Enriched ASHE Quick Start Guide

Wage and Employment Dynamics

www.wagedynamics.com

Contents

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Note: This work was produced using survey data accessed through the ONS Secure Research Service. The use of the ONS data in this work does not imply the endorsement of the ONS or data owners in relation to the interpretation or analysis of the statistical data. This work uses research datasets which may not exactly reproduce National Statistics aggregates. National Statistics follow consistent statistical conventions over time and cannot be compared to these findings.

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The Wage and Employment Dynamics Project

The Wage and Employment Dynamics (WED) project was funded by Administrative Data Research 2019-2022 to review, quality assure and enhance ASHE data. The project was also provided with ASHE data linked to the 2011 Census for England and Wales. This document describes the 'Enriched ASHE' dataset created by the code, which can be applied to the standard ASHE dataset. The code can also be applied to the ASHE-2011 Census dataset, creating an 'Enriched ASHE – 2011 Census' dataset. A separate document describes the ASHE - 2011 Census base dataset. The code is available to researchers within the Secure Research Service (SRS). Note that the ASHE – 2011 Census dataset does not hold geography for individuals below the level of Local Authority.

Enriched ASHE - Overview

The Annual Survey of Hours and Earnings (ASHE) is carried out in Spring each year by the UK Office for National Statistics (ONS). It is intended to be a 1% sample of employees, with data provided by employers. The same individuals are sampled in April each year that they hold an employee job, meaning their longitudinal employment path can be studied.

As data is supplied by employers, the information is limited to what can be supplied from payroll records: detailed information on wages and paid hours, employer pension contributions, occupation, industry and location, but only age and gender for personal characteristics. From the survey form and its own records, ONS generates several useful derived variables.

The data can be linked to other ONS business datasets that contain data on the employer (the enterprise) through the Inter-departmental Business Register (IDBR) Enterprise Reference numbers that are provided on the ASHE dataset. However, workplaces can only be indirectly linked to workplace data in other datasets as ASHE uses its own reference system for workplaces.

ASHE data is available from 2004 onwards. Its predecessor, the New Earnings Survey (NES) ran from 1975; it used the same sampling frame and collected much the same variables, so potentially information is available on some workers for over 40 years. There are some concerns about linking individuals over this period, but the 'ASHE' data files supplied to researchers by ONS include NES data from 1998-2003 which has been reliably linked.

ASHE is generally seen as high-quality data as it is provided by employers from payroll records rather than relying on employee recall. Large employers directly supply ONS with payroll records, rather than completing individual forms for members of staff. A major potential issue with ASHE is the sampling and weighting (see below).

ASHE is point-in-time information. There is no information on what ASHE respondents do through the rest of the year, while employees in the ASHE population but not working during the April reference week are not included in the dataset.

The standard ASHE dataset has been available to researchers through the ONS's SRS and the UK Data Archive Secure Data Service for many years, as well as being directly distributed to government departments. The Wage and Employment Dynamics (WED) team have generated an enriched dataset (Enriched ASHE), which includes additional variables derived by the WED team. The key

difference between the Enriched ASHE and standard ASHE datasets is the creation of additional variables by running Stata code available to all approved researchers[1].

ASHE does not cover NI; data is collected by NISRA on a consistent basis, but this is not generally available to GB researchers.

Survey basis and sample selection

The ASHE population is based on a random 1% sample of national insurance numbers (NINos). These same numbers are used every year, so a person is either in the sampling frame for the whole of their employment career or not in at all. The sample changes as migrants or young workers join the labour force, and emigrants or retirees leave. Hence ASHE should be seen as a rolling random sample with replacement. NINos are not available in the research dataset but are replaced with a random index.

The sampling frame is the HMRC record of employees registered for PAYE. HMRC supplies ONS with details of the employer of every employee in scope in February. Forms of employment that are not on the register (e.g., self-employment) will not be included. People with multiple employers (e.g., doing two part-time jobs) will have all of their jobs reported. ONS writes to employers at the addresses identified by HMRC. Large employers have the option of supplying ONS with extracts from their payroll systems. Other employers receive paper or electronic forms, with some fields (such as employee name, NINo and workplace address) pre-filled. If any employer reports to ONS that the employee has left the organisation since being selected for the survey, ONS contacts HMRC to see if the worker can be followed up.

Employers are required to report on the earnings of employees in a particular week in April of the survey year. The date varies to take account of Easter. The attained sample is around 0.67% of the workforce, two-thirds of the target. While completion of the form is a legal requirement, ONS typically will only chase responses until mid-August, when the attained sample is around 170,000 employees. This is because ASHE follows a very tight reporting schedule, with statistical results needed by October to facilitate Low Pay Commission and HM Treasury forecasts for the next financial year. The attained sample is thought to be sufficient for official statistics. However, there is clearly an incentive for less diligent employers to delay reporting in the hope of avoiding compliance altogether. WED analysis shows that the responses probabilities appear to be non-random[2], which potentially compromises both the cross-sectional and panel (longitudinal) dimension of the dataset[3].

There is also some evidence that ASHE misses some low-paying employees[4].

Numbers of observations

Numbers of individuals and jobs observed in the dataset are given in Table 1

Year	Number of jobs held at survey time			Total
	1	2	3 or more	

[1] The code is available to researchers in the SRS, along with additional documentation. There is an additional data set generated by ONS with some extra variables (WED-ASHE). This dataset is not currently available for general use by researchers but is expected to be released in October 2022.

[2] Internal WED calculations based on Business Structure Database; available on request within SRS

[3] Forth, J., Phan.V., Stokes, L., 2021. *Longitudinal Attrition in ASHE*. Methodology Paper. The WED Project.

[4] Bird, D., 2004. *Methodology for the 2004 Annual Survey of Hours and Earnings*. Labour Market Trends. [online] Office for National Statistics. Available at: <https://www.beta.ons.gov.uk/file?uri=/employmentandlabourmarket/peopleinwork/earningsandworkinghours/methodologies/annualsurveyofhoursandearningsashemethodologyandguidance/ashemethodarticletcm77254753.pdf>

2004	156,444	3,307	170	159,921
2005	159,288	2,681	87	162,056
2006	160,609	2,654	102	163,365
2007	134,017	2,204	80	136,301
2008	133,731	2,326	119	136,176
2009	163,281	2,987	117	166,385
2010	165,394	3,470	135	168,999
2011	173,414	4,280	208	177,902
2012	168,160	3,995	218	172,373
2013	170,878	4,020	216	175,114
2014	176,048	4,143	227	180,418
2015	174,035	3,912	233	178,180
2016	170,231	3,607	203	174,041
2017	170,145	3,677	193	174,015
2018	171,782	3,513	189	175,484
Total	2,447,457	50,776	2,497	2,500,730

Table 1 Numbers of individuals and the jobs they hold (SRS dataset)

Table 2 displays how often individuals are observed subsequent to their first appearance. The rate of attrition is higher than expected simply from people leaving work. Analysis suggests that this is affected by the sampling strategy; work is still ongoing on this[5].

Year (T)	T+1	T+2	T+3	T+4	T+5	T+6	T+7	T+8	T+9	T+10	T+11	T+12	T+13	T+14	T+15
2004	77.3	71.6	55.3	52.3	61.4	58.8	58.4	54.5	53.2	51.5	48.4	45.1	43.2	41.2	38.8
2005	78.1	59.0	55.1	64.4	61.2	60.8	56.6	55.3	53.7	50.3	46.9	44.9	42.8	40.2	
2006	64.1	58.6	67.8	64.0	63.3	58.9	57.4	55.7	52.2	48.6	46.5	44.3	41.8		
2007	75.7	71.2	66.3	65.4	60.8	59.1	57.4	53.7	50.0	47.9	45.4	42.8			
2008	77.2	70.2	68.5	63.3	61.6	59.6	55.7	52.0	49.7	47.1	44.5				
2009	77.4	73.1	67.0	64.8	62.5	58.2	54.3	51.9	49.3	46.5					
2010	78.6	70.7	67.9	65.3	60.7	56.5	54.1	51.9	48.9						
2011	76.0	71.5	68.1	63.1	58.5	55.9	53.2	50.2							
2012	77.8	72.4	66.6	61.4	58.6	55.5	52.4								
2013	78.1	70.3	64.4	61.1	57.9	54.5									
2014	75.0	67.5	63.3	59.7	56.2										
2015	73.7	67.1	62.4	58.5											
2016	73.4	66.3	61.6												
2017	72.7	65.6													
2018	71.3														
Average	75.1	68.2	64.2	61.9	60.2	57.8	55.5	53.1	51.0	48.7	46.3	44.3	42.6	40.7	38.8

Note: Shading is used to indicate the scale of sample retention: darker green for higher rates, amber for middling rates, then darker shades of red for lower rates.
Source: ASHE

Table 2 Individuals followed over time in the ASHE[6]

Tables 1 and 2 reflect a sample cut in 2007 and 2008, targeted at industries or occupations with relatively little wage variation (particularly the public sector, education workers, health workers). The full sample was restored in 2009 but this has affected the longitudinal integrity of the data.

[5] Forth, J., Phan.V., Stokes, L., 2021. *Longitudinal Attrition in ASHE*. Methodology Paper. The WED Project.
[6] Forth, J., Phan.V., Stokes, L., 2021. *Longitudinal Attrition in ASHE*. Methodology Paper. The WED Project.

Appendix tables show the numbers of jobs (not individuals) broken down by region, high level industry/occupation, and sector. Numbers do not tally across tables due to missing values.

Dataset structure

The data is collected in annual year files from 1998 onwards. These contain all the variables supplied by ONS or created by the WED team.

The WED team produces a panel dataset. This contains all observations 1998 onwards, but only a limited subset of the most relevant variables to prevent the file becoming too large to handle. Variables from the annual files can be added back by merging on year and 'serno', the unique observation references.

ONS also produces a panel dataset with all the variables but with only the 'main job' included for multiple job holders. Numbers also show some inconsistences with the yearly files.

ASHE-NES datasets are also available (see below).

Variables

The table below summarises topics covered and some of the core variables on the dataset. There are many more variables derived from these; for example, home and work postcodes are used to derive multiple geographical areas, urban/rural markers, and eastings/northings.

In the final column, 'src' implies the data are collected from the survey form – these are described in the core ASHE documentation produced by ONS; 'ons' variables are generated as part of ONS survey processing; 'wed' means additional variables created by the WED team – see documentation for details.

Employee characteristics		
ID	Permanent person ID	src
Age	Year	src
Sex	M/F/missing	src
Apprentice	If apprentice and when started (2013 onwards)	src
Home address	Postcode	src
Employment characteristics (for each job if multiple)		
Industry	5-digit (SIC2003, SIC2007)	src
Occupation	3 digit (SOC90) 4 digit (SOC2K, SOC2010)	src
Employer reference	Links to IDBR (for size, type)	src
Work address	Postcode of establishment	src
Main job	Main job (different definitions)	ons/wed
Same job	Same job (not employer) for >12 months	src
Job number	Link to job in previous period	ons/wed
Time with employer	Start date with current employer	src
Contract	FT/PT, temp/permanent	src
Collective agreement	Whether covered and if so by which	src
Wage and hours data (for each job if multiple)		
Components of wages	Reported as weekly, converted to hourly Annual earnings	src
Hourly wage	Reported separately if hourly paid	src
Hours	Actual, expected, overtime	src
Adjustments	Matters affecting pay in this period	src
Pay period	Pay period	src
Minimum wage	MW at reference data and previous quarter	wed
Sample characteristics		
CS weights	Regular and adjusted for low pay statistics	src
Sample dates	Survey reference data, and date for Easter	wed
Special arrangements	Whether eligible to submit form electronically	src
Sample appearances	Time in dataset and with employer	wed

Weights

ASHE data has two sets of cross-sectional weights supplied by ONS: a regular weight ('weight'), and a 'low pay' weight ('weightLP')[7]. ASHE is weighted to the employment estimates in the Labour Force Survey, which itself is weighted to the decennial Census and the intercensal population estimates. Low pay weights exclude employees that experienced loss of pay due to absence (variable 'lop'). The weights in the core documentation are those used in official statistics from ONS and the Low Pay Commission.

In addition to those core weights, the WED team have constructed two additional weights. Two-period longitudinal weights are designed to support analysis of changes in earnings over two years. In addition, the team have identified potential issues with sampling that suggest revised cross-sectional weights are necessary. These weights are available as separate files, linkable to the core data by the variable 'serno'.

[7] These variables are called 'calwgt' and 'lpcalwgt' in the original files; the name was changed for clarity.

Longitudinal analysis

ONS does not treat ASHE as a longitudinal dataset (that is, seeking to maintain its longitudinal integrity as a design requirement). ASHE is longitudinal as a consequence of the sampling strategy (always the same 1% of NINos are surveyed). Hence ASHE is longitudinal and can be analysed using panel methods, but users should be aware of some issues (the rate of employees exiting the ASHE is three times more likely than the rate of employees exiting employment; Employer non-response is a large contributor to employees exiting the ASHE; panel attrition is non-random[8])

While individuals are followed through time with the same personal identifier, jobs in general are not. Jobs are identified by 'serial number' (the variable serno), which is assigned each year without reference to other years. The binary variable 'j12m' indicates whether, in the opinion of the person completing the form, the person has been doing the same job for over a year. WED team analysis suggests that, when this variable is set to 'true', the employee is genuinely in the same job. However, if an employee has multiple jobs, it is not clear which of the jobs the 'same job' refers to.

As part of the WED project, ONS identified a variable called 'sernol' which provided a direct link to the job in the previous year, even if the individual had multiple jobs. Analysis by the WED team suggest this is accurate, and it has been used to construct a variable 'job_number' which is a consistent reference to track jobs over time. This variable is currently only available in the Enhanced ASHE[9].

Linking to other datasets

ASHE 2004 onwards contains IDBR references, allowing it to be linked to all the other ONS business surveys. This linking has to happen at 'enterprise' level; ASHE does not use the IDBR identifiers for local units to say which establishment an employee works at. The WED team have created local area identifiers based on Census output area, which should work for most businesses. Where business report at 'reporting units' below the level of the enterprise (as for example in the BERD and ABS), these need to be aggregated to the enterprise level.

As IDBR references can be linked to Companies House and Dun & Bradstreet numbers, it is possible to link to other business datasets such as FAME.

ONS does retain name and address information on ASHE going back some years. This allows ASHE data to be linked to other sources (this is used in the WED project that links ASHE and 2011 Census data[10]). The use of NINo as the sampling frame also means that ASHE data can be directly linked to other datasets that also indexed by NINo, for example those held by HMRC and DWP (not linked at present).

All new linking other than using the IDBR references is carried out by ONS, and requires ethical review and the approval of all data holders.

ASHE and NES

ASHE and NES share the same sample frame, mostly identical questionnaires, and almost sampling strategies. In theory, they can be linked as complete dataset from 1975 onwards, for individuals who

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[8] Forth, J., Phan, V., Stokes, L., 2021. *Longitudinal Attrition in ASHE*. Methodology Paper. The WED Project. http://www.wagedynamics.com/wp-content/uploads/2022/07/Longitudinal-attrition-in-ASHE-Version-1b-13.04.22.pdf

[9] Ritchie, F., McKenzie, A., 2021. *'Same job' marker*. Quality Assurance paper. The WED Project.

[10] Forth, J., Phan, V., Singleton, C., 2021. *ASHE-Census Linkage.* WPEG Conference. Available at: http://www.wagedynamics.com/wp-content/uploads/2021/08/ASHE-Census-linkage-WPEG-July2021.pdf

have been working throughout this period. In practice, some of the information about NINos was not retained in the NES dataset, and so there are a large number of ambiguous references. As a result, some individuals observed before 2004 may not be linked to their later appearances. Longitudinal analysis using data prior to 2004 should be treated with caution.

NES is also missing IDBR references, meaning the data cannot be linked to other datasets. In practice, the 'ASHE' data from 1998-2003 (which is simplify NES data retrofitted with weights) does have some enterprise references, but the proportion of these drops as the data goes back further. Again, use of IDBR references prior to 2004 should be treated with caution.

Detailed documentation, and where to find it

The WED website (www.wagedynamics.com) hosts research publications, training material, and documentation (QA and data creation) to create these datasets. The table below gives links to a range of documentation.

Description		Source
Characteristics of the datasets		
ONS official ASHE description		ONS
ASHE questionnaires 2004-2014		ONS
List of core SRS variables		SRS catalogue
List of additional WED variables		SRS catalogue
Recordings of ASHE training sessions		WED
Weighting		
Longitudinal weights		WED
Cross-section weights		WED
QA Information and Commentary on ASHE		
WED page containing methodological and QA reports		WED
Code and descriptions (available inside SRS)		WED
2004 methodology paper for ASHE		ONS

Appendix: characteristics of the sample

The statistics below relate to the standard SRS dataset.

Year	NE	NW	Yorks	EM	WM	SW	East	London	SE	Wales	Scot	Total
1997	6,581	17,288	14,077	10,988	15,274	12,409	13,986	22,209	20,667	6,298	14,173	153,950
1998	6,946	17,820	14,789	11,915	15,589	13,455	14,482	23,091	21,539	6,878	14,874	161,378
1999	6,837	18,054	14,157	12,115	15,462	13,454	14,758	23,459	22,187	6,991	14,276	161,750
2000	6,882	17,637	13,997	11,705	14,452	13,682	14,567	22,846	21,711	7,004	14,415	158,898
2001	6,951	18,036	14,363	11,522	15,148	13,658	14,733	22,997	21,931	7,034	14,827	161,200
2002	6,769	18,038	14,827	11,734	15,118	13,790	15,120	23,863	22,032	7,470	14,932	163,693
2003	6,923	18,551	14,681	12,014	15,394	14,426	15,035	23,621	22,427	7,682	15,356	166,110
2004	7,031	18,513	14,652	12,053	15,205	14,522	15,136	23,748	22,677	7,725	15,532	166,794
2005	7,050	18,966	14,941	12,345	15,785	14,622	15,277	23,197	22,967	7,584	15,609	168,343
2006	7,064	19,386	14,693	12,437	15,813	14,686	15,986	23,266	23,026	7,665	15,911	169,933
2007	5,844	15,736	12,014	9,794	12,629	12,265	13,357	20,660	19,487	6,230	12,920	140,936
2008	5,637	15,769	11,882	9,922	12,483	12,183	13,608	20,548	18,910	6,267	13,494	140,703
2009	7,152	19,097	15,227	12,428	15,297	14,968	15,626	24,540	23,668	7,751	16,137	171,891
2010	7,116	19,416	15,116	12,534	15,695	14,989	16,324	25,341	24,071	7,952	16,577	175,131
2011	7,410	20,360	15,758	13,123	16,430	15,943	17,045	27,071	25,940	8,432	16,989	184,501
2012	7,077	19,631	15,032	12,764	15,913	15,463	16,627	26,003	24,557	8,004	16,393	177,464
2013	7,358	20,129	15,117	12,985	15,965	15,613	16,926	26,398	24,723	8,190	16,678	180,082
2014	7,504	20,563	15,284	13,292	16,674	16,132	17,420	27,760	25,547	8,549	17,037	185,762
2015	7,297	20,591	15,216	13,436	16,369	16,010	17,567	26,805	25,312	8,274	16,598	183,475
2016	7,107	20,017	15,034	13,160	15,924	15,731	16,994	26,356	24,298	7,932	16,469	179,022
2017	7,261	20,343	15,133	12,874	15,839	15,664	16,777	25,986	24,514	8,059	16,493	178,943
2018	7,221	20,478	15,421	13,284	16,202	15,668	16,781	26,082	24,361	8,254	16,433	180,185
Total	153,018	414,419	321,411	268,424	338,660	319,333	344,132	535,847	506,552	166,225	342,123	3,710,144

Table A. 1 Number of jobs, by region; standard SRS dataset

Year	primary	manuf	utilities	construct	sales	services	fin/law	public	health	creative	other	Total
1997	1,768	31,263	1,382	4,436	23,566	14,689	25,089	28,650	16,236	2,833	4,038	153,950
1998	1,819	31,925	1,465	5,363	25,006	15,988	26,332	30,870	16,922	2,860	2,828	161,378
1999	1,565	29,945	1,434	5,431	25,560	16,027	26,774	31,764	17,345	2,964	2,941	161,750
2000	1,520	27,296	1,251	5,462	23,504	16,000	28,616	31,993	17,372	3,077	2,874	158,965
2001	1,398	26,828	1,063	5,542	24,390	16,278	29,446	33,370	17,136	3,095	2,812	161,358
2002	1,297	25,220	970	5,903	24,831	15,961	30,299	34,520	18,383	3,257	3,180	163,821
2003	1,299	23,965	758	6,206	25,188	16,667	31,405	35,320	19,130	3,480	2,888	166,306
2004	1,302	22,847	730	6,223	28,123	16,692	29,183	35,763	19,375	3,539	2,850	166,627
2005	1,254	22,441	655	6,121	29,277	17,023	29,674	35,773	19,611	3,449	2,954	168,232
2006	1,272	21,007	887	6,412	28,720	17,287	30,975	36,313	20,441	3,670	2,874	169,858
2007	938	14,817	827	6,139	24,190	14,298	30,892	28,006	14,678	3,543	2,530	140,858
2008	1,003	14,469	829	6,230	24,288	13,327	30,998	28,253	15,080	3,555	2,596	140,628
2009	1,108	17,173	2,079	6,430	29,424	21,571	29,326	37,293	21,505	2,904	2,973	171,786
2010	1,175	16,556	2,199	6,215	29,895	22,343	29,072	37,381	23,588	3,160	3,196	174,780
2011	1,234	16,824	2,191	5,956	31,388	24,075	32,147	38,655	25,300	3,178	3,517	184,465
2012	1,211	16,143	2,203	5,628	31,166	23,416	30,482	36,239	24,461	3,266	3,214	177,429
2013	1,178	16,574	2,113	5,565	31,408	23,631	30,588	36,273	26,046	3,343	3,311	180,030
2014	1,286	16,774	2,166	5,663	32,313	24,900	32,865	35,699	26,853	3,627	3,548	185,694
2015	1,270	16,166	2,164	5,779	31,982	25,237	32,818	34,091	26,860	3,402	3,644	183,413
2016	1,239	15,814	2,136	5,729	30,864	25,281	31,464	33,349	26,060	3,461	3,583	178,980
2017	1,221	15,694	2,195	5,849	30,392	25,573	31,304	33,433	25,920	3,637	3,675	178,893
2018	1,301	16,625	2,326	6,366	29,594	24,907	31,552	32,420	27,124	3,921	3,973	180,109
Total	28,658	456,366	34,023	128,648	615,069	431,171	661,301	745,428	465,426	73,221	69,999	3,709,310

Table A. 2 Number of jobs by major industrial group

Year	Managers, Directors And Senior Official	Professional Occupations	Associate Professional And Technical Occupations	Administrative And Secretarial Occupations	Skilled Trades Occupations	Caring, Leisure And Other Service Occup	Sales And Customer Service Occupations	Process, Plant And Machine Operatives	Elementary Occupations	Total
1997	20,051	15,630	14,698	29,660	14,498	16,346	12,756	16,699	13,612	153,950
1998	21,251	16,150	15,315	30,774	15,341	17,651	13,583	17,313	14,000	161,378
1999	21,873	16,589	15,522	30,982	14,775	18,122	13,526	16,620	13,741	161,750
2000	22,239	16,643	15,653	30,543	13,944	18,224	13,348	15,074	13,297	158,965
2001	22,960	17,288	16,276	31,017	13,620	18,459	13,864	14,639	13,235	161,358
2002	19,816	18,813	20,690	29,221	13,396	11,940	13,679	13,279	22,987	163,821
2003	20,248	18,966	21,952	28,825	12,890	12,287	14,678	12,900	23,685	166,431
2004	19,910	18,506	22,397	28,532	12,539	12,682	16,091	12,437	23,700	166,794
2005	20,251	18,093	22,803	28,703	12,112	12,615	17,795	12,270	23,701	168,343
2006	21,211	18,885	24,462	27,240	11,768	13,078	17,607	11,427	24,255	169,933
2007	18,533	15,592	19,341	22,587	9,304	10,645	16,007	8,766	20,161	140,936
2008	18,446	15,773	19,498	22,171	8,968	11,175	16,302	8,652	19,718	140,703
2009	23,325	19,830	24,456	26,080	10,665	15,211	18,535	10,718	23,071	171,891
2010	23,228	20,269	24,926	24,948	10,574	16,585	18,636	10,550	25,415	175,131
2011	24,362	21,231	25,797	26,527	10,738	18,032	19,284	11,406	27,124	184,501
2012	14,579	29,541	21,856	25,688	11,225	17,821	20,149	11,127	25,478	177,464
2013	14,717	30,723	22,022	25,550	11,191	18,583	20,587	11,152	25,557	180,082
2014	14,573	31,258	22,189	25,734	11,384	19,650	21,444	11,332	28,198	185,762
2015	14,180	30,705	21,110	25,872	11,120	19,783	21,049	11,086	28,570	183,475
2016	13,445	30,328	20,759	24,968	11,029	19,111	20,744	10,912	27,726	179,022
2017	13,439	30,587	21,375	25,314	10,921	18,989	20,676	10,878	26,764	178,943
2018	13,834	30,633	21,505	26,113	11,323	19,628	18,989	11,251	26,909	180,185
Total	416,471	482,033	454,602	597,049	263,325	356,617	379,329	270,488	490,904	3,710,818

Table A. 3 Number of jobs by major occupation group

Year	Private Sector Jobs	Public Sector Jobs	Total
1997	105,430	39,021	144,451
1998	111,460	41,010	152,470
1999	111,290	41,518	152,808
2000	108,829	41,168	149,997
2001	111,132	41,078	152,210
2002	109,847	42,804	152,651
2003	110,623	44,643	155,266
2004	110,859	43,968	154,827
2005	112,203	44,456	156,659
2006	112,850	44,913	157,763
2007	96,574	34,964	131,538
2008	96,047	35,246	131,293
2009	111,267	47,408	158,675
2010	112,581	49,947	162,528
2011	120,622	51,218	171,840
2012	117,611	46,582	164,193
2013	119,755	46,214	165,969
2014	142,287	43,407	185,694
2015	141,216	42,197	183,413
2016	137,575	41,405	178,980
2017	138,092	40,801	178,893
2018	140,999	39,110	180,109
Total	2,579,149	943,078	3,522,227

Table A. 4 Number of jobs by public/private sector