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Price index for employment activities

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Symbols in tables	Symbol
Category not applicable	.
Data not available	..
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Not for publication	:
Nil	-
Less than 0.5 of unit employed	0
Less than 0.05 of unit employed	0.0
Provisional or preliminary figure	*
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Preface

The service sector of the economy has increased tremendously in recent decades and there is a need to develop new statistics within this area. The European Community Regulation concerning short-term statistics covers producer prices for services. The regulation is based on the NACE classification. A broader effort to develop producer price indices for services is being carried out in Statistics Norway. The aim of this project is to develop new price indices and improve the quality of existing indices and the development of a quarterly price index for employment activities is part of this effort.

The service price index is a producer price index and will serve several purposes. Its main purpose is for use as a deflator for the National Accounts and for enterprises in the industry in question. It can be used for calculating fixed prices for production of services. Another use of the index is for planning and management, both at a political level and for economic life.

In order to establish a price index we need knowledge about the sector in question. Hence we need to acquire information about the structure of the sector (size and geographic concentration), the enterprises' size, turnover and the number of enterprises, among other things. One of the key aspects we need to ascertain when making an SPPI is how the mechanisms of price setting work. Typical products need to be identified in a way that enables us to make a good decision about what information we need. This is essential if we want to develop a good SPPI.

Summary

Developing a price index for NACE rev.2 78 Employment activities is part of a broader project in Statistics Norway that focuses on price statistics. The development of a price index for Employment activities started at the beginning of 2008 and will be published for the first time during the spring of 2010.

We have studied experiences from other countries that have already established an SPPI for Employment activities. We have developed a method based on these experiences, and of course our own studies of the market in Norway, our meeting and correspondence with the National Federation of Service Industries (NHO Service) and selected members of important enterprises in the industry. We use the industry classification given to us by NHO Service, which consists of three more fields of activities than we had intended by looking at the Classification of Products by Activity (CPA). The industry is divided into three sub-classes: 78.100 Labour recruitment of personnel, 78.200 Provision of personnel and 78.300 other human resources provision services. The latter industry sub-class is very small and we have decided to omit it from this SPPI. 78.200 provision of personnel is the larger of the remaining two.

The method used in this price index can briefly be summarised as follows: the price measure in the survey is the turnover and hours billed in the particular quarter for provision of personnel. For labour recruitment of personnel we collect an average fee per person employed. The average fee is divided into two categories of employees; executives and other personnel. For provision of personnel we divide the industry into 12 fields of activity. These methods are both characterised as B – methods, and are therefore approved and acceptable methods (Handbook on price and volume measures in national accounts, 2001). We started collecting data from the 1st quarter of 2008.

The prices are compared with the previous period, which we use as a base period and chained with the previous results (1st quarter 2008 - q-1). The first weights are collected in 2008, and we will update them every year.

The results from the first six quarters indicate that the total index follows a reasonable development, with a continuous increase in all the six first quarters, as shown in table 7.1. From the 1st quarter of 2008 to the 2nd quarter of 2009, the total index has grown by 6.3 per cent.

Content

1. International experience

According to OECD - Eurostat 2005 Inquiry on National Collection of Services Producer Prices (OECD, 2005), some countries have developed an SPPI for employment activities. Methodological guide for developing producer price indices for services (OECD/Eurostat, 2005) also briefly describes how Australia, Denmark, France, Japan, the UK and USA developed their price index for NACE Rev 1. 74.5. This industry class has also been treated by the Voorburg Group. In Ottawa in 2004 and in Helsinki in 2005, Australia, France and the UK all gave mini presentations on their experiences with the producer price index. The most common pricing methods used for this index are charge-out rates, contract pricing and percentage fee. There is however no mutual, clear pricing method used in all the countries that have developed this index.

For provision of personnel, charge-out rates is used by most countries. France uses two types of this measure; charge-out rates for sample of jobs and charge-out rates for sample of clients. Charge-out rates for sample of jobs is also used by the UK, Australia and the USA. Japan distinguishes itself from these countries by using average unit value in tightly defined groups as a measure of price. Denmark also uses hourly rates divided into personnel categories.

For the measure of price in labour recruitment, most of the countries that have already developed this index use a percentage fee of the workers' annual salary. If the salary for the worker is NOK 300 000 per year, the agency receives, for example, 5 per cent (= NOK 15 000). The UK, France and Australia all use this in their indices. Denmark uses hourly prices and standard prices (on services such as personality testing).

Several countries have reported difficulties in separating the prices for what the client pays for the service and what the employee is paid. The client pays a certain sum that includes both a fee to the agency and the salary to the employee placed.

2. Industry structure

In the early phase of developing this index, we met with NHO Service, the largest trade association in Norway, regarding the industry class of employment activities. We found that their members covered about 90 per cent of the total turnover in the largest sub-class, provision of personnel, but not so much in labour recruitment of personnel, owing to the enterprises' (small) size and lack of interest. We then decided to work together with NHO Service on this index. This cooperation was a new experience for us, but both parties had a positive attitude to it, and still do.

2.1. Population structure

From tables 2.1 and 2.2 we can see that the industry mainly consists of small enterprises, but there are also quite a few big ones with over 50 employees.

In 78.100, labour recruitment, 90 per cent of the enterprises has less than 10 employees and only three have more than 50. However, the biggest enterprises stand for almost 50 per cent of the employees in the sub-industry and 28 per cent of the total turnover among the total 270 enterprises in this population.

Table 2.1. Population structure, Labour recruitment of personnel, Norway 2007

Size by number of employees	Labour recruitment of personnel, enterprises 2007 Population structure by number of employees					
	Number of enterprises	%	Number of employees	%	Turnover (mill. NOK)	%
0	131	48.5	0	0	112.2	9.1
1-9	111	41.1	267	18.1	367.4	30.0
10-19	14	5.2	200	13.6	207.2	16.9
20-49	11	4.1	298	20.2	192.5	15.7
50+	3	1.1	707	48.1	347.6	28.3
Total	**270**	**100**	**1 472**	**100**	**1 226.9**	**100**

In 78.200, provision of personnel, which is a significantly larger sub-industry, we find the structure to be somewhat different from 78.100. We still have a lot of the enterprises with less than 10 employees (60 per cent), but 16 per cent have over 50, and the 64 largest enterprises have an average of almost 500 employees. This is the reason 86 per cent of the employees are in the two largest strata, together with almost 80 per cent of the turnover.

Table 2.2. Population structure, Provision of personnel, Norway 2007

Size by number of employees	Provision of personnel, enterprises 2007 Population structure by number of employees					
	Number of enterprises	%	Number of employees	%	Turnover (mill. NOK)	%
0	217	26.8	0	0,0	156.8	0.7
-9	274	34.0	872	2.1	840.0	3.9
10-19	71	8.8	1 006	2.4	1 303.3	6.1
20-49	116	14.3	3 731	9.0	2 227.8	10.4
50-99	65	8.1	4 423	10.6	2 534.6	11.8
100+	64	8.0	31 550	75.9	14 366.4	67.0
Total	**807**	**100**	**41 582**	**100**	**21 428.9**	**100**

We can see from table 2.3 that the total turnover in this industry is NOK 22 650 million (approximately €2 750 million). Ninety per cent of this turnover comes from provision of personnel. From this table we can also see that the largest fields of activity in this sub-industry are industrial/manufacturing and other office support personnel. We also notice that over 97 per cent of the turnover is domestic.

Table 2.3. Turnover within industry class and sub-class divided by CPA/type of service, CPA study 2007

	78 Employment activities					
	78 Labour recruitment and provision of personnel		78.100 Labour recruitment of personnel		78.200 Provision of personnel	
	Turnover (mill. NOK)	Turnover (per cent)	Turnover (mill. NOK)	Turnover (per cent)	Turnover (mill. NOK)	Turnover (per cent)
Placement services of personnel	1 424.6	6.3	735.8	60.0	688.8	3.2
Executive search services	574.8	2.5	416.6	34.0	158.2	0.7
Placement services of office support personnel and other workers	849.8	3.8	319.2	26.0	530.6	2.5
Supply services of personnel	20 153.1	89.0	14.1	1.2	20 139.0	94.0
Computer and telecommunication	980.6	4.3	0.1	0	980.6	4.6
Other office support personnel	5 610.3	24.8	11.0	0.9	5 599.3	26.1
Commercial/trade	698.3	3.1	0.3	0	698.0	3.3
Industrial/manufacturing	6 123.3	27.0	0	0	6 123.3	28.6
HORECA	369.9	1.6	0	0	369.9	1.7
Medical	1 132.9	5.0	0.6	0.1	1 132.3	5.3
Transport/warehousing/logistics	1 501.0	6.6	0.6	0.1	1 500.3	7.0
Building and construction	2 342.4	10.3	0	0	2 342.4	10.9
Other	1 394.5	6.2	1.5	0.1	1 393.0	6.5
Other human resources	874.3	3.9	468.4	38.2	405.9	1.9
Other additional products	203.8	0.9	8.6	0.7	195.2	0.9
Domestic	22 072.2	97.4	1 140.5	93.0	20 931.7	97.7
Intra-EU	378.7	1.7	30.1	2.5	348.6	1.6
Extra-EU	204.9	0.9	56.3	4.6	148.6	0.7
Total	22 655.8	100	1 226.9	100	21 428.9	100

2.2. Sample design

As a result of the aforementioned cooperation, our sample consists of the members of NHO Service. We compared the sample with Statistics Norway's business register, and discovered that all the major enterprises were members of the trade association. In accordance with Statistics Norway's principles, we would put most of the burden on the large enterprises anyway, so we see no problem with some of the small ones being left out of this index. The coverage, both in employees and turnover, is sufficient. In our sample, we include 60 per cent of the turnover in the industry. After meeting with NHO Service, we decided that it would be easiest if they collected the data from the enterprises. They were already collecting other information from their members, and told us that it would not be much more work for them to collect the information we needed as well. By collecting the data in this way, we also avoid extra work for the enterprises chosen in our sample. The number of enterprises in our sample is 75, and these will be divided into three strata, depending on the number of employees. NACE rev.2. 78.300 Other human resources provision services will not be taken into account in this index, mainly because of its size. In Norway this sub-class is very small, with only a total of about 220 employees.

2.3. Observation unit

We have chosen enterprises as the observation unit for this SPPI instead of establishments. This choice is motivated purely by practical reasons and has little or no significance on the ultimate outcome of this index. NHO Service uses enterprises when they collect information from their members, and if we wanted establishments to be our observation units, a lot of extra work would have been required of NHO and the respondents. Representatives from the large enterprises told us that they wanted the questionnaires to be sent to the central office because many of their regional offices are not able to fill them out correctly.

3. Market and prices

This industry has had tremendous growth in recent years, and the turnover in 2007 was 250 per cent higher than in 2001. From 2006 to 2007 alone, the growth in turnover was over 35 per cent, and from 2007 to 2008 there was an increase of about 10 per cent. As a result of worse economical times, the growth in turnover is decreasing after some very good years for the industry. Up to the 2nd quarter of 2009, the turnover decreased by 10 per cent.

When we met with NHO Service, we received a lot of useful information. We found that they classified the industry in a few more fields of activity; instead of splitting the industry into 9 fields of activity, they use 12. To make it easy for the respondents, we decided to use this classification when designing the questionnaire. Since NHO Service had gathered a few members of the largest enterprises at the meeting, we spent some time trying to figure out which price measure was the most suitable. The decision to use turnover and number of hours billed, instead of asking directly about the charge-out rates or contract prices was unanimous among the attendants. At the same meeting, the topic of publication of results was also raised. The enterprises wanted to be anonymous, but on the other hand they seemed very interested in our index and wanted to use it in their work. We assured them that we do not publish results with few observations, where enterprises can be recognised from the data. At this point we are not publishing anything besides the total index, but we are looking into the opportunity to make sub-indices for the largest fields of activity. For most of the fields, we have enough price derivatives even though some are smaller in volume. We were told that the fields of activity with the largest growth recently are HORECA, construction and technical services.

4. Classifications and definitions

This is the classification as described in our CPA study.

4.1. Classification, definition and description of services

78 Employment services

78.1 Services provided by employment placement agencies

78.10 Services provided by employment placement agencies

78.10.1 Services provided by employment placement agencies
This sub-category includes:

- specialised search and recruitment services limited to filling highly paid executive, senior manager, and professional positions, according to client specifications. Included are the services of:
- conducting detailed interviews with the client organisation's management team
- developing job profiles, conducting original research and advertising to locate potential job candidates
- screening possible candidates, preparing, presenting and discussing a confidential list of highly qualified applicants with the client
- making interview arrangements, negotiating compensation, and providing post-hire follow-up
- The prospective employee/client makes the decision as to which candidate to hire. The fee for the services provided is charged whether or not the candidate is hired. This service is also known as retained search. This sub-category also includes:
- online executive search services

78.10.11 Executive search services
This sub-category includes:

- testing, interviewing, reference checking, evaluation and counselling of prospective employees
- recruiting, selecting and referring candidates to the client to fill positions on a permanent (indeterminate) basis
- The services may be procured by the potential employer or by the prospective employee. The candidate is selected and hired by the prospective employee. The placement firm is paid on a contingency basis, i.e. only for successful placement of a candidate. This sub-category includes permanent placement services for a complete range of occupations from low-level employees to management employees, including executives, except those recruited through executive/retained search, and for domestic or international job placements.

This sub-category also includes:

- online permanent employment placement agency services
- services of casting agencies and bureaus, such as theatrical casting agencies
- This sub-category excludes:
- services of personal theatrical or artistic agents or agencies, see 74.90.20

78.10.12 Permanent placement services, other than executive search services

78.2 Temporary employment agency services

78.20 Temporary employment agency services

This category includes:

- staffing services for the supply of personnel for temporary work assignments.
- The temporary staffing firm hires its own employees and assigns/supplies them to clients to support or supplement the client's workforce in work situations

such as employee absences, temporary skill shortages, seasonal workloads, and special assignments and projects. The employees are on the payroll of the temporary staffing firm which is legally responsible for their actions, but when working they are under the direct supervision of the client. The temporary staffing firm specifies the pay, benefits, etc. of the employee.

78.20.1 Temporary employment agency services
This sub-category includes:

- temporary staffing services for the supply of computer and telecommunications personnel such as IT and telecommunications systems support personnel, software developers, data processing personnel etc.

78.20.11 Temporary employment agency services for the supply of computer and telecommunications personnel
This sub-category includes:

- temporary staffing services for the supply of other office support personnel such as secretaries, clerks, book-keepers, typists etc.

78.20.12 Temporary employment agency services for the supply of other office support personnel

78.20.13 Temporary employment agency services for the supply of commercial and trade personnel
This sub-category includes:

- temporary staffing services for the supply of transport, warehousing, logistics or industrial workers such as construction workers, maintenance workers, drivers, machinists, assemblers, machine operators, labourers, movers, shippers, etc.

78.20.14 Temporary employment agency services for the supply of transport, warehousing, logistics or industrial workers
This sub-category includes:

- temporary staffing services for the supply of hotels and restaurants personnel such as cooks, waiters, hotel receptionists.

78.20.15 Temporary employment agency services for the supply of hotels and restaurants personnel

78.20.16 Temporary employment agency services for the supply of medical personnel
This sub-category includes:

- temporary staffing services for the supply of teachers, executives and other personnel n.e.c.
-

78.20.19 Temporary employment agency services for the supply of other personnel

78.3 Other human resources provision services
This class excludes:

- provision services of human resources functions together with supervision or running of the business, see the class in the respective economic activity of that business
- provision services of only one of human resources functions; see the class in the respective economic activity of that function
-

78.30 Other human resources provision services
This category includes:

- services for the supply of personnel for extended work assignments.
- Under the terms of this arrangement, the client may recruit the person or persons hired by the staffing firm and assigned to their place of work, or transfer a portion of their existing workforce to the staffing firm. Long-term employees are placed on the payroll of the staffing firm, which is legally responsible for their actions, but when working they are supervised by the client. This service includes labour leasing, staff leasing, employee leasing, extended employee staffing and pay rolling.
-

78.30.1 Other human resources provision services
This sub-category includes:

- staffing and management services for the supply of computer and telecommunications personnel such as IT and telecommunications systems support personnel, software developers, data processing personnel etc.

78.30.11 Other human resources provision services for computer and telecommunications personnel
This sub-category includes:

- staffing and management services for the supply of other office support personnel such as secretaries, clerks, book-keepers, typists etc.

78.30.12 Other human resources provision services for other office support personnel

78.30.13 Other human resources provision services for commercial and trade personnel
In addition to these, NHO Service split some of these groups into two separate fields of activity. The complete list can be viewed in figure 6.1, the questionnaire.

4.2. Prices

We will use two price measures. For provision of personnel, we find hourly charge-out rates as the best method to observe price changes and for labour recruitment we consider an average fee per employment to be the best option.

4.3. Quality

There are a number of ways to measure quality in this industry. We can, for instance, distinguish between different kinds of workers with different amounts of experience, or distinguish between different kinds of positions, whether it is an executive position or a co-worker at a warehouse. We have decided to distinguish between fields of activity. The different activities can be viewed in the questionnaire (table 4.1). Since we do not distinguish between other matters, we are not able to see if the changes in prices are a result of real price growth or growth that is a result of changes in the productivity.

4.4. Questionnaire

Our questionnaire consists of 14 questions which request information about turnover and hours billed, distributed by different fields of activity. We have two questions for labour recruitment, where we separate the recruited persons by the type of job offered; executive positions and other positions. For provision of personnel, we have 12 questions, which are the 12 fields of activity on which NHO Service separate their services. Based on this data, we calculate an hourly charge-out rate for each field of activity.

Figure 4.1. The questionnaire

Prices for Employment activities
1st quarter 2008

1 What was the turnover and number of employments for labour recruitment in the 1st quarter of 2008?

Task Category		Turnover (excl. VAT)		Number of employments			Average price
I.	Recruitment of executives	NOK	150 000	10		=>	NOK 15 000
II.	Recruitment of other personnel	NOK	0	0			
	TOTAL	NOK	150 000	10	employments		

2 What was the turnover and number of hours billed for provision of personnel in the 1st quarter of 2008, divided by field of activity?

Fields of activity		Turnover (excl. VAT)		Hours billed			Average hourly charge-out rates
I.	Commercial/trade	NOK	1 000 000	3 000	hours	=>	NOK 333
II.	Call centre	NOK			hours		
III.	Other office support personnel	NOK			hours		
IV.	Economy and accounting	NOK	500 000	2 000	hours	=>	NOK 250
V.	Computer and telecommunication	NOK			hours		
VI.	Transport/warehousing/logistics	NOK			hours		
VII.	Technical services	NOK			hours		
VIII.	Construction	NOK			hours		
IX.	Medical	NOK			hours		
X.	HORECA	NOK			hours		
XI.	Industrial/manufacturing	NOK			hours		
XII.	Other	NOK			hours		
	TOTAL	NOK	1 500 000	5 000	hours		

3 If you have any comments, please let us know below:

Thank you for your help!

5. Pricing methodology

This section explains the mathematical formulation of index calculation for the SPPI for NACE rev.2 78. Statistics Norway has developed an application for data editing and price index calculation. This application is intended for use in all SPPIs that Statistics Norway is planning to develop over the next few years and the SPPIs that Statistics Norway have already developed. This application will secure thorough and efficient data editing and price index calculation. The description of the steps in the index calculation will be in accordance with this general application and is developed by Zhang (2006).

5.1. Mathematical formulation

Notation

- Weight basis period (b)
- Price basis period (s)
- Statistical/actual period (t)
- Index reference period (r)

Price relative and Elementary Index

Denote service j in elementary group i with (ij), for j = 1,..,n_i. p_{ij}^t is the price for (ij) at the statistical/actual period t, and p_{ij}^s the price in the base period. An example of an elementary group for this SPPI is: NACE 78.200 (industry sub-class) — commercial/trade (type of service/work area) — size band 1 (stratum). This elementary group consists of all price relatives from the commercial/trade working area, in stratum 1, within NACE 78.200. Furthermore, let

$$I_{ij}^{s,t} = \frac{p_{ij}^t}{p_{ij}^s}$$

be a price relative. $P_i^{s,t}$ is the i elementary index, also known as micro index. An elementary index is calculated without the use of weights. This is the first step of the calculation, and we will use a Jevons index, which we calculate as follows:

- Jevons index (geometric average)

$$P_i^{s.t} = \left(\prod_{j=1}^{n_i} \frac{p_{ij}^t}{p_{ij}^s} \right)^{\frac{1}{n_i}} = \exp\left\{ \frac{1}{n_i} \sum_{j=1}^{n_i} \log p_{ij}^t - \frac{1}{n_i} \sum_{j=1}^{n_i} \log p_{ij}^s \right\}$$

We have decided to use the Jevons index and calculate a geometric average. We looked at the strengths and weaknesses for the different indices (Carli, Dutot and Jevons), and applying theory from The Producer Price Index Manual (IMF, 2004. Table 9.1 in the PPI Manual (IMF, 2004) shows us that the choice of elementary index can make a substantial difference to the results obtained. First, it is well known that an arithmetic mean or average (Carli index) is always[1] greater than the geometric average (Jevons index). The Dutot index may be greater or less than the Jevons, but tends to be less than the Carli index. The PPI Manual also states that

[1] Only in the odd case where all of the price relatives are equal will the arithmetic average be equal to the geometric average.

the differences between the results obtained by using the different elementary indices tend to increase as the variance of the price relatives increases.

A weakness with the Carli elementary index is that it is not transitive. The example in the PPI Manual shows that the chained Carli index that has the same prices for all products in the base period and the actual period does not give the same index value in the two periods. We are chaining the indices for this SPPI, so this may be a reason for preferring the Dutot or the Jevons elementary index.

The PPI Manual recommends using several criteria when choosing an elementary index. The two main approaches are the axiomatic and the economic approaches. From the results of the tests we did and from theory, we found that a Jevons index would fit our index the best.

Weights

We aggregate the elementary indices up to a total SPPI with the use of weights, w_i^b for elementary group i in the weight basis period b. We have that:

$$w_i^b \rangle 0 \qquad \text{and} \quad \sum_{i=1}^{M} w_i^b = 1$$

In addition to calculating the total SPPI, we will also calculate some sub-indices. To calculate elementary indices up to a sub-index at aggregation level G, we need the weight $w_{i(G)}^b$ for i ε G. Sub-index weights are calculated as follows:

$$w_{i(G)}^b = \frac{w_i^b}{\sum_{k \varepsilon G} w_k^b}$$

Index Calculation

To calculate this index, we use a Laspeyre-type index:

$$P^{s,t}(b) = \sum_i w_i^b P_i^{s,t}$$

This is the most common choice for the SPPIs.

$P^{s,t}(b)$ becomes a true Laspeyres index if b = s and $P_i^{s,t} = I_i^{s,t} = \frac{p_i^t}{p_i^s}$, and we will calculate the SPPI as follows:

$$P^{s.t}(s) = \sum_i \frac{q_i^s p_i^s}{\sum_k q_k^s p_k^s} \left(\frac{p_i^t}{p_i^s} \right) = \frac{\sum_i q_i^s p_i^t}{\sum_i q_i^s p_i^s}$$

6. Documentation of the statistical procedures

To ensure that the data we collect from the respondents are reliable and represent a realistic picture of the industry, we need to carry out quality assurance. Every questionnaire is closely examined and edited if necessary. This process requires both judgement and knowledge about the index. Every questionnaire is considered manually, and is supported by electronic editing applications.

There are two main aspects of the editing task, micro and macro-based methods. The former method assesses every single piece of information we receive from the

respondents. These assessments are executed in a editing application called Dynarev. In this application we can define several controls that mark a data field with "error" if the piece of information does not meet the right criteria. This control only works as an alarm; the actual editing has to be executed manually. There are three types of controls in particular that we employ with every piece of price information:

Value compared with previous period

The control will activate with a large change in price compared with the previous quarter. A significant change might indicate a discontinuity.

Value compared with the same quarter previous year

The control will activate in the event the price is lower than it was in the corresponding quarter of the previous year. Normally we can expect that the prices move in an increasing direction. However, there have been cases where verified price decreases occur. We get this verification by contacting the respondent.

Continuity

The control will activate if the value has been unchanged over five quarters. A source of error with the index calculation that can be difficult to detect is the case where observations remains unchanged over a longer period. These cases can be a result of a respondent's uncommitted attitude towards the survey, or it can be attributed to natural causes. To settle this we usually contact the respondent, either by phone or e-mail. It is not unusual for a company to have unchanged prices over several periods. This can especially be the case for smaller companies that are located outside the major cities. After a while it may be relevant to extend the limit for alarm activating with additional periods.

Macro editing means that we control which price observations constitute the strongest effect on the calculated indices. We employ Rstudent and DFFITS to rank the most diverging and decisive values. We also have to conduct approximate assessments of whether the observations actually represent something problematic.

Figure 6.1. Screen print of Rstudent controls

Rstudent control

Weight	Basis price	ORGNR	Price this quarter	ei_gruppe	Studentized Residual without Current Obs	ref_rstudent
0,014980	25124	982742XXX	39605	1;2;1	2,74196	2
0,003100	48902	982742XXX	61509	1;1;1	2,56866	2
0,003100	89000	985222XXX	101115	1;1;1	2,79780	2
0,001820	47313	886032XXX	25576	1;2;2	-3,64499	2
0,001820	33348	986482XXX	101914	1;2;2	17,70830	2
0,001820	51667	988970XXX	33154	1;2;2	-3,01705	2
0,001410	27000	983516XXX	10000	1;2;3	-2,87277	2
0,001410	59694	984441XXX	45675	1;2;3	-2,14716	2
0,001410	93000	892115XXX	45000	1;2;3	-9,26633	2
0,000350	100000	986482XXX	80000	1;1;2	-3,07415	2

Rstudent is a standardised residual (with constant variance) by regression of the present price over the basis price. An example of an Rstudent control is shown above. "Orgnr" tells us which company the observation comes from. "Weight" gives us an indication of how significant the observation (weight group) is in proportion to the calculated index. Only Rstudent values greater than +/-2 (we can also use other values, but this is the standard value) are shown in this table. In the example above we can see that we have a price observation with Rstudent value past 17. In our example, this reflects a price increase from NOK 33 348 to NOK 101 914 (price per employment, 78.100). This observation needs closer examination.

DFFITS is a diagnostic intended to show how influential a point is in a statistical regression. In other words, it is a method we use to intercept price relatives that have a strong influence on the index calculation.

7. Results

7.1. Estimation of data back to 2006

According to COUNCIL REGULATION (EC) No. 1165/1998 of 19 May 1998 concerning short-term statistics AMENDED by the REGULATION (EC) No. 1158/2005 of the EUROPEAN PARLIAMENT and of the COUNCIL and by COMMISSION REGULATION (EC) No. 1503/2006, the first reference period for transmission of the output price variable No. 310 is not later than the first quarter of 2006. Since we began our data collection in the 1st quarter of 2008, we have to estimate data back to 2006 in order to make this our base year.

We had a few possible ways to do this. One was to use Statistics Norway's statistics on average monthly earnings within the industrial classification of employment activities (NACE Rev 2 78). Another option was to use data on turnover and hours billed from NHO Service. The problem with both these methods is that we only get data on a yearly basis, and not quarterly. After we decided not to trouble the respondents with filling out data for 2006 and 2007, and a discussion with NHO Service, we decided to use their turnover and hours billed data for the back-casting. We took the original index (2008=100), and estimated these figures backwards by means of annual growth.

With index figures from all the quarters of 2006 and 2007, we were able to set the base year to 2006. The calculation procedure will proceed as usual, but since we don't have actual data from 2006 we have to multiply the future index outputs we get from our calculation application (PRIS) with the index output we estimated in the 1st quarter of 2008. Accordingly, we will obtain index figures adapted to the desired base year.

7.2. Index results

Table 7.1 shows the development of the price index for employment activities from the first quarter of 2006 to the second quarter of 2009. This table has real data from the 1st quarter of 2008, and estimated data for 2006 and 2007 (read more in chapter 7.1). Figure 7.1 gives a graphic description of this development.

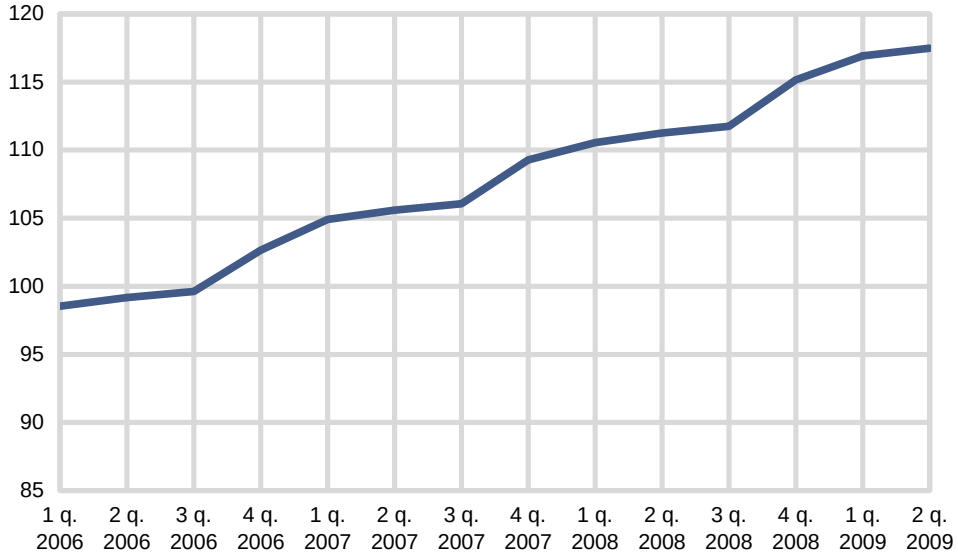
Table 7.1. Price index for employment activities. Q1 2006-Q2 2009. 2006=100

1st quarter 2006	98.5
2nd quarter 2006	99.2
3rd quarter 2006	99.6
4th quarter 2006	102.6
1st quarter 2007	104.9
2nd quarter 2007	105.6
3rd quarter 2007	106.1
4th quarter 2007	109.3
1st quarter 2008	110.5
2nd quarter 2008	111.3
3rd quarter 2008	111.8
4th quarter 2008	115.2
1st quarter 2009	116.9
2nd quarter 2009	117.5

Since the data for 2006 and 2007 are estimated, as described in chapter 7.1, we focus on 2008 and the two quarters of 2009. We can see that within 2008 the growth has been continuous, with the biggest leap in the 4th quarter. In 2009 the index continues to increase, but not as much as in the end of 2008. The graphic figure (figure 7.1) shows how the index develops gradually in the first three

quarters of 2008, and then takes a leap of 3 per cent in the fourth quarter of 2008. The increase in the 1st quarter of 2009 is by 1.5 per cent, and in the 2nd quarter there is just a small increase of 0.5 per cent.

Figure 7.1. Price index, employment activities, Q1 2006 – Q2 2009



With a brief account we can state that the total index for employment activities follows a continuous growth for all the six quarters. Within the last 18 months the index shows a price increase of 6.3 per cent. From the first quarter of 2008 until the corresponding quarter in 2009 the increase is 5.8 per cent. The growth is almost the same between the second quarter of 2008 and the second quarter of 2009, with a 5.6 per cent increase.

Figure 7.2. Total index and sub indices, employment activities (2008 =100)

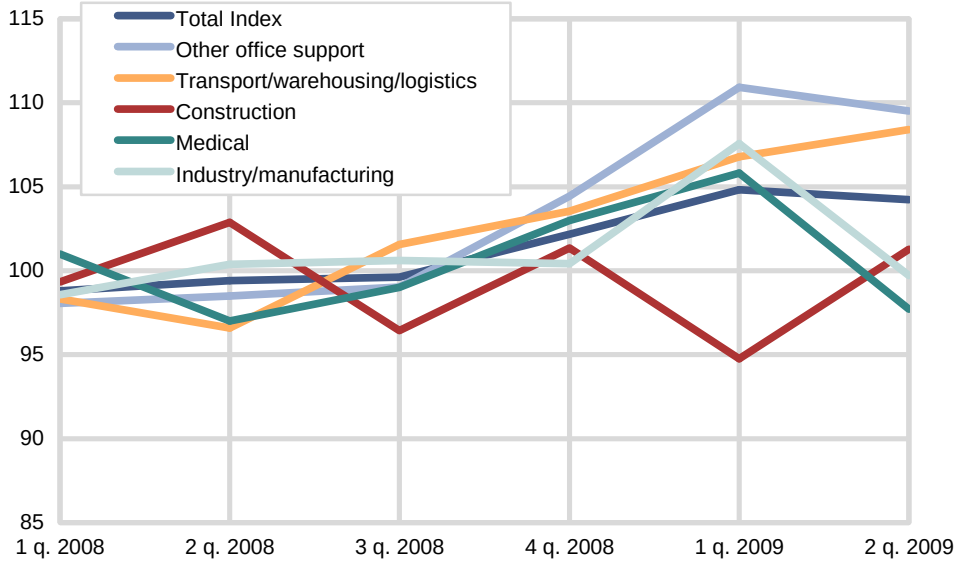


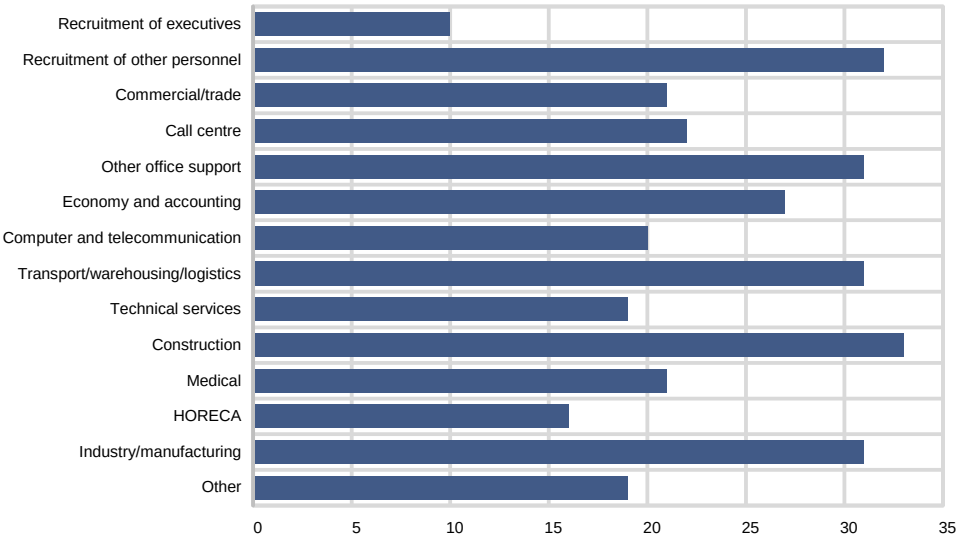
Figure 7.2 gives us an indication of the price development within the largest fields of activity. In spite of our opportunity to obtain this kind of information about the different activity fields, our intention is not to publish these sub-indices, at least not yet. The reason for this is simply because of too few observations on most of them, and because none of the respondents want too many details published. These five (of 14) sub-indices in figure 9.2 stand for about 60 per cent of the total weights, and the total index is therefore highly influenced by them.

We notice that none of the indices follow each other, which says a lot about the industry. In many other industries, there are some factors that affect the entire industry, but here the fields of activity are more isolated. For example, if the field of construction is experiencing a hard time, it does not necessarily affect any other fields.

Two of these sub-indices have had considerably stronger growth than the rest; other office support and transport/warehousing/logistics. Other office support grew strongly in the 4th quarter of 2008 and the 1st quarter of 2009. Despite a decrease in the 2nd quarter of 2009, this is the sub-index with the strongest increase for the period as a whole.

We have to be aware that variance can occur when we have a small amount of observations on several indices. As we have stated earlier this is one of the reasons for not publishing the sub-indices at this current point in time. Figure 7.3 illustrates how many observations we had on the different sub-indices when we started to collect data. These numbers will vary from quarter to quarter, depending on which of the sub-indices the establishments provide labour to. Additionally, some establishments will go bankrupt or leave NHO Service, and new ones will arrive. In total, we have 333 observations.

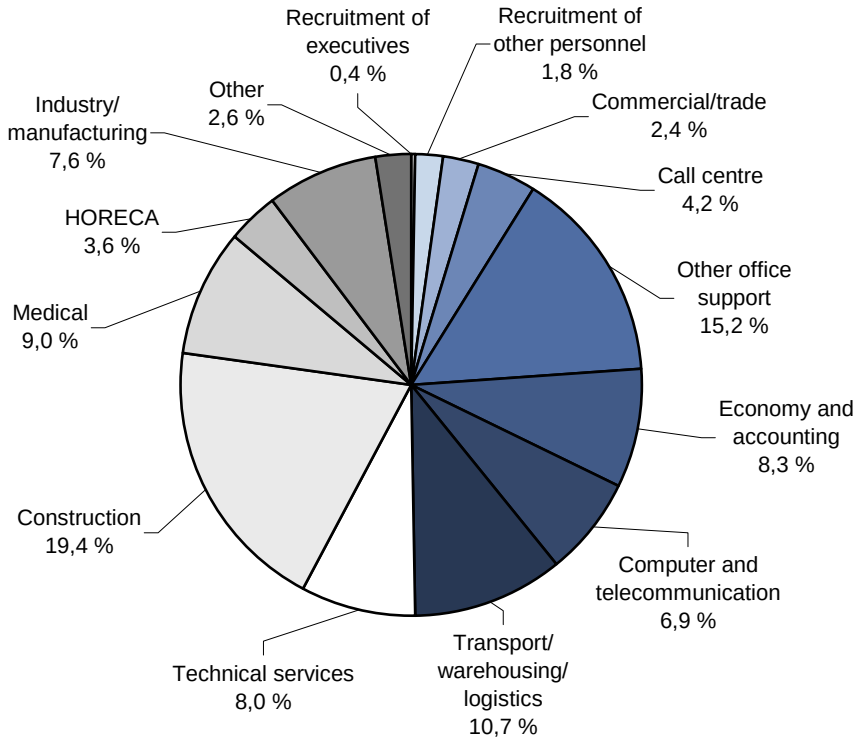
Figure 7.3. Number of observations per sub-index



7.3. Weight distribution

Our weights are calculated from the turnover for 2008. Figure 7.4 illustrates how the distribution among the different fields of activity turns out.

Figure 7.4. Distribution of weights (2008)



And we can see, and as already mentioned, construction and other office support personnel are the largest fields of activity in this index, with 19.4 and 15.2 per cent of the total turnover in the sample respectively. The largest enterprises provide employees in all the fields of activity, and the smaller ones typically specialise in a few fields, mainly construction and medical.

7.4. Evaluation of uncertainty

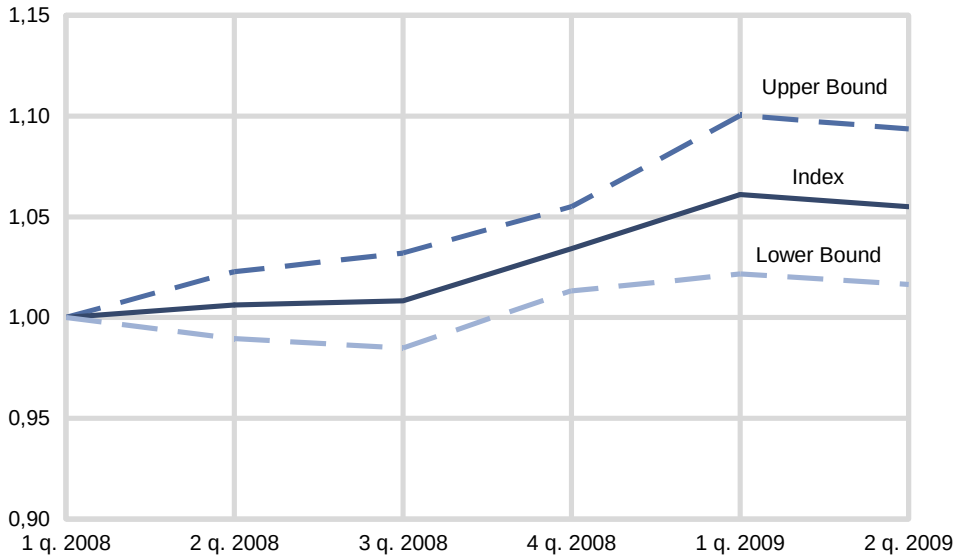
We have a stochastic approach in the calculation of this price index, an approach to index number theory that treats each price relative as an estimate of a common price change. The advantage of this approach is that the uncertainty gets quantified, by estimation of probability distributions for the results. This uncertainty can be estimated with model variance, which is the weighted sum of variance in the elementary indices. The variance that we measure will mainly be affected by variance within single price observations, as well as the amount of price observations that are included in an elementary index.

The estimate starts out very low and increases gradually as we get through the quarters, because we use the same base period for multiple quarters. The more observations we have, the lower the estimate will be. We will for example have more increases in sub-indices with few observations than in those with many observations.

Another way to describe the uncertainty is by calculating the confidence interval. A confidence interval is an interval that with great probability contains the X that we wish to estimate. We operate with a 95 per cent confidence interval. This means that we can with 95 per cent certainty say that the mean of the population lies

between these intervals. Figure 7.5 illustrates how the confidence intervals lie in proportion to the total index.

Figure 7.5. Total index with 95 per cent confidence interval



We calculate the 95 per cent confidence interval by taking the index value and adding or subtracting the standard error multiplied with 2. Similar to the standard errors, the confidence interval also indicates an increase as the time moves forward.

7.5. Publishing

As mentioned in the introduction of this report, the main purpose of this index is for use in the Norwegian National Accounts system. In order to achieve excellent actuality in our index and in the Norwegian National Account system, we publish our indices within 45 days of expiry of the quarter. In the second quarter the actuality is within 60 days, because of the respondents' extended deadline in the holidays. Since the first quarter of 2009, all our price indices (in classifications M and N) have been published together.

Within the last few years, the development of Service Producer Price Index (SPPI) has been a clear priority for Statistics Norway. In elucidating this focus we have improved our subject site for price indices on our website (http://www.ssb.no/priser_en/).

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