

Description of national job vacancy statistics: GERMANY

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1 Description of the general survey design or the administrative sources

- *Survey mode (written questionnaire, telephone interviews, online survey...)*
- *Sampling (design, frequency and further characteristics)*
- *or: description of administrative sources*

1.1 Survey mode

- The German Job Vacancy Survey started in 1989. It has been conducted always in the fourth quarter as a written survey among firms (local unit level, private firms and public administrations with at minimum one employee). The questionnaire has a length of 8 pages and contains questions on the number and the structure of vacancies (vacancies to be filled immediately and later, number of vacancies by qualification level, by professional code), questions on the overall economic situation of the firm/administration, questions on recruitment procedures and questions related to actual labour market issues.

Beginning with 2006, this yearly written survey was supplemented by short telephone interviews on the number and structure of vacancies in the first, second and third quarter. An overview on the questions is given in the annex.

- A random sub-sample of roundly 10,000 firms is drawn from the sample of participating firms in the written survey. These firms are contacted in the following three quarters again by telephone. Thereby a yearly panel is created.
- Firms have the possibility to answer the written questionnaire by internet (password) or fax, only few firms use this option.

1.2 Sampling

- For the fourth quarter every year a sample of roughly 70,000 firms is drawn randomly from the official business register of the Federal Employment Agency. The sample is stratified by:
 - 26 sectors (NACE 2003)
 - 8 firm size classes
 - 2 regions (East and West Germany), as much as possible also stratified by NUTS 1 (Bundesländer)
- The number of firms in every cell of the sample matrix is chosen regarding the participation rates in previous surveys to ensure a sufficient number of answering firms.
- The probability to have an open vacancy is especially low in the very small firms. On the other hand very small firms count for about 30 percent of all vacancies. To capture them sufficiently the sample size is relatively large in this firm size class.

2 Details of the Q1 2008 data collection

- *population of firms by sector and size (matrix)*
- *net sample (respondents) of firms by sector and size (matrix)*
- *non-response-rate (total and by sector)*

Table 1 gives an overview on the total population of firms in Germany in 2007, table 2 depicts the net sample of the first quarter 2008. Table 3 features the share of the drawn net sample in the total population of firms. Finally, table 4 presents the non-response-rate in the fourth quarter 2007 and in the first quarter 2008.

Data usually is available 45 days after the end of the reference quarter.

TABLE 1: Population

NACE-code	NACE category	firmsize		TOTAL
		< 10 employees	≥ 10 employees	
.	TOTAL	1,422,690	655,337	2,078,027
A, B	Agriculture, fishing	53,417	11,934	65,352
C, E	Mining, manufacturing, energy	3,384	4,550	7,934
D	Manufacturing	116,838	109,595	226,432
F	Construction	159,852	60,929	220,781
G	Trade	319,656	137,050	456,706
H	Hotel and catering	103,318	40,547	143,865
I	Transport	65,539	39,328	104,869
J	Banking, insurance	46,670	11,406	58,076
K	Business services	265,500	95,073	360,574
O, P	Private and public services	84,955	32,033	116,987
M, N	Social services	193,599	89,305	282,905
L, Q	Public administration	9,961	23,585	33,546

TABLE 2: Net sample Q1 2008

NACE-code	NACE category	firmsize		TOTAL
		< 10 employees	≥ 10 employees	
.	TOTAL	2,620	5,379	7,999
A, B	Agriculture, fishing	191	164	355
C, E	Mining, manufacturing, energy	77	262	339
D	Manufacturing	423	1,448	1,871
F	Construction	170	250	420
G	Trade	257	262	519
H	Hotel and catering	206	163	369
I	Transport	151	271	422
J	Banking, insurance	145	214	359
K	Business services	253	317	570
O, P	Private and public services	376	642	1,018
M, N	Social services	252	629	881
L, Q	Public administration	119	757	876

TABLE 3: Share of net sample Q1 2008 in total population (%)

NACE-code	NACE category	firm size		TOTAL
		< 10 employees	≥ 10 employees	
.	TOTAL	0.18	0.82	0.38
A, B	Agriculture, fishing	0.36	1.37	0.54
C, E	Mining, manufacturing, energy	2.28	5.76	4.27
D	Manufacturing	0.36	1.32	0.83
F	Construction	0.11	0.41	0.19
G	Trade	0.08	0.19	0.11
H	Hotel and catering	0.20	0.40	0.26
I	Transport	0.23	0.69	0.40
J	Banking, insurance	0.31	1.88	0.62
K	Business services	0.10	0.33	0.16
O, P	Private and public services	0.44	2.00	0.87
M, N	Social services	0.13	0.70	0.31
L, Q	Public administration	1.19	3.21	2.61

TABLE 4: Non-response-rate Q4 2007 and Q1 2008 (%)

NACE-code	NACE category	quarter	
		IV. 2007	I. 2008
.	TOTAL	80,5	44,4
A, B	Agriculture, fishing	75,2	10,1
C, E	Mining, manufacturing, energy	72,4	7,4
D	Manufacturing	80,9	10,0
F	Construction	77,4	12,3
G	Trade	85,7	13,4
H	Hotel and catering	86,1	12,8
I	Transport	82,1	11,5
J	Banking, insurance	85,5	9,6
K	Business services	81,5	9,1
O, P	Private and public services	76,1	8,6
M, N	Social services	80,9	10,4
L, Q	Public administration	74,7	7,8

3 Deviations from the definitions of the regulation

No deviations.

4 Description of data validation methods, if applied

As extreme values are treated:

- more than 250 vacancies per firm \Rightarrow number of vacancies is cut by 50%
- vacancy rate ($\frac{\text{vacancies}}{\text{employees}}$) higher than 250 % \Rightarrow number of vacancies is cut by 50%
- In cases of unreliably high numbers of vacancies the written questionnaire of the fourth quarter or the telephone interview (all interviews are recorded) is checked again or the firms are contacted once more. In case of doubt (no reliable information available) the number of vacancies is treated as missing value.

5 Description of imputation methods, if applied

- Single imputation is used for the number of employees (one of the extrapolation variables):
 - Fourth quarter (written questionnaire): The number of employees is asked twice in the questionnaire. It is checked if both numbers are identical. The firm is contacted again if differences occur that can't be explained out of the context. If this is not successful, the number of employees from the official business register is used.
 - First to third quarter (telephone interviews): If information on the number of employees are not given by the firm, available data from the written survey or data from the business register are used instead.
- Single imputation is also used in case of missing answers that can be constructed using the available information (e. g. structure of employees by qualification is available, but total number of employees is missing).
- Several *multiple* imputation methods have been tested during the last years. The result of this research was that the available methods are not appropriate for the specifics of a job vacancy survey. The majority of respondents has no single job vacancy at the reference date, limiting strongly the database and the application of multiple imputation methods.

6 Description of the grossing up

In order to gain representativity for the population of German businesses, the survey results are being extrapolated in three different ways:

6.1 Sampling design extrapolation

Extrapolation towards the population of all businesses (B) with its sampling fraction from the gross sample for every cell out of a matrix consisting of j economic sectors and s firm-size classes:

$$B_{j,s} = d_{j,s} b_{j,s}$$

with

$$d_{j,s} = \frac{\Lambda_{j,s}}{b_{j,s}}$$

$b_{j,s}$ cases in realised sample, resp. net sample
 $\Lambda_{j,s}$ cases in population

6.2 Extrapolation to local businesses

Extrapolation to the population of businesses with employees covered by social security (B) weighted by their weighting coefficient μ . Extrapolated variables are being calculated by a multi-level iterative method (as described in section 6.5).

$$B_{j,s} = \mu_{j,s} b_{j,s}$$

with

$$\mu_{j,s} = \alpha_{j,s} \mu_{j,s}^{with} + (1 - \alpha_{j,s}) \mu_{j,s}^{without}$$

$$\alpha_{j,s} = \frac{b_{j,s}^{with}}{b_{j,s}^{with} + b_{j,s}^{without}}$$

Wherein $\mu_{j,s}$ is the business' weighting coefficient and $\alpha_{j,s}$ the share of businesses *with* job openings (vacancies plus job openings to be filled later). This method distinguishes between businesses *with* and *without* job openings and calculates different extrapolation variables for each.

6.3 Extrapolation to employees

Extrapolation towards the population of all employees covered by social security E using their employee weighting coefficient. This extrapolation – formally – uses the same method as the extrapolation by firms:

$$E_{j,s} = \varphi_{j,s} e_{j,s}$$

with

$$\varphi_{j,s} = \alpha_{j,s} \varphi_{j,s}^{with} + (1 - \alpha_{j,s}) \varphi_{j,s}^{without}$$

$$\alpha_{j,s} = \frac{e_{j,s}^{with}}{e_{j,s}^{with} + e_{j,s}^{without}}$$

Wherein $\varphi_{j,s}$ is the employee weighting coefficient and $e_{j,s}$ the sample value for the number of employees covered by social security. As before, the extrapolation method distinguishes between businesses *with* and *without* job openings.

This extrapolation method results in the total amount of employees covered by social security, thus exclusively being valid for variables counting employment quantitatively. For weighting categorical variables or relative values (r) not being stated in the “employment”-dimension, the amount of employees covered by social security is implied:

$$R_{j,s} = r_{j,s} \varphi_{j,s} e_{j,s}$$

Thus, named values represent quota, averages and relations weighted by the amount of employees covered by social security.

6.4 Derived extrapolation

Data from the additional part of the survey (“Firms with recruitment(-s) during the preceding 12 months”) are weighted using both the employee weighting coefficient and the business’ weighting coefficient. Therefore, the coefficients are adopted from the main part of the survey in order to keep up compatibility with data from the main part.

6.5 Iterative extrapolation method

The extrapolation is taking place in perspective to two different target variables:

- The population’s matrix of firms, respectively of the employees covered by social security, with the dimensions “economic sector” (j) and “firm-size class” (s). This extrapolated variable will hereafter be referred to as Λ .
- The vector of job openings registered with FEA, separated by j economic sectors. This extrapolated variable will hereafter be referred to as Ω .

Extrapolated variables are being determined to accurately reproduce both the vector of registered job openings and the vector of row and column totals from the business/employee-matrix. Therefore, both target variables are being extrapolated by the same factors, thus being consistent to each other.

Extrapolation for businesses and employees covered by social security both are being implemented in the same manner; hereafter, extrapolation to businesses will be described.

Two restrictions apply to this extrapolation method:

1. Marginal totals of the matrix of estimated values for businesses B_j and B_s must equal the marginal totals of the population Λ :

$$B_j = \Lambda_j \text{ and } B_s = \Lambda_s$$

with

$$B_j = \sum_s \mu_{j,s}^{with} b_{j,s}^{with} + \sum_s \mu_{j,s}^{without} b_{j,s}^{without}$$

as marginal total for economic sectors and

$$B_s = \sum_j \mu_{j,s}^{with} b_{j,s}^{with} + \sum_j \mu_{j,s}^{without} b_{j,s}^{without}$$

as marginal total for firm-size classes.

Thus, consistency is required for marginal totals, but not for every element of the matrix.

2. Estimated values for vector O must equal the elements of the population Ω :

$$O_j = \Omega_j$$

with

$$O_j = \sum_s \mu_{j,s}^{with} o_{j,s}$$

In order to comply with these restrictions, businesses again are being divided into those *with* and *without* job openings. For each, a separate extrapolated variable is being calculated ($\mu_{j,s}^{with}$ and $\mu_{j,s}^{without}$), whilst registered job openings are being extrapolated by the factor $\mu_{j,s}^{with}$, for only those businesses are able to register job openings with FES.

7 Description of error measurement

7.1 Calculation of the sampling error

The variance of a stratified sample $V(r)$ is:

$$V(r) = \sum_{h=1}^i W_h^2 * \frac{S_h^2}{n_h} * (1 - f_h)$$

the sum over all squared weights W of all i strata h multiplied by the variance S^2 of the variable observed (divided by the size n of stratum h) and the odds of the sampling fraction f (according to Cochran: “Sampling Theory”).

In general the variance of a fraction is

$$S_h = r_h(1 - r_h)$$

In recent surveys the fraction of job offering companies was 0.2 and thus its variance was 0.16.

Starting from this, the same fraction is assumed for all strata, in order to show the effects of sampling and weighting rather than empirical observations of one single variable. Therefore S^2 is the same in every stratum (0.0256). The sampling fractions f and the weights of the strata W however vary between the 208 strata (26 sectors and 8 size groups). The design weights are used as weights, for they reflect the chance to be part of the sample.

Following this method, the following sampling errors are computed:

TABLE 5: Calculated variance and sampling errors

	Western Germany	Eastern Germany
Variance	21.66	1.70
Sampling error	0.0245	0.0074
Coefficient of variance (%)*	12.26	3.69

* Sampling error in relation to fraction r (simplified calculation).

7.2 Calculation of the CV

The IAB is actually developing a method to calculate the CV. The calculation needs to take into account the specific design of the sample (stratified in three dimensions: sector, size and region). Results will be presented at the workshop.

8 Main difficulties concerning the provision of reliable data following the rules described in the regulation

Please add a short sentence on the implementation of NACE Rev.2

- Despite the large number of participating firms the available database is insufficient to yield data for all economic sectors. In some of the service sectors the number of participants is too small to calculate the number of vacancies and the job vacancy rate on their basis. At the present a feasibility study is conducted to find out, if - and how - estimation methods can be used to calculate the number of vacancies and the job vacancy rates for all sectors according to the regulation.
- In case of decreasing participation rates, estimations might be necessary also in sectors covered well at the present. In general the number of vacancies follows a stochastic process: at the reference date the majority of firms only has one or two vacancies, like shown in figure 1. The probability to have a job vacancy is especially low in the very small firms.

Therefore a sufficient gross sample and a sufficient number of respondents is necessary in every quarter. The larger the gross and the net sample are, the higher the overall costs of the survey. The maximal costs are limited.

- One extrapolation variable is the number of registered vacancies by economic sectors and regions from the Federal Employment Agency. Because firms are not obligated to cancel the registered vacancies immediately after they found a candidate, there is some inaccuracy in this statistic the job vacancy survey has to deal with. So the basis statistic on registered vacancies is partially adjusted following our own assumptions on these inaccuracies.
- The NACE Rev. 2 will not be introduced for job vacancy data before 2010, because the necessary data for the grossing up procedure are not available in the new NACE structure before 2010.

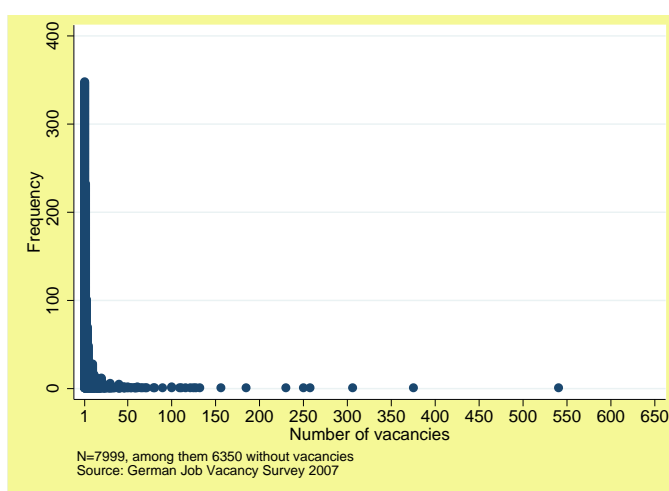


FIGURE 1: Frequencies of vacancies in firms with vacancies in Q1 2008

9 Description of ongoing activities and further plans (including dissemination/publications)

Indicate if and how Job Vacancy Statistics are disseminated nationally (press release, databases, etc.). If available, please provide a link.

Also indicate what indicators are released (number of vacancies, job vacancy rates, etc.) and the scope (raw data/seasonally adjusted, breakdowns (NACE, firm size, ISCO, regional, type of vacancy, other).

- Press infos¹ containing results from the quarterly surveys are issued regularly between four and eight weeks after the regarding quarter. Data on vacancies (to be filled immediately

¹last press info (November 17, 2008) available (in German only) on the internet at <http://iab.de/de/informationsservice/presse/presseinformationen/os0803.aspx>

and later), and vacancies registered with the Federal Employment Agency is included in these infos.

- Every spring a short report (“IAB-Kurzbericht”²) covering the main findings of the survey is issued. These short reports include data on vacancies (to be filled immediately and later), vacancies registered with the Federal Employment Agency, hard-to-fill vacancies, vacancy rates and channels of recruitment.
- Research papers (“IAB-Forschungsbericht”) about various survey topics are being published aperiodically.
- Data is being revised every two years, for grossing up partially is grounded on estimated data.
- At the present it is checked if the quarterly survey on job vacancies can be transferred into a monthly survey, to get more short term information on the labour market development.
- A seasonal adjustment procedure needs to be developed.
- The available time series shall be used more intensively for economic research, also with perspective to international comparisons of labour markets.

10 Contact person for questions

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²last short report: “IAB-Kurzbericht № 07/2008”, available (in German only) on the internet at <http://doku.iab.de/kurzber/2008/kb0708.pdf>

Annex: Questionnaire Q1 2008

- Number of employees
- Number of publically subsidized jobs (if applicable)
- Upcoming 12 months: expected trend in the number of employees (ascending/descending/stable)
- Number of vacancies
 - Number of vacancies to be filled shortly
 - Number of vacancies to be filled later
 - Number of vacancies registered with Federal Employment Services
 - Number of hard-to-fill vacancies
- TOP3-professions for vacancies
- Number of vacancies for college/university graduates