

Data Observer

Sebastian Link*

Harmonization of the ifo Business Survey's Micro Data

<https://doi.org/10.1515/jbnst-2019-0042>

1 Introduction

The micro data of the ifo Business Survey (IBS) provide unique opportunities to study firms' economic behavior and expectation formation along a multitude of dimensions. Its advantages are manifold: first, the survey receives approximately 9000 monthly responses from a set of firms that is representative for the German economy.¹ Second, the number of observations per firm is very large (on average, firms are observed more than 70 times) as response rates are uncommonly high and attrition is low compared to other business surveys. Third, the set of questions is extensive. Every month, firms are asked about, *inter alia*, current trends and expectations for the development of their general business situation as well as their volume of production, demand situation, and changes in employment and prices. In addition, the survey covers industry-specific questions that, e. g. refer to constraints to business activity, credit supply by banks, or subjective uncertainty. At times, the IBS is supplemented by questions about recent events such as the integration of refugees into the German labor market, the introduction of a statutory minimum wage in 2015, and their perceptions with respect to Brexit.

However, existing studies based on the micro data of the IBS could not tap its full potential because the survey is divided into four separate industry surveys covering the main sectors of the economy (manufacturing, services, retail/wholesale, construction) that could not have been jointly analyzed

¹ The IBS provides input for the ifo Business Climate Index, which is the most recognized leading indicator for the German business cycle, the ifo Employment Barometer, and the ifo Export Expectations, see Becker and Wohlrabe (2008) for details. According to a meta-study by Sauer and Wohlrabe (2019), the survey is usually answered by senior management such as firm owners, members of the executive board, or department heads.

*Corresponding author: Sebastian Link, Ifo Institute for Economic Research, Poschingerstraße 5, Munich 81679, Germany, E-mail: link@ifo.de

so far. This is mainly due to the fact that the industry-specific surveys are heterogeneous in the level of observational units (product vs. firm) as well as in the industry classification systems used in the micro data. Hence, researchers usually restricted their analyses to the subset of manufacturing firms (e.g. Pesaran/Timmermann 2009; Bachmann et al. 2013; Carstensen et al. 2013; Strasser 2013; Fidrmuc/Hainz 2013; Bachmann/Elstner 2015; Bachmann et al. 2018; Massenet/Pettinicchi 2018; Huber 2018; Bachmann et al. 2019; and Enders et al. 2019a,b).

The goal of this paper is to harmonize the micro data of the most important industry-specific surveys of the IBS in a way that allows for a joint econometric analysis of the firms. In order to ensure a high level of generality, I use the three main surveys: (a) IBS-IND (2017) covering manufacturing firms since 1980, (b) IBS-TRA (2017) including retailers and wholesalers since 1990, and (c) IBS-SERV (2017) containing service companies since 2004.² For this purpose, I standardize the level of observational units across surveys by aggregating to the firm level. Thereby, I adjust for a methodological break in the retail and wholesale survey in 2006. Based on this procedure, the full panel of data for the retail and wholesale industries can be analyzed for the first time.³

Moreover, I harmonize the industry classification in the micro data of the IBS that are originally coded according to heterogeneous classification systems within and across the different industry surveys. The respective codes are transferred to the German standard classification systems of 2003 and 2008 (henceforth, *WZ 03* and *WZ 08*), which largely correspond to the European “NACE Rev. 1.1” and “NACE Rev. 2” classification systems. Codifying all firms to a unique classification system expands the scope of empirical analyses based on the IBS due to at least two reasons: First, fixed effects can be applied along the same level of industry aggregation in order to flexibly control for industry-specific variation of any kind. Second, the IBS data can be merged to administrative data at disaggregate industry levels.

The remainder of this paper is organized as follows: Section 2 provides information on how the micro data of the IBS and the codes of the harmonization procedure can be accessed. Section 3 presents the harmonization of the IBS micro

² I do not use data from the construction survey (IBS-BAU 2017) due to a lack of comparability to the other industry-specific surveys of the IBS.

³ For example, Buchheim and Link (2017) make use of this adjustment when examining the anticipation effects of the increase in German value added taxes in 2007 based on firms' responses between January 2004 and December 2007. In contrast, Schenkelberg (2014) does not adjust for the methodological break and restricts her analysis to the micro data of the retail and wholesale survey prior to 2006.

data and Section 4 provides descriptive statistics of the harmonized IBS micro data set. Section 5 concludes.

2 Data access

The micro data of the IBS can be accessed under strict non-disclosure agreements on-site the ifo-LMU Economics & Business Data Center (EBDC) in Munich, Germany. In addition to the IBS micro data, the EBDC also provides access to the micro data of other surveys conducted by the ifo Institute such as the “ifo Investment Test,” the “ifo Innovation Test,” and the “World Economic Survey” as well as combined panel data sets of the surveys with balance sheet data. The website of the EBDC (<https://www.ifo.de/EBDC>) provides a comprehensive overview and description of the data sets that are hosted at the ifo Institute and explains the application procedure for data access in detail. The codes of the data set harmonization presented in this paper are also available at the EBDC and can be jointly used with the IBS micro data.

3 Preparing the IBS micro data for panel data research

The goal of this section is to harmonize the micro data of the IBS such that firms in the most important industry-specific surveys can be analyzed jointly. Panel A of Table 1 summarizes the two challenges this task includes: First, in the original micro data, the level of observational units is heterogeneous between the industry surveys and has been changed over time in the retail and wholesale survey. Second, the original micro data provides information with respect to each firm’s main sector of business based on different classification systems across and within the industry-specific surveys. In principle, the harmonization procedure applies to all survey questions in the IBS. For the ease of exposition, the description is exemplified using the questions regarding current and expected business conditions⁴:

Q1 *“Current situation: We evaluate our current business condition as [1] good, [0] satisfactory (typical for the season), [-1] bad.”*

⁴ Please refer to Link (2018) for details on the interpretation of Q1 and Q2.

Table 1: Characteristics of Original Micro Data of Industry-Specific Surveys of the IBS.

	Manufacturing		Services		Retail/Wholesale	
	1990–2017 (1)	2004–2017 (2)	1990–2006m1 (3)	2006m2–2017 (4)		
<i>Panel A: Methodological Heterogeneity Between and Within Industry-Specific IBS Surveys</i>						
Frequency	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly
Level of Observational Units	Product	Firm	Product	Firm	Product	Firm
Industry Classification System Used in Original Micro Data						
– WZ93 (≙ NACE Rev. 1)	yes	no	no	no	no	no
– WZ03 (≙ NACE Rev. 1.1)	no	Until 2011m3	East Germany	no	yes	yes
– WZ08 (≙ NACE Rev. 2)	yes	Since 2011m4	no	no	no	no
– Other Product Classification System	yes	no	West Germany	no	no	no
<i>Panel B: Multiple Reported Expectations to Q2 per Firm and Date: Within-Firm Correlation</i>						
# Firm-Date Combinations	1014172	374489	239115		215722	
# Firm-Date Comb. w. Multiple Reports	7148	1017	117930		1597	
– All Expectations in the Same Answer Category	5996	842	97196		1322	
– Referring to Distinct Answer Categories	1152	175	20734		275	
Fraction of Expectations Diverging from the Mode in Case of Multiple Reports per Firm and Date	0.106	0.079	0.079		0.086	

Notes: Panel A documents the methodological heterogeneity between and within the different industry-specific IBS surveys with respect to their frequency, the level of observational units the survey questions refer to, and the industry classification system used in the original IBS micro data. If not stated differently, the industry identifiers are usually available during all periods covered by the respective survey. Panel B summarizes the degree to which firms in the different industry surveys provided multiple reports regarding their business expectations for the next six months (Q2) at the same date, i. e. multiple reports per firm-date combination. The frequencies for the case of Q1 are comparable and hence omitted.

Q2 *“Expectations for the next 6 months: After elimination of purely seasonal fluctuations, the development of our business will be [1] more favorable, [0] about the same, [-1] more unfavorable.”*

3.1 Standardization of observational units to the firm level

In the original IBS micro data, the questions either refer to the firm as a whole or to specific products of the firm. Aiming at the construction of a homogeneous data set, I define the firm as the unit of observation and aggregate the micro data to this level. As the anonymized micro data of the IBS do not allow to sharply discriminate between subsidiaries of larger conglomerates in different locations and stand-alone firms, the term “firm” refers to both types of entities interchangeably. As the identification of manufacturing firms is not unambiguous in many cases during the 1980s, I restrict the dataset to firms that responded to the IBS for more than one time between 1990 and 2017.⁵

To begin with, I have to cope with a methodological change in the retail/wholesale survey: Since February 2006, firms have been asked to answer each survey question only once while referring to the firm as a whole. Before this date, firms responded to the same set of questions for different products. Answers for all products had to be given on the same questionnaire. As summarized in Column (3) Panel B of Table 1, almost half of the firms ($117930/239115 = 49$ percent) provided assessments of expected business conditions with respect to more than one product per point in time prior to the break. This fraction decreased to less than 1 percent after February 2006, see Column (4).⁶

To use the entire universe of the micro data in the retail/wholesale survey, I aggregate the data before January 2006 to the firm level by taking arithmetic

⁵ The micro data of the IBS usually contain an anonymized identification variable “idnum” which originates from ifo’s address database. This variable is needed to unambiguously discriminate between firms because the firm-specific identifiers in the IBS micro data (“runnum”) of firms that dropped out of the survey have been assigned to newly entering firms in some cases. As the identifier “idnum” is not available for many manufacturing firms during the 1980s, the dataset is restricted to observations since 1990 for which the identifier “idnum” is available. This restriction is not too restrictive in light of the fact that industry-level administrative datasets based on the *WZ 03* and *WZ 08* classification systems are usually only available since the early 1990s. However, if the researcher also wanted to use the data of the 1980s, she could alternatively use the combinations of “runnum” and the identifier of the federal state the firm is located in and check whether there are combinations that re-appear in the dataset after some years of non-response.

⁶ Since February 2006, multiple observations per firm at a specific point in time are mainly due to firms submitting multiple questionnaires.

means of the answers.⁷ This is feasible as the answers before the methodological break were almost perfectly correlated within firms at a given point in time. If retail or wholesale firms provided assessments with respect to multiple products at the same date, they reported exactly the same expected business conditions for all products in more than 82 percent of cases, see Panel B of Table 1. Hence, it is reasonable to assume that the current and expected business conditions of each firm are well captured by the average reports with respect to different products. Figure 1 plots cross-sectional means and standard deviations of

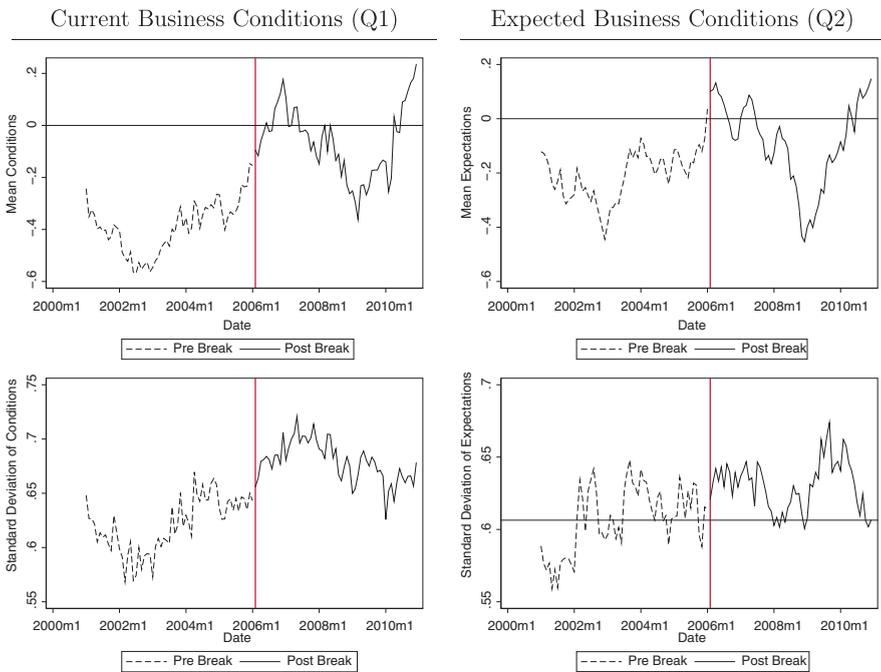


Figure 1: Correction of the Methodological Break in the Retail/Wholesale Survey.

Notes: The figures plot the cross-sectional means (upper graphs) and standard deviations (lower graphs) of current business conditions (left) and expected business conditions (right) of retail and wholesale firms over time. Before January 2006, the reports to the retail and wholesale survey referred to different products. This data is aggregated to the firm level by taking means and rounding to the next integer. Cross-sectional means and standard deviations of the aggregated data are plotted using a dashed line. Accordingly, the solid lines display the cross-sectional means and standard deviations of reports firms after February 2006 that referred to each firm as a whole.

⁷ In case of dissimilar assessments referring to different products, I round the mean response to the next integer. For the sake of symmetry, a mean of “-0.5” is rounded to “-1.”

aggregated reported business conditions and expectations of retail and wholesale firms over time. The methodological break between January and February 2006 did not generate differing patterns in the data.⁸ Hence, the data before January 2006 can be aggregated to the firm level without major concerns.

The aggregation is more straightforward for the manufacturing and services surveys of the IBS. While the questions in the services survey refer to the firm as a whole, firms in the manufacturing survey are asked for an assessment regarding a specific product. As the latter usually refers to the main product of the firm and firms are mostly observed only once per month in the survey, the responses are interpreted as referring to the current and expected business conditions of the firm as a whole. In turn, the micro data in the manufacturing (services) survey contain multiple reports per firm and date in 0.8 percent (0.3 percent) of cases only, see Table 1. As these simultaneous reports are usually identical, the respective observations are again aggregated to the firm level by taking means and rounding to the next integer.

3.2 Harmonization of industry classification systems

The organization of sector identifiers strongly differs between the industry-specific surveys in the original IBS micro data, see Panel A of Table 1: first, almost all observations of the manufacturing survey simultaneously contain three different sector identifiers that are roughly equivalent to (1) the older classification system of 1993 (*WZ 93*), to (2) *WZ 08*, as well as (3) provide additional details about the good produced by the firm. Second, in the services survey there is only one identifier available at any given point in time that corresponds to the older *WZ 03* classification system before March 2011 and to the *WZ 08* classification system since April 2011. Finally, the organization of sector identifiers is most involved for the case of the retail and wholesale survey: Since February 2006, firms have been classified according to the *WZ 03* classification system. Before that date, firms in East Germany are also coded according to *WZ 03*, while observations in West Germany are attached with an IBS-specific product classification system that is more detailed than the *WZ 03* or *WZ 08* industry classifications.

Given the information contained in the different sector identifiers, each observation is assigned to the German standard classification systems *WZ 03* and *WZ 08*. The procedure largely differs between the sub-surveys due to the

⁸ Moreover, the distributions of answers to Q1 and Q2 are similar before and after the break. In January 2006, firms reported non-neutral current (expected) business conditions in 43.6 percent (37.8 percent) of the cases. In February 2006, these numbers were largely comparable (43.9 percent and 39.5 percent).

heterogeneity in the organization of sector identifiers and mostly uses the verbal descriptions in the sector identifiers as well as conversion tables provided by the Federal Statistical Office. For the sake of brevity, please refer to Link (2018) for a detailed description of the harmonization of industry classifications.⁹ In the final harmonized dataset, the industry identifiers are informative at least at the four-digit level.

4 Descriptive statistics of harmonized IBS micro data

The harmonized sample of the IBS comprises of on average approximately 5500 firms per month between 1990 and 2017 if the data is restricted to firms that responded to the survey in at least two months. As displayed in Figure 2, the

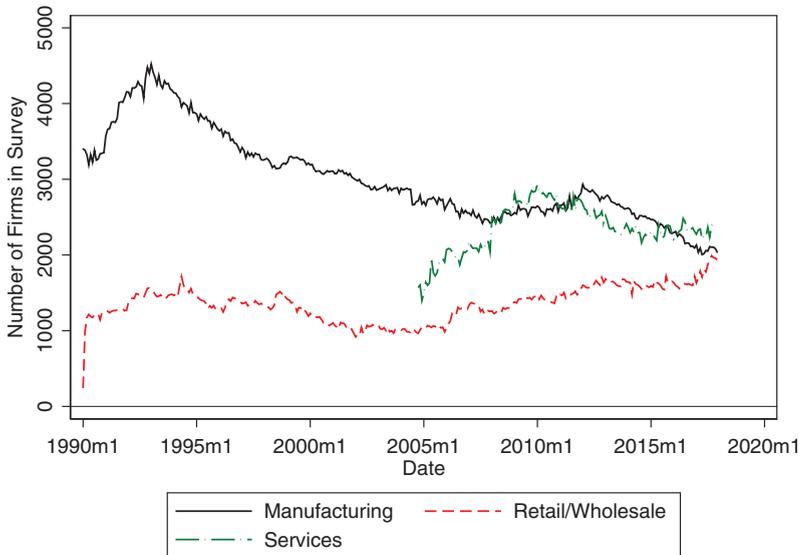


Figure 2: Number of Firms in the Different Industry-Specific Surveys of the IBS.

Notes: This figure plots the number of firms in the respective industry-specific surveys of the IBS over time conditional on responding in at least two months.

⁹ For the case of multiple reports per firm and date, I first assign each observation to *WZ 03* and *WZ 08* codes. Then the observations, which potentially are grouped to different sector identifiers, are aggregated to the firm level as outlined in Section 3.1 and assigned to unique *WZ 03* and *WZ 08* codes based on the procedure described in detail in Link (2018).

number of reporting firms per period is largest in the manufacturing survey (on average approximately 3000 firms), but declining over time. In contrast, the number of firms in the retail and wholesale survey has been relatively constant (on average roughly 1350 firms). Moreover, an average number of 2300 firms has responded to the services survey since its introduction in October 2004. Hence, researchers can build their analyses on more than three times as many firms in the recent waves of the harmonized IBS panel compared to only using the subset of manufacturing firms.

Conditional on responding to the survey more than once, attrition is very low and firms are observed for 7.5 years on average.¹⁰ While attrition of firms is not found to be random, dropout of firms does not appear to be problematic for most research questions. As documented in Column (1) of Table 2, firms reported current business conditions—coded as $\{-1, 0, 1\}$ —that were significantly worse by -0.14 on average during the last month in the sample compared to the mean of reported business conditions in all other observations.¹¹ However, dropout of firms does not appear to be driven by industry-specific shocks because the estimated average condition in the month prior to firms' dropout is largely unaffected by the inclusion of date fixed effects at the level of four-digit industries, see Column (2). In contrast, the coefficient drops by roughly two thirds relative to its

Table 2: Relationship Between Business Conditions and Sample Attrition.

	Conditions _{<i>i,t</i>}		
	(1)	(2)	(3)
1(Last Observation of Firm in Sample) _{<i>i</i>}	-0.14*** (0.0055)	-0.11*** (0.0051)	-0.048*** (0.0045)
Constant	yes		
Time*4-dig. Sector FE		yes	yes
Firm FE			yes
Adjusted R ²	0.000	0.185	0.429
Observations	1748349	1748349	1741061

Notes: The dependent variable is firms' reported current business situation (Q1). 1(Last Observation of Firm in Sample)_{*i*} is a dummy that is one at the last date firm *i* is observed in the sample. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

10 The average duration in the data set of firms in the industry-specific surveys respectively is 9.6 years (manufacturing), 6.2 years (retail and wholesale), and 5.6 years (services).

11 The respective empirical model reads: $\text{Conditions}_{i,t} = (\beta_0 +) \beta_1 \times \mathbb{1}(\text{Last Observation of Firm in Sample})_i + (\alpha_i + \delta_t \times \mathbb{1}(\text{Sector}_i)) + \varepsilon_{i,t}$, where $\text{Conditions}_{i,t}$ denotes current business conditions as reported to Q1, $\mathbb{1}(\text{Last Observation of Firm in Sample})_i$ is a dummy that is one during the last date firm *i* is observed in the sample and α_i and $\delta_t \times \mathbb{1}(\text{Sector}_i)$ are firm fixed effects and time fixed effects at the four-digit industry level.

size in Column (1) after controlling for firm fixed effects in Column (3). Hence, firms that drop out of the sample generally performed worse during all other periods compared to the remaining firms. Furthermore, the pattern of attrition does not appear to have changed substantially over time. As can be inferred from Table 3, the survival rates are rather constant across different cohorts of firms.

Table 3: Attrition: Survival Rates Depending on Starting Dates.

Start Date t	Firms @ t	Fraction of Firms Surviving (in %) For At Least...						
		6m	1yr	2yrs	5yrs	10yrs	15yrs	20yrs
1992m1	6603	98.6	95.3	89.5	70.2	49	33.9	24.1
1995m1	6914	94.8	90.4	81.2	61.8	42	29.2	20.6
1998m1	5855	94.9	89.9	81.7	63.9	43.9	31.3	
2001m1	5062	95.7	91.8	83.7	66.2	46.6	32.2	
2004m1	4586	95.6	91.5	84.9	68.2	48.5		
2007m1	7540	94.8	90.1	83.5	67.3	44.6		
2010m1	8455	96.1	92.3	85.9	67.2			
2013m1	8510	95.5	91	82.9				

Notes: This table summarizes the survival rates of firms, i. e. the fraction of firms that is still contained in the sample after a specific period of time elapsed since several predefined starting dates t .

Moreover, the response rates to the IBS are remarkably high despite of the fact that participation is voluntary. On average, firms answer in 80.5 percent of months and response rates do not differ substantially between firms in the industry surveys on manufacturing (82.3 percent), retail and wholesale (79.3 percent), and services (77.5 percent).¹²

5 Conclusion

This paper describes how two major obstacles that have prevented panel data research based on the universe of firms in the IBS can be removed: (1)

¹² Even though the response rate of firms is high, researchers might need to deal with non-response of firms if their empirical approach is based on firms' reports to the IBS in several consecutive months, for example. One possibility is to linearly interpolate missing answers as long as the gap in the data is shorter than a predefined number of periods. Link (2018) shows that interpolated responses do not differ substantially from the answers originally contained in the dataset. Moreover, Seiler and Heumann (2013) provide a statistical analysis of different imputation methods and conclude that the bias due to non-response does not significantly reduce the forecasting performance of the Ifo Business Climate Index that is based on the micro data of the IBS. In addition, see Seiler (2014) for a more detailed analysis on the determinants of non-response in the IBS.

heterogeneity across different industry-specific surveys of the IBS in the level of the observational units (product vs. firm) as well as (2) heterogeneity in the industry classification systems used in the micro data. For this purpose, I aggregate the survey responses of the most important industry-specific surveys covering manufacturing, retail/wholesale, and services to the firm level and transfer the sector identifiers contained in the micro data to the official German industry classification systems *WZ 03* and *WZ 08*.

The harmonized firm level dataset expands the scope for economic research based on the micro data of the IBS to more firms in a broader set of sectors. While existing studies that use the IBS micro data usually restricted the analysis to the subset of manufacturing firms due to the inconsistencies between industry-specific surveys, the harmonized dataset contains of more than three times as many firms in the recent waves of the IBS. The value added of the harmonization procedure is largest for the micro data in the retail and wholesale survey as it adjusts for a break in the methodology in the survey in 2006. This adjustment permits to jointly analyze firms' survey responses in the time periods before and after the break. For example, Buchheim and Link (2017) make use of this opportunity in order to study the formation of firms' expectations regarding their own future business conditions across firms in all main sectors of the economy. Moreover, they are able to examine anticipation effects of retail firms to an increase in German value added taxes in 2007 based on data before and after the methodological break.

In addition, the transfer of the sector identification variables to the standard industry classification systems *WZ 03* and *WZ 08* is useful for at least two reasons. First, fixed effects can be applied along the same level of industry aggregation in order to flexibly control for industry-specific variation of any kind. Second, the harmonized IBS data can be merged to industry level data from other sources which are usually coded according to the classification systems *WZ 03* and *WZ 08*. Based on this, Link (2019) matches firms in the IBS to data on the distribution of wages in their industry and location in order to identify the degree to which firms are affected by the introduction of a statutory minimum wage in Germany in 2015.

Acknowledgment: For helpful comments I thank Lukas Buchheim, Stefan Lautenbacher, Uwe Sunde, Sebastian Wichert, Joachim Winter, Klaus Wohlrabe, and Peter Zorn. I also thank the team of the ifo-LMU Economics & Business Data Center for excellent support and provision of the data. Parts of this work were written during my doctoral studies at the University of Munich and supported by the Egon Sohmen Graduate Center at the Munich Graduate School of Economics and the German Research Foundation (DFG) through GRK 1928.

References

- Bachmann, R., B. Born, S. Elstner, C. Grimme (2019), Time-Varying Business Volatility, Price Setting, and the Real Effects of Monetary Policy. *Journal of Monetary Economics* 101: 82–99.
- Bachmann, R., C. Carstensen, C. Lautenbacher, M. Schneider (2018), Uncertainty and Change: Survey Evidence of Firms' Subjective Beliefs. Mimeo.
- Bachmann, R., S. Elstner (2015), Firm Optimism and Pessimism. *European Economic Review* 79: 297–325.
- Bachmann, R., S. Elstner, E. R. Sims (2013), Uncertainty and Economic Activity: Evidence from Business Survey Data. *American Economic Journal: Macroeconomics* 5 (2): 217–249.
- Becker, S. O., K. Wohlrabe (2008), Micro Data at the Ifo Institute for Economic Research - The "Ifo Business Survey" Usage and Access. *Schmollers Jahrbuch-Zeitschrift für Wirtschafts- und Sozialwissenschaften* 128 (2): 307–319.
- Buchheim, L., S. Link (2017), The Effect of Disaggregate Information on the Expectation Formation of Firms. CESifo Working Paper No. 6768.
- Carstensen, K., S. Elstner, G. Paula (2013), How Much Did Oil Market Developments Contribute to the 2009 Recession in Germany? *The Scandinavian Journal of Economics* 115 (3): 695–721.
- Enders, Z., F. Hünnekes, G. J. Müller (2019a), Firm Expectations and Economic Activity. CESifo Working Paper No. 7623.
- Enders, Z., F. Hünnekes, G. J. Müller (2019b), Monetary Policy Announcements and Expectations: Evidence from German Firms. Mimeo.
- Fidrmuc, J., C. Hainz (2013), The Effect of Banking Regulation on Cross-Border Lending. *Journal of Banking & Finance* 37 (5): 1310–1322.
- Huber, K. (2018), Disentangling the Effects of a Banking Crisis: Evidence from German Firms and Counties. *American Economic Review* 108 (3): 868–898.
- IBS-BAU (2017), Ifo Business Survey Construction 1/1991 - 12/2017. LMU-ifo Economics & Business Data Center, Munich, doi: 10.7805/ebdc-ibs-con-2017b.
- IBS-IND (2017), Ifo Business Survey Industry 1/1980 - 12/2017. LMU-ifo Economics & Business Data Center, Munich, doi: 10.7805/ebdc-ibs-ind-2017b.
- IBS-SERV (2017), Ifo Business Survey Service Sector 10/2004 - 12/2017. LMU-ifo Economics & Business Data Center, Munich, doi: 10.7805/ebdc-ibs-serv-2017b.
- IBS-TRA (2017), Ifo Business Survey Trade 1/1990 - 12/2017. LMU-ifo Economics & Business Data Center, Munich, doi: 10.7805/ebdc-ibs-tra-2017b.
- Link, S. (2018), Harmonization and Interpretation of the Ifo Business Survey's Micro Data. CESifo Working Paper No. 7427.
- Link, S. (2019), The Price and Employment Response of Firms to the Introduction of Minimum Wages. CESifo Working Paper No. 7575.
- Massenot, B., Y. Pettinicchi (2018), Can Firms See into the Future? Survey Evidence from Germany. *Journal of Economic Behavior & Organization* 145: 66–79.
- Pesaran, M. H., A. Timmermann (2009), Testing Dependence Among Serially Correlated Multicategory Variables. *Journal of the American Statistical Association* 104 (485): 325–337.
- Sauer, S., K. Wohlrabe (2019), Chef oder Praktikant—wer beantwortet eigentlich die Fragebögen in den Ifo Konjunkturumfragen? *Ifo Schnelldienst* 72 (03): 30–32.

- Schenkelberg, H. (2014), The Determinants of Sticky Prices and Sticky Plans: Evidence from German Business Survey Data. *German Economic Review* 15 (3): 353–373.
- Seiler, C. (2014), The Determinants of Unit Non-Response in the Ifo Business Survey. *ASTA Wirtschafts-und Sozialstatistisches Archiv* 8 (3): 161–177.
- Seiler, C., C. Heumann (2013), Microdata Imputations and Macrodata Implications: Evidence from the Ifo Business Survey. *Economic Modelling* 35: 722–733.
- Strasser, G. (2013), Exchange Rate Pass-Through and Credit Constraints. *Journal of Monetary Economics* 60 (1): 25–38.