ARTICLE

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Implementation of SIC 2007 for the Vacancy Survey

SUMMARY

The article reports on the work to publish the Vacancy Survey on Standard Industrial Classification 2007 (SIC 2007). The main developments are:

- changes to the survey design have led to changes in both the industrial groupings and employment size bands used for sampling
- creation of historical series on a consistent basis with the latest data
- seasonal adjustment of the new series
- changes made to published outputs, including the impact of the revisions.

Introduction

In December 2009, the Office for National Statistics (ONS) published updated plans for moving to the new Standard Industrial Classification 2007 (SIC 2007) – that is the method of classifying businesses by their type of economic activity (see Hughes et al 2009). This included the intention to move the Vacancy Survey to SIC 2007 from February 2010. The first estimates on this basis, corresponding to the three months November 2009 to January 2010, were published in the Labour Market statistical bulletin on 17 February 2010.

This article describes how SIC 2007 was implemented for the Vacancy Survey and explains other changes made to the survey methods and publications.

Changes to the survey design and sample allocation

Like many business surveys conducted by ONS, the Vacancy Survey is stratified by industrial activity and business size. To reflect the new SIC 2007, the first major revision of the classification since 1992 and the outcome of a series of consultations across Europe since 2002, the sample design has had to be changed. The move to SIC 2007 complies with European regulations and has been pre-announced by ONS. The industry strata for the Vacancy Survey are defined by sections within SIC 2007, with the exception of section G (wholesale and retail trade; repair of motor vehicles and motor cycles) which is split into its three divisions given their large size. **Table 1**

shows the industries under the SIC 2007 survey design compared to their nearest equivalent in the original SIC 2003 survey design.

ONS also took the opportunity to standardise business size bands (based on employment) across industries, fulfilling a recommendation from the Report on the Triennial Review of the Monthly Vacancy Survey (2005). Originally, different combinations of 10 size bands were applied to different industries, which did not always align with the published size bands required under European regulation. These have now been reduced to five standard size bands across all industries in line with the published size bands (see **Table 2**). This improvement has caused significant revisions to the level of some of the size band estimates, increasing the proportion of vacancies reported in businesses with more than 2500 employees, while reducing the number in the 250–2499 size band. This is explained in greater detail later in the article.

For the sample, the lower size band limit was raised from businesses with employment of one, to businesses with employment of two. Businesses with employment of one are still included in the population and thus estimated for. This fulfils a recommendation from the Report on the Triennial Review of the Vacancy Survey (2009), with the aim of reducing the administrative burden on the smallest businesses.

The overall sample size remains at approximately 6,000 businesses per month

Table 1

Industries used to stratify the Vacancy Survey: SIC 2007 compared to their nearest equivalent in SIC 2003

SIC 2003			SIC 2007		
Sections	Description	SIC 2003 Range	Sections	Description	SIC 2007 Range
C	Mining and quarrying	10100 14500	B	Mining and quarrying	0510 0990
DA	Food, drink and tobacco	15111 16000	C	Manufacturing	1011 3320
DB/DC	Textiles, clothing and leather	17100 19300			
DD	Wood	20100 20520			
DE	Paper, pulp, printing and publishing	21110 22330			
DF	Coke, nuclear fuels, refined oil	23100 23300			
DG	Chemicals	24110 24700			
DH	Rubber and plastics	25110 25240			
DI	Non-metallic mineral products	26110 26829			
DJ	Base metals and fabricated metal products	27100 28750			
DK	Machinery and equipment	29110 29720			
DL	Electrical and optical equipment	30010 33500			
DM	Transport equipment	34100 35500			
DN	Manufacturing (NEC)	36110 37200			
E	Gas, electricity and water supply	40110 42000	D	Electricity, gas, steam and air conditioning supply	3511 3530
			E	Water supply, sewerage, waste management and remediation activities	3600 3900
F	Construction	45110 45500	F	Construction	4110 43999
G	Motor Vehicles	50101 50500	G	Motor Vehicles	4511 4540
G	Wholesale	51110 51900	G	Wholesale	4611 4690
G	Retail	52110 52740	G	Retail	4711 4799
H	Hotels and restaurants	55101 55520	I	Accommodation and food service activities	5510 56302
I	Transport, storage	60101 63400	H	Transport and storage	4910 53202
I	Communications	64110 64200	J	Information and communication	5811 6399
J	Financial Intermediation	65110 67200	K	Financial and insurance activities	6411 6630
K	Real estate, renting	70110 70320	L	Real estate activities	6810 6832
K	Business activities	71100 74849 (exc. 74500)	M	Professional, scientific and technical activities	6910 7500
			N	Administrative and support service activities	7711 8299 (exc. 781-3)
L	Public administration and defence; compulsory social security	75110 75300	O	Public administration and defence; compulsory social security	8411 8430
M	Education	80100 80429	P	Education	8510 8560
N	Health and social work	85111 85322	Q	Human health and social work	8610 8899
O	Other community, social and personal service activities;	90010 93059	R	Arts, entertainment and recreation	9001 9329
			S	Other service activities	9411 9609

Source: Office for National Statistics

Table 2

Approximate sample sizes by size band under the latest sample design

Employment size band	Sample size
2-9	2086
10-49	978
50-249	702
250-2499	1056
2500 and over	1176

Source: Office for National Statistics

(15,000 different businesses per quarter). The sample was allocated across the new sample design, using a method that minimises the variance at the total level but also gives good estimates for subgroups. This objective is balanced by following ONS guidance to minimise the administrative burden and ensure the confidentiality of respondents. The achieved sample by size band is shown in Table 2.

The sample rotates for businesses below a certain size depending on the industry:

- for most industries in the new design,

sample rotation occurs for businesses below employment of 2500

- for section B (mining and quarrying) and section E (water supply, sewerage waste and remediation), the cut-off is employment of 250
- for section D (electricity, gas, steam and air conditioning supply), the cut-off is employment of 50

The lower cut-offs in sections B, D and E are because the business population in these relatively small industries cannot support rotational sampling above these thresholds.

All businesses in the population above the sampling cut-off are selected every month. Businesses sampled below the cut-off are selected once a quarter, and remain in the sample for a number of consecutive quarters before being rotated out. There are three separate samples, one for each month of the quarter, which are combined in the rolling three-month average series. Due to the changes in classification and sample design, businesses might remain in the sample for a shorter or longer period than would usually be expected, but ONS has attempted to minimise those occurrences.

Constructing continuous series over time

Continuous time series are required in order to ensure comparability of estimates over time. ONS used a combination of the following three methods for different time spans, which have then been linked to form a continuous time series:

1. from the start of the series in April 2001 to January 2008, a conversion matrix was used (in fact series were produced up to September 2009 to give an overlap with the second method to enable the linking process). This method apportions the SIC 2003 series to SIC 2007 sections, using proportions derived from dual coded employment data in the Inter-Departmental Business Register (IDBR). This aggregate level method was widely used by ONS at the last major classification change and is widely used by other National Statistics Institutes
2. from February 2008 to December 2009, a micro-method was used. The individual survey responses selected under the original design were re-weighted and aggregated using the new sample design with strata based on SIC 2007 and the new five standard size bands. This method was deemed to give better estimates than the first method. It was only applicable from the start of 2008, when businesses were first dual coded on the IDBR for both SIC 2003 and SIC 2007
3. from January 2010, the survey was selected, weighted and aggregated using the new design

The series produced from the first and second methods were joined by applying linking factors. These were calculated by taking the ratio of the data calculated by the second method with the first method for the overlapping data points between February 2008 to September 2009, producing 12 month rolling averages of these ratios, and then selecting a robust rolling average based on the nine spans. The link factors were applied backwards from January 2008 to the series generated from the first method, and then attached to the latter part of the series generated by the

second method. In effect, the level of the linked series was set by the second method. Because this is a micro-method it gives the best estimate of the level of SIC 2007 series. However, this differs to the total level when estimated using SIC 2003 industries. Consequently there were revisions across the whole length of the series, at both subgroup and aggregate levels.

The linking process was applied to the industry and size band series. The size band series were then constrained to the sum of the industry series, to remove small differences between the sum of the industry series and the sum of the size band series. No linking between the second and third methods was undertaken because there were no overlapping periods – the selection switched over to the new design in January 2010. There do not appear to be any discontinuities at this point.

Seasonal adjustment review

Seasonal adjustment reviews of the Vacancy Survey are carried out each year, usually in the April release. Given the described changes in moving the survey on to a SIC 2007 basis, it was necessary to conduct a seasonal adjustment review on the revised series ahead of the February 2010 release. The review involves looking at each component and aggregate series individually to determine the type of adjustment to be used, identifying the seasonal pattern and any other effects on the data that are not strictly seasonal. A number of improvements were identified which also contributed to revisions to the seasonally adjusted series.

In addition, the review has resulted in modifications to the seasonal adjustment modelling options in all the series. An additive decomposition has been adopted for the total vacancies seasonally adjusted series. Analysis of the 20 industry series has resulted in eight series adopting a

multiplicative decomposition, seven series an additive composition, with the remaining five showing no seasonality. The five 'size of enterprise' series have three with a multiplicative decomposition and two with an additive decomposition. (see **Box 1**, Seasonal adjustment using X12 ARIMA). As a consequence, seasonally adjusted figures have been revised back to the beginning of the series.

Revisions to the seasonally adjusted series have been relatively small and have had little effect on the assessment of the latest trends.

Impact of changes

The impact of the changes to the continuous back series on the total non-seasonally adjusted series, and the subsequent revisions to the total seasonally adjusted series, are shown in **Table 3**. These are also illustrated in **Figure 1**, which shows the old unadjusted vacancy series, the revised unadjusted vacancy series, the old seasonally adjusted vacancy series and the revised seasonally adjusted vacancy series.

The main impact on the size band analysis has been to increase the proportion of the total vacancies that are in businesses with more than 2,500 employees, while reducing the number in the 250–2,499 employee size band. This is because the previous methodology was generally over-attributing vacancies within cells that straddled size bands to the smaller category. Changes in the number of vacancies in other size bands are much smaller than the movement between these two. **Figure 2** shows the seasonally adjusted figures for each of the size bands before and after the changes to the sample design.

Changes to published tables

The introduction of SIC 2007 required some changes to the tables published in the Statistical Bulletin to reflect the new

Box 1

Seasonal adjustment using X-12 ARIMA

Seasonal adjustment is the process of identifying and removing the seasonal components from a series leaving the trend and irregular components.

The Vacancy Survey series are seasonally adjusted using X-12 ARIMA. In future this program will be used across ONS as the logical replacement for X-11 ARIMA, due to its superior power and additional capabilities. It is now being introduced for some new series where practical.

The program splits the series into a trend, seasonal, and irregular components. If the series is modelled additively, summing

the three parts gives the unadjusted data. If it is modelled multiplicatively, the raw data is the product of the three components. The seasonal component cannot be found without knowing the trend component. Therefore, X-12 ARIMA performs a series of iterations, obtaining a better estimate for the trend and seasonality with each one.

The ARIMA functionality can be used with series of five years or more. The program fits an autoregressive integrated moving average (ARIMA) model to the data, using forecasts for one year ahead to improve the estimation of seasonal factors at the end of the series.

Table 3
Revisions to Vacancy Survey series, April 2001 to December 2009

United Kingdom				Thousands and per cent (three-month averages)		
	Non- seasonally adjusted series			Seasonally adjusted series		
	Revised Series (000s)	Change (000s)	Change (per cent)	Revised Series (000s)	Change (000s)	Change (per cent)
Apr-Jun 2001	676	9	1.4	670	10	1.5
May-Jul 2001	676	9	1.4	664	9	1.4
Jun-Aug 2001	664	9	1.4	652	9	1.4
Jul-Sep 2001	672	8	1.2	654	9	1.4
Aug-Oct 2001	666	8	1.2	630	8	1.3
Sep-Nov 2001	651	7	1.1	617	7	1.2
Oct-Dec 2001	596	5	0.9	593	5	0.9
Nov-Jan 2002	557	5	0.9	598	6	1.1
Dec-Feb 2002	563	5	0.9	607	6	1.0
Jan-Mar 2002	583	6	1.1	610	7	1.1
Feb-Apr 2002	604	6	1.0	610	6	1.0
Mar-May 2002	602	6	0.9	604	6	1.0
Apr-Jun 2002	613	6	1.0	607	6	1.0
May-Jul 2002	615	7	1.2	602	6	1.1
Jun-Aug 2002	615	7	1.1	604	6	1.0
Jul-Sep 2002	619	5	0.9	600	4	0.7
Aug-Oct 2002	636	4	0.7	600	3	0.5
Sep-Nov 2002	633	4	0.6	599	3	0.5
Oct-Dec 2002	597	3	0.5	595	3	0.6
Nov-Jan 2003	553	3	0.6	594	4	0.7
Dec-Feb 2003	543	3	0.6	587	6	1.0
Jan-Mar 2003	557	4	0.7	585	5	0.9
Feb-Apr 2003	571	3	0.6	577	4	0.7
Mar-May 2003	578	3	0.6	581	4	0.6
Apr-Jun 2003	577	3	0.5	571	3	0.5
May-Jul 2003	579	4	0.6	565	2	0.4
Jun-Aug 2003	580	3	0.6	568	2	0.4
Jul-Sep 2003	601	4	0.7	583	3	0.5
Aug-Oct 2003	629	5	0.7	595	3	0.6
Sep-Nov 2003	634	5	0.7	602	4	0.7
Oct-Dec 2003	608	4	0.7	606	5	0.8
Nov-Jan 2004	565	4	0.7	605	4	0.7
Dec-Feb 2004	565	4	0.6	608	5	0.8
Jan-Mar 2004	587	4	0.7	615	4	0.6
Feb-Apr 2004	615	5	0.8	621	5	0.8
Mar-May 2004	626	5	0.7	628	5	0.7
Apr-Jun 2004	638	5	0.9	632	6	0.9
May-Jul 2004	658	6	0.9	643	6	1.0
Jun-Aug 2004	657	7	1.1	644	7	1.2
Jul-Sep 2004	662	8	1.2	643	8	1.3
Aug-Oct 2004	678	8	1.2	645	10	1.5
Sep-Nov 2004	680	8	1.2	649	10	1.5
Oct-Dec 2004	654	7	1.1	653	8	1.2
Nov-Jan 2005	614	6	0.9	653	3	0.4
Dec-Feb 2005	604	5	0.8	648	3	0.5
Jan-Mar 2005	610	5	0.9	638	4	0.6
Feb-Apr 2005	625	6	0.9	630	5	0.9
Mar-May 2005	635	5	0.8	637	5	0.8
Apr-June 2005	642	5	0.8	636	5	0.8
May-Jul 2005	644	5	0.7	628	4	0.7
Jun-Aug 2005	632	5	0.8	617	5	0.9
Jul-Sep 2005	633	5	0.9	614	5	0.9
Aug-Oct 2005	634	6	1.0	603	5	0.9
Sep-Nov 2005	631	7	1.1	602	6	1.0
Oct-Dec 2005	606	6	1.0	605	7	1.2
Nov-Jan 2006	570	5	0.9	610	5	0.8
Dec-Feb 2006	564	5	1.0	608	7	1.1
Jan-Mar 2006	569	5	0.9	596	5	0.8
Feb-Apr 2006	590	5	0.9	594	5	0.8
Mar-May 2006	593	6	1.0	593	6	0.9
Apr-June 2006	606	6	1.1	600	6	1.1
May-Jul 2006	619	7	1.1	604	5	0.9
Jun-Aug 2006	624	7	1.1	610	8	1.3
Jul-Sep 2006	627	7	1.1	608	7	1.2

Table 3 continued

Revisions to Vacancy Survey series, April 2001 to December 2009

United Kingdom				Thousands and per cent (three-month averages)		
Non- seasonally adjusted series				Seasonally adjusted series		
	Revised Series (000s)	Change (000s)	Change (per cent)	Revised Series (000s)	Change (000s)	Change (per cent)
Aug-Oct 2006	641	7	1.2	611	7	1.2
Sep-Nov 2006	637	7	1.1	609	7	1.1
Oct-Dec 2006	612	6	1.0	612	8	1.3
Nov-Jan 2007	575	5	0.9	616	4	0.7
Dec-Feb 2007	581	5	0.9	625	5	0.8
Jan-Mar 2007	614	6	1.0	639	3	0.5
Feb-Apr 2007	640	7	1.0	643	5	0.8
Mar-May 2007	648	6	1.0	647	6	0.9
Apr-June 2007	661	7	1.0	656	7	1.0
May-Jul 2007	681	7	1.0	666	7	1.1
Jun-Aug 2007	689	7	1.0	674	11	1.6
Jul-Sep 2007	695	7	1.0	676	10	1.5
Aug-Oct 2007	708	7	1.0	678	11	1.6
Sep-Nov 2007	713	7	1.0	685	10	1.5
Oct-Dec 2007	683	6	0.9	684	9	1.3
Nov-Jan 2008	636	5	0.9	677	0	0.0
Dec-Feb 2008	642	11	1.7	685	5	0.8
Jan-Mar 2008	674	15	2.3	697	9	1.3
Feb-Apr 2008	691	11	1.6	692	9	1.3
Mar-May 2008	681	9	1.3	679	8	1.1
Apr-June 2008	663	5	0.8	659	5	0.8
May-Jul 2008	657	11	1.7	642	10	1.6
Jun-Aug 2008	635	8	1.3	621	12	1.9
Jul-Sep 2008	625	5	0.9	607	7	1.1
Aug-Oct 2008	617	4	0.7	587	3	0.6
Sep-Nov 2008	585	2	0.4	558	0	0.0
Oct-Dec 2008	526	-3	-0.5	528	0	0.0
Nov-Jan 2009	461	-7	-1.4	503	0	0.0
Dec-Feb 2009	439	-6	-1.5	482	2	0.4
Jan-Mar 2009	444	-1	-0.2	466	2	0.5
Feb-Apr 2009	453	2	0.4	454	1	0.2
Mar-May 2009	448	2	0.5	446	1	0.2
Apr-June 2009	439	3	0.6	435	1	0.3
May-Jul 2009	444	4	1.0	430	0	-0.1
Jun-Aug 2009	449	4	0.8	436	3	0.7
Jul-Sep 2009	450	3	0.8	431	0	-0.1
Aug-Oct 2009	459	8	1.8	430	0	-0.1
Sep-Nov 2009	469	13	2.8	441	5	1.1
Oct-Dec 2009	463	15	3.3	465	17	3.9

Source: ONS Vacancy Survey

Figure 1
Number of job vacancies in the UK, three-month averages

Source: ONS Vacancy Survey

Figure 2

Vacancy size bands before and after improvements to the survey sample design

Source: ONS Vacancy Survey

industry breakdown. At the same time ONS took the opportunity to implement other changes to the published outputs, based on the recommendations of the Report on the Triennial Review of the Vacancy Survey (2009) and an internal review of all Labour Market statistical outputs.

One of the outcomes of these reviews was that users would like to see information at a more detailed level of industrial breakdown than the eight broad industrial groupings that were previously published. These groupings reflected the level at which seasonal adjustment of the industrial series was carried out. Under SIC 2007, the publication has been moved from these broad industrial groupings to 18 individual sections. Consequently this has required the seasonal adjustment of a larger number of industrial series. The new breakdowns will give the user more information on the relative performance of the different industry sections than was previously available. However, the more detailed breakdown does mean that for some smaller sectors little variation in the published estimate of vacancies is likely to be seen over time.

Another recommendation of the 2009 triennial review was the removal of the single month series in favour of the rolling three-month average. The design of the Vacancy Survey is optimised to produce rolling three-monthly average estimates.

Although single month estimates are possible from the series and have been published in the past, the relatively high sampling variability of these estimates make it difficult to conclude to what extent movements are reflecting real variations in the labour market. Therefore rather than continue to publish this series, which may lead to spurious conclusions about the state of the labour market, ONS will only publish the rolling three-month average estimates that the survey is designed to produce.

In place of the single month series, ONS have introduced two new tables to the Labour Market statistical bulletin. The first of these is a table giving the breakdown of vacancies by the size of business, as measured by the number of employees working for the business. Although not in the Statistical Bulletin, this table has previously been published in ELMR as Table 6.25 in the section on Further Labour Market Statistics. However as explained, due to changes to the sample design, the methodology used to produce this table has now improved, leading to significant revisions from the previous versions. This table is now additionally included as Table 21 in the Statistical Bulletin.

A second new table introduces a ratio of the number of unemployed people per vacancy. Although not all people who will apply for vacancies will be unemployed, this will give some indication of the supply

and demand relationship prevalent in the labour market. This new table will appear as Table 21(1) of the Statistical Bulletin. The periods available in this table differ from the other vacancy tables to reflect the latest unemployment figures available in Table 1 of the Statistical Bulletin. This means that the latest figures will always be one month behind the other vacancy tables. This new table has also replaced Table 6.25 of the ELMR tables.

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