,168,600

Source: ABI SIC 2003 and ABI SIC 2007

Change in the Annual Business Inquiry part 1 (ABI/1) methodology (2006)

In 2006, changes to the Annual Business Inquiry part 1 (ABI/1) methodology were introduced resulting in improved detailed industry and regional employment estimates and improvements to the apportionment of the lower level estimates[22]. These changes were the first phase of the transition to the Business Register and Employment Survey (BRES). The three key changes introduced in 2006 were:

- Change in the reference date from December to September.
- Use of BRES data within the ABI/1 results for large companies.
- Change to the level at which regional apportionment was calculated was reviewed and improved for certain sectors.

[22] The Office for National Statistics, Discontinuity analysis affecting the 2006 ABI employee estimates, December 2009.

As a result of these amendments to the methodology, the number of employee jobs in London was approximately 63,400 or 1.6 percentage points lower, with the overall discontinuity in Great Britain estimated at around 417,000 in a downward direction, with the retail sector most affected by this change. According to the ONS analysis, the largest impact on employee estimates in London arose from the change in the survey reference date, i.e. the timing when the data were collected affecting highly seasonal industries, such as retail, the most. The change in the source data is also significant for London as well as across most other Government Office Regions.

The impact of discontinuity on employee estimates by industry in London is demonstrated in Table 6. The difference in the employee estimates arising from the change in methodology is the greatest in Wholesale and retail trade, a reduction of around 18,200 (equivalent to a 3.2 per cent difference between the two methodologies)[26]. The second most affected industry in London is Real estate, renting and business activities with a 16,100 employee difference (or around 1.6 per cent difference) in the downward direction between the two methodologies.

Table 6: 2006 Discontinuity in Annual Business Inquiry employee estimates in London by industry based on SIC 2003[27]

SECTION LEVEL (1-DIGIT)	Published	Discontinuity removed	Value	%
Industry	ABI SIC 2003	ABI SIC 2003	Difference	Difference
Section level	2006	2006	2006	2006
A : Agriculture, hunting and forestry	4,500	3,600	900	-20.0%
B : Fishing	*	*		
C : Mining and quarrying	4,100	4,000	100	-2.4%
D : Manufacturing	190,600	191,100	-500	0.3%
E : Electricity, gas and water supply	5,800	7,400	-1,600	27.6%
F : Construction	117,200	123,200	-6,000	5.1%
G : Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	566,600	584,800	-18,200	3.2%
H : Hotels and restaurants	286,700	291,100	-4,400	1.5%
I : Transport, storage and communication	298,400	307,100	-8,700	2.9%
J : Financial intermediation	314,200	320,200	-6,000	1.9%
K : Real estate, renting and business activities	1,023,500	1,039,600	-16,100	1.6%
L : Public administration and defence; compulsory social security	232,700	233,500	-800	0.3%
M : Education	287,900	296,500	-8,600	3.0%
N : Health and social work	384,200	390,100	-5,900	1.5%
O : Other community, social and personal service activities	277,300	265,300	12,000	-4.3%
	3,993,700	4,057,500	-63,800	1.6%

Source: Discontinuity analysis affecting the 2006 ABI employee estimates

Note: Data for section B have been excluded for confidentiality reasons.

Part 2 outlines the processes used to construct employee estimates for the period 1998 to 2005 that are consistent with the later years.

[23] Ibid.

[24] Ibid.

[25] In short, this change in the source data references a shift in the way results were processed and what data were included in the employee estimates. For a more detailed description of this, see 'Discontinuity analysis affecting the 2006 ABI employee estimates'.

[26] All figures used for the discontinuity analysis are based on Standard Industrial Classification 2003.

[27] Our estimates for the discontinuity in each of the industry sectors are based on published rounded ONS figures, whilst the ONS's analysis 'Discontinuity analysis affecting the 2006 ABI employee estimates' is based on raw survey data. Hence, the difference in the totals.

2: Methodology on employee jobs

As set out in Part 1, in order to produce a consistent time series of employee jobs in London there are several data issues that will need to be overcome. General changes in the datasets and issues affecting the data over the time period covered by this analysis are summarised here:

- Changes in business survey methodologies; change in the ABI/1 in 2006, change from Annual Business Inquiry (ABI/1) to Business Register and Employment Survey (BRES) in 2008, and the treatment of working owners in BRES in 2011.
- Changes in definitions; treatment of head offices in 2003.
- Changes in the Standard Industrial Classification (SIC)
    - Discontinuities between SIC 1992 and SIC 2003
    - Conversion between SIC 2003 and SIC 2007 and subsequent adjustments to the data.

Building a consistent time series of employees

This section outlines the key steps that were taken to produce a consistent London-level time series of employee jobs overcoming the discrepancies described in Part 1 and as outlined in the previous GLA Economics analysis, Working Paper 52[28]. First this section will outline the key steps on how a detailed and consistent historic time series of employee jobs for London was produced followed by a more detailed description of each of the steps taken as a part of the employee jobs methodology.

The central approach to creating a consistent time series involved analysing employee data from the different ONS employee surveys (summarised in Table 7) in overlapping years. In addition, a conversion matrix, a spreadsheet that the ONS has provided that gives an indication of how each of the 4-digit SIC 2003 codes are associated with the codes within SIC 2007 framework, is used. The steps set out in Table 8 below explain the methodology in more detail.

Table 7: Business Survey data sources of employee data from 1998 to 2013:

BRES data from 2009 to 2013 in SIC 2007 (new definition of working owners introduced)
BRES data from 2008 to 2010 in SIC 2007 (methodology that replaced ABI/1[29])
ABI/1[30] data from 2007 to 2008 in SIC 2007 (to enable analysis on change in SIC)
ABI/1[31] data from 1998 to 2007 in SIC 2003

[28] GLA Economics, Working Paper 52, London's jobs history – a technical paper (December 2011).
[29] BRES data for 2008 are not 'true' BRES estimates but employee jobs estimates based on ABI/1 data run through BRES methodology.
[30] BRES questionnaire for large firms already in use.
[31] ABI/1 data for 1998 to 2008 is also available on a SIC 1992 basis.

Table 8: Summary of methodological steps

Step 1 – to create a consistent ABI/1 series

1. Amending the data for 2006 discontinuity

2. Modelling work to address missing data between SIC 1992 and SIC 2003

Step 2 – converting ABI/1 from a SIC 2003 on to SIC 2007 basis

Step 3 – adjusting for the change in business surveys

1. The change from ABI/1 to BRES

2. The change in the BRES methodology

3. Incorporating the latest BRES data, constraining to Workforce Jobs and addressing data confidentiality

Source: GLA Economics analysis.

Step 1 – to create a consistent ABI/1 series

1. Amending the data for 2006 discontinuity

The methodological change to the ABI/1 that took place in 2006 resulted in a break in the data where estimates prior to 2006 were not comparable to published data after or in 2006. To correct for this break, 2-digit adjustment factors (provided by the ONS) were applied to the published 4-digit historic ABI/1 data for 1998 to 2005.

To produce these linking factors, the ONS compared the employee job estimates based on the amended methodology to the previously utilised methodology. In essence, the adjustment factor for all codes within the division 67: for example, was produced by estimating the employee jobs using both the 'old' and the 'new' methodology and by taking a ratio of the two.

In order to address this discontinuity in the previously published data, each of the 4-digit level ABI/1 codes in each of the years from 1998 to 2005 were multiplied by their relevant division level (2-digit) linking factor for London[32,33]. Take division '67: Activities auxiliary to financial intermediation' as an example and specifically code '6711: Administration of financial markets'. All of the employee estimates between 1998 and 2005 are multiplied by 0.89 to bring the estimates in line with the amended methodology. In cases where no data to produce a linking factor is available or where a factor is equal to 0, an assumption that the adjustment factor is equal to 1 is made[34]. The analysis assumes that the conversion relationship between 'old' and

[32] This implies that the proportion of data at a division level produced using the new methodology to data compiled using the old methodology has been used to amend all 4-digit level employee job estimates (i.e. if the ratio of data produced using new methodology compared to the data compiled using the old methodology in division 73: Research and development is 0.95, the historic data from 1998 to 2005 is multiplied by this is adjustment factor bringing the historic estimates in line with the reformed methodology).

[33] ONS publication on the discontinuity is available here. The document also provides links to these published London-level adjustment factors.

[34] This incident is rare and only include the following divisions: 05 : Fishing, operation of fish hatcheries and fish farms; service activities incidental to fishing; 10 : Mining of coal and lignite; extraction of peat; 12 : Mining of uranium and thorium ores; 13 : Mining of metal ores.

'new' methodology holds in all of the years before the link year and these linking factors used are applied at the same ratio across all years (factors are not phased in or out over time).

The assumption that the conversion relationship between data sets across 4-digit level data remains constant over time it is likely to be heroic especially over a longer period of time as the economic structure changes this relationship is more than likely to breakdown. Therefore, the accuracy and reliability of employee estimates in the early years of the time series from 1998 to 2013 is likely to be poorer when compared to the estimates available for the last couple of years, in 2013 for example.

2. Modelling work to address missing data between SIC 1992 and SIC 2003

Table 4 outlined all of the codes that were affected by the change in the SIC in 2003 that resulted in discontinuity and absent historic data. The missing data in SIC 1992 is a result of industry codes being split into two or more sub-classes in SIC 2003 and the information is not available for publication. This section will provide more information on the modelling work that was done to produce time series data for those missing data points for the period between 1998 and 2002. Following the initial data analysis, Table 9 reflects the decisions how to treat different 4-digit codes with missing data points.

Table 9: All affected codes and how the discontinuity was addressed

Code	Method to address discontinuity
2123 : Manufacture of paper stationery	Treated as one code with 2125
2125 : Manufacture of other articles of paper and paperboard not elsewhere classified	Treated as one code with 2123
2941 : Manufacture of portable hand held power tools	Used 3-digit level data
2942 : Manufacture of metalworking machine tools	Used 3-digit level data
2943 : Manufacture of other machine tools not elsewhere classified	Used 3-digit level data
4011 : Production of electricity	Linear backcast of shares
4012 : Transmission of electricity	Linear backcast of shares
4013 : Distribution and trade in electricity	Linear backcast of shares
4021 : Manufacture of gas	Used 3-digit level data
4022 : Distribution of gaseous fuels through mains	Used 3-digit level data
5184 : Wholesale of computers, computer peripheral equipment and software	Used relative shares of 5184 & 5185
5185 : Wholesale of other office machinery and equipment	Used relative shares of 5184 & 5185
5186 : Wholesale of other electronic parts and equipment	Used relative shares of 5186 & 5187
5187 : Wholesale of other machinery for use in industry, trade and navigation	Used relative shares of 5186 & 5187
5510 : Hotels	Used 3-digit level data
7221 : Publishing of software	Average share applied to the history
7222 : Other software consultancy and supply	Average share applied to the history
7415 : Management activities of holding companies	Difference between existing 4-digit and 3-digit data
7481 : Photographic activities	Treated together with 7485 (backcast share of total)
7485 : Secretarial and translation services	Treated together with 7481 (backcast share of total)
7486 : Call centre activities	Average share applied to the history
9001 : Collection and treatment of sewage	Average share applied to the history
9002 : Collection and treatment of other waste	Average share applied to the history
9003 : Sanitation, remediation and similar activities	Average share applied to the history
9305 : Other service activities not elsewhere classified	Difference between existing 4-digit and 3-digit data

Source: Annual Business Inquiry/part 1 (ABI/1), GLA Economics modelling work

Combining two or more codes to be treated jointly

Codes 2123 and 2125 were treated as one on the basis that the 3-digit level data combined with the available information for the other codes under 212 give a total number of employee jobs for 2123 and 2125[35].

[35] Overall, 3-digit code 212 consists of the following 4-digit codes: 2121 : Manufacture of corrugated paper and paperboard and of containers of paper and paperboard; 2122 : Manufacture of household and sanitary goods and of toilet requisites; 2123 :

Using 3-digit level data
In some cases where little or no information about the historic employee numbers for 1998 to 2002 is available on a 4-digit level basis, the 3-digit level data were used instead. This approach was adopted with codes 2941, 2942 and 2943 (these codes are associated with Manufacture of machinery and equipment not elsewhere specified) as well as with 4021 and 4022 (that fall under division 'Electricity, gas, steam and hot water supply'). In these instances, the 4-digit level data in the analysis is replaced by the 3-digit level data and appropriate adjustments to the data analysis throughout are made.

In other cases, the 3-digit level information data was used in conjunction with 4-digit level data to induce values for codes where no published data were available (e.g. 5510 : Hotels or 9305 : Other service activities not elsewhere classified[36]).

Linear backcast of shares
Linear backcast approach was adopted with codes 4011, 4012 and 4013. Data for 2003 to 2008 suggests that each of these codes and the proportion that they each account for of the 3-digit level 401, display a trend over time. Therefore, producing a linear backcast of the shares that are then applied to the 3-digit level data provides a reasonable estimate of employee jobs between 1998 and 2002, in the absence of any other information.

Relative shares over time
In the case of 4-digit codes under 518 (the codes with missing data are 5184, 5185, 5186 and 5187), the adopted approach of modelling data for years from 1998 to 2002 involved using the relationship between two industry sub-classes in SIC 1992 that were split into four classes in SIC 2003[37] to inform our modelling work. A total employee estimate for these four classes was calculated by combining 3-digit level data for '518: Wholesale of machinery, equipment and supplies' with the other four available 4-digit level data[38] under 518.

By combining the total employee estimate in 1998 to 2002 with the proportions that each code account for of the total number of employee jobs (obtained from more recent data for 2003-2008 that are assumed to remain constant over the 1998 to 2002 period) for each of these codes, we can induce the number of employee jobs for each of these four codes (5184, 5185, 5186 and 5187).

Average ratios
In the cases where no clear trends in the data are displayed in either the number of employee jobs or in shares of these 4-digit codes relative to the 3-digit level data, a simple average or an arithmetic mean of the shares across the years where we have data for was taken (this approach was adopted with 7221 and 7222 as well as with 9001, 9002 and 9003). These shares were then used to portion the 3-digit level data to the individual codes.

Manufacture of paper stationery; 2124 : Manufacture of wallpaper; 2125 : Manufacture of other articles of paper and paperboard not elsewhere classified.

[36] In the case of 9305, the 3-digit level 930 consists of five different codes including 9305 but for the other four 4-digit level codes the information is available from 1998 to 2002. In conjunction with the 3-digit level data, the available data for the other four codes from 9301 to 9304 will give us a value for 9305.

[37] Code 5164 in SIC 1992 was split into codes 5184 and 5185 in SIC 2003, whilst 5165 was divided into codes 5186 and 5187.

[38] Information that are available included the following codes: 5181 : Wholesale of machine tools; 5182 : Wholesale of mining, construction and civil engineering machinery; 5183 : Wholesale of machinery for the textile industry, and of sewing and knitting machines; 5188 : Wholesale of agricultural machinery and accessories and implements, including tractors.

Adjusting for the change in the treatment of head offices
Firstly, a historic time series estimate for the 4-digit SIC component that includes head office activities, 7415: Management activities of holding companies, is produced going back to 1998 and this is split into two components; holding companies and head offices. This is done by taking the difference between 3-digit and 4-digit level data to determine the number of employee jobs in holding companies activities between 1998 and 2002 and the total number of employee jobs across holding companies and head offices in 2003-2008. The average number of jobs in holding companies 1999-2002[39] is used as an estimate for the number of jobs in 2003-2008. To get an estimate of head offices jobs for 2003-2008 the difference between the overall 4-digit level published data for 7415 and the estimated holding company jobs for 2003-2008 is taken. As no historic estimates for 1998-2002 for head offices exist an average of head office jobs in 2003-2008 is assumed to be a fair reflection of head offices jobs in 1998 and 2002.

As this modelling work increases the total historic employee jobs in 7415 by approximately 19,000 a year between 1998 and 2002, the figures elsewhere require modification to take into account of this. This is done by reducing all 4-digit codes across all industries by their relative size compared to the total number of employee jobs.

Step 2 – converting ABI/1 from a SIC 2003 on to SIC 2007 basis

Converting the ABI/1 data that are on a SIC 2003 basis on to SIC 2007 consistent data is done in a two-step process. Firstly, a weighted correlation matrix[40] is applied to the ABI/1 data adjusted for the 2006 discontinuity (1998 to 2008) to convert it to a SIC 2007 basis. The weighted conversion matrix shows how each of the 4-digit SIC 2003 codes is associated with the codes within SIC 2007 framework providing guidance on the approximate weighting between different codes between SIC 2003 and SIC 2007[41,42]. The number of employees in each of the 4-digit codes from 1998 to 2008, is multiplied by the corresponding proportion associated with each of the 4-digit level code in the weighted correlation matrix producing a time series of employee estimates for each of the 4-digit level codes. It should be noted that the methodology assumes that the SIC conversion matrix relationship holds true in all of the earlier years as it stood in 2009 December, at the time of the IDBR extraction. Furthermore, this conversion matrix was produced at the UK-level, but the analysis makes the assumption it also holds true for London.

In addition to the published weighted correlation matrix, the ONS has also provided the ABI/1 data for 2007 and 2008 on both SIC 2003 and SIC 2007 basis. The next step, therefore, involves assessing how well our converted data compare with the published data and producing adjustment factors to amend for potential differences between the two. Again, it is necessary to

[39] The estimate for employee jobs in 1998 is elevated in comparison to estimates for 1999 to 2002 and was excluded from the average for this reason.
[40] Weighted Tables with percentages SIC 03 – SIC 07, ONS.
[41] The weighting reflects the position of the Inter-Departmental Business Register (IDBR) in December 2009. The IDBR contains information on VAT traders and PAYE employers in a statistical register comprising of over 2 million enterprises. The ONS also notes that the weighted table from the IDBR does not exactly match non-weighted correlation tables produced by Eurostat. Furthermore, there may be small errors caused by correlations on the IDBR that should not occur, e.g. at the time of the exercise, some classifications for SIC 2003 and SIC 2007 were protected to ensure ONS survey continuity resulting in some invalid correlations.
[42] SIC 2003 to SIC 2007 conversion matrix is at the UK (not London) level.

assume that the proportionate differences between estimates are constant over time, so that the factors are applied at the same ratio across the historic data[43].

Table 10 presents the differences in the data, for which there are overlapping years, published on a SIC 2007 basis and the estimates produced by converting the data produced on a SIC 2003 basis. In cases where our employee estimate is different from the published estimate, but neither the published nor our converted employee estimate is equal to zero, the discrepancy between the two figures is amended by applying an adjustment factor at a class level (4-digit)[44]. Adjustment factors for years 2007 and 2008 are applied to the corresponding estimates for those years, whilst the employee job estimates for 1998 to 2006 are adjusted by taking the average across the two adjustment factors.

If the published or the converted data are equal to zero at the class level the adjustment is carried out at the group level if possible, otherwise, at the most detailed level possible[45].

After these adjustments have been made for each of the 4-digit level codes all class level employee estimates are constrained to the section level (1-digit) estimates.

Table 10: Differences in employee estimates between estimated and published ABI/1, SIC 2007

SECTION LEVEL (1-DIGIT)	Published	Converted	Value	%	Published	Converted	Value	%
Industry			Difference	Difference			Difference	Difference
Section level	2007	2007	2007	2007	2008	2008	2008	2008
A : Agriculture, forestry and fishing	1,800	1,600	200	-11.1%	1,500	1,500	0	0.0%
B : Mining and quarrying	4,300	4,300	0	0.0%	3,300	3,300	0	0.0%
C : Manufacturing	126,700	126,500	200	-0.2%	122,400	122,400	0	0.0%
D : Electricity, gas, steam and air conditioning supply	6,700	6,700	0	0.0%	6,600	6,600	0	0.0%
E : Water supply; sewerage, waste management and remediation activities	14,800	15,000	-200	1.4%	16,300	16,500	-200	1.2%
F : Construction	137,800	138,000	-200	0.1%	140,500	140,700	-200	0.1%
G : Wholesale and retail trade; repair of motor vehicles and motorcycles	563,900	563,800	100	0.0%	565,500	569,000	-3,500	0.6%
H : Transportation and storage	238,900	238,900	0	0.0%	236,900	240,700	-3,800	1.6%
I : Accommodation and food service activities	288,600	288,600	0	0.0%	302,900	303,000	-100	0.0%
J : Information and communication	277,200	277,000	200	-0.1%	295,100	293,700	1,400	-0.5%
K : Financial and insurance activities	332,900	329,600	3,300	-1.0%	333,200	333,700	-500	0.2%
L : Real estate activities	72,500	65,100	7,400	-10.2%	79,200	74,400	4,800	-6.1%
M : Professional, scientific and technical activities	457,300	459,700	-2,400	0.5%	473,000	457,700	15,300	-3.2%
N : Administrative and support service activities	449,000	456,900	-7,900	1.8%	451,400	465,600	-14,200	3.1%
O : Public administration and defence; compulsory social security	225,700	224,100	1,600	-0.7%	223,500	223,300	200	-0.1%
P : Education	306,300	307,600	-1,300	0.4%	313,200	312,300	900	-0.3%
Q : Human health and social work activities	381,700	383,100	-1,400	0.4%	387,700	387,700	0	0.0%
R : Arts, entertainment and recreation	110,600	110,100	500	-0.5%	114,300	113,900	400	-0.3%
S : Other service activities	100,900	100,900	0	0.0%	102,100	102,600	-500	0.5%
Column Total	4,097,600	4,097,500			4,168,600	4,168,600		

Source: Annual Business Inquiry/part 1 (ABI/1), ONS

Given the modelling that was required to address the discontinuity in the data between SIC 1992 and SIC 2003, there are three SIC groups that require separate attention to convert them

[43] I.e. there is no phasing in or out or the difference is not 'wedged' over time.
[44] If our converted estimates for code '4711: Retail sale in non-specialised stores with food, beverages and tobacco predominating' in 2007 and 2008 are lower than the published figures on a SIC 2007 basis for the number of employee jobs in these years then the adjustment factor that is applied will be greater than zero. The adjustment is carried out by multiplying our employee estimates in 2007 and 2008 by the corresponding factors.
[45] For example, if the converted summed 4-digit SIC codes at a class level equal zero, the data are adjusted at a group level, or if the summed 4-digit codes at a group level equal zero, the data are adjusted at a division level.

to a SIC 2007 basis; these are 212, 294 and 748[46,47]. Within 748, one component of SIC, 7486, is converted on a 4-digit level basis[48], whilst the remaining codes under 748 are converted on a 3-digit basis. Table 11 shows the published conversion percentages for each of the 3-digit level codes[49].

Table 11: 3-digit weighted conversion percentages

Sic2003	Sic2007	Count %	Employment %	Turnover %
212	172	88%	92%	94%
212	181	12%	8%	6%
294	279	2%	3%	3%
294	282	3%	13%	18%
294	284	87%	81%	76%
294	331	7%	4%	3%
294	332	0%	0%	0%
748	592	0%	0%	1%
748	639	1%	1%	2%
748	741	13%	8%	8%
748	742	7%	5%	3%
748	743	0%	1%	0%
748	749	16%	12%	19%
748	774	0%	0%	0%
748	803	0%	0%	0%
748	821	2%	3%	2%
748	822	1%	11%	5%
748	823	3%	4%	4%
748	829	56%	53%	57%

Source: Weighted Correlation Tables, the Office for National Statistics.

As a result of the treatment of code 7486, the percentages in the published 3-digit weighted conversion matrix are rescaled to take account of the 4-digit level adjustment of 7486. On the 3-digit basis 7486 or 8220 accounts for 11 per cent of 748. Therefore, to rescale the percentages for the remaining codes we divide each of the existing ratios by (1-0.11 = 0.89). These rescaled percentages are then multiplied by the 3-digit 748 employee jobs number in each of the individual years and codes that has been amended to take into account of the removal of 7486 or 8220.

Step 3 – adjusting for the change in business surveys

The introduction of BRES in 2008[50] improved the published regional and national employment estimates but resulted also in a discontinuity between estimates produced using BRES methodology and its predecessor ABI/1 estimates. A second change in the business survey

[46] Firstly, 2123 and 2125 codes in the SIC 2003 framework were treated together as one code, 4-digit level codes within 294 were treated on a 3-digit level, whilst 7481 and 7485 were treated jointly to produce a single employee estimate for these two codes.

[47] Codes at the 4-digit level under 748 are converted on a 3-digit basis and the 3-digit weighted conversion percentages are used (the modelled codes included in 748 were 7481, 7485 and 7486). In principle, this implies taking the 3-digit code 748, that is a sum of all modelled 4-digit codes within it, and multiplying this by the 3-digit conversion matrix percentage, (see Table 11 for examples of the conversion percentages).

[48] Given that code 8220 in SIC 2007 consists solely of code 7486 and the fact that 100 per cent of 7486 converts into code 8220, the code 7486 conversion is carried out at 4-digit level.

[49] Link in footnote 45 to Weighted Tables with percentages SIC 03 – SIC 07 will also provide information on the 3-digit weighted conversion percentages.

[50] BRES 2008 estimates are not 'true' BRES estimates but ABI/1 results processed through the BRES processing system. Therefore BRES 2008 estimates are not as robust as the ones produced for the subsequent years.

occurred in 2010 when the treatment of working owners within BRES changed. This section outlines the amendments made to the employee estimates from these two survey changes.

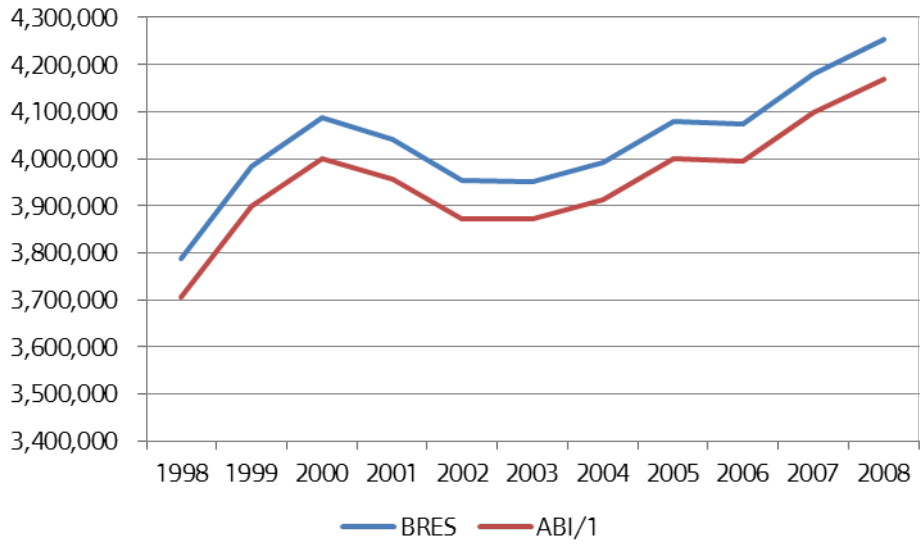
1. The change from ABI/1 to BRES

Similarly to the adjustments that were made to take account of the discrepancy between converted ABI/1 from SIC 2003 on to SIC 2007 and the published data, historic employee estimates for 1998 to 2008 were adjusted for the change in the business survey methodology from the ABI/1 to BRES. As these two data sets overlap in 2008 and employee estimates based on both ABI/1 and BRES methodologies are available, an adjustment factor[51] for each of the 4-digit level SIC classes was produced. The analysis assumes that the relationship between ABI/1 and BRES holds in all of the years before the link year.

These 4-digit adjustment factors were then applied to the data series from 1998 to 2008. Where possible these adjustments were done at the class level, but otherwise these adjustments are made at the most detailed level. Following the adjustment, all 4-digit level estimates were constrained to their relevant section level estimates in each year.

On average, between 1998 and 2008, the ABI/1 estimates are around 83,800 higher when adjusted to be consistent with the new BRES methodology. Figure 1 demonstrates the difference in the employee estimate time series following the adjustment.

Figure 1: Employee jobs estimates adjusted for change from ABI/1 to BRES



Source: BRES and ABI/1, modelling by GLA Economics.

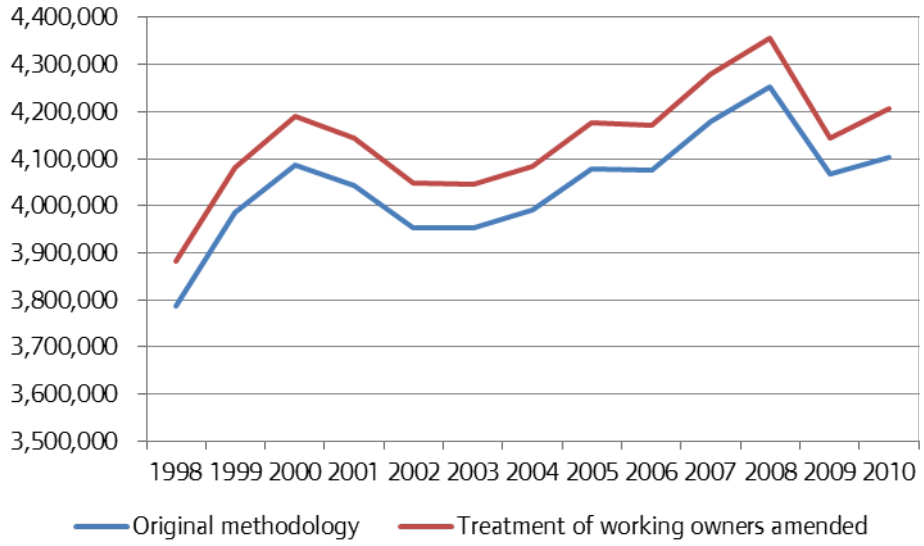
2. The change in the BRES methodology

The BRES adjusted its treatment of working owners to ensure consistency with the definition used for tax purposes by HM Revenue and Customs. This created a discontinuity in employee jobs data. However, the ONS has published BRES data for 2009 and 2010 using both the old methodology before the treatment of working owners changed, and the new improved methodology.

[51] Each of the 4-digit level BRES employee estimates are divided by the corresponding 4-digit employee estimates from ABI/1.

As a part of the adjustment process, the estimates from the two BRES datasets in the two overlapping years were compared. As with other changes described above, 4-digit level adjustment factors were produced. This was done for the 2009 and 2010 data, and the factors were then averaged and applied to the historic time series between 1998 and 2008. The analysis assumes that the relationship between ABI/1 and BRES holds in all of the years before the link year. Again, following the application of the adjustment factors employee estimates were then constrained to the section level data.

Figure 2: Employee jobs estimates adjusted for change in BRES



Source: BRES and ABI/1, additional modelling by GLA Economics.

As reflected in Figure 2, this adjustment has resulted in an upward revision of historic employee jobs estimates. In 2009, the difference in employee estimates between the two methodologies was around 76,600 and, in 2010, approximately 103,300.

3. Incorporating the latest BRES data, constraining to Workforce Jobs and addressing data confidentiality

The final step of the process of producing a consistent employee jobs time series for London involves including the latest jobs data (BRES estimates for 2012 and 2013), constraining the time series estimates to the Workforce Jobs series and addressing the issue of data confidentiality.

In preparation of publication, all data tables to be included in the Working Paper and the London Datastore underwent disclosure control as required in the Statistics and Registration Service Act 2007, Section 39. Access to BRES estimates is limited to licenced users and subject to confidentiality agreement. To comply with this licence requirement data suppression was carried out in two stages:

1. Hard suppression or primary suppression where any confidential values on a 4-digit basis were blanked out from the tables.
2. Soft suppression or secondary suppression where rows and columns were deleted to ensure that it is not possible to induce confidential employee estimates by subtracting class level data from group level data (or by subtracting group level data from division level data).

Finally, the employee estimates were rounded to the nearest 100 so that figures of less than 50 would not appear anywhere in the published tables.

Summary

The lack of detailed industry jobs data over time constrains our understanding of London's economy. To improve this understanding this methodology develops a detailed industrial breakdown of jobs in London over time. However, the methodology involves a number of simplifying assumptions and the use of various different datasets. As a result, the figures produced from this work are estimates and should be treated with relevant caution.

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