RESEARCH DATA CENTRE (FDZ)
of the German Federal Employment Agency (BA)
at the Institute for Employment Research (IAB)

FDZ-METHODENREPORT

Methodological aspects of labour market data

01|2021 EN Technical Report on the IAB Establishment Panel — Wave 27 (2019)

Sebastian Bechmann, Nikolai Tschersich, Peter Ellguth, Susanne Kohaut, Elisabeth Baier, Christina Florian

Bundesagentur für Arbeit

KANTAR

Technical Report on the IAB Establishment Panel

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Sebastian Bechmann (Kantar)
Nikolai Tschersich (Kantar)
Peter Ellguth (IAB)
Susanne Kohaut (IAB)
Elisabeth Baier (Kantar)
Christina Florian (Kantar)

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Content

1 Changes Compared to 2018

- Some questions are asked not annually but every two or more years. Within the framework of this modular system a number of questions were removed from the questionnaire in wave 27 and others were included. Outside the modular system a number of new questions have been included (cf. section 3.1 in detail). This year, these were questions about the use of robots and the training section was extended (reasons for the termination of training contracts, benefits in non-cash and cash benefits for trainees).
- The sample of establishments surveyed for the first time was almost completely switched to a computer-assisted survey mode. For a detailed description, see chapter 4.2.
- Since the end of May 2018, the EU Data Protection Regulation (GDPR) has been directly applicable in all EU member states. Against this background, in the 2018 wave, the consent of the establishments was collected at the end of the questionnaire for a renewed contact in the follow-up wave in 2019 by Kantar (Art. 6 para. 1 a, DSGVO). For this reason, the sample of panel establishments was approximately 10 percent smaller than in the 2018 survey year. This loss was offset by an increased gross input in the sample of establishments surveyed for the first time. For detailed information on the sample, see chapters 2 and 4.2.
- For a number of questions, the coding of missing values has changed from previous years. The code "-1" now assigned means that this is not a conventional missing value, but rather response options ("cannot say (yet)", "not known") offered in the questionnaire in the event that information cannot (yet) be provided for content-related reasons. These are the questions ba06a, ba17, ba18, ba72, ba73, ba86a and ba86b.

2 Population, Sampling Frame, Sample

2.1 Population and Selected Population

The population of the IAB Establishment Panel comprises all establishments with at least one employee subject to social insurance contributions as of the reference date 30 June of the previous year.[1] The basis for sampling is the Federal Employment Agency establishment file. This contains all the establishments that in the context of the social security registration process notify the social security agencies of their employees who are subject to social insurance contributions, and are given an establishment number. As of the reference date 30 June 2018 the establishment file contained 2,136,419 establishments belonging to the population, with a total of 32,801,276 employees subject to social insurance contributions. Establishments without employees subject to social insurance contributions, for example one-man establishments or establishments only with marginal employment or employing only civil servants, are not covered by the IAB Establishment Panel. For this reason, for example, with 44,690,000 people in gainful employment (Destatis 2020), the national accounts exhibit distinctly more people employed than the IAB Establishment Panel with 40,293,998 (rounded) employees.[2]

2.2 The Logic behind the Establishment Number

An establishment denotes a regionally and economically separate unit with employees, which is awarded its own establishment number in accordance with certain rules during the registration process for the social security agencies.[3]

- Branches of one employer in different local authority districts strictly receive their own establishment number.
- Branches of one employer within one local authority district are merged under one establishment with one establishment number provided if they exercise the same economic activity. Branches with different economic activities are given different establishment numbers.
- An establishment itself can have several establishment numbers; this applies in particular to larger establishments with different functional areas that are considered as independent concerning their administration.
- Crossholdings between companies play no role. Every legally independent company is given establishment numbers according to the rules just mentioned.

1 Private households and exterritorial organisations have been excluded since the 2004 survey.
2 Situation as of June 2018 resp. 30th June 2018.
3 For the logic behind establishment numbers and the rules on issuing them, cf. Fritsch/Brixy 2004 and further information on the website https://www.arbeitsagentur.de/web/content/DE/Unternehmen/Sozialversicherung/Betriebsnummernvergabe/index.htm.

Establishment numbers are (re-)allocated when

- the establishment previously did not have an establishment number (usually because it is the first time that the establishment has an employee who is subject to social insurance contributions),
- the establishment's economic activity has changed or
- there is a change of ownership.

2.3 Stratification Matrix and Partial Samples

The sample is disproportionally stratified by the size of the establishment, sector and federal state. On the one hand the target degree of completion of the individual cells is determined by the scope of the basic sample and that of the extension samples specific to the federal states and sectors. On the other hand, the individual cells are drawn according to the principle of optimal stratification proportional to the number of employees. For these reasons, large establishments, small federal states and small sectors as well as the manufacturing industry in East Germany are overrepresented in the sample. These disproportionalities are corrected with the aid of a weighting procedure afterwards (cf. in detail Chapters 7 and 8). Table 13 and Table 14 in the Appendix provide an overview of the classification of the sectors and establishment sizes. The last major changes to the stratification matrix were undertaken in 2009 in respect of the delineation of sectors, during the changeover from the economic sector classification WZ2003 to WZ2008. Since 2007 East and West Berlin have been combined.[4]

There are three partial samples in total:

- **Continuer sample:** This comprises all the establishments that are willing to participate and have a valid interview from the previous year. The continuer sample reflects the panel nature of the IAB Establishment Panel. It is necessary so that panel evaluations extending beyond pure time-series analyses can be undertaken. Panel analyses examine the developments at establishment level over time. On the other hand, cross-sectional data from at least two points in time are sufficient for time-series analyses.
- **Follow-up sample:** This comprises all the establishments that are willing to participate and have a valid interview from the year before last.[5] This partial sample increases the number of cases that can be evaluated cross-sectionally.
- **Supplementary and extension sample:** This includes extension samples that are specific to federal states, and a sector-specific extension for the manufacturing industry in East German federal states. It also comprises establishments with a new establishment number. The aim of this partial sample is to replace panel attrition, to achieve the sample sizes required in the individual federal states and in the manufacturing industry, and to illustrate economic structural change. The attribute "New

4 At the wish of the Halle Institute for Economic Research (IWH), Berlin was excluded from the extension to the manufacturing industry in East Germany. Since then this extension has only included East German federal states.

5 These are generally establishments which expressed the wish to miss a year, but would then be willing to participate again in the subsequent year.

Establishment Number" has to be used carefully and can not simply be put on the same level with „New Establishment".[6]

Up to 2002 unit-non-responses were generally excluded from further sampling processes. In the greater size classes in particular, there were ultimately hardly any new establishments in the sampling frame which might have been included in the sample. Since then, unit-non-responses can be drawn again after a three-year rest period. Establishments of this kind that are newly drawn are reincluded in the sample with a new identification number.

6 New establishment numbers are characterised by the fact that as of the reference date of the current survey wave (= 30 June of the previous year) they had at least one employee subject to social insurance contributions, whereas a year earlier they had none. This definition is aligned with the system used for the Federal Employment Agency establishment file, and is only suitable to a limited extent for identifying the genuine founding of new establishments. The establishment might have existed before as an establishment without employees subject to social insurance contributions. It also happens that establishments do not continuously have employees; these so-called perforated establishment numbers can appear in the sample of a survey year as new establishment numbers under the above definition (cf. also the overview of how establishment numbers are awarded in Section 1.2). For this reason, this characteristic should be used with care, and only when additional characteristics from the questionnaire are taken into account, such as information on the manner in which they were founded.

3 Questionnaire and Pretest

3.1 **Questionnaire Development and Module System**

The development of the questionnaire also takes account of the panel character of the IAB Establishment Panel. In every wave so-called basic modules are used with as many unchanged questions as possible. These basic information on establishments are available for every year since 2008.[7] The basic modules are supplemented by additional modules, in which more in-depth questions are asked at defined intervals of time, usually in a two-year cycle.

Every year there are also one or more focus areas for questions which are coordinated with the various clients (cf. Appendix). Here more in-depth questions are asked about particular topics or current labour market trends.[8] Table 1 below lists the questions that were included in the questionnaire besides the module system. In the development of the questionnaire itself, a compromise must be found between comparability over time and the adaptation or modification of existing questions as well as the inclusion of new and current topics.

7 Up until the 2007 wave this statement only applies to particular topic areas. Cf. in more detail Fischer et al. (2009: 138).
8 An overview of the individual questions and the questionnaire can be found in the tools for the IAB Establishment Panel at-http://fdz.iab.de/.

Table 1: Questions (re)included in the questionnaire in 2019[9]

Question	*Section*	*Question text*	*Response options*	*Last surveyed (question)*	*Changes compared to last survey*
40c	Personnel movement and recruitment	Please indicate the total number of new employees that had fixed-term contracts without the need to state a legally recognized ground (relaxed regulations for use of fixed-term contracts).	Number (numeric)	first raised	-
43c	Personnel movements and recruitment	Please indicate the number of employees given a permanent contract who had fixed-term contracts without legally recognized grounds in the first half of 2019.	Number (numeric)	first raised	-
55a	Vocational training and apprenticeships	Were any of these apprenticeship contracts dissolved by the establishment/office?	yes/no	first raised	-
55b	Vocational training and apprenticeships	If so: How many? Please estimate if an exact indication is not possible!	Number (numeric)	first raised	-
56a	Vocational training and apprenticeships	What were the reasons that your establishment/agency terminated training contracts? Please list all that apply in the following list.	Multiple answers	first raised	-
56b	Vocational training and apprenticeships	What was the main reason?	Most important reason	first raised	-
61	Vocational training and apprenticeships	Does your establishment/office offer following payments in kind or monetary payments additionally to the apprenticeship pay to increase the attractiveness of the vocational training?	yes/no	first raised	-
77a	Use of robots	Have you used robots over the last 5 years for operational performance or production? A robot is any automated machine with multiple axis or directions of movement, programmed to perform specific tasks (partially) without human intervention. This includes industrial robots but also service robots. This excludes machine tools, e.g. CNC-machines.	yes/no	first raised	-
77b	Use of robots	How many robots have you used in total per year over the last five years? An estimate will suffice. If multiple robots are used in one robot cell, please count them individually. Again, please provide an estimate if no exact figure is available.	Number (numeric)	first raised	-

9 Questions included or dropped due to the module system are not shown in the table, but only questions are shown that are included in individual waves (or for short periods of time).

78	Use of robots	How many of the robots used in 2018 were purchased at a price of less than €50,000? Please (if possible) consider only the purchase price, without any further costs for tools or the integration of the robots into your production circle.	Number (numeric)	first raised	-
79	Use of robots	How many of the robots used in 2018 are separated from employees during the regular operations with the help of a protection device, e.g. cage, fence, separate room, light barrier or sensor mat?	Number (numeric)	first raised	-
80	Use of robots	How many of the robots used in 2018 did you just purchase in 2018?	Number (numeric)	first raised	-

3.2 Cognitive Pretest

Since the 2005 wave, there has been a cognitive pretest for the sake of quality assurance. New questions are initially checked as to whether they appear suitable in principle for an establishment survey, and whether the establishments are likely to be capable of providing information on the content being asked, to the effect that the desired information is available at establishment level. When these criteria are met, the questions undergo a cognitive pretest, for which interviews are carried out in over 100 establishments from different sectors and establishment size classes. The pretest interview consists of two parts. Firstly the test person is asked to answer the questionnaire, then the second stage comprises the actual cognitive test. The establishments are requested to comment on each question, and are asked whether they had any difficulties in answering. The establishments' ability to provide information and their difficulties in answering as well as their problems in interpreting the questions are of particular interest. The results of the cognitive pretest flow into the further development of the questions: Which questions can be included in the next wave without making changes? Which questions still need to be adjusted and which questions are too complex or not suitable for an establishment survey? (cf. in more detail Ellguth et al. 2014: 30) The cognitive pretest interviews are undertaken by specially trained project staff from the so-called "Stützpunktagenturen" [*supporting agencies*] (ProIAB) (cf. Winters/Kargus 2012).

3.3 Introduction of a computer-assisted questionnaire

Since 2018, the questionnaire is also available as a computer-assisted questionnaire that reflects the functionality and flexibility of the paper questionnaire (cf. also the notes on study design in section 4.1). The core functionalities include the following:

- The computer-assisted questionnaire can be used both in CAPI mode and in CAWI mode.
- The interviewers are thereby able to conduct the interview on site with their CAPI laptop.
- Furthermore, the questionnaire can be left to the establishment for partial or complete completion via internet (CAWI).
- The computer-assisted questionnaire makes it possible to jump to specific questions or question modules with pinpoint accuracy. The target person is able to browse back and forth like in a paper questionnaire.
- Several thematically related questions are displayed simultaneously on one screen. Filtered questions are not hidden but only deactivated. This is to avoid mode effects compared to the paper questionnaire.
- The establishments are able to archive the completed questionnaire as a PDF or printed document for internal documentation purposes.

4 Study Design and Field Organisation

4.1 **Study Design**

Usually the interviews are conducted completely face-to-face. The questionnaire asks for a series of items of operational information (e.g. turnover, investments, total wages and salaries), about which in principle the establishment ought to be capable of providing, but which cannot always be spontaneously recalled by the person being interviewed. In such cases the interviewer can leave the questionnaire at the establishment, so that the person being interviewed can look up the missing information and then complete the questionnaire. At the request of the establishment the questionnaire can also be left for total self-completion. In both cases, it is the interviewer's task to collect the completed questionnaire from the establishment. The majority of establishments are interviewed completely face-to-face (cf. also Table 7 in section 5.2). The option of self-completion (partly or fully) is taken up most frequently by larger establishments.

This approach leads to a response rate that is stable at a high level and ensures a high data quality (cf. chapter 5 and 6): this is because the option of self-completion often results in more precise information than in purely face-to-face interviews with a higher number of missing values in terms of "don't know" or very approximate estimates. In turn the use of trained interviewers leads to fewer errors in the completed questionnaires in principle compared to the purely mail questionnaires, and the proportion of missing information is lower.[10]

The interviews are undertaken exclusively by interviewers from the in-house interviewer staff at Kantar. The interviewers are responsible for the following sub-steps:

- Contacting the establishment (in person or by phone),
- identifying a target person who is able to provide information, and motivating this person to participate,
- checking that the correct establishment unit is being surveyed[11] and
- conducting the interview.

10 Up to and including 2014, in Saarland (since 2001) and Schleswig-Holstein (since 2002) a part of the sample was conducted as a mail survey. This had become necessary for capacity reasons, because due to the extension samples specific to these individual federal states, the desired sample sizes could not have been achieved in the stipulated field period. In 2015 Schleswig-Holstein switched over completely to a face-to-face data collection mode, and Saarland followed in the 2016 wave.

11 Cf. in detail Section 4.2.

Continuity of the interviewers used is crucial for the success of the survey. In this respect, Janik and Kohaut (2009) were able to demonstrate the very strong effect a change of interviewer has on the likelihood of participation. The probability of non-participation increases markedly when a different interviewer is used to the one who was used the previous year. Changes are necessary in principle when interviewers have left in the meantime or establishments have moved. Table 2 shows that changes of interviewers are very rare in the context of the IAB Establishment Panel and that the bulk of interviews are undertaken by the same interviewers as the previous year.

Table 2: Summary of the use of interviewers[12]

	2019	2018
Proportion of interviewers used again	82 %	84 %
Proportion of cases without a change of interviewer	87 %	88 %
Number of interviewers used	496	518

The data collection generally takes place annually from the end of June to the end of October. In parallel the data that has been gathered undergo checks and errors are eliminated (for this cf. Chapter 6). In advance the establishments receive an announcement letter from the Federal Employment Agency (BA), a letter of recommendation from the Confederation of German Employers' Associations (BDA), a data privacy declaration and a summary of the most important results from the previous year – in the form of a 8-page flyer.

4.2 Field organization

In the 2018 wave, as part of a mixed-mode experiment, the sample of establishments to be surveyed for the first time was divided into different subsamples and successively surveyed using different modes (see chapter 5.3 of the 2018 technical report). The establishments in this experiment were surveyed in 2019 using the same survey mode as in 2018 (see Table 3).

Table 3: Survey mode in wave 2019 for establishments in the initial respondent sample of wave 2018

Subgroup in 2018	Actual survey mode in 2018	Subgroup in 2019
PAPI	PAPI incl. self-completion	PAPI (P1)
CAWI1st[13]	CAWI	CAWI1st (with f2f-follow-up survey via CAPI, if necessary) (P3)
	PAPI incl. self-completion via PAPI	CAPI (P2)
CAPI	CAPI incl. CAWI- self-completion	CAPI (P2)

12 In contrast to previous years, first-time respondents from the previous year were included in the calculation as repeat respondents.
13 These establishments were first invited to the online survey by mail. After two reminders, all farms without an online interview were included in the f2f follow-up.

The panel sample thus consisted of a total of three subgroups (see Table 4).

Subgroup PAPI (P1): In this subgroup, the classic paper questionnaire was used. The interview was to be conducted face-to-face (PAPI). It was possible to leave the questionnaire at the establishment for partial or complete self-completion.

Subgroup CAPI (P2): In this subgroup, the computer-assisted questionnaire was used (see also Section 3.3). In principle, the interview was to be conducted face-to-face (CAPI). Here, too, the interviewer could hand over the questionnaire to the establishment for partial or complete self-completion. For this purpose, the establishment was given the opportunity to complete the questionnaire online (CAWI). In such a case, the interviewer had to collect the e-mail address of the target person. Kantar then emailed the target respondents an invitation link for the questionnaire.

Subgroup CAWIfirst (P3): Establishments of this subgroup were asked to participate in the IAB Establishment Panel online (CAWI) in a postal invitation letter (if an e-mail address was known, also by e-mail). After two reminders in which the establishments were again asked to participate in the IAB Establishment Panel, all establishments without an interview were sent to a CAPI follow-up by f2f interviewers from Kantar. In the second reminder it was pointed out that an interviewer would get in contact if no interview was available.

The refreshment sample was almost entirely switched to a computer-assisted questionnaire in 2019. About 3% of the refreshment sample was interviewed using a paper questionnaire by interviewers who did not have a laptop (see Table 4):

CAPI subgroup (R1): In this subgroup, the computer-assisted questionnaire was used (see also Section 3.3). In principle, the interview was to be conducted face-to-face (CAPI). Here, too, the interviewer could hand over the questionnaire to the establishment for partial or complete self-completion. For this purpose, the establishment was given the opportunity to complete the questionnaire online (CAWI). In such a case, the interviewer had to collect the e-mail address of the target person. Kantar then emailed the target respondents an invitation link for the questionnaire.

Subgroup PAPI (R2): In some regions, Kantar did not have a sufficient number of f2f interviewers equipped with a laptop. In order to optimize the response rate and to secure the number of cases, interviewers without laptops were sometimes used in these regions in agreement with the IAB. The interviews were then conducted using the classic paper questionnaire. In principle, the interview was to be conducted face-to-face (PAPI). It was possible to leave the questionnaire at the establishment for partial or complete self-completion.

Subgroup CAWIfirst (R3): Subgroup R3 pursued The same goal as subgroup 2. In regions with a generally low density of interviewers, the establishments were asked to fill out the questionnaire directly online (CAWI) by means of a postal invitation letter. After two reminders in which the establishments were again asked to participate in the IAB Establishment Panel, all establishments without an interview were sent to a CAPI follow-up by f2f interviewers from Kantar. In the second reminder, it was pointed out that an interviewer would contact them if no interview was available.

CAPI subgroup (R4): In regions where the forecasts for the number of cases were particularly poor, a CAPI supplementary sample was launched into field, since higher response rates can be expected when the survey is conducted face-to-face. In principle, the interview was to be conducted face-to-face (CAPI). Here, too, the interviewer could hand over the questionnaire to the establishment for partial or complete self-completion. For this

purpose, the establishment was given the opportunity to complete the questionnaire online (CAWI). In such a case, the interviewer had to record the e-mail address of the target person. Kantar then emailed the target person an invitation link for the questionnaire.

Subgroup CAWI (R5): Towards the end of the field work, when it became clear that the reponse rate was below expectations and thus the target number of cases could no longer be guaranteed, a further supplementary sample was sent into the field in agreement with the IAB. In this group, only the CAWI questionnaire (without a follow-up survey by the interviewers) was to be used. In addition to a postal invitation letter with a link to the online questionnaire, the establishments received up to three reminders. The third reminder was also accompanied by a paper questionnaire, which the establishment could fill out alternatively.

In certain cases, there was a switch from an interview-based survey to a pure CAWI survey towards the end of the field period. This change was always made when the interviewers could no longer be expected to conduct interviews or no significant response rate was to be expected any more from the interviewers. This was the case, for example, if the interviewer fell ill or had previously very poor response rates achieved. These establishment received a postal invitation letter with a link to the online questionnaire. The letter was also accompanied by a paper questionnaire that the company could fill out alternatively. Such a mode change occurred in subgroups R1, R2, R3 and R4 and affected a total of 955 establishments.

Fieldwork started on 02 July 2019 and was completed on 09 December 2019. Table 4 shows a detailed overview of the subgroups.

Table 4: Subgroups of the 2019 sample

Subgroup	Gross sample	Survey instrument	Mode in phase 1	Mode in phase 2	Mode in phase 3	Cover letter type	Content
Refreshment sample							
R1	12.067	CAPI	CAPI with CAWI-self filler			Invitation	Announcement interviewer
				CAWI/paper questionnaire		Invitation	Link+paper questionnaire
R2	1.035	PAPI	PAPI with PAPI-self filler			Invitation	Announcement interviewer
				CAWI/paper questionnaire		Invitation	Link+paper questionnaire
R3	1.399	CAWI/CAPI	CAWI			Invitation	Link
						1. Reminder	Link
						2. Reminder	Link + Announcement interviewer
				CAPI with CAWI-self filler		-	-
					CAWI/paper questionnaire	3. Reminder	Link+paper questionnaire
R4	2.630	CAPI	CAPI with CAWI-self filler			Invitation	Announcement interviewer
				CAWI/paper questionnaire		Invitation	Link+paper questionnaire

R5	14.638	CAWI	CAWI		Invitation 1. Reminder 2. Reminder 3. Reminder	Link Link Link Link+paper questionnaire
				CAWI/paper questionnaire		

Repeater

P1	14.031	PAPI	PAPI with PAPI-self filler		Invitation	Announcement interviewer
P2	260	CAPI	CAPI with CAWI-self filler		Invitation	Announcement interviewer
P3	167	CAWI/CAPI	CAWI		Invitation 1. Reminder 2. Reminder	Link Link Link + Announcement interviewer
				CAPI with CAWI-self filler		

4.3 Identification of the Correct Establishment Unit

The interviewer is responsible for ensuring that the correct establishment unit is surveyed. For establishments being surveyed for the first time, the establishment number defines the survey unit. The interviewer has to decide on the spot whether the information requested in the questionnaire is actually available for this unit. The establishment number itself is a characteristic that is difficult to handle when identifying the correct establishment unit. For that reason the interviewers – aside from the name of the establishment – rely on the sector and the number of employees subject to social insurance contributions as of the reference date of the previous year, according to the details held by the Federal Employment Agency (BA). It is only in the event of deviation that the interviewers resort to the establishment number. In specific cases the interviewer can interview a different unit, especially if the unit specified by the establishment number does not constitute a unit which is worthwhile interviewing.[14] If there is another possible survey unit, there must still be some relationship to the original establishment number on the address protocol: The deviating survey unit must contain all or part of the given establishment number. If this is not the case, no interview takes place.

In the case of establishments periodically interviewed, the same unit as the unit in the previous year should be interviewed. This applies irrespective of the relationship between the unit surveyed the previous year and the originally stipulated establishment number. The connection to the previous year is established using the details of the total number of employees and sector from the previous year. Only when the provided information in the current year on the reference date of the previous year are identical with the corresponding information given in the previous year, it can be assumed that the interview is taking place in the same establishment as last year (in terms of the employee numbers within a defined range of tolerance).[15] This information forms the basis of the panel case definition provided, and thus of the individual longitudinal sections (cf. Chapter 8 on this in detail). It should be pointed out that as well as this panel case variable, the researcher should always also make use of additional variables to define establishments that are identical with the previous year for his specific interest. Thus a decision on whether, for example, an establishment which has closed some subunits, but has also integrated other units, is still the same establishment or not has to be taken on the basis of considerations of content.

14 This can occur, for example, if individual functional areas (e.g. administrative and care personnel in a hospital) are each given their own establishment number, or the establishment number comprises several branch offices (cf. Section 2.2 in this respect too). This is found in particular in the public sector, the non-profit sector, manufacturing industry with a relatively large proportion of large establishments, and in sectors with a large number of legally independent branch offices such as retail. According to Fritsch/Brixy (2004: 185f), this occurs in less than ten percent of cases, and discrepancies in terms of numbers of employees are generally relatively small.

15 For establishments with more than 20 employees the range of tolerance is +/– 5 %, for establishments with up to 20 employees +/– 1.

4.4 Training and Monitoring Interviewers

Kantar continuously recruits interviewers for its in-house f2f interviewer staff. Interviewers are selected in an extensive, multistage selection and assessment process, within the prospective interviewers receive training face-to-face and in writing. They receive detailed basic information about statistical selection procedures, data protection and interviewing behaviour. The so called contact interviewers, experienced interviewers who take over the local supervision of the new interviewers, practise the later interview situation with the new interviewers. Since contact interviewers also work as interviewers, they are able to pass on their experiences and practical tips to the new interviewers. The new interviewers are intensively supervised by the contact interviewers during their first projects. The interviewers at Kantar receive follow-up training as standard at regular intervals.

As already mentioned above, in 2019 almost 82% of the interviewers deployed for the IAB Establishment Panel had already worked for the project in one or more previous waves. Thus they are extremely familiar with the special requirements of the project. Extensive written instructions for interviewers were also prepared for the current survey wave, dealing with the following points: new features compared with the previous wave, the issues being studied, clarification of the correct establishment unit, information about making contact and documenting contacts, identifying the main target person(s) for the editing, information about data protection and special information about the questionnaire as far as necessary.

In addition to these written instructions, interviewers working for the IAB Establishment Panel for the first time also receive personal project training from the responsible contact interviewer. Kantar has prepared a project-specific concept and corresponding training documents especially for this. During this training, the contact interviewers convey the most important information about the project, such as the client, duration and scope of the project, the background and objectives of the study, and what the collected data will be used for. They explain to the interviewers how they should identify the correct establishment unit and the target person, and they are told the importance of ensuring that the establishments take part. Finally the new interviewer and the contact interviewer go through the questionnaire together with the contact interviewer explaining it.

As well as the intensive interviewer training for quality assurance purposes the interviewers' work is continuously monitored to ensure "that no significant falsification of the research results takes place through interviews – consciously or unconsciously – not being conducted correctly" (Sommer et al. 1999: 414):

- For the IAB Establishment Panel a project-specific control of all the interviews that have been conducted takes place through the extensive ex-post data validation and follow-up telephone surveys (cf. in detail Chapter 6). In order to make sure that interviews that are correct right from the start will be considered for checks, an additional random-based control was inroduced. The interviews of the interviewers with more than 50 interviews are checked with a control rate of at least 25 % each. The interviews of the interviewers with up to 50 interviews are checked with a control rate of at least 10 % each.
- In addition, there are random checks of the interviewers' work in other projects. This routine monitoring takes place at the individual interviewer level, so that any erroneous or incorrect work by interviewers can be recognised as early as possible and independently of any specific study. Kantar checks at least 10 % of all the interviews held every year as standard. Thus amongst other things, the interviewee stated in each case is subsequently asked by mail, by phone or also face-to-face whether, when and with whom the interview took place and how long it lasted. If the checks give cause to doubt

the quality of an interviewer's work, this interviewer is asked to provide a written comment. The interviewer is given further training as appropriate or – in serious cases – he runs the risk of reduced fees, or even of leaving the interviewer staff. If an interviewer becomes conspicious during a routine check, also his faultless questionnaires get checked in project specific controls as mentioned above.

5 Result of Field Work

5.1 Overview of Field Work

The field work started on 02 July 2019, with the last interview being held on 09 December 2019. Figure 1 shows both the weekly response rate in terms of the interviews held and the reported non-responses, as well as the cumulative response rate.

Figure 1: Number of interviews and non-responses as well as cumulative response rate per week (in number of responses)

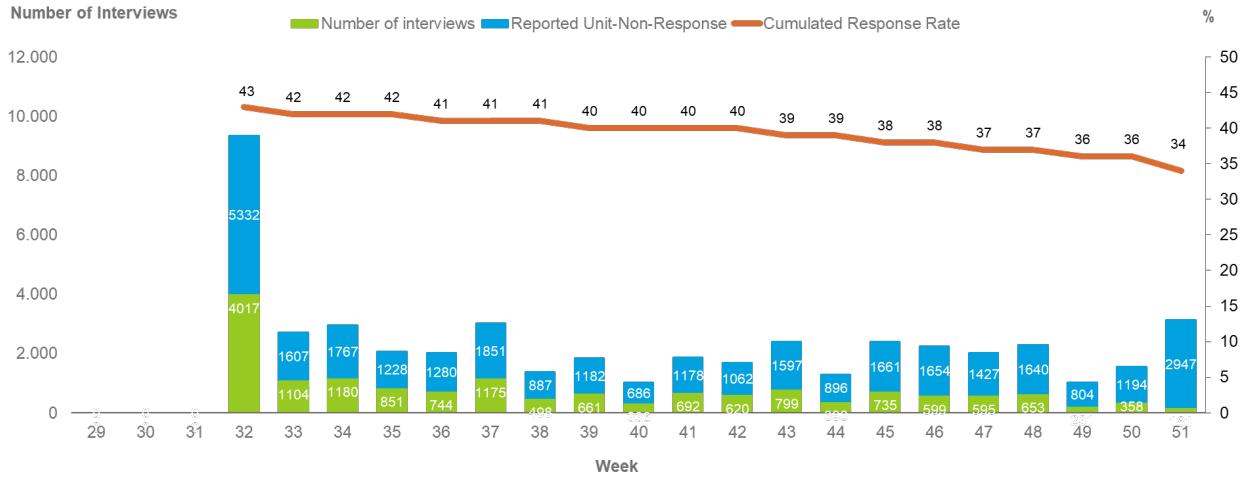


Figure 2 shows an overview of the distribution of the interviews by the date on which they were held – and not by the date of the return as in Figure 1. The typical field work progression can be seen clearly: the number of interviews achieved per week rises initially and falls continuously as the field period increases. From calendar week 42 – in this week additional establishments were contacted and asked to participate in the survey (subgourp R4 and R5) – the number of interviews realized per week increased.

Figure 2: Proportion of interviews (date on which they were held), in percent

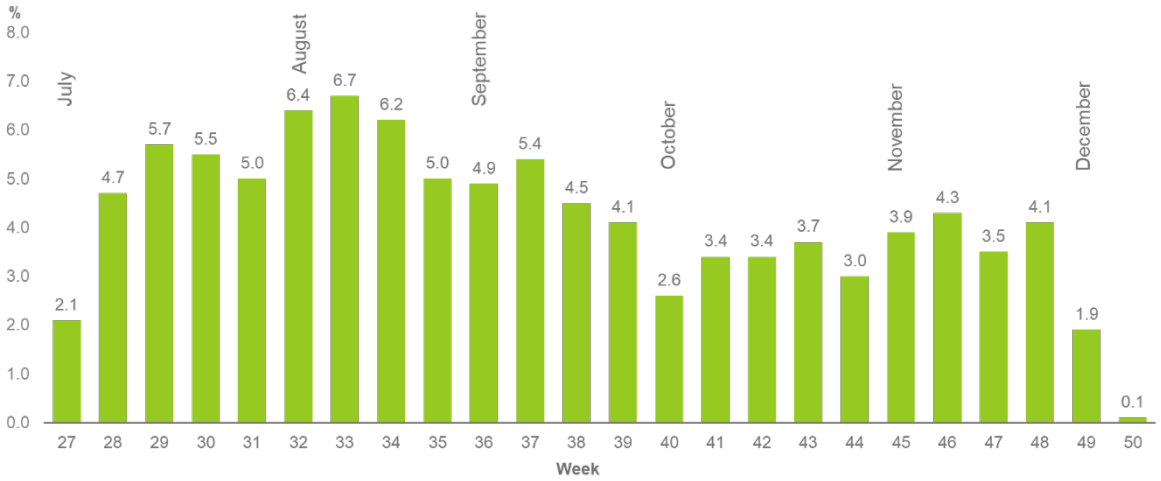
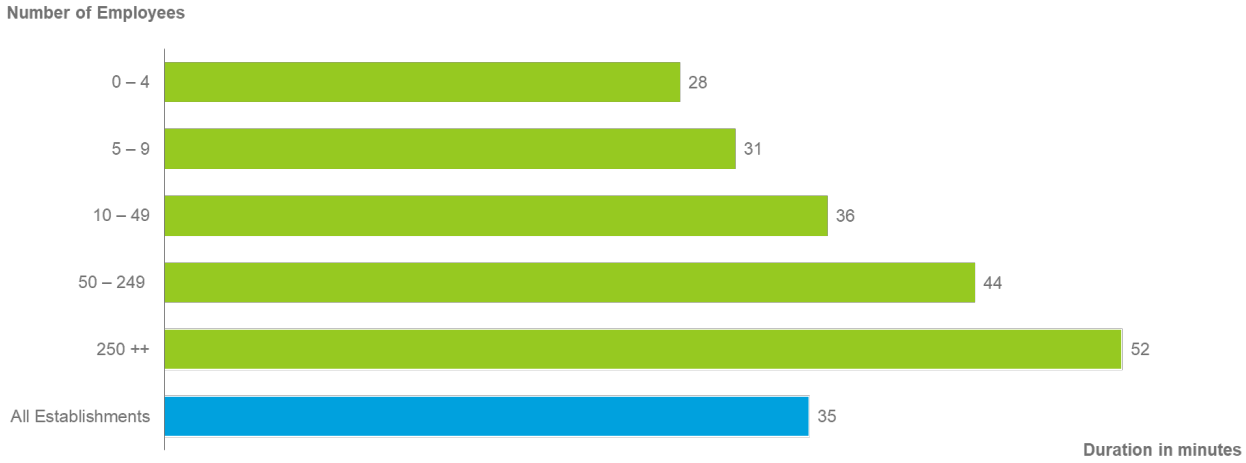


Figure 3 shows the average duration of the interviews by establishment size class. The average interview duration in smaller establishments is in principle lower than in larger establishments, mainly due to the fact that smaller establishments have a better ad hoc overview of what happens in the establishment than larger establishments. Thus questions about the personnel structure (e. g. proportion of part-time employees) are easier to answer in a 3-person-establishment than in an establishment with 100 employees. In addition, certain issues frequently do not apply to smaller establishments, so they have to answer a greatly reduced catalogue of questions due to the use of suitable filter questions. Thus, for example, the entire block of training or development questions is omitted if the establishment is not an authorised training provider or no employee received training respectively. Both of these cases occur more frequently with smaller establishments than with larger ones. As a result we can see that as the number of employees increases, the average interview duration rises from 28 minutes approximately 52 minutes. The average interview duration in 2019 was approximately 35 minutes.

Figure 3: Average interview duration by establishment size class, in minutes



5.2 The Responses in detail – Unit-Non-Response

As already described in Section 2.3, the IAB Establishment Panel is disproportionately stratified according to different characteristics. Table 5 provides an overview of the extent of the gross sample used and the numbers of cases actually realised for each federal state (federal state-specific extension samples) and for the manufacturing industry in East Germany (sector-specific extension sample). The number of establishments successfully re-interviewed is shown separately.

Table 5: Overview of gross and net sample, by federal state and manufacturing industry in East Germany[16]

	Gross	Net (actual)	of which repeated
Schleswig-Holstein	1,697	882	649
Hamburg	1,244	245	177
Lower Saxony	3,269	1,182	822
Bremen	2,567	877	687
North Rhine-Westphalia	6,480	1,527	1,058
Hesse	3,107	1,018	824
Rhineland-Palatinate	2,486	858	659
Baden-Württemberg	3,729	1,239	916
Bavaria	3,663	1,134	846
Saarland	4,850	861	547
Berlin	2,526	818	614
Brandenburg	1,973	1,106	871
Mecklenburg-West Pomerania	1,813	1,029	818
Saxony	2,189	1,229	987
Saxony-Anhalt	3,216	1,093	813
Thuringia	3,490	1,118	852
Total	**48,299**	**16,216**	**12,140**
Manuf. ind. East Germany (excl. Berlin)	3,517	1,706	1,324

From the total gross sample of 48,299 establishments, a total of 16,216 valid interviews were realised. Thus compared with the total sample, a response rate of about 34 % was achieved (cf. Table 6).

16 The manufacturing industry in East Germany is shown separately as these cases are already contained in the case numbers differentiated by East German federal states (excluding Berlin).

Table 6: Number of evaluable interviews and response rate, by partial sample[17]

Partial samples	Region	Gross (absolute)	Evaluable interviews	
			absolute	as % of gross
a) Respondents from wave 2018	West	9,610	7,185	75 %
	East	6,523	4,955	76 %
	Total	**16,133**	**12,140**	75 %
b) Samples of non-respondents from previous year willing to be surveyed again in 2019	West	831	129	16 %
	East	425	86	20 %
	Total	**1,256**	**215**	17 %
c) Refresher sample 2019	West	22,651	2,509	11 %
	East	8,259	1,352	16 %
	Total	**30,910**	**3,861**	12 %
d) Gesamt	West	33.092	9.823	30 %
	Ost	15.207	6.393	42 %
	Gesamt	**48.299**	**16.216**	**34 %**

The different subsamples differ greatly in terms of the response rates.[18]

- In the subsample of continuer establishments (excluding non-respondents from the previous year willing to be surveyed again), at 75 % the response rate is distinctly higher than in the establishments being surveyed for the first time, at about 12 %. In the sub-sample of establishments surveyed repeatedly, which is particularly important for the project, a high response rate rate was once again achieved. The decline of six percentage points compared to the 2018 wave is due to the significant increase in the number of refusal in advance, thus establishments that refused to participate already in the previous wave. The introduction of an explicit question on willingness to be re-contacted by Kantar (question 95) in 2018 resulted in a methodological change here. 1,608 (78%) of the 2,072 prior refusals (the refusals in advance correspond to 4.3% of the gross sample) were based on this question; only 464 were made by other means (by telephone or e-mail on the part of the establishments or by feedback from the interviewer) (in 2018 there were 621).[19] The roughly seven percentage point lower response rate in the sub-sample of establishments surveyed for the first time compared to the 2018 wave is primarily due to the CAWIonly subgroup R5. There, with a rate of 8%, the response rate was significantly worse than in the subgroups in which interviewers were deployed. This subgroup corresponds to almost half of the initial respondent sample, which explains the low response rate among the initial respondents to a large extent.
- The response rate of about 17 % in the subsample of non-respondents from the previous year willing to be surveyed again is slightly higher than that in the partial sample of establishments being surveyed for the first time.

17 Due to the method test mentioned above, the exhaustion rates for the total and supplementary sample are no longer comparable with previous years.
18 Excluding the neutral non-responses (e. g. addresses for which it was not possible to determine whether they belong to the target group), a cooperation rate of 55 % was achieved.
19 The explicit question on willingness to be re-surveyed was introduced in 2018 in response to the EU Data Protection Regulation (GDPR), which came into force at the end of May 2019.

Table 7 shows an overview of the way of realisation of the interviews. In the address protocol the way of conducting the interview with the respective establishment was recorded. In the majority of cases, the interview was held entirely face-to-face (77 %). In about 19 %, the questionnaire was completely filled in by the respondent himself (in other words without the interviewer being present). In 5 percent of cases, the interview was started face-to-face and the questionnaire was then left at the establishment for completion of the questions that the interviewee was unable to answer spontaneously.

Table 7: Overview of the form of the interview

	Total	Total (without R5)	Respondents from previous wave (PAPI)					
			P1 -PAPI	P2 - CAPI	P3 Total	*P3 - CAWI*	*P3 - CAPI*	Total
Conducted entirely face-to-face	77 %	82 %	82 %	94 %	23 %	*0* %	*65* %	82 %
Conducted partly face-to-face	5 %	5 %	6 %	0 %	3 %	*0* %	*9* %	6 %
Entirely completed by the respondent himself	19 %	13 %	12 %	6 %	73 %	*100* %	*27* %	13 %

	Refresher sample (incl. follow-up sample)								
	R1 - CAPI	R2 - PAPI	R3 Total	*R3 - CAWI*	*R3 - CAPI*	R4 - CAPI	R5 - CAWI	Total	Total (without R5)
Conducted entirely face-to-face	87 %	81 %	44 %	*0* %	*76* %	91 %	0 %	61 %	85 %
Conducted partly face-to-face	2 %	7 %	1 %	*0* %	*2* %	1 %	0 %	2 %	2 %
Entirely completed by the respondent himself	11 %	12 %	55 %	*100* %	*22* %	8 %	100 %	37 %	13 %

These values are roughly in line with the previous year's figures, but there is a slight increase in the proportion of interviews completed entirely by the respondents themselves. This increase is attributable to subgroup R5, in which the establishments completed the questionnaire exclusively themselves. If this subgroup is excluded for the calculation, the proportion of those establishments that completed the questionnaire themselves is at 13 % actually slightly lower than the previous year's figure.

As previously, the form the interview takes is substantially associated with the size of the establishment: the proportion of establishments surveyed entirely face-to-face falls linearly from 86 % of the smallest establishments (with 1 to 4 employees) to 12 % of the large establishments with 5,000 or more employees. This is because the larger the establishments the more frequently the interviewee is able to provide the complex quantitative details only with extensive preliminary work; this applies in particular to the employee structure, personnel recruitment, appointments and resignations, training, business volume and investments. In these cases it is helpful for the interviewee and the interviewer if the questionnaire can be left at the establishment for further processing or is made available to the respondent in advance (cf. also Section 4.1).

Table 8 shows the correlation already mentioned in Section 4.1, namely that a change of interviewer has a negative effect on the establishments' willingness to participate. In the group without a change of interviewer, the response rate is 14 percentage points higher than that of the group with a change of interviewer.

Table 8: Response rate with and without a change of interviewer

	Response rate
The same interviewer as previous year	86 %
Different interviewer to previous year	72 %

5.3 Dealing with Missing Information – Item-Non-Response

A further element in ensuring the highest possible data quality is the way missing information (so-called item non-response) is dealt with. In the IAB Establishment Panel this includes on the one hand measures to prevent missing details, and on the other hand the most differentiated recording possible of the different forms of missing values.

Missing details especially arise because the corresponding question is difficult to understand, difficult to answer for factual reasons or the interviewee refuses to answer (e. g. for reasons of confidentiality or the time required to look up the answer). The already mentioned cognitive pretest serves not least to identify such questions that will probably be problematic in advance, and as applicable to revise them or even not take account of them at all (see Section 3.2). To some extent to avoid missing values the interviewees are given the option of stating estimated values ("If it is not possible to answer precisely, please estimate").

A particulary important factor in minimising missing information is the use of interviewers. Thus, as in previous years, the frequency of missing information has shown clear differences between face-to-face interviews and interviews conducted via mail. In general, the quality of face-to-face interviews (and also of those cases in which the questionnaire was left at the establishment for (partial) self-completion) was significantly better than interviews via mail.[20]

Questions that do not apply to an establishment (e.g. follow-up questions on further vocational training in establishments that have given negative answers to the initial filter question) are simply not asked at all in the IAB Establishment Panel. If a question does not apply to the establishment, the corresponding variable in the data set is empty (system-missing), but can of course be recoded into a corresponding missing category at any time. If however the use of filters means that for example certain groups of employees do not exist in the establishment (e.g. number of employees who have received further training), then the missing information can/must be replaced by the user with a zero. In this respect the reason for a non-response "Does not apply" is not coded separately in the IAB Establishment Panel.

Generally in literature, when designing questions for item non-response a differentiation is required between the categories "No answer/declined to answer" and "Don't know". In our view these categories cannot be – with few exceptions – reliably differentiated. Many items of information that are required – even if they are available in the establishment – are associated with a certain research effort, or passing them on is regarded as sensitive. In the event of a refusal to answer, the interviewees would presumably choose one of the two options depending on the topic.

Against this background, apart from a small number of exceptions the explicit provision of answer categories for "Don't know" or "No answer/declined to answer" has been avoided in the questionnaire. If such answers are explicitly provided, this attracts such responses in addition, as it is easier to tick "Don't know" than to search for a particular business figure.[21] As an example: up to the year 2000 the question in the IAB Establishment Panel about advance payments offered "Don't know" as a permissible option to response, but with the 2001 wave, while the question was otherwise unchanged, this option no longer existed. In the 2001 wave, the proportion of missing answers fell by 21 percentage points.

20 Thus, the average proportion of missing values for interviews conducted entirely face-to-face was at one percent, for those completed by mail at five percent.

21 This phenomenon comes under the problem of satisficing. Detailed explanations can be found e.g. in Krosnick et al. (1996).

In a small number of cases the “Don’t know” category contains utilisable information and can be used for analysis purposes. Thus, for example, the question on the development of the volume of business expected in the current financial year (in comparison to the previous year) includes the category “Don’t know yet”. Another example concerns special labour market programmes from the Federal Employment Agency, which under certain circumstances are not yet known in the establishment. In such cases the corresponding variable in the data set is given its own code for “Don’t know (yet)/Cannot say/Not known”. There are seven such questions in the entire 2019 questionnaire (questions 6, 17, 18, 72, 73, 86a, 86b). For all other questions there is no separate answer category “Don’t know” (or a category with similar content), which is the reason why this category cannot be displayed separately.

Overall in the 2019 survey, 20 % of all questions/variables had less than 0.5 % missing values, 70 % had less than two percent and 92 % had less than five percent missing values. Table 9 provides an overview of the questions with a very high proportion (10 % and more) of missing values. When evaluating variables with a lot of missing information, possible distortions as a result of this should of course always be borne in mind.

Table 9: Questions with a high proportion of missing values

Question/ Variable	Content	Unit	2019
ba11	Business volume 2018	(EUR)	25 %
ba14	Share of intermediate inputs/external costs in sales 2018	(%)	25 %
ba66	Gross payroll June 2019	(EUR)	24 %
ba77b14	Number of used robots 2014	(number)	22 %
ba77b15	Number of used robots 2015	(number)	20 %
ba56b	Most important reason for the termination of apprenticeship contracts	-	18 %
ba77b16	Number of used robots 2016	(number)	18 %
ba34_1eu	Number 1-Euro-jobber 06/19	(number)	16 %
ba77b17	Number of used robots 2017	(number)	15 %
ba22	Share of expansion investments in investment volume	(%)	10 %
ba77b18	Number of used robots 2018	(number)	10 %
ba21	Sum of all investments 2018	(EUR)	10 %

6 Data Verification and Follow-Up Telephone Interview

In parallel with the field work, the data that has already been collected is checked both cross-sectionally and longitudinally for its completeness, consistency and plausibility. In the 2019 wave, in total 156 cross-sectional checks, 26 longitudinal checks and 51 filter checks were carried out. A distinction is made between four essentially different checks:

- **Filter errors**: Were the filter instructions obeyed in the intended way, or have establishments mistakenly answered resp. not answered a question?
- **Checks for completeness**: For selected questions checks are undertaken as to whether the question was answered. This applies in particular to questions that are relevant for weighting, such as the question on the number of employees subject to social insurance contributions.
- **Plausibility checks**: These checks assess information that are generally unlikely, but can nonetheless occur in practice. One example of this type of check involves reviewing the per capita incomes. The check indicates an error for values which are comparatively high or low.
- **Consistency checks**: These checks refer to logical connections between different answers. Consistency criteria are infringed, for example, if the questionnaire contains contradictory information. The consistency checks include for instance checking the total amount stated in one question against the total of the individual values.

If missing or incorrect information cannot be supplemented or corrected by means of the questionnaire, an attempt is made to obtain clarity together with the interviewee during a follow-up telephone interview. As a result, missing information can be supplemented and incorrect information corrected. In plausibility checks, implausible values are released with corresponding justification after consultation with the establishment – so despite infringing the test conditions, the value will be accepted.

In the 2019 wave, 26 % of all interviews were completely error-free right from the start, and therefore did not require any further processing. Corrections of the remaining 74 % not completely error-free interviews were undertaken during the editing process, and in the majority of these cases (8,736 respectively 73 %) the establishment was also contacted for a follow-up telephone interview.[22] This intensive downstream data check also involves a comprehensive project-specific review of the work of the interviewers (cf. also Section 4.3). A further 3,053 cases were controlled by the random-based control described in section 4.3.

22 This corresponds to 54 % of all 16,216 evaluable interviews.

7 Definition of Cross-Sectional Cases and Projection

7.1 Definition of Cross-Sectional Cases

All cases for which a valid questionnaire has been completed and which had at least one employee subject to social insurance contributions as of the reference date of 30 June of the previous year are referred to as cross-sectional cases. Due to the disproportionate structure of the sample the data has to be weighted before descriptive evaluations. With a disproportionate sample structure analyses of unweighted data lead to non-representative results.

For 2019 in total 15,438 cases are available for cross-sectional analyses, of which 9,398 are from West German federal states and 6,041 from East German federal states. 778 further interviews were conducted with establishments which had no employees subject to social insurance contributions as of the reference date of 30 June of the previous year, and therefore did not belong to the population for cross-sectional evaluations; these cases are only used for longitudinal evaluations.

7.2 Cross-Sectional Weighting Process

Weighting is necessary because the sample structure is disproportionate in terms of the establishment size, sector and federal state, and is also needed in order to compensate for any possible differences between the actual and target size of the individual stratification cells (cf. also Section 2.3).

The weighting of the IAB Establishment Panel essentially takes place in the form of a projection onto the population. This applies for the establishments in the population, in other words for the whole of Germany but also for East and West Germany, for the individual federal states, and for manufacturing industry establishments in East Germany. The target structures are taken from the establishment file of the Federal Employment Agency. The determining factor is the structure (distribution of the establishments) at the time of drawing the sample for the respective wave (in other words as per 30 June of the respective previous year). This projection compensates the disproportionalities as well as the different response rates along the stratification cells in one step.

The weighted sample of the IAB Establishment Panel is proportional to the number of establishments, and thus reflects the distribution of the establishments across the cells of the stratification matrix. Its structure therefore differs from numerous other establishment surveys, in which the over-representation of large establishments is not corrected (and which thus deliver results that are proportional to the number of employees or the turnover, but not to the number of establishments). However, the weighted data of the IAB

Establishment Panel enables analyses that are not only proportional to the establishments, but also proportional to the employees. Moreover, during the cross-sectional weighting, attention is paid to ensuring that at federal state level the employee figures projected from the weighted sample (employees subject to social insurance contributions as of the reference date of 30 June the previous year) correspond to the targets of the Federal Employment Agency. For analyses that are proportional to the number of employees, the weighted number of employees from the establishments to which the characteristic in question applies has to be set in proportion to the total number of employees.

The result of the weighting is an integrated weighting factor that is proportional to the numbers of establishments and employees:

- A weighting that is proportional to the number of establishments reflects the distribution of the establishments across the cells of the stratification matrix. This enables representative statements to be made on the percentage of the establishments in Germany to which a particular statement (e.g. establishment has a works council) is applicable.
- The weighting that is proportional to the number of employees reflects the distribution of the employees across the federal states in Germany. This enables representative statements to be made on the percentage of the employees that work in establishments to which a particular statement is applicable (e. g. employees work in an establishment with a works council).

For drawing the sample and for projections proportional to the number of establishments the population is subdivided into 19 sectors and 10 establishment size classes per federal state (see Table 13 or Table 14 in the annex). This creates a stratification matrix consisting of 190 cells per federal state. This subdivision has been in place since 2010. The consideration of the above-mentioned parameters in the cross-sectional weighting can lead to extremely high weighting factors in individual cases. In order to limit the outlier problem, we only allow weighting factors up to a maximum of 3,000.

The weighting resp. projection factors are calculated using an iterative marginal totals method (cf. fundamentally Deming/Stephan 1940 and Cochran 1968). Thereby the adjustments to the marginal totals of the establishment and employee matrices are successively improved until a predefined convergence criterion is achieved. The convergence criterion is the stipulation that for every marginal distribution, a maximum 0.1 % deviation in the total of the individual cells is tolerated. Sometimes this requirement cannot be achieved. The iteration is discontinued when the adjustment to the individual marginal distributions is no longer improved. During the weighting, there are checks of whether the factors in the individual cells are becoming too high or too low, or whether there is no case at all in a cell. In such cases the cell is amalgamated with an appropriate neighbouring cell.

We can illustrate the iterative marginal totals method taking a adjustment to two marginal distributions as an example:

- Firstly the weightings are calculated according to the first marginal distribution. Then the weightings are calculated according to the second marginal distribution, with the result from the first margin denoting the input distribution for the second margin.
- Now the iteration commences: The result from the adjustment to the second marginal distribution counts as the input distribution for a new calculation of the weightings according to the first marginal distribution, and then in turn successively to the second marginal distribution etc. The iteration is repeated until the adjustment has fulfilled the convergence criterion or no improvement to the adjustment is recognisable.

The result of the weighting process are projection factors which ideally adjust the realised sample to all the stipulated target distributions with predefined accuracy and minimal variance.

8 Definition of Longitudinal Cases and Projection

Longitudinal or panel analyses allow researchers to trace developments in individual establishments over a longer period. Due to its large net sample and its long duration of meanwile 27 survey waves, the IAB Establishment Panel offers a wide range of options for such analysis. Table 10 gives an overview of the number of valid interviews for different starting years in order to produce a balanced panel for each starting year respectively.

Table 10: Overview of the number of evaluable interviews for different starting years (balanced panel)

	Starting year						
wave	1996	2000	2003	2007	2009	2012	2016
1996	–	–	–	–	–	–	–
1997	6,822	–	–	–	–	–	–
1998	5,597	–	–	–	–	–	–
1999	4,654	–	–	–	–	–	–
2000	4,004	–	–	–	–	–	–
2001	3,479	10,840	–	–	–	–	–
2002	2,999	8,762	–	–	–	–	–
2003	2,610	7,295	–	–	–	–	–
2004	2,286	6,363	12,775	–	–	–	–
2005	2,011	5,542	10,771	–	–	–	–
2006	1,761	4,854	9,118	–	–	–	–
2007	1,524	4,242	7,845	–	–	–	–
2008	1,382	3,774	6,889	12,567	–	–	–
2009	1,233	3,338	6,037	10,598	–	–	–
2010	1,095	2,973	5,324	9,118	12,524	–	–
2011	990	2,666	4,759	7,991	10,653	–	–
2012	868	2,361	4,199	6,983	9,132	–	–
2013	781	2,108	3,761	6,179	8,019	12,622	–
2014	682	1,883	3,352	5,430	6,970	10,515	–
2015	603	1,674	2,951	4,800	6,116	9,010	–
2016	537	1,520	2,667	4,287	5,447	7,920	–
2017	474	1,348	2,363	3,792	4,813	6,950	12,614
2018	412	1,173	2,060	3,343	4,230	6,071	10,505
2019	337	971	1,708	2,754	3,538	5,047	8,476

8.1 Panel Case definition for Longitudinal Cases

For longitudinal weighting, all the establishments which were a panel case the previous year and all new establishment numbers of the supplementary and extension sample from the subsequent years are generally considered as panel cases. To count as a panel case, information must be available for every survey year from the respective first interview to the latest survey, in the form either of a valid interview or the information that the establishment (or the establishment number as applicable) has expired. We therefore differentiate between "panel cases with interview" (panel cases for which valid questionnaires are held for every individual year up to the current survey) and "no longer operational panel cases" (in which from the date on which the establishment ceased operations onwards the only information held is that the establishment no longer exists). For the panel cases with interview, it is also necessary to ensure that the information obtained applies to the same establishment unit every year.[23]

The subgroups comprising the respective panel cases can be shown using the longitudinal section for 2012 – 2019:

- All cross-sectional cases from the 2012 wave for which information is available from the 2012 wave onwards.
- Establishments from the supplementary and extension samples 2013 (only "new establishment numbers"), for which information from the 2013 wave onwards is available.
- Establishments from the supplementary and extension samples 2014 (only "new establishment numbers"), for which information from the 2014 wave onwards is available.
- Establishments from the supplementary and extension samples 2015 (only "new establishment numbers"), for which information from the 2015 wave onwards is available.
- Establishments from the supplementary and extension samples 2016 (only "new establishment numbers"), for which information from the 2016 wave onwards is available.
- Establishments from the supplementary and extension samples 2017 (only "new establishment numbers") for which information from the 2017 wave onwards is available.
- Establishments from the supplementary and extension samples 2018 (only "new establishment numbers") for which information from the 2018 wave are available.
- Establishments from the supplementary and extension samples 2019 (only "new establishment numbers") which participated in the 2019 wave.

To make it easier for the users of the IAB Establishment Panel to identify different subgroups for cross-sectional and in particular for longitudinal analyses, the relevant subgroups have been marked. For this the following information has to be appropriately combined:

- Field result of the ongoing wave (valid interview with/without employees subject to social insurance contributions as of the reference date, establishment no longer operational, cases that did not respond the previous year but are willing to be surveyed again/final non-responses)

23 In companies with several establishments in particular, it can be the case that the interviewees provide details of different units in different years (e.g. once about the local establishment, once about the entire company). This information (from the address protocol or as the result of the validation and editing process) is taken into account when forming the wave code (WELLwxyz) and is thus available for defining the panel cases.

- Was the establishment surveyed in the previous wave (respondents from the previous wave, non-responses from the previous year that are willing to be surveyed again, supplementary and extension sample)?
- Was the same establishment surveyed as last time?

In consultation with the IAB we have developed the following concept for this. Every case is given a unique identifier in each wave which takes account of the above criteria. This so-called wave code is stored in the variables WELLwxyz, where wxyz stands for the year in which the survey took place (thus WELL1993 for wave 1 in 1993, WELL1994 for wave 2 in 1994 etc.). This labelling takes place using a letter of the alphabet (see Table 11).

Table 11: Group identifiers in the variable WELLwxyz

		Labelling letter	
		with	***without***
		employees subject to social insurance contributions as per the respective reference date[24]	
1.	Cases **with** interview in the ongoing wave		
1.1	Establishments surveyed for the **first time** (= at the date of drawing)	**A**	Not permitted
1.2	Establishments surveyed **repeatedly**		
1.2.1	**with** interview the previous year		
1.2.1.1	**same** unit interviewed as previous year	**B**	**C**
1.2.1.2	**different** unit interviewed to previous year	**D**	Not permitted
1.2.2	**without** interview in previous year[25]	**E**	Not permitted
2.	Cases **without** interview in the ongoing wave		
2.1	Non-response that can be surveyed again in future		**H**
2.2	Cases from earlier extensions that can no longer be surveyed[26]		**W**
2.3	Non-responses that can no longer be surveyed[27]		**X**
2.4	No longer operational establishments (according to field result, editing or BA file respectively)		
2.4.1	in the ongoing wave		**Y**
2.4.2	earlier than this		**Z**

In principle, other longitudinal sections can also be defined, however there are no weighting factors available for this.

24 The weighting takes place using the questionnaire information and the targets from the BA establishment file as of this reference date. No newer information from the BA establishment file is yet available as per the respective weighting date.

25 Since 2002 non-responses from the previous year (H cases) have been treated in the same way as establishments being surveyed for the first time and the employee details from the previous year according to the BA used for identification. For this reason, there are no longer any G cases (establishments repeatedly surveyed without an interview the previous year and different unit to that surveyed the year before last) (cf. Section 4.2 on identifying the correct establishment unit).

26 Thus e.g. the cases from the extension sample in 1997 in agriculture in Mecklenburg-West Pomerania, or the cases from the Halle Institute for Economic Research (IWH) extension sample in 1998 for the construction sector in East Germany.

27 These include (a) establishments which declined to be interviewed, unless they expressly consented to being interviewed again the following year, and (b) non-responses from the previous wave from which no interview has also been obtained in the ongoing wave (i.e. the combination HH is not permitted and becomes HX).

8.2 Overview of the Longitudinal Sections provided with Weighting Factors

There are three longitudinal sections for which a panel weighting was undertaken for the 2019 wave. Table 12 depicts the case numbers for the respective longitudinal sections from 2009, 2012 and 2016 onwards.

As already mentioned above, the definition of panel cases essentially comprises all the establishments which were a panel case the previous year – either with an interview or as a no longer operational establishment – and all the establishments that were newly founded between the reference date of the year before last and the reference date of the previous year. For this reason, the number of newly-founded establishments (in the sample) is identical for all longitudinal sections. After the longitudinal section has existed for a certain period of time, the number of newly-founded establishments more or less counterbalances the number of non-responses. Hence after 3 – 5 waves, largely stable case numbers are achieved. For this reason, and because the longitudinal sections shown in Table 12 started with relatively similar case numbers, the number of panel cases in the individual longitudinal sections (with exception of the new longitudinal section of 2016) in 2019 is at a similarly high level.

Table 12: Overview of all longitudinal sections since 2009

Starting year of the respective longit. section	No. of panel cases in start year+1	No. of panel cases 2019	Thereof are..	No. of repeaters	No. of newly founded current wave	No. of no longer operational
2009	14,308	11,840		7,354	1,550	2,936
2012	14,186	11,656		8,128	1,550	1,978
2016	14,250	12,282		9,937	1,550	795

8.3 Longitudinal Weighting Process

Specific panel weighting factors are calculated for every longitudinal section. As for the cross-sectional weighting, the panel weighting takes place in the form of a projection onto the population. The aim of the panel weighting is that panel analyses using the respective longitudinal weighting factor should as far as possible generate the same distributions for all the waves involved as those from cross-sectional analyses of the individual waves.

Panel weighting essentially takes place in eight steps, each forming the basis for the next, with East and West Germany being differentiated in all steps. Unlike the cross-sectional weighting, for the longitudinal weighting a weighting at federal state level takes place only in the first step. In the subsequent steps the federal state level is no longer monitored. In total the eight weighting steps of the longitudinal weighting are repeated iteratively for as long as this is necessary and purposive.

The first step is to adapt the latest available cross-sectional cases to the structure of the population (number of establishments and employees subject to social insurance contributions as of 30 June of the previous year). The entry factor is the previous year's panel weighting factor and for new establishment numbers the cross- sectional weighting factor of the current wave.

The next stage is to adjust the key figure for the stock of establishments for each individual year included in the longitudinal section, and for the establishment numbers that in the

meantime have become no longer operational or are new. Each year's stock includes the establishments with at least one employee subject to social insurance contributions as of the reference date. The new establishment numbers consist of those from the stock that had no employees subject to social insurance contributions as of the reference date one year before. The no longer operational establishment numbers are those in the stock that no longer had any employees subject to social insurance contributions as of the reference date one year later. This step depicts the recovery or termination of establishment numbers over the course of time.

The third step is to adjust for the establishments that are surviving or no longer operational from the different entry cohorts.

The fourth and fifth steps take account of the establishment dynamics (growth and shrinkage of establishments). In particular in the longitudinal sections that have been running for a longer period, an extremely large number of combinations is possible in respect of the development of the number of employees. Simply because of the limited case numbers, it is not possible to obtain a finely differentiated picture of the possible development paths (changes between individual establishment size classes from one year to the next year). We have therefore applied a simplified procedure for the panel weighting in consultation with the IAB: a change of establishment size class is only taken into account between the starting wave of the respective longitudinal section (or as applicable for new establishment numbers, the first time they were surveyed) and the latest available data. No check is kept on changes occurring in between. Due to extremely low numbers of cases in certain combinations, the theoretically possible combinations are compounded as follows: as of the latest available data the establishment is in the same establishment size class as it was at the beginning, or has grown, or has shrunk. It is self-evident that when this approach is used the development paths of establishments can only be represented approximately during the panel weighting. In the fourth step, the establishment dynamics are taken into account for the establishments from the stock of the starting wave of the respective longitudinal section. In the fifth step, this is done for the "new" establishment numbers added during the longitudinal period.

The sixth step is to correct any disproportional non-responses depending on the answers to individual questions from the previous year's survey. This is done by undertaking multivariate analyses of non-responses in comparison between the previous wave and the most recent available data.

The two subsequent steps involve adapting the cases belonging to the respective cross-section to the requirements of the stratification matrix for every survey year included in the longitudinal section. To limit the number of weighting cells, only the establishment size classes (seventh step) and a simplified sector structure with six categories (step eight) are taken into account (cf. Appendix).

In individual cases using the aforementioned parameters during the panel weighting can lead to extremely high weighting factors. To limit the resulting problems of outliers, only weighting factors up to a maximum of 4,000 are permitted for the panel weighting. As a consequence, the theoretically necessary target numbers for individual characteristic values may not be reached due to the weighting process. Thus, for example, new establishment numbers in certain years are substantially underestimated during the panel weighting.

9 General Information about Evaluation

- Descriptive results should always be calculated and interpreted on a projected level, so that the disproportional sample structure and selective non-responses are corrected.
- The results should always be interpreted against the background of the underlying (unweighted) case numbers. The lower the number of cases considered, the more uncertain the results. The area of uncertainty for different unweighted case numbers is shown in the error tolerance table (cf. Appendix). The case number of 15,000 establishments can exhibit differences of two percentage points and more as significant differences.
- If analyses should be undertaken on a weighted basis, and insofar as this is not undertaken by the statistical program used, the projection factors from the data set must be scaled to the number of cases of establishments surveyed in the cross-section. This can be achivied by multipling the cross-sectional weights with the quotient of the number of cross-sectional cases and the sum of establishments in the population. Only then the significance levels and confidence intervals are based on correctly estimated standard errors and can be correctly interpreted. If there was no conversion to the actual case number of the establishments surveyed in the cross-section, the significance levels would be calculated as being too high respectivley confidence intervals too narrow. In STATA the conversion is done automatically when weights are used, but not in SPSS.
- The projection factors for the longitudinal sections are converted in the same way. Here, too, the projection factors are scaled to the unweighted number of cases. In this case, the scaling factor is the quotient of the number of longitudinal cases and the sum of the projection factors of the respective longitudinal section.
- Even when the projection factor contains an adjustment proportional to the numbers of employees, we recommend always showing employee numbers rounded to full thousands.
- The panel weighting does indeed take place in the form of a projection, however for methodological reasons it is associated with greater inaccuracies in terms of the adjustment to the different target structures than the respective cross-sectional weightings, because the target structures of the various cross-sections, which fluctuate to some extent, has to be achieved with just one projection factor. This limitation applies to both the projected number of establishments and – to an even greater extent – to projected employee figures from the IAB Establishment panel.
- We therefore urgently recommend that when analyses take place using longitudinal factors not to show absolute figures. Projected absolute figures (even if rounded to full thousands) give the reader the impression of an accuracy that cannot be achieved with the IAB Establishment Panel when longitudinal analyses are used.
- As with all sample-based data, we recommend to use distribution measures, in other words statements of the type “X % of establishments have grown since 2003, Y % have

contracted" or "The number of employees by Year Y developed better/worse in establishments which invested more than average in Year X than was the case for establishments which made no investments in Year X". It should also be borne in mind that the percentage values obtained can also be afflicted with inaccuracies, so the values should if anything be interpreted as orders of magnitude.

- When undertaking analyses, account should always be taken of the type of survey (conducted completely face-to-face through to entirely self-completed by the respondent) in the form of a third variable control.[28] In the 2019 wave this information is stored in the variable befart19.
- When undertaking analyses, particularly in comparisons across time, account needs to be taken of changes to the delineations of the sectors, the regional classification and the population. Such changes on their own can lead to sometimes substantial changes in the parameters and distributions. Thus when the employee statistics were revised with the 2015 wave, new groups of persons were included; hence the increase at that time in the number of employees subject to social insurance contributions by a good three percent can also be ascribed to the revision of the employee statistics, and not just to changes in the real employee situation.

  Moreover, in 2009 the last change of the stratification matrix was made in the course of the changeover from the WZ2003 to the WZ2008 classification of economic sectors. Changes in the shares of establishments by sector can therefore only be attributed to real changes in the economy structure to a limited extent.

  Since 2007 East and West Berlin have been aggregated. In the consequence of this, Berlin was excluded from the extention sample in manufacturing industry in eastern Germany at the request of the Leibniz Institute for Economic Research in Halle (IWH). Since then, this extention sample only includes eastern German territorial states. The IWH sample since 2007 is therefore only partially comparable with the IWH sample before 2007.
- Generally when undertaking time series and panel analyses, account should be taken of changes to the question or the individual items, so that differences in results are actually ascribable to real changes and not to changes to the question and/or the answer requirements. Account should also be taken of the respective timeframe. Thus establishment sizes refer to the reference date 30 June, flow figures to the first half year, and some questions – e. g. the business volume –relate to the last year or the financial year that has recently expired.

28 With the introduction of the mail survey method in 2000 "a test was carried out as to what extent distortions of content derived from the mix of methods. Differences in answering behaviour that were to some extent significant became apparent between the face-to-face and mail interviews. Account should therefore be taken of the characteristic of the survey method when analysing the federal states concerned." (Fischer et al. 2008: 14).

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11 Appendix

The study “Employment Trends – Employer Survey 2019” (IAB Establishment Panel 2019) was undertaken on behalf of the Institute for Employment Research (IAB) of the Federal Employment Agency (BA).

Regional and sectoral expansions of the sample were commissioned by:

- The Senate Department for Integration, Labour and Social Affairs of the Federal State of Berlin
- The Ministry for Labour, Social Affairs, Health, Women and Family in the Federal State of Brandenburg
- The Ministry for Economic Affairs, Labour and Health for the Federal State of Mecklenburg-West Pomerania
- The Saxony State Ministry for Economic Affairs, Labour and Transport
- The Ministry of Labour, Social Affairs and Integration Saxony-Anhalt
- The Thuringian Ministry for Labour, Social Welfare, Health, Women and Family Affairs
- The Halle Institute for Economic Research (IWH)
- The Ministry of Finance and Economic Affairs Baden-Württemberg
- The Bavarian Ministry of Labour and Social Affairs, Family and Integration
- The Senator for Economic Affairs, Labour and Ports of the Federal State of Bremen
- The Hessian Ministry of Economics, Energy, Transport and Regional Development
- The Ministry of Economic Affairs, Employment,Transport and Digitalization of Lower Saxony
- The Ministry of Labour, Health and Social Affairs of North Rhine-Westphalia
- The Ministry for Social Affairs, Labour, Health and Demography of Rhineland-Palatinate
- The State Ministry of Saarland for Economic Affairs, Labour, Energy and Traffic

Table 13: Classification of economic activities by 19 sectors for sampling and cross-sectional weighting from the 2010 wave onwards

Variable BR19BAxy	Sector	WZ2008 code	Questionnaire sector
1	Agriculture, forestry and fishing	1 – 3	1
2	Mining and quarrying, electricity, gas and water supply; sewerage and waste management	05 – 09, 35 – 39	2 – 3
3	Food products, beverages and tobacco	10 – 12	4
4	Consumer products (excluding manufacture of timber products)	13 – 18	5 – 6
5	Industrial goods (including manufacture of timber products)	19 – 24	7 – 10
6	Capital and consumer goods	25 – 33	11 – 17
7	Construction	41 – 43	18 – 19
8	Wholesale, sale and repair of motor vehicles	45 – 46	20 – 21
9	Retail	47	22
10	Transport and warehousing	49 – 53	23
11	Information and communication	58 – 63	24
12	Hotels and restaurants	55 – 56	25
13	Financial and insurance services	64 – 66	26
14	Economic, scientific and freelance services	68 – 82	27 – 36
15	Education	85	37
16	Health and social services	86 – 88	38
17	Other services	90 – 93, 95, 96	39 – 41
18	Representations of interests	94	42
19	Public administration, defence, social security	84	43

Table 14: Establishment size class classifications for sampling and cross-sectional and longitudinal weightings

Employees subject to social insurance contributions on 30 June of the previous year
1 – 4
5 – 9
10 – 19
20 – 49
50– 99
100 – 199
200 – 499
500 – 999
1000+

Table 15: Classification of economic activities by 6 sectors for longitudinal weighting from the 2009 wave onwards

Sector	Code from classification by 19 sectors
Agriculture and forestry, fishing	1
Manufacturing industry	3 – 6
Other production industry	2, 7
Retail/transport and warehousing/hotels and restaurants	8 – 12
Financial and insurance services/business services	13, 14
Public and private services	15 – 19

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Corresponding author
Susanne Kohaut
Phone: +49 911 179-3253
Email: susanne.kohaut@iab.de