The Forecasting Power of the ifo Business Survey

Robert Lehmann

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Abstract

The ifo Institute is Germany's largest business survey provider, with the ifo Business Climate Germany as one of the most important leading indicators for gross domestic product. However, the ifo Business Survey is not solely limited to the Business Climate and also delivers a multitude of further indicators to forecast several important economic variables. This paper gives a literature overview over existing studies that deal with the forecasting power of various ifo indicators both for gross domestic product and further economic variables such as exports. Overall, the various indicators from the ifo Business Survey can be seen as leading indicators for a multitude of variables representing the German economy, making them a powerful tool both for an in-depth business cycle diagnosis and for applied forecasting work.

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1. Introduction

The ifo Business Climate Germany is one the most important leading indicators for the German economy.[1] Most of the media attention the ifo Business Climate gains is for its leading properties for the growth of real gross domestic product (GDP). But the ifo Business Survey does not only provide leading indicators for total German output, it rather comprises a large pool of indicators that mirror the development of other economic variables at hand.

In this paper, I give an overview over existing studies that evaluate the forecasting power of the indicators provided by the ifo Institute and I identify possible future research activities with a special focus on economic forecasting. My paper is not the first to evaluate the forecasting power of the ifo Business Survey: two major literature reviews are provided by Abberger and Wohlrabe (2006) and Seiler and Wohlrabe (2013), both written by researchers that have been employed at the ifo Institute at that time. Both articles have in common that they exclusively focus on studies for the performance of the ifo Business Climate Index to forecast either German GDP or industrial production (IP). But to date, a large body of literature exists that either studies the forecasting properties for other economic variables (for example, employment growth) or focus on the regional level. The aim of this survey at hand is to enhance the existing literature reviews with respect to two dimensions. First, I list all articles that have been published until or are in preparation at the end of December 2019. And second, I will also review the studies that focus on, among others, employment growth, production in various industries or inflation.

The surveyed articles are divided in seven categories: (1) GDP, IP, and turning points; (2) further economic variables such as, for example, investment, exports, or prices; (3) labor market outcomes; (4) supply-side components; (5) service sector outcomes; (6) regional economic variables; and (7) revisions of economic variables. I allocate the existing studies to at least one category and summarize the main results of each study concerning the forecasting power of the applied ifo indicator(s). For each study, I additionally give a detailed overview of the applied method(s) and the time period under investigation.

In sum, the majority of existing studies certify the ifo indicators a high forecasting power. For German GDP especially the three headline indices (ifo Business Climate, ifo Business Situation, and ifo Business Expectations) either in delimitation of Industry and Trade (sum of manufacturing, construction, and trade) of for Germany (industry and trade plus services) provide accurate forecasts. On the demand-side calculation of GDP, the ifo indicators are valuable leading indicators (for example, the ifo Export Climate to forecast German export growth). On the supply-side calculation of GDP, the ifo Institute provides good leading

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[1]In April 2018, the famous ifo Business Climate Industry and Trade has been replaced by the ifo Business Climate Germany (see Sauer and Wohlrabe, 2018a,b; Sauer *et al.*, 2018; Weber, 2019). One of the main reasoning for the replacement is the growing importance of the service sector for total output. The ifo Institute therefore decided to update its Business Climate Index which now also includes the service sector, next to industry, construction, and trade.

indicators for a multitude of different industries (for example, the ifo Business Climate Manufacturing). Next to these outcome variables, the ifo indicators are also able to accurately forecast labor market variables (for example, the ifo Employment Barometer to forecast employment growth) or inflation (for example, the ifo Price Expectations as leading indicator for producer price development). The good forecasting power of the ifo indicators is not solely confirmed for the German economy but also for three regional entities: the German states Baden-Württemberg and Saxony, and Eastern Germany.

The literature survey at hand is organized as follows. I briefly introduce the main features of the ifo Business Survey in Section 2. Section 3 defines the criteria for the selection of the articles and the subsequent categorization. For each of the seven categories I discuss and present the existing studies in Section 4. Section 5 concludes and outlines possible future research activities.

2. The ifo Business Survey

I start by giving a brief introduction to the universe of the ifo Business Survey, which is a monthly survey among German firms that exists since 1949.[2] The most popular business cycle indicator, that results from this monthly survey, is the *ifo Business Climate Germany*. Each month, the ifo Business Climate is based on a relative stable sample incorporating 9,000 answers of German firms. This large pool of answers ensures that the ifo Business Survey is representative on the firm and industrial level, that is, it mirrors the distribution of firm size and industrial composition in the German economy quite well. One of the most important purposes of the ifo Business Survey is to provide fast and non-revised indicators to describe the short-term behavior of German macroeconomic variables.

Industrial Coverage. The ifo Business Survey provides indicators for the following four main industries: manufacturing, construction, trade, and services. The industrial coverage of the ifo Business Survey has increased over time and started solely with a relatively small sample in manufacturing in 1949 (see Sauer and Wohlrabe, 2020). At the beginning of the 1950s, the survey has been extended to the German trade sector (retail trade: 1950, wholesale: 1951); the construction sector followed in 1956. The service sector has been added in 2001 with a monthly annotation since 2005. Based on these four main industries one would argue that the ifo Business Survey covers all economic activities in Germany. However, not all industries are surveyed each month. Table 1 presents all broader industries[3] of the German economy together with the coverage of the ifo Business Survey; the last column shows the single weight of each industry as of 2018. Overall, the ifo Business Survey

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[2]A detailed and comprehensive introduction to the ifo Business Survey has now been published as German-speaking collection (see Sauer and Wohlrabe, 2020). An English-speaking version will be published in the near future.

[3]For a detailed description of the Classification of Economic Activities see Table A1 in Appendix A.

comprises industries that account for approximately 74% of total German gross value added (GVA) in 2018. The small industries not covered by the monthly survey are agriculture, mining and quarrying as well as electricity, gas and water supply that represent 4% of total German GVA. The ifo Business Survey also does not comprise banking and insurance activities with a similar weight to that of the smaller industries. As the ifo Institute only surveys market-traded activities, the whole public sector, with a weight of roughly 20%, is missing, too. However, the ifo Business Survey is constructed to gain cyclical signals of the German economy and one can argue that public services do not have any pronounced business cycle at all.

Questionnaire. The monthly survey is divided into standard and special questions; Tables B1 to B5 in the Appendix provide a comprehensive overview of the monthly questionnaire in each industry. Whereas the standard questions are asked each month, the special questions follow a specific timely pattern.[4] With the exception of a small number (for example, capacity utilization in manufacturing), all questions are of *qualitative* nature, thus, the firms are exclusively asked for tendencies. The standard questions are divided into four time categories: questions focusing on (i) the current situation, (ii) the tendencies in the previous month, (iii) the expectations for the next three months, and (iv) the expectations for the next six months. For all industries it is common to ask the firms for their assessment of their current business situation, their orders at hand, their demand situation, their price developments and expectations, their employment developments and expectations, their business expectations, and the development and expectation for a industry-specific output variable (for example, the production in manufacturing, the construction activity, orders in wholesale and retail trade, and turnover in the service sector).

The two most important standard questions that experience the largest medial attention are the ones on the assessment of the current business situation (*ifo Business Situation*, BS) and the business expectations for the next six months (*ifo Business Expectations*, BE). The wording is as follows: situation: 'We assess our current business situation as [...]'; expectations: 'In the next six months, our business situation will be [...]'. For each question, the firm can choose from three different, qualitative answers reflecting a positive (+), neutral (=), or negative (−) assessment. In case of the business situation, the three answers are: (+) good, (=) satisfactory, and (−) bad; the three answers for the business expectations are: (+) rather favorable, (=) stay the same, and (−) rather unfavorable.

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[4]Next to the standard and special questions, the ifo Institute also asks for firm-specifics on a bi-annual and annual basis. It is also possible—after consulting the ifo Institute—to ask single questions for specific purposes or research activities. Only to name a few: questions on the influence of climate change on the firm's business activity (see Auerswald and Lehmann, 2011), the influence of the 2014 Ukraine-conflict (see Grimme *et al.*, 2014), the influence of the US tax reform in 2018 (see Krolage and Wohlrabe, 2018), or the German 'Mittelstand' (see Berlemann *et al.*, 2018).

Table 1: Industrial Coverage of the ifo Business Survey

Industry	Coverage	Weight
WZ08-A: Agriculture, forestry and fishing	–	0.9%
WZ08-B: Mining and quarrying	–	0.2%
WZ08-C: Manufacturing	all industries (2-digit level)	22.7%
WZ08-D: Electricity and gas supply	–	1.6%
WZ08-E: Water supply; disposal of waste	–	1.0%
WZ08-F: Construction	only main construction industry	5.1%
WZ08-G: Wholesale and retail trade; repair	all industries (2-digit level) except maintenance and repair of motor vehicles and wholesale on a fee or contract basis	10.0%
WZ08-H: Transportation and storage	all industries (2-digit level)	4.4%
WZ08-I: Accommodation and food service activities	all industries (2-digit level)	1.6%
WZ08-J: Information and communication	all industries (2-digit level) except publishing activities	4.6%
WZ08-K: Financial and insurance activities	–	3.9%
WZ08-L: Real estate activities	total industry	10.5%
WZ08-M: Professional, scientific and technical activities	all industries (2-digit level) except veterinary activities	6.4%
WZ08-N: Administrative and support service activities	all industries (2-digit level)	5.1%
WZ08-O: Public administration and defense	–	6.1%
WZ08-P: Education	–	4.6%
WZ08-Q: Human health and social work activities	–	7.6%
WZ08-R: Arts, entertainment and recreation	all industries (2-digit level)	1.4%
WZ08-S: Other service activities	all industries (2-digit level)	2.2%
WZ08-T: Activities of households as employers	–	0.2%

Source: Federal Statistical Office of Germany; Sauer and Wohlrabe (2020). The weights are based on gross value added figures as of 2018.

The special questions vary across industries of the economy and the months within a quarter. Per industry, however, they follow a specific pattern. Each special question is asked four times a year, either in the first, the second, or the third month of a quarter. For example, each January, April, July, and October, the German manufacturing firms are asked on their capacity utilization (CU): 'The current utilization of our equipment (customary full use of the capacity = 100%) amounts to [...]'. Each firm can choose from eleven given answers ranging from 30% to 100% or have the possibility to state a number by their own if capacity utilization reaches a level above 100%.

Aggregation and Presentation. For the aggregation of the firm-individual answers, the ifo Institute applies two weights: one based on firm-specific and the other based on industry-specific information. For the different industries either the number of employees (manufacturing, construction) or the amount of turnover (trade, services) serve as the firm-specific weight. Table 2 shows a schematic aggregation example based on five firms with different weights and answers. In the case of an unweighted aggregation, 50.0% of the firms formulate a positive answer, 33.3% have a neutral assessment, and 16.7% or one firm answers the question with a negative assessment. Based on this unweighted aggregation, the largest part of the firms answer the question by a positive assessment, whereas their economic weight is smaller than the one of the firms with neutral answers (weight 8 vs. 10). By applying a weighted aggregation scheme, the economic picture changes in favor of a neutral assessment. In this case, 40.0% of the firms formulate a positive answer, 50.0% of the firms' answers are neutral, and 10.0% of the firms have a negative assessment. In the end, this means that larger firms are more important for the business cycle assessment as smaller firms.

The second weights applied by the ifo Institute are based on official gross value added data. Each firm and product can be assigned to an industry on a 2-digit level. For example, a single car manufacturer is directly assigned with its firm-specific weight to division WZ08-C-29 – manufacture of motor vehicles, trailers and semi-trailers of the German Classification of Economic Activities, Edition 2008. A restaurant, instead, is assigned with its firm-specific weight to division WZ08-I-56 – food and beverage service activities (see Table A1 in Appendix A). To each industry its weight in total gross value added is applied (for example, the 2017 weight of the sector WZ08-C-28 – manufacture of machinery and equipment is 15.4% in total manufacturing) to calculate the main industrial aggregates (manufacturing, construction, retail trade, wholesale, and services). As for the firm-specific aggregation, smaller industries also get a lower weight. The last step is the calculation of the *ifo Business Climate Germany*. Therefore, the ifo Institute applies constant weights as follows (see Sauer and Wohlrabe, 2018a): manufacturing 30.2%, construction 6.0%, wholesale 7.1%, retail trade 6.2%, and services 50.5%.

Table 2: Aggregation Example ifo Business Survey

Firm #	Answer	Weight	Distribution of Answers (+)	(=)	(−)
A	(=)	5		5	
B	(+)	2	2		
C	(+)	4	4		
D	(−)	2			2
E	(=)	5		5	
F	(+)	2	2		
Sum (unweighted)		6	3	2	1
Sum (weighted)		20	8	10	2
Percent (unweighted)		100.0%	50.0%	33.3%	16.7%
Percent (weighted)		100.0%	40.0%	50.0%	10.0%

Source: Marjenko *et al.* (2020, p.15).

The application of these two weights leads to a high aggregation flexibility of the answers. Only to name a few, the ifo Institute has the possibility to calculate indicators for:

- each industry (for example, the manufacturing of motor vehicles),

- each of the five main industrial groups (intermediate goods, capital goods, consumer durables, consumer non-durables, and energy; see Table A2 in Appendix A),

- each aggregation of industries (for example, industry and trade comprising manufacturing, construction, and trade which was the previous delimitation of the ifo Business Climate before the incorporation of the service sector),

- each aggregation based on specific firm characteristics (for example, all firms with more than 500 employees),

- ...

All indicators that the ifo Institute publishes are presented as balances. This is expressed as difference between the share of positive and negative answers, leaving the neutral category aside. For the example in Table 2, the weighted balance statistic is $40.0\% - 10.0\% = 30.0\%$. The balance methodology leads to natural boundaries of the indicators ranging from -100 to $+100$. If all firms report a positive assessment, the balance becomes $100.0\% - 0.0\% = 100.0\%$; the opposite holds if all firms formulate a negative assessment: $0.0\% - 100.0\% = -100.0\%$. In the end, each indicator can be treated as stationary by construction.

The Business Climates (BC) of each branch of the economy or for Germany are the averages of the Business Situation (BS) and the Business Expectations (BE) balances according to the following formula:

$$\text{BC}_t = \sqrt{(\text{BS}_t + 200)(\text{BE}_t + 200)} - 200 \, .$$

Each balance statistic is increased by 200 in advance to ensure non-negative terms in the square root. After the calculation of the geometric average, 200 are subtracted again so that the Business Climate fluctuates around zero in a range between -100 and $+100$. The zero serves as a natural reference as values above this threshold indicate that more firms formulate a positive assessment compared to those reporting a negative answer. The opposite holds true for negative values. Usually, the ifo Institute does not publish the balance statistics but transforms the indicators to indices, referring the current value of the indicator to the value in a base year. For example, the formula for the Business Climate index is as follows:

$$\mathrm{BC}_t^I = \left(\frac{\mathrm{BC}_t + 200}{\mathrm{BC}^B + 200} \right) \times 100 \,.$$

The Business Climate as index value (BC_t^I) is the ratio between the balance of the Business Climate in month t increased by 200, $\mathrm{BC}_t + 200$, and the average balance of the Business Climate in the base year increased by 200, $\mathrm{BC}^B + 200$. If, for example, the current value of the Business Climate is $\mathrm{BC}_t = 25$ and the average value of the Business Climate in the base year is $\mathrm{BC}^B = 20$, the index value amounts to $\mathrm{BC}_t^I = 225/220 = 102.3$; the current base year is 2015 as all statistics of the Federal Statistical Office of Germany are based on this year. This is the usual way the ifo Institute presents its monthly indicators.

For the media, the ifo Institute only publishes seasonally-adjusted indicators. X-13ARIMA-SEATS serves as the seasonal adjustment procedure. However, the unadjusted values are also available upon request or on usual platforms such as Macrobond. The seasonal adjustment takes place at the level of each unadjusted series, that is, the seasonal adjusted Business Climate is not the average of both the seasonal adjusted Business Situation and Business Expectations but it is seasonally adjusted by itself after averaging the unadjusted values of the two components. This procedure could lead to the case where the seasonal adjusted Business Climate deviates from the average of both seasonal adjusted sub-indices.

Target Series and Interpretation. The main purpose of the ifo Business Survey is to provide timely, non-revised and leading business cycle indicators. A business cycle indicator is mainly characterized by its ability to describe the economic development appropriately. For example, the ifo Business Climate can serve as such a leading business cycle indicator if it signals changes in the dynamics of the German economy at an early stage. The main challenge, however, is to define on which reference or target series the business cycle indicator should focus on; this differentiation is very important for the following assessment of the forecasting power of the survey results. In case of the ifo Business Climate a public debate was ongoing in 2017, challenging its validity as leading indicator for the German economy. This is why Wohlrabe and Wollmershäuser (2017a) reacted to the upcoming critique by clarifying how the ifo Business Climate can be interpreted. In the following, I stick to this discussion by taking a deeper look in the existing literature. As the example I use German

GDP and the ifo Business Climate Industry and Trade, as the latter is available since 1991, too. The following argumentation also holds for other target series, for example, industrial production.

The ifo Business Climate is a *business cycle* indicator, thus, its natural reference series it should be able to early describe is the *cyclical component* of German GDP. This is especially pronounced in the articles by Abberger and Nierhaus (2007a,b). To extract the cyclical component of German GDP, I have to eliminate the underlying economic growth trend. For this purpose, and to keep it as simple as possible, I apply a Hodrick-Prescott-Filter (HP-Filter) with a $\lambda = 1,600$ for quarterly data. The ifo Business Climate is kept in levels as the survey results are by construction stationary and show no inherent trending behavior. To compare GDP and the ifo Business Climate, I need to calculate three-month-averages of the latter in order to have the same time frequency. Panel A in Figure 1 shows the cyclical component of German GDP together with the ifo Business Climate in levels since the first quarter of 1991 until the latest available data. It is obvious from Panel A that the ifo Business Climate serves as a leading indicator for the cyclical component of German GDP, which is also the main result of Abberger and Nierhaus (2007a,b).
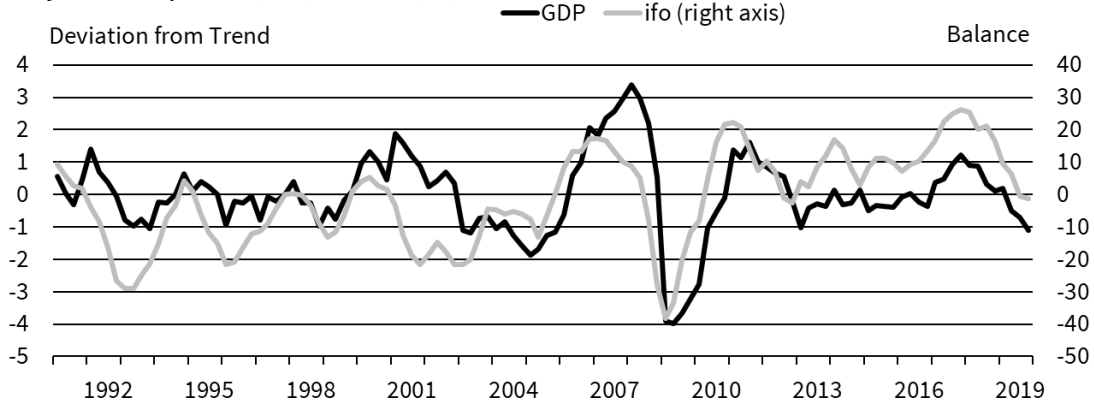
In the public debate, nobody talks about the cyclical component of German GDP. The largest part of medial reporting deals with the development of GDP, namely its percentage change over the same quarter of the previous year. On the opposite, in applied forecasting work GDP is usually transformed into its percentage change over the previous quarter. Both transformations come with the price that the leading properties of the ifo Business Climate in levels become disguised. As argued by Abberger and Nierhaus (2007a, footnote 7, p.29, free translation from German), this is mainly because "the calculation of growth rates is the result of an asymmetric filtering, leading to a phase shifting in the series. Due to this asymmetric filtering, the transformed GDP series and its business cycle turning points are shifted backwards in time." Both authors conclude: "The leading properties of the ifo Business Climate can be restored by applying the same filtering procedure as for GDP." This means that either differences to the quarter of the previous year or differences to the previous quarter should be applied to the ifo Business Climate if the reference series is annual or quarterly GDP growth, respectively. Panel B (annual growth) and Panel C (quarterly growth) in Figure 1 point to these two transformations. The ifo Business Climate retains its leading properties in both the annual and quarterly transformation, whereas the quarterly transformation is much noisier compared to annual growth rates. This transformation debate is crucial for the following assessment of the leading and forecasting properties.

Figure 1: GDP Transformation and ifo Business Climate

Comparison between GDP and ifo Business Climate [a]

Three transformations

A. Cyclical Component (GDP) vs. Level (ifo)

Deviation from Trend ———GDP ———ifo (right axis) Balance

B. Change over the previous year (both) ———GDP ———ifo (right axis)

in % Balance points

C. Change over the previous quarter (both) ———GDP ———ifo (right axis)

in % Balance points
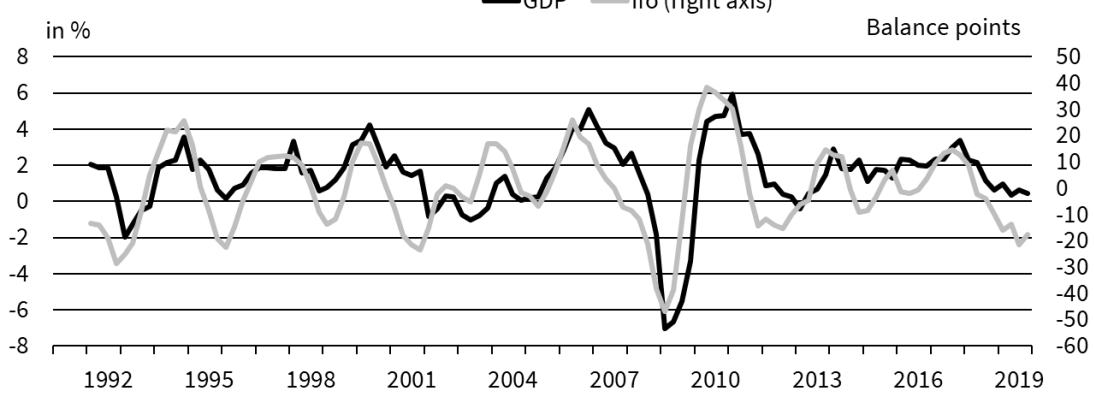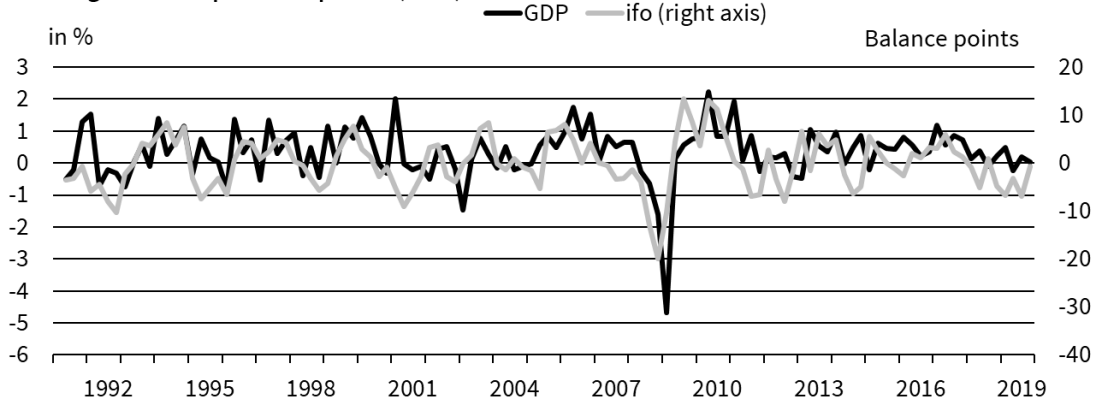
[a] Price-, seasonal- and calendar-adjusted GDP. Trend extracted via a HP-Filter ($\lambda = 1,600$).
Source: Federal Statistical Office; ifo Business Survey; own calculations.

3. Article Selection and Categorization

A literature survey typically starts by a systematic collection of existing studies. This also comprises the examination of whether these studies have relevance for the underlying question of the literature survey or not. In this section, I discuss the criteria defined to select the articles at hand. I furthermore present the categories that I have decided to use to structure the selected studies.

Forecasting Performance.   I will only present those studies that explicitly investigate the forecasting performance of the various indicators provided by the ifo Institute. I define the phrase 'forecasting performance' in a rather broad sense. Each study that either concentrates on *in-sample* (for example, the examination of the leading properties of various indicators by applying cross-correlations), *out-of-sample* (for example, studies with an explicit forecast experiment) or both forms of analysis will be part of the pool of studies in this survey. From my point of view, this is a crucial differentiation. Whereas out-of-sample studies explicitly examine the forecasting power of the respective indicator(s), in-sample analyses are especially valuable to assess the validity of the indicator(s) for a business cycle diagnosis, which is usually done prior to each forecast. A forecaster might only be able to formulate good forecasts by initially investigating in which phase of the business cycle the economy currently is; this investigation is usually the main part of a business cycle diagnosis. Based on the definition of what forecasting performance means, I do **not** consider a study that satisfies at least one of the following four criteria:

1. articles that periodically and exclusively comment new releases of the survey results,

2. studies that examine large sets of indicators and that do not primarily focus on the performance of ifo indicators,

3. articles with a methodological focus (see, among others, Carstensen *et al.*, 2020), and

4. studies that focus on the evaluation of microfounded macroeconomic theory by using the business survey outcomes.

Time Period.   One of my purposes is to shed light on newer articles. This is why I only survey articles that have been published between 1997 and 2019, which is a period of more than 20 years of intensive research and that might be a good approximation of the newer literature. A large part of the following surveyed articles have also been published in two larger collections of the ifo Center for Macroeconomics and Surveys (see Abberger *et al.*, 2007; Wollmershäuser and Nierhaus, 2016). These two publications, however, do not comment on the forecasting power of the survey results.

Categorization. The literature survey at hand comprises **93** studies that have either been published in refereed journals, in non-refereed periodicals, or as discussion papers. As the main purpose of this survey is to present articles that not exclusively focus on gross domestic product but rather on other economic variables, it would be misleading to mix up all studies and arrange them in a timely manner. I therefore decided to group the articles into the following categories, with studies that comprise:

1. gross domestic product, industrial production, or turning points,

2. further economic variables (for example, investment, exports, or prices),

3. labor market outcomes,

4. supply-side components of GDP,

5. service sector outcomes,

6. economic variables at the regional level, and

7. revisions of economic aggregates.

Most of the existing studies concentrate on either GDP, IP, or the identification of turning points. This is not surprising as, for example, GDP gains the largest medial attention and is the most comprehensive measure for a country's economic activity. The IP is the most important indicator for quarterly GDP due to its monthly availability. Each economic variable will be discussed in separate sub-sections because of the large number of studies. These studies are complemented by articles that explicitly focus on either the demand- or the supply-side calculation of GDP.

I decided to separate the studies focusing on the service sector. The main reason is the relative novelty of the business survey results. Whereas the surveys in manufacturing, construction, retail trade and wholesale have a very long tradition, the survey in the service sector was only established in 2001 with a monthly annotation since October 2005.

Next to the provision of survey results for Germany, the ifo Institute also supplies indicators for regional entities such as the German states. On the one hand there is increasing interest of regional policy-makers in early signals of the state of the regional economy. And on the other hand, the Dresden Branch of the ifo Institute regularly publishes forecasts of regional activity in Saxony and Eastern Germany. Based on these two arguments, I decided that the regional results should be discussed in a separate section.

The last group of studies can be indicated as rather exotic in the pool of studies in this review. Whereas all other studies focus on the performance of the indicators for forecasting economic aggregates, the studies in group number seven are aimed at forecasting revisions of economic variables over time. Large revisions over time usually take place because of

missing information or new methodologies. The first estimates of economic variables are based on samples that might not coincide with the population of firms in the economy. The ifo sample, on the opposite, is rather fixed and, as described before, representative for the German economy. This is one reason why a small strand of the literature has focused on forecasting revisions with the ifo indicators and grows since the beginning of the 2010s.

4. Forecasting Performance

Each table in the following sections has a similar structure based on six columns: (i) the *article*, (ii) the target series to forecast and its *transformation*, (iii) the *period* under investigation, (iv) the *ifo indicator(s)* used, (v) the applied *method(s)*, and (vi) the *main results*. To present each table on one single page, it was necessary to introduce meaningful abbreviations which are mentioned in the notes to each table. I also indicate the studies that solely use in-sample techniques (∗), out-of-sample methods (†), or apply both forms of analyses.

4.1. Gross Domestic Product

The main economic indicator that receives the highest medial attention is gross domestic product. As GDP is the most comprehensive indicator to measure economic activity of a country, most of the existing studies that evaluate the forecasting power of the ifo indicators focus on this variable. The majority of existing studies attest the ifo indicators a very good or high forecasting power for real GDP growth (see Table 3).

By screening the articles in Table 3, three ifo indicators seem to be best suited to forecast German GDP: the *ifo Business Climate Industry and Trade*, the *ifo Business Situation Industry and Trade* and the *ifo Business Expectations Industry and Trade*. Earlier studies solely focus on Western Germany. Recent studies test the performance of the ifo indicators for Germany and confirm the results from earlier contributions on Western Germany.

Next to the high relative forecast performance, which has also increased during the global financial and economic crisis 2008/2009 according to Drechsel and Scheufele (2012b), the studies by Schumacher and Dreger (2004), Kholodilin and Siliverstovs (2006) and Drechsel and Scheufele (2012a) underpin the outstanding ability of the ifo indicators to forecast German GDP growth. On the one hand, simple time series models including either the ifo Business Climate or one of its two components (ifo Business Situation and ifo Business Expectations) are competitive compared to forecast pooling or factor models.[5] On the other hand, the main ifo indicators are regularly selected by the algorithms to enter the factor.

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[5]Pooling is a technique that densifies a multitude of competing forecasts from different models to one specific figure based on a selected weighting scheme. If, for example, 100 competing forecasts for GDP are available, the forecaster can apply a simple mean or median to calculate one single weighted forecast for GDP. On the opposite, factor models are applied to the data before a forecast is formulated. The competing indicators are densified to a small number of so called factors beforehand and enter the applied forecasting model afterwards. One prominent representative of factor models are principal components.

Table 3: Forecasting Power of ifo Indicators for Real Gross Domestic Product

Article	Transformation	Period	ifo Indicator(s)	Method(s)	Main Result(s)
Langmantel (1999)[*,†]	% previous year	1963-Q1 – 1998-Q4	BC MAN West	Granger Causality, ADL models	Business Climate suitable indicator for GDP
Hinze (2003)[*,†]	% previous year	1992-Q1 – 2003-Q1	BE I&T	Cross-correlations, Granger Causality, VAR models	Business Expectations suitable as leading indicator, less forecasting power compared to OECD Leading Indicator
Langmantel (2004)[*,†]	% previous year	1963-Q1 – 2002-Q4	BS MAN West, BE MAN West	Granger Causality, Impulse Responses, Variance Decomp., VAR models	Business Situation and Business Expectations Granger-cause GDP, explanation of a large part of in-sample forecast errors, lower forecast performance of both indicators compared to a benchmark model (with exception of single years)
Schumacher and Dreger (2004)[†]	% previous quarter	1978-Q2 – 2002-Q1	BC I&T West	ADL models, factor models	Business Climate as very good predictor up to one year, various other ifo indicators enter the factor
Benner and Meier (2005)[†]	% previous quarter	1965-Q1 – 2004-Q3	BC I&T West, BS I&T West, BE I&T West	VECM (real-time)	All three indicators suitable to forecast GDP up to one year ahead
Kholodilin and Siliverstovs (2006)[†]	% previous year	1991-Q2 – 2004-Q4	BC I&T West, BS I&T West, BE I&T West	ADL models, factor models	ifo indicators among the best ones, survey results competitive to factor models
Sinn and Abberger (2006)[*]	% previous year	1993-Q1 – 2005-Q4	BC I&T	Graphical analysis	Business Climate serves as leading indicator
Drechsel and Scheufele (2012a)[†]	% previous quarter, annualized	1992-Q1 – 2009-Q4	BC I&T, BE I&T, BC MAN, BE MAN, WEC, WEE	Linear and non-linear ADL models	ifo indicators among best ones compared to benchmark models (with exception of the World Economic Expectations), sometimes better than forecast combination techniques, ifo indicators as good as results from Consensus Economics
Drechsel and Scheufele (2012b)[†]	% previous quarter, annualized	1991-Q1 – 2009-Q2	BC I&T, BE I&T, BC MAN, BE MAN, sub-indices	ADL models	Before economic crisis of 2008/2009: good forecasting performance of the ifo indicators in the short-term but worse compared to pooling, during crisis: relative performance of ifo indicators increases
Henzel and Rast (2013)[†]	% previous quarter	1992-Q1 – 2012-Q4	BC I&T, BS I&T, BE I&T	ADL models and bridge equations	Business Expectations with the smallest forecast error for current quarter predictions, industrial production becomes best indicator after its release, Business Expectations remain best performing indicator for next quarter predictions
Heinisch and Scheufele (2019)[†]	% previous quarter	1991-Q1 – 2015-Q4	BC I&T, BS I&T, BE I&T	Mixed-frequency VAR models, Nowcasting	Forecast performance of the ifo indicators independent from data vintage, Business Climate and Business Expectations best performing indicators at beginning of the quarter, industrial production becomes best indicator after its release, highest forecasting performance by combining ifo indicators with industrial production
Lehmann and Reif (2020)[†]	% previous quarter	2005-Q1 – 2009-Q2	BC, BS, BE	ADL models (real-time)	ifo headline indices have virtually the same forecasting power as the Composite Output Index (PMI) by IHS Markit in the nowcast situation, ifo Business Climate and ifo Business Situation superior for one-quarter ahead forecasts

Abbreviations: ADL: Autoregressive Distributed Lags, BC: ifo Business Climate, BE: ifo Business Expectations, BS: ifo Business Situation, I&T: Industry and Trade, MAN: Manufacturing, PMI: Purchasing Managers Index, VAR: Vector Autoregression, VECM: Vector Error Correction Model, WEC: ifo World Economic Climate, WEE: ifo World Economic Expectations, West: Western Germany. *Note:* The studies either focus on in-sample (*), out-of-sample (†), or both forms of analyses.

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Two of the most recent studies, Henzel and Rast (2013) and Heinisch and Scheufele (2019), evaluate the evolution of the ifo indicators' forecasting power for different information sets during the quarter. In general, quantitative indicators from official statistics (for example, industrial production) have a publication lag of one or more months while survey indicators are readily available at the end of each month. Survey indicators are moreover not revised over time, which is clearly another advantage compared to hard data (see Section 4.9 for a discussion on the forecasting properties of the ifo indicators for revisions). This informational advantage should naturally lead to a higher forecast performance of the ifo indicators in comparison to hard indicators published by the Federal Statistical Office of Germany. Both studies indeed show that the ifo Business Climate Industry and Trade and the ifo Business Expectation Industry and Trade generate the smallest forecast errors for GDP when the forecast is calculated at the beginning of a quarter. However, after the first publication of industrial production for a specific quarter, the ifo indicators are, on average, no longer able to beat IP. By turning to one-quarter-ahead forecasts, the ifo Business Expectations exhibit the smallest forecast errors and ranked first across the pool of investigated indicators. Heinisch and Scheufele (2019) also show that a model incorporating industrial production and one of the ifo indicators simultaneously increase the forecasting power of simple one-indicator models. All in all one can summarize that the prominent monthly survey indicators by the ifo Institute have very good leading properties for the development of German GDP.

The pool of studies also reveals two articles that rate the forecasting performance of the ifo indicators as rather bad: Hinze (2003) and Langmantel (2004). Whereas Hinze (2003) finds that the ifo Business Expectations—despite the fact that they serve as leading indicator—produce higher forecast errors than the OECD Leading Indicator, the ifo Business Situation and the ifo Business Expectations for the Western German manufacturing sector both exhibit a lower forecasting performance than an autoregressive benchmark (see Langmantel, 2004).

4.2. Industrial Production

One major disadvantage that comes along by investigating GDP as business cycle indicator is its rather low publication frequency. This disadvantage can partially be eliminated by using industrial production. Despite the fact that the German industry[6] only accounts for approximately 25% of total German GDP, manufacturing is commonly identified as the cycle-maker of the German economy (see Abberger and Nierhaus, 2008a). Since industrial production is one of the main primary statistics that enter the calculation of GDP by the Federal Statistical Office of Germany (see Hartmann *et al.*, 2005), both variables show a high correlation coefficient in their growth rates. The previous section has also shown that industrial production plays a crucial role for an unbiased forecast of German GDP. It is thus

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[6]In this delimitation, industry is the sum of manufacturing, mining and quarrying and energy. The construction sector is not included.

not surprising that a multitude of studies evaluate the forecasting power of the ifo indicators for industrial production; Table 4 currently lists 10 articles.

Five articles attest the ifo indicators a high forecasting power, four studies argue in the opposite direction and one article assesses the performance across different forecasting situations. A comparison of the studies is rather difficult as the articles vary in various dimensions. Next to different methods and time periods applied, the studies also vary in the question which ifo indicators should be evaluated. As especially the indicators from German manufacturing should be applied, I start by presenting their results first. Fritsche (1999), Fritsche and Stephan (2002) as well as Abberger (2006b) certify the ifo indicators, and here especially the *ifo Business Climate Manufacturing* and its two sub-indices, to have very good leading properties that can be utilized to formulate point forecasts. Vogt (2007) confirms this result for the latest vintage of data. However, if he applies real-time[7] data for industrial production, the ifo indicators lose their performance for short-term predictions; for longer horizons they are still superior. This issue is again discussed in Section 4.9.

The remaining studies apply the survey results for the aggregate Industry and Trade that also incorporates—next to manufacturing—the survey results from construction and the trade sector; this is also the case for most of the articles focusing on GDP. These studies approximate the development in manufacturing by economic signals stemming from manufacturing, construction, and trade and are mainly the ones that find a bad forecasting performance of the ifo indicators. Breitung and Jagodzinski (2001) state that the *ifo Business Climate Industry and Trade* and the *ifo Business Expectations Industry and Trade* have the worst power in their applied forecast experiment; Dreger and Schumacher (2005) also find that the most prominent ifo indicators are not able to beat a benchmark model. These results are especially confirmed by Hüfner and Schröder (2002a,b) for the ifo Business Expectations Industry and Trade, that exhibit a lower forecasting power compared to the ZEW Indicator of Economic Sentiment. With reference on these results, the argumentation by Benner and Meier (2004) exactly goes in the opposite direction; they state that the ifo Business Expectations Industry and Trade has a better forecasting performance compared to the ZEW Indicator of Economic Sentiment. The main difference between both studies is the applied empirical model. Whereas Hüfner and Schröder (2002a,b) use a VAR framework, Benner and Meier (2004) expand the VAR by an error correction term for the survey indicators; the three articles are based on the same set of indicators and investigated time period.

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[7]A real-time forecast situation is characterized by the solely application of information a forecaster had at a specific point in time. Most of the existing studies focus on the latest vintage of data that were revised by the Federal Statistical Office of Germany several times. In real-time, these revisions are, however, unknown to the forecaster and might change the current assessment of the business cycle phase and the estimated empirical model that is used to calculate the forecasts.

Table 4: Forecasting Power of ifo Indicators for Industrial Production

Article	Transformation	Period	ifo Indicator(s)	Method(s)	Main Result(s)
Fritsche (1999)*	cyclical component	1981-M1 – 1998-M6	BC MAN West, BS MAN West, BE MAN West, PE MAN West, sub-indices	Cross-correlations, Granger Causality, stability tests, structural breaks	Highest lead by Business and Production Expectations, most indicators Granger-cause industrial production, leading properties become more stable over time
Breitung and Jagodzinski (2001)*,†	% previous year	1991-M1 – 2001-M6	BC I&T, BE I&T	Graphical analysis, cross-correlations, Granger Causality, VAR models	Both ifo indicators with leading properties and Granger-cause industrial production, Business Climate and Business Expectations with worst forecasting performance compared to other indicators
Fritsche and Stephan (2002)*,†	% previous year	1978-M1 – 1998-M12	BC MAN West, BS MAN West, BE MAN West, sub-indices	Spectral analysis, cross-correlations, Granger Causality, ADL models, VAR models	ifo indicators with leading properties in the spectral range, convincing performance in the forecasting experiment
Hüfner and Schröder (2002a)*,†	% previous year	1992-M1 – 2002-M3	BE I&T West	Cross-correlations, Granger Causality, VAR models	ifo Business Expectations as leading indicator with a lead of 5 months, ifo Business Expectations with smallest forecast errors up to 3 month ahead, ZEW Indicator of Economic Sentiment superior for longer horizons
Hüfner and Schröder (2002b)*,†	% previous year	1991-M12 – 2000-M9	BE I&T West	Granger Causality, VAR models, Encompassing tests	Business Expectations by ifo with worse forecasting performance compared to ZEW Indicator of Economic Sentiment
Benner and Meier (2004)†	% previous month	1991-M12 – 2000-M9	BE I&T West	VAR models, Error Correction Term for indicators	ifo Business Expectations better compared to ZEW Indicator of Economic Sentiment and a benchmark model, no statistical significance across forecast errors
Nierhaus and Sturm (2004)*,†	cyclical component	1991-M1 – 2002-M12	BC I&T, BS I&T, BE I&T	Cross-correlations, in-sample analysis, ADL models	All three indicators with expected leading properties, highest in-sample fit for Business Climate, high forecasting power for intended forecasting horizon of the indicators
Dreger and Schumacher (2005)*,†	% previous year	1991-M1 – 2003-M12	BC I&T	Granger Causality, ADL models	Business Climate Granger-causes production, no improvement over the benchmark model, pooling increases forecasting power (together with other indicators)
Abberger (2006b)*,†	cyclical component, % previous month	1991-M1 – 2005-M4	BC MAN, BE MAN, CO MAN, PE MAN, sub-industries	Graphical analysis, Signal-to-Noise Ratio, cross-correlations, Granger Causality, ADL models	Aggregate indicators show turning points and are leading indicators, no good leading properties of indicators from the food industry, very good leading properties by indicators from mechanical engineering, electrical equipment, basic and fabricated metals, chemical products
Vogt (2007)*,†	% previous year	1992-M1 – 2006-M6	BC MAN, BS MAN, BE MAN	Cross-correlations, Granger Causality, VAR models (real-time)	All three indicators usable for explaining and forecasting industrial production, overwhelming forecasting power in the non-real-time case, forecast errors larger in real-time, no sufficient explanation of ifo indicators in the short-term, only in the long-term (under real-time conditions)

Abbreviations: ADL: Autoregressive Distributed Lags, BC: ifo Business Climate, BE: ifo Business Expectations, BS: ifo Business Situation, CO: ifo Current Orders, I&T: Industry and Trade, MAN: Manufacturing, PE: ifo Production Expectations, VAR: Vector Autoregression, West: Western Germany, ZEW: Leibniz Centre for European Economic Research in Mannheim. *Note*: The studies either focus on in-sample (∗), out-of-sample (†), or both forms of analyses.

Finally, Nierhaus and Sturm (2004) find a high forecasting power of the *ifo Business Climate Industry and Trade*, the *ifo Business Situation Industry and Trade* and the *ifo Business Expectations Industry and Trade* for industrial production. A major difference between Nierhaus and Sturm (2004) and the previous mentioned studies is the transformation of industrial production. Whereas all the other studies calculate growth rates of industrial production in advance (either to the previous month or the month of the previous year), the forecasting experiment by Nierhaus and Sturm (2004) focuses on the cyclical component of industrial production. The differentiation between growth rates and the business cycle of an economic time series is crucial. However, this issue is insufficiently discussed in the literature to date. The ifo indicators are leading indicators for the German business cycle as also the questionnaire suggests. A calculation of growth rates instead distorts the cyclical signal as these growth rates are still superimposed by the trending behavior of the original series and it suppresses the leading characteristics of the indicator(s). The more the trend growth rate of industrial production varies over time, the more lose the ifo indicators their power to forecast growth rates of industrial production. In such cases it is preferable to set up a forecasting experiment that focuses on the cyclical component of the target series.

4.3. Turning Points

One of the major tasks for an applied forecaster is the early detection of turning points. This is, however, the most challenging task in applied forecasting work, especially if the turning point occurs relatively late in the forecasting horizon. As each applied forecast is subject to various assumptions (for example, stable political conditions in Germany), qualitative leading indicators only deliver an important contribution to detect business cycle turning points in the very short-run. Most of the studies in Table 5 find evidence that either the *ifo Business Climate Industry and Trade* or *the ifo Business Climate Manufacturing* are able to early detect a change in the speed of cyclical growth or turning points. The second finding is confirmed by an ex-post comparison of realized turning points in the ifo indicators and indicators from official statistics that were filtered by suitable approaches.

At this stage in the paper, I again have to explicitly bring forward the differentiation between in-sample and out-of-sample analyses. The ability of an indicator to detect ex-post turning points in realized data does not necessarily lead to the conclusion that this indicator is able to accurately forecast turning points ex-ante. This is the main reason why various studies with other methods present different results or conclusions. The listing of studies in Table 5 underpins this general guess.

Table 5: Ability of ifo Indicators to Detect Turning Points

Article	Transformation	Period	ifo Indicator(s)	Method(s)	Main Result(s)
Funke (1997)*,†	% previous quarter (GDP)	1971-Q4 – 1995-Q4	BC I&T West	Probit models, forecast experiment	Business Climate with lead of one to two quarter to detect recessions in-sample, less forecast power compared to other indicators
Döpke (1999)*,†	industrial production	1968-M1 – 1998-M12	BC MAN West, BS MAN West, BE MAN West	Probit models, forecast experiment	ifo indicators not suitable to detect turning points, only usable in the very short-term, Business Expectations highest relative forecast power, bad in absolute terms
Bandholz and Funke (2003)*,†	% previous year (output gap)	1971-Q1 – 2002-Q2	BC I&T West	Markov-Switching-Model	Business Climate with worse performance to detect turning points compared to a factor
Abberger (2004)*	trend-adjusted industrial production	1969-M1 – 2004-M5	BC I&T	Local Polynomial Regression	"Threefold-Rule" indicates turning points, Business Climate as leading indicator to detect turning points with the nonparametric method
Hott et al. (2004)*	% previous year (GDP), trend-adjusted industrial production	1992-Q1 – 2002-Q4 / 1969-M1 – 2002-M12	BC I&T / BC I&T West	Graphical analysis, cross-correlations, turning-point-rules	Business Climate contemporaneous indicator to GDP, "Threefold-Rule" dates turning points in advance, few wrong signals
Fritsche and Kuzin (2005)*,†	% previous year (industrial production)	1978-M1 – 1998-M12	BC MAN West, BS MAN West, BE MAN West, sub-indices	Probit models, Markov-Switching-Model	Business Expectations of intermediate goods producers with leading characteristics of industrial recessions
Abberger (2006a)*	cyclical component (industrial production)	1991-M1 – 2006-M6	BC I&T, BS I&T, BE I&T, CO MAN, PE MAN	Graphical analysis, Signal-to-Noise Ratio	Business Climate as reliable leading indicator to detect turning points, all other indicators also work quite well
Abberger and Nierhaus (2007a)*	cyclical component (GDP)	1970-Q1 – 2006-Q4	BC I&T	Graphical analysis, cross-correlations, spectral analysis	Early detection of turning points via Business Climate with lead of 2 quarters, spectral analysis confirms results
Abberger and Nierhaus (2007b)*	cyclical component (GDP)	1970-Q1 – 2006-Q4	BC I&T	Bry-Boschan-Algorithm	Business Climate with an average, statistical significant lead of 1.3 quarters to turning points of GDP
Abberger and Nierhaus (2008c, 2010b)*	cyclical component (GDP)	1970-Q1 – 2008-Q2	BC I&T	Bry-Boschan-Algorithm, Markov-Switching-Model	Detection of turning points with a lead, ifo Business Cycle Traffic Lights with valuable information on the current business cycle phase
Abberger and Nierhaus (2008b)*	cyclical component, temporal disaggregated (GDP)	1994-M1 – 2008-M12	ifo Business Cycle Clock	Linear-circular correlation	Good conversion and mapping of the German business cycle
Abberger and Nierhaus (2010a,c)*	cyclical component (GDP)	1971-Q1 – 2009-Q4	ifo Business Cycle Clock	Graphical analysis, cross-correlations, circular correlation	Leading properties of Business Situation, high contemporaneous correlation with Business Expectations, high circular correlation all phases of the business cycle
Nierhaus and Abberger (2014)*	cyclical component (industrial production)	1991-M1 – 2014-M5	BC MAN	"Threefold-Rule", Markov-Switching-Model	Highest correlation by a lead of the Business Climate of 4 months, reliable turning point detection, "Threefold-Rule" as good as the Markov-Model at lower turning points, Markov-Model superior at upper turning points
Nierhaus and Abberger (2015)*	cyclical component (GDP)	1991-Q1 – 2014-Q4	BC I&T	Markov-Switching-Model	Lead of the Business Climate remains stable at 2 quarters after the introduction of the new seasonal-adjustment procedure

Abbreviations: BC: ifo Business Climate, BE: ifo Business Expectations, BS: ifo Business Situation, CO: ifo Current Orders, I&T: Industry and Trade, MAN: Manufacturing, PE: ifo Production Expectations, West: Western Germany. *Note*: The studies either focus on in-sample (*), out-of-sample (†), or both forms of analyses.

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The existing literature for Germany from the 2000s and 2010s was significantly shaped by Klaus Abberger and Wolfgang Nierhaus. Based on proven in-sample approaches (for example, the Bry-Boschan-Algorithm, several correlation coefficients and simple Markov-Switching-Models), both authors show in several studies that the *ifo Business Climate Industry and Trade* is a reliable leading indicator to date business cycle turning points for either German GDP or industrial production. The ifo Business Climate Industry and Trade exhibits an average lead of 1 to 2 quarters of the turning points in German GDP. Again this is a matter of transformation as already brought forward in the industrial production section. In all studies by Abberger and Nierhaus the cyclical component is analyzed instead of a transformation in growth rates. This choice seems reasonable as the ifo survey indicators focus, by construction, on the business cycle signal.

The article by Hott *et al.* (2004) is worth mentioning as the authors test several "Turning-Point-Rules" for their capability to early detect economic turning points. One of the most prominent representatives is the well-established "Threefold-Rule" by Vaccara and Zarnowitz (1978). Once the ifo Business Climate falls (rises) three times in a row, these movements are interpreted as upper (lower) turning points of the German economy. Hott *et al.* (2004) indeed find that the "Threefold-Rule" leads to remarkable good dating results. Only a small fraction of wrong signals are emitted by the ifo Business Climate. Nierhaus and Abberger (2014) also evaluate the "Threefold-Rule" and compare its capability with a simple Markov-Switching-Model. They conclude for the cyclical component of German industrial production that the ifo Business Climate early detects turning points in manufacturing. All in all, the "Threefold-Rule" is appropriate to date turning points, even though that the Markov-Switching-Model is superior at upper turning points of the German economy.

Fritsche and Kuzin (2005) underpin these in-sample findings by a forecast experiment based on Probit models and Markov-Switching-Models. Especially the *ifo Business Expectations of Intermediate Goods Producers*—one of the main industrial groups introduced in Section 2—show a lead to forecast recessions in industrial production growth. However, it has to be stated that a large number of quantitative indicators such as long-term interest rates deliver at least the same or even better results compared to the business survey indicators. From their article follows that the ifo indicators have in general a good performance to detect turning points, but they are less competitive compared to data from official statistics. This is also more or less the result of the articles by Funke (1997), Döpke (1999) and Bandholz and Funke (2003) which certify the ifo indicators less good or even bad properties to early detect and forecast turning points. For German GDP, the ifo Business Climate Industry and Trade exhibits worse power either compared to other variables or a diffusion index based on a factor model. The same holds true for industrial production and the ifo Business Climate Manufacturing and its two sub-indices. Thus, the literature indicates that the ifo indicators are especially able to early detect ex-post turning points but lose their power when it comes to forecasting a cyclical change in the German economy.

An unerring forecast of business cycle turning points in general and recessions in particular is for sure the most difficult task for an applied forecaster. The recent literature, however, takes a step forward to increase the forecast performance of detecting recessions in advance by more elaborate methods (see Carstensen *et al.*, 2020). In this literature the ifo indicators play a major role as they are regularly selected from a large pool of qualitative and quantitative indicators to calculate, for example, a factor that enters a well-specified empirical model.

4.4. Further Economic Variables

In the 2010s a large academic literature evolved that focus on other economic variables rather than GDP or industrial production. Table 6 summarizes the 16 articles in this category. The literature comprises seven economic aggregates: investment (4 articles), exports (4 articles), imports (2 articles), private consumption (1 article), inventories (2 articles), business and property income as well as gross value added (1 article), and prices (2 articles). With the exceptions of Knetsch (2005) and Abberger and Nierhaus (2011) all remaining studies use an evaluation period from the beginning of the 1990s till the recent available data at that time. Most studies apply cross-correlations or forecast experiments.

One of the most important but difficult to forecast economic variables are price-adjusted equipment investments. This might be the reason for the small number of articles published. Five ifo indicators seem to be well-suited to forecast equipment investments: the *ifo Business Climate Investment Good Producers*, the *ifo Business Expectations Leasing*, the *ifo Business Expectations Investment Goods Producers*, the *ifo Investment Indicator Leasing*, and the *ifo Investment Indicator*. All five indicators show leading properties with equipment investments and are able to retrace its development over time. Billharz *et al.* (2012) find that the indicators mirroring the mood of investment goods producers deliver the highest forecast performance for one-quarter-ahead predictions.

The most important economic variable for Germany are exports as the German business model is characterized by selling investment goods abroad. But the same holds true as for equipment investment: the high volatility in export growth makes this economic variable very difficult to predict. The most important indicators are the *ifo Export Expectations* and the *ifo Export Climate*. Ruschinski (2005) and Grimme and Wohlrabe (2014) mainly apply in-sample techniques such as cross-correlations, whereas Elstner *et al.* (2013) and Grimme and Lehmann (2019) apply a forecast experiment. Overall, the ifo indicators are very beneficial instruments for German export growth. On the one hand, they show leading properties and early signal turning points. On the other hand, they generate smaller forecast errors compared to official monthly data such as special trade figures.

Table 6: Forecasting Power of ifo Indicators for Further Economic Aggregates

Article	Transformation	Period	ifo Indicator(s)	Method(s)	Main Result(s)
Gürtler (2004)*	% previous year (Equipment investment)	1993-Q2 – 2003-Q3	BE Leasing	In-sample analysis	Business Expectations Leasing as leading and unerring indicator for investment
Billharz et al. (2012)*,†	% previous quarter (Equipment investment)	1991-Q1 – 2012-Q2	BC IGP, BE IGP	Cross-correlations, Granger Causality, ADL models	Business Climate with contemporaneous correlation and Business Expectations as leading indicator, both Granger-causal, most accurate forecast performance for one-quarter-ahead predictions
Reif and Städtler (2017)*	% previous year (Equipment investment)	2007-Q1 – 2016-Q4	II Leasing	Graphical analysis	Investment Indicator Leasing suitable to trace investment
Wollmershäuser (2018)*	% previous year (Investment)	1992 – 2017	II, II MAN, II TRA, II SER	Graphical analysis, correlations	High correlation coefficients between the ifo Investment Indicators and either total or sub-sector investment
Ruschinski (2005)*	% previous year (Goods exports)	1991-Q1 – 2005-Q1	EXE, EXC	Graphical analysis, cross-correlations	Export Expectations with high contemporaneous and leading correlations, Export Climate with distinct leading properties, both indicators able to track turning points
Elstner et al. (2013)*,†	% previous quarter (Exports)	1991-Q1 – 2012-Q3	EXE, EXC, CO MAN	Cross-correlations, ADL models	ifo indicators with leading properties and lowest forecast errors compared to hard indicators from official statistics
Grimme and Wohlrabe (2014)*	% previous year (Goods exports)	1992-M1 – 2014-M12	EXE	Graphical analysis, cross-correlations	Export Expectations with high contemporaneous correlations and leading properties
Grimme and Lehmann (2019)*,†	% previous quarter (Exports)	1991-Q1 – 2019-Q2	EXC, EXE, FO	Cross-correlations, ADL models (real-time)	Equal performance of ifo indicators compared to quantitative data in the nowcast situation, ifo Export Climate as best performing indicator for one-quarter-ahead predictions
Grimme et al. (2018a,b)†	% previous quarter (Imports)	1996-Q1 – 2016-Q4	IMC	Indicator models, factor models, pooling	Import Climate with the lowest forecast errors for the current and next quarter compared to a magnitude of other survey or hard indicators
Lehmann et al. (2016)†	% previous quarter (Consumption)	1991-Q1 – 2016-Q2	Retail trade and wholesale	ADL models	Business Expectations of retail trade with durable and non-durable goods show highest forecast performance
Knetsch (2005)*,†	cyclical component (Inventories)	1970-Q1 – 2003-Q2	SFP MAN, SFP RT, SFP WS	Cross-correlations, spectral analysis, forecast experiment	ifo Inventories Indicator for the total economy suitable to describe different publication vintages and revisions of inventories, higher forecast performance compared to first release of the Federal Statistical Office of Germany
Abberger and Nierhaus (2015)*	% previous year (Inventories)	1992-Q1 – 2015-Q2	SFP MAN, SFP RT, SFP WS	Graphical analysis, cross-correlations	ifo Inventory Indicator used by the Federal Statistical Office of Germany for their quarterly estimates, lead of 1 quarter
Abberger and Nierhaus (2011)*	cyclical component (BPI, GVA)	2000-Q1 – 2009-Q4	BC I&T	Graphical analysis, cross-correlations	Business Climate with leading properties and signaling of turning points, also leading properties to the cyclical component of business and property income
Abberger (2005a)*	% previous year, cyclical component (PPI)	1991-M1 – 2005-M6	PRE MAN	Graphical analysis, spectral analysis	Price Expectations with a lead of 3-4 months to the producer price index, early signaling of turning points
Lehmann and Wollmershäuser (2017)*,†	% previous year (Prices RT, WS, MAN, CON, CPI)	1992-M1 – 2016-M12	PRE RT, PRE WS, PRE MAN, PRE CON, PRE I&T	Cross-correlations, ADL models	Each Price Expectations as valuable indicator for the single sectors, Price Expectations for the total economy usable as indicator for core inflation

Abbreviations: ADL: Autoregressive Distributed Lags, BC: ifo Business Climate, BE: ifo Business Expectations, BPI: Business and property income, CO: ifo Current Orders, CON: Construction, CPI: Consumer price index, EXC: ifo Export Climate, EXE: ifo Export Expectations, FO: Foreign Orders, GVA: Gross value added, IGP: Investment goods producers, II: ifo Investment Indicator, IMC: ifo Import Climate, I&T: Industry and Trade, MAN: Manufacturing, PPI: Producer price index, PRE: ifo Price Expectations, RT: Retail trade, SER: Services, SFP: ifo Stock of Finished Products, TRA: Trade (wholesale trade and retail sales), WS: Wholesale.
Note: The studies either focus on in-sample (*), out-of-sample (†), or both forms of analyses.

Along the lines of export growth, German import growth is also characterized by a high volatility, thus, leading to large forecast errors. Additionally, there are no leading indicators for imports available to date. Therefore, Grimme *et al.* (2018a,b) established the so-called *ifo Import Climate* and tests its forecasting properties with well-established indicator models. For the current and next quarter, the ifo Import Climate produces the smallest forecast errors and is therefore superior to official data such as special trade figures.

One study exists that focuses on the largest demand-side component of German GDP: private consumption (Lehmann *et al.*, 2016). As the ifo survey focuses on the firm side of the economy, it seems unusual at first to extract indicators to forecast consumer spending. However, if the survey participants from wholesale and retail trade are rational and able to formulate an unbiased assessment of their markets, the ifo indicators from these two branches of the German economy might be helpful to forecast private consumption. Despite the fact that the article by Lehmann *et al.* (2016) focuses on the evaluation of the ifo-internal forecasting approach IFOCAST (see Carstensen *et al.*, 2009), the results reveal a special pattern of the indicators' forecasting performance. The best performing indicators are the *ifo Business Expectations Retail Trade Non-Durable Goods* and the *ifo Business Expectations Retail Trade Durable Goods*. Thus, also the business survey results can be used to formulate unerring forecasts of private consumption.

Many variables that are calculated within the arithmetic of national accounts are not even recognized by academics or the public. One prominent example are inventories that, despite its low level of attention, play a crucial role for regular business cycle diagnoses or analyses. On the one hand, inventories measure the discrepancy between demand and supply. On the other hand, inventories are a central element in business cycle theory. Despite its crucial role, no reliable (leading) indicators for inventories are available which is why this variable is heavily revised over time. Two studies exist that developed and tested an indicator for inventories based on the ifo Business Survey results (see Knetsch, 2005; Abberger and Nierhaus, 2015). The *ifo Stock of Finished Products* indicator, an aggregation of survey results relating to firm-specific stock-keeping in manufacturing and trade, shows leading properties compared to inventories published by the Federal Statistical Office of Germany. The authors follow from their results that the ifo indicator can be used to forecast inventories of the current and next quarter.

Not only inventories are disregarded in the academic and public debate, also the firms' profits are not recognized or analyzed. The main reason might be the missing information on firms profits by the Federal Statistical Office of Germany. Profits are currently calculated as the residual of national income and aggregate wages. As profits are a precarious variable, the ifo Institute consciously asks for business situation and business expectations and let the firms decide how to interpret these two rather abstract concepts. Nevertheless, the ifo Institute wanted to know which economic variable the firms attach to business situation and business expectations. It therefore asked its firms about their associations, which is called

the "ifo Meta Survey" (see Abberger *et al.*, 2009, for results of the German trade sector). The vast majority of respondents declare that they either think of their profit situation or the development of their turnover by answering the ifo questions concerning business situation or business expectations. Based on these insights, Abberger and Nierhaus (2011) studied the statistic connection between the ifo Business Climate Industry and Trade and firms' profits measured as business and property income from German sector accounts. It turns out that the *ifo Business Climate Industry and Trade* has leading properties for the cyclical component of these profits.

The last economic variable in this category are prices either for the whole German economy or its main industries. It is indisputable that inflation is, next to GDP, the most central variable for an economy. One question in the pool of ifo's survey questionnaire is the assessment of firms regarding their price development over the next three months. Two studies exist that test the suitability of this question as leading indicator for the price development of either upstream stages of production (for example, producer price indices in manufacturing) or the consumer price index. Abberger (2005a) as well as Lehmann and Wollmershäuser (2017) conclude that the *ifo Price Expectations* are a suitable indicator to forecast either producer prices in different industries or core inflation for Germany.

4.5. Labor Market Outcomes

The academic literature on forecasting German labor market variables is rather small compared to the studies focusing on GDP. One well-established leading indicator is the *ifo Employment Barometer* as Table 7 shows. Existing studies (to date: 7 articles) mainly focus on three labor market variables: the number of employees subject to social security, the total number of employees and the number of unemployed persons. Vacancies and the unemployment rate only play a minor role. The existing studies apply a large set of methods to investigate the leading properties of the ifo Employment Barometer. They range from simple cross-correlations, over non-parametric regression methods up to forecast experiments.

Overall, the studies focusing on employment development in different industries find a lead of the ifo Employment Barometer for manufacturing; the highest correlation in construction and trade can be found contemporaneously. The ifo Employment Barometer Industry and Trade or for the total German economy (incl. services) is a leading indicator for both the number of employees subject to social security and the total number of employees.

Table 7: Forecasting Power of ifo Indicators for Labor Market Variables

Article	Transformation	Period	ifo Indicator(s)	Method(s)	Main Result(s)
Hott and Kunkel (2004)*	% previous year (Employees, sub-industries)	1998-M12 – 2003-M8	EB I&T, EB MAN, EB CON, EB Trade	Graphical analysis, cross-correlations	Employment Barometer with leading properties in manufacturing, high contemporaneous correlations in the other sectors
Abberger (2005d)*	% previous year (Employees, manufacturing)	1998-M1 – 2005-M3	EB MAN	Graphical analysis	Employment Barometer with leading properties
Abberger (2007)*	% previous year (Employment)	1995-M1 – 2004-M5	EB I&T	Non-parametric regressions, error correction models, probit models	Employment Barometer as valuable leading indicator for employment growth, detection of turning points
Abberger (2008)*	% previous year (Employment)	1998-M1 – 2008-M4	EB I&T	Graphical analysis, cross-correlations	Leading properties of the Employment Barometer, detection of turning points, lead important due to large revisions of employment data
Henzel and Wohlrabe (2014)[†]	various labor market variables	2002-M1 – 2014-M5	EB, EB MAN, EB CON	ADL models	Employment Barometer with leading properties to employment growth and vacancies, worse performance for unemployment compared to the IAB Labour Market Barometer
Hutter and Weber (2015)[†]	% previous year (Unemployment)	2008-M11 – 2012-M6	EB I&T	ADL models	Employment Barometer with high forecasting performance for the number of unemployed, worse performance compared to the IAB Labour Market Barometer
Lehmann and Wohlrabe (2017b)[†]	% previous year (Employment)	2008-M11 – 2015-M11	EB	ADL models	Employment Barometer more accurate to forecast employment growth compared to the IAB Labour Market Barometer

Abbreviations: ADL: Autoregressive Distributed Lags, CON: Construction, EB: ifo Employment Barometer, IAB: Institute for Employment Research, I&T: Industry and Trade, MAN: Manufacturing. *Note:* The studies either focus on in-sample (*), out-of-sample (†), or both forms of analyses.

A very interesting debate on the suitability of the ifo Employment Barometer as leading indicator comprises the studies by Henzel and Wohlrabe (2014), Hutter and Weber (2015) and Lehmann and Wohlrabe (2017b). The most recent study by Lehmann and Wohlrabe (2017b) applies the ifo Employment Barometer and the newly established IAB Labour Market Barometer to forecasting both the number of employees subject to social security and the total number of employees. Both authors find that the ifo Employment Barometer produces, on average, lower forecast errors than the IAB Labour Market Barometer. Henzel and Wohlrabe (2014) instead find via cross-correlations that the statistical relationship between ifo Employment Barometer and the unemployment rate is weaker compared to the relationship between the IAB Labor Market Barometer and the unemployment rate. This result is confirmed by Hutter and Weber (2015) whose forecast experiment reveals that the ifo Employment Barometer is in general a reliable indicator to forecast the unemployment rate but shows larger forecast errors compared to the IAB Labour Market Barometer. All three studies are very plausible as the ifo Employment Barometer focuses on labor demand of German firms, whereas the questionnaire of the IAB Labour Market Barometer asks for the development of the number of unemployed persons. It follows from these studies that the applied forecaster should focus on the *ifo Employment Barometer* when it comes to forecasting the number of employees and the *IAB Labour Market Barometer* when the focus lies on the unemployment rate.

4.6. Supply-side Variables

The main focus in the following section lies on variables representing the supply-side of the German economy. This is mainly motivated by the reason that the ifo Institute surveys firms and therefore collects a large number of supply-side (leading) indicators. The differences compared to Sections 4.1 to 4.3 are that the following studies do not exclusively focus on either GDP or total industrial production. This section rather captures studies evaluating industry-specific variables (for example, machinery and equipment production), studies that focus on domestic trade or articles that examine further supply-side variables (for example, new orders in manufacturing). Table 8 lists the corresponding studies.

The 10 existing studies can be classified into three groups. The first group of studies concentrates on the development in the two industries wholesale and retail trade. The second group is characterized by studies focusing on the performance of industry-specific ifo indicators for economic variables in manufacturing. The third and last group is only represented by the study of Abberger and Nierhaus (2008a) that also concentrates on manufacturing, but applies one of the few quantitative indicators from the ifo Business Survey: capacity utilization of the German manufacturing sector.

Table 8: Forecasting Power of ifo Indicators for Various Supply-side Variables

Article	Transformation	Period	ifo Indicator(s)	Method(s)	Main Result(s)
Goldrian (2003a)†	cyclical component (NO total, sub-industries)	1991-M1 – 2002-M12	industry-specific indicators	ADL models	Different ifo indicators with high forecasting performance for total and industry-specific new orders
Abberger (2005b)*	% previous year (turnover retail trade)	1994-M1 – 2004-M12	BC RT	Graphical analysis	ifo Business Climate suitable as leading indicator for retail trade turnover
Abberger (2005c)*	% previous year (turnover wholesale)	1995-M1 – 2005-M9	BC WS	Graphical analysis	ifo Business Climate suitable as leading indicator for wholesale turnover
Abberger and Nierhaus (2008a)*	cyclical component (GVA MAN)	1978-Q1 – 2008-Q1	CU MAN	Graphical analysis, cross-correlations, spectral analysis	High contemporaneous correlation, ifo Capacity Utilization in manufacturing with early signals of turning points
Scharschmidt and Wohlrabe (2011)†	annualized growth (industrial production 2-digit level)	1994-M1 – 2011-M3	industry-specific indicators	ADL models	ifo indicators beat the autoregressive benchmark model
Kudymowa and Wohlrabe (2014a)*	% previous year (IP and TO printing and reproduction)	1991-M1 – 2013-M11	industry-specific indicators	Cross-correlations	ifo Business Climate in manufacturing as most important leading indicator, lead of 1 month for industrial production and lead of 3 months for turnover, ifo Employment Expectations in manufacturing and ifo Current Orders as further important indicators
Kudymowa and Wohlrabe (2014b)*	% previous year (IP and TO rubber and plastics)	1991-M1 – 2013-M12	industry-specific indicators	Cross-correlations	ifo Business Climate in manufacturing with high contemporaneous correlation, leading properties of 1 month for ifo Development of Production and ifo New Orders
Litsche and Wojciechowski (2016)*	% previous year (IP and TO machinery and equipment)	1991-M1 – 2015-M12	industry-specific indicators	Cross-correlations	ifo New Orders with a lead of 2 months for industrial production in machinery and equipment, ifo Development of Demand with a lead of 2 months for new orders in machinery and equipment
Rumscheidt (2017)*	% previous year (Employment, prices and turnover WS)	1995-M1 – 2017-M3	industry-specific indicators	Cross-correlations	Most important indicators for employment: ifo Business Climate, ifo Business Situation, ifo Business Expectations and ifo Employment Expectations, prices: ifo Development of Prices and ifo Price Expectations, weak performance for turnover
Lehmann and Reif (2020)†	% previous quarter (GVA MAN)	2005-Q1 – 2009-Q2	BC MAN, BS MAN, BE MAN, sub-indices	ADL models (real-time)	ifo headline indices superior compared to the Manufacturing PMI both for the nowcast situation and one-quarter-ahead forecasts

Abbreviations: ADL: Autoregressive Distributed Lags, BC: ifo Business Climate, CU: ifo Capacity Utilization, GVA: Gross value added, IP: Industrial production, MAN: Manufacturing, NO: New orders, PMI: Purchasing Managers Index, RT: Retail trade, TO: Turnover, WS: Wholesale. *Note*: The studies either focus on in-sample (*), out-of-sample (†), or both forms of analyses.

Abberger (2005b,c) started to establish the literature in the first group of studies that tackles the issue of leading indicators for German domestic trade. Both studies investigate the leading properties of ifo indicators and the cyclical component of trade turnover by a graphical analysis. The *ifo Business Climate Retail Trade* and the *ifo Business Climate Wholesale* are characterized as leading indicators for the cyclical component of the corresponding turnover series. The latter result has been partially confirmed by Rumscheidt (2017), who investigates via a cross-correlation analysis the relationship between ifo indicators and prices, employment and turnover in wholesale. She finds the strongest connection between ifo indicators and employment growth. For wholesale prices, the relationship is much weaker. For turnover development it has to be stated that the relationship is very weak, which stands in sharp contrast to Abberger (2005c) who attests the ifo Business Climate wholesale leading properties and thus a qualification as leading indicator. The main reason might be again the differences between the transformation of the series. Whereas Abberger (2005c) applies the cyclical component of turnover in wholesale, Rumscheidt (2017) calculates growth rates to the month of the previous year.

The second group comprises the studies for German manufacturing. An early contribution is the article by Goldrian (2003a) that applies a large set of ifo indicators from manufacturing to forecast new orders for total manufacturing and two sub-industries. His main result is that ifo indicators are very helpful to formulate short-term forecasts for the new orders series for total manufacturing as well as the industry-specific development. Much more comprehensive is the article by Scharschmidt and Wohlrabe (2011). Both authors test the forecasting properties of industry-specific ifo indicators for twenty-two 2-digit-level industries of the German manufacturing industry. It turns out that the industry-specific indicators beat a simple autoregressive benchmark model. The next three articles in this second group (see Kudymowa and Wohlrabe, 2014a,b; Litsche and Wojciechowski, 2016) can be attributed to the 2014 newly established series "ifo Business Survey at a Glance".[8] The three articles exclusively focus on the following industries: printing and reproduction of recorded media (WZ08-C-18 – German Classification of Economic Activities, Edition 2008), manufacture of rubber and plastic products (WZ08-C-22 – German Classification of Economic Activities, Edition 2008) and manufacture of machinery and equipment (WZ08-C-28 – German Classification of Economic Activities, Edition 2008). All three studies apply cross-correlations, either for the whole sample or in a rolling fashion, as method to detect leading properties of the ifo indicators. The most important leading indicator in the articles by Kudymowa and Wohlrabe (2014a,b) is the *ifo Business Climate Manufacturing*. For the sector manufacture of rubber and plastic products also the indicators *ifo Production Development* and *ifo New Orders* are classified as leading indicators. Litsche and Wojciechowski (2016) find for the production index of manufacture of machinery equipment, one of the German key

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[8]It has to be mentioned that the article by Rumscheidt (2017) officially counts to this new series of publications. As it focuses on the first group of supply-side articles, I decided to assign it to this group.

industries, leading properties of the indicator *ifo New Orders*. The last article in this group is the one by Lehmann and Reif (2020) who compare the real-time forecasting power of the ifo headline indices for manufacturing with the Manufacturing PMI by IHS Markit. In a forecast experiment they find that the ifo headline indices (*ifo Business Climate Manufacturing, ifo Business Situation Manufacturing* and *ifo Business Expectations Manufacturing*) are superior to the Manufacturing PMI in the nowcast situation and for one-quarter-ahead predictions.

Abberger and Nierhaus (2008a) builds the last group in this section. Remarkable at this article is the application of one of the few quantitative survey results—capacity utilization in manufacturing—from the ifo Business Survey, whereas the other studies focus on the qualitative results. The authors test the leading properties of capacity utilization for the cyclical component of real gross value added in manufacturing. Based on a graphical analysis, cross-correlations and a spectral analysis they find that the *ifo Capacity Utilization Manufacturing* reliably signals turning points and has a high contemporaneous correlation with gross value added in manufacturing. Since capacity utilization is available at the beginning of each quarter, the high contemporaneous correlation becomes a technical lead as official statistics exhibit a considerable publication lag.

4.7. Service Sector

This section exclusively focuses on the forecast performance of ifo indicators for the German service sector. One could argue that an integration of these studies in Section 4.6 would make sense. However, the service sector still takes a special role in the ifo Business Survey. On the one hand, the service sector survey has been first established in 2001, whereas the other industries are part of the monthly survey for a much longer period. On the other hand, the ifo Institute distinguished between the ifo Business Climate Industry and Trade and the ifo Business Climate Services in its monthly press releases until April 2018. Since then the ifo solely comments on the ifo Business Climate Germany which is the aggregation of the two former mentioned indices (see Sauer and Wohlrabe, 2018a,b). Moreover, the literature on the forecasting power of ifo's service indicators is very young as the time series were too short to estimate meaningful econometric models or to apply standard forecasting techniques.

The small strand of the literature started with the extensive studies by Wohlrabe (2011, 2012). However, I will not summarize these two extensive studies as the number of presented ifo indicators and forecasted series from official statistics are nearly overwhelming. Nevertheless, it can be stated that the ifo indicators for the German service sector exhibit a high forecasting power. Four identified studies followed the articles by Wohlrabe. These are listed in Table 9.

Table 9: Forecasting Power of ifo Indicators for the Service Sector

Article	Transformation	Period	ifo Indicator(s)	Method(s)	Main Result(s)
Wohlrabe and Wojciechowski (2014)*	% previous year (turnover and employment)	2005-Q1 – 2014-Q2	BC SER, BS SER, BE SER, sub-indices	Graphical analysis, cross-correlations	ifo indicators with leading properties for turnover in services, high contemporaneous correlation of ifo indicators with employment
Wojciechowski (2015a)*	% previous year (turnover accommodation and food)	2005-M1 – 2015-M9	industry-specific indicators	Cross-correlations	Highest correlations between ifo indicators and turnover, lead of 1 month, worse performance for employment
Wojciechowski (2015b)*	% previous year (GVA information and communication)	2005-Q1 – 2014-Q4	BC ICT, BS ICT, BE ICT, sub-indices	Cross-correlations	High contemporaneous and leading correlations of various ifo indicators, suitable for forecasting
Lehmann and Reif (2020)†	% previous quarter (GVA SER excl. government)	2005-Q1 – 2009-Q2	BC SER, BS SER, BE SER, sub-indices	ADL models (real-time)	ifo headline indices show a worse performance than the Service Business Activity Index (PMI) by IHS Markit for one-quarter-ahead predictions, ifo indicators slightly better in the nowcast situation

Abbreviations: ADL: Autoregressive Distributed Lags, BC: ifo Business Climate, BE: ifo Business Expectations, BS: ifo Business Situation, GVA: Gross value added, ICT: Information and communication technologies, SER: Services (total sector). *Note:* The studies either focus on in-sample (*), out-of-sample (†), or both forms of analyses.

Wohlrabe and Wojciechowski (2014) again focus on the total service sector. For the period 2005-Q1 to 2014-Q2 they test the forecasting performance of several ifo indicators for real turnover and the number of employees in the service sector. The methods they apply are a graphical analysis and cross-correlations. Overall, the ifo indicators show leading properties and can thus be used for forecasting. The *ifo Business Expectations Services* show the highest correlation with real turnover at a lead of 2 quarters. By investigating the number of employees it turns out that the ifo indicators have the highest correlation contemporaneously. As the statistics for the German service sector are also exposed to large publication lags, the high contemporaneous correlation technically becomes a lead in applied forecasting.

The next two studies for the service sector are those by Wojciechowski (2015a,b). The first of the two articles focuses on gross value added for the sector information and communication (WZ08-J – German Classification of Economic Activities, Edition 2008). Based on cross-correlations, the article reveals that the *ifo Business Climate Information and Communication* has the highest correlation with sectoral gross value added at a lead of one quarter. As highly contemporaneous correlated indicators, the *ifo Business Situation Information and Communication* and the *ifo Employment Expectations Information and Communication* are preferable. The second article by Wojciechowski tests the leading properties of ifo indicators for German accommodation and food service activities (WZ08-I – German Classification of Economic Activities, Edition 2008). Again based on cross-correlations, the *ifo Turnover Expectations Hotel and Restaurant Industry* shows leading properties to year-over-year growth of official turnover in this sector.

The latest article is the one by Lehmann and Reif (2020) which tests the ifo headline indices for the service sector in real-time and compare their performance with the Business Activity Index of IHS Markit. Based on a real-time forecast experiment, it turns out that the IHS Markit indicator for services is better than the ifo headline indices for one-quarter-ahead predictions. In the nowcast situation, the ifo indicators slightly outperform the IHS indicator. Overall, the small number of studies for this sector bear the potential for additional research activities in the future.

4.8. Sub-national Variables

Forecasts for sub-national entities are rather scarce in Germany and not as common as the prediction of German GDP. Also the academic literature was underdeveloped for a long period of time.[9] Nevertheless, sub-national forecasts are important because of, for example, the budget planning of the German states. A state-specific approximation by the total German development might be misleading because of sharp differences in the economic structure across the German states (see Lehmann and Wohlrabe, 2015).

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[9]In the last decade the literature on regional GDP forecasting has noticeably evolved (see Kholodilin *et al.*, 2008; Kopoin *et al.*, 2013; Henzel *et al.*, 2015; Lehmann and Wohlrabe, 2014a,b, 2015, 2017a; Chernis *et al.*, 2020; Claudio *et al.*, 2020).

The ifo Institute provides a large set of indicators for several German states or regional aggregates (see Lehmann *et al.*, 2019). All studies that focus on sub-national entities are listed in Table 10. Based on this compilation, three regions are analyzed in the existing literature: Baden-Württemberg, the Free State of Saxony and Eastern Germany. Goldrian (2003b) investigates the leading properties of ifo indicators for official data for Baden-Württemberg, namely, new orders in manufacturing, nominal turnover in wholesale, current orders in building construction and the number of employees subject to social security in manufacturing. The industry-specific ifo indicators—the *ifo Demand Development Manufacturing Baden-Württemberg*, the *ifo Turnover Development Wholesale Baden-Württemberg*, the *ifo Current Orders Construction Baden-Württemberg* and the *ifo Employment Expectations Manufacturing Baden-Württemberg*—serve as leading indicators for the industry-specific target series. Moreover, the indicators early detect turning points.

Compared to the previous mentioned studies that focus on Baden-Württemberg, Vogt (2008) and Lehmann *et al.* (2010) test the performance of ifo indicators for the Free State of Saxony. Both articles are based on graphical analyses and cross-correlations. Vogt (2008) introduces an ifo Employment Barometer for Saxony. He finds that this barometer for Saxony shows a high contemporaneous correlation with the monthly year-over-year growth rate of Saxon employment subject to social security. Nevertheless, the analysis reveals that the correlations remain high until a lead of the *ifo Employment Barometer Saxony* up to six months, which is why the indicator can also be used for forecasting purposes. Lehmann *et al.* (2010) explicitly focus on the period around and in the great recession (2007-M1 to 2009-M12). They ask whether the ifo indicators for Saxon manufacturing lose their leading properties in this period of time or not. The results reveal that both the *ifo Business Climate Manufacturing Saxony* and the *ifo Business Climate Machinery and Equipment Saxony* remain reliable leading indicators during the crisis. For total Saxon manufacturing, the ifo indicator shows a lead of 1 month to new orders and 2 months to turnover. The lead becomes 3 month to turnover in the Saxon machinery and equipment sector. In contrast, the ifo indicators shows lagging properties for new orders in the Saxon machinery and equipment sector. This lag is, nevertheless, compensated by the early availability of the ifo indicators.

Table 10: Forecasting Power of ifo Indicators for Sub-national Variables

Article	Transformation	Period	ifo Indicator(s)	Method(s)	Main Result(s)
Goldrian (2003b)*	cyclical component (BW: NO MAN, TO WS, NO CON, employm. MAN)	1990-M1 – 2003-M5	BW: DD MAN, TOD WS, CO CON, EE MAN	Graphical analysis	ifo indicators precisely reproduce the cyclical components, early detection of turning points, ifo indicators with leading properties for data of Baden-Württemberg
Vogt (2008)*	% previous year (SX: employm.)	1999-M6 – 2008-M1	SX: EB I&T	Graphical analysis, cross-correlations	ifo Employment Barometer for Saxony as leading indicator for Saxon employment growth
Lehmann (2010)*	% previous year (EG: employm.)	1999-M6 – 2010-M3	EG: EB I&T	Graphical analysis, cross-correlations	ifo Employment Barometer for Eastern Germany as leading indicator for Eastern German employment growth
Lehmann et al. (2010)*	cyclical component (SX: NO and TO MAN, NO and TO machinery and equipment)	2007-M1 – 2009-M12	SX: BC MAN, BC ME	Graphical analysis, cross-correlations	ifo Business Climate for Saxon manufacturing with leading properties of 1 month for new orders and 2 months for turnover, ifo Business Climate for Saxon mechanical engineering with leading properties of 3 months for turnover, but lags behind new orders
Lehmann et al. (2014)*	% previous year (SX, EG: TO MAN, TO CON)	1995-M1 – 2014-M6	SX, EG: BC, BS, BE (MAN, CON)	Cross-correlations, Granger Causality	Strong connection between the three ifo indicators and official data in manufacturing with leading properties, ifo indicators as leading indicators for construction
Claudio et al. (2020)†	% previous year (EG: GDP)	1996-Q1 – 2018-Q4	EG: BC, BS, BE (MAN, CON, RT, WS, I&T)	MIDAS models, forecast averaging	The ifo survey results from Eastern German retail trade are the best performing indicators, in addition to the ifo Business Climate for the Eastern German manufacturing sector

Abbreviations: BC: ifo Business Climate, BE: ifo Business Expectations, BS: ifo Business Situation, BW: Baden-Württemberg, CO: ifo Current Orders, CON: Construction, DD: ifo Demand Development, EB: ifo Employment Barometer, EE: ifo Employment Expectations, EG: Eastern Germany (except Berlin), I&T: Industry and trade, MAN: Manufacturing, ME: Mechanical Engineering, MIDAS: Mixed data sampling, NO: New orders, RT: Retail trade, SX: Free State of Saxony, TO: Turnover, TOD: ifo Turnover Development, WS: Wholesale. *Note:* The studies either focus on in-sample (∗), out-of-sample (†), or both forms of analyses.

The last two studies that are assigned to this section are the ones by Lehmann (2010) and Lehmann *et al.* (2014). Both studies can be seen as follow-up articles to Vogt (2008) and Lehmann *et al.* (2010). The idea of an ifo Employment Barometer Saxony is transferred to Eastern Germany in Lehmann (2010). Indeed he finds that the *ifo Employment Barometer Eastern Germany* is a leading indicator for local employment growth. The highest correlation is observable at a lead of three months to the monthly year-over-year growth rate of Eastern German employment subject to social security. Lehmann *et al.* (2014) modify the study by Lehmann *et al.* (2010) in two dimensions. First, they relinquish on the exclusive focus on the global 2008/2009 economic crisis. Second, they additionally broaden the focus of the study on Eastern Germany and the construction sector. Overall, the regional ifo indicators have leading properties, whereas the statistical connection is higher for Eastern Germany compared to the Free State of Saxony. The highest correlations for the manufacturing sector can be found for the *ifo Business Expectations Manufacturing Eastern Germany* or the *ifo Business Expectations Manufacturing Saxony*. The connection between the ifo indicators and official statistics become weaker by focusing on the construction sector. Nevertheless, the user might focus on the *ifo Business Situation Construction Eastern Germany* or *ifo Business Situation Construction Saxony*.

Next to the leading properties of the ifo indicators, they also play a key role for regional economic analysis. On the one hand, important business cycle indicators such as industrial production are not regularly published by official statistics for all German states. On the other hand, regional statistics exhibit a higher publication lag compared to their German counterpart. Political decision-maker, however, need early and reliable sources for the current economic development. Such a source might be the regional ifo Business Survey as it produces early available leading indicators to assess the local business cycle development.

4.9. Data Revisions

In this section I do not focus on the forecasting performance of the ifo indicators for official statistics but rather on their revisions over time. Revisions of economic variables usually take place because of incomplete information of the Federal Statistical Office of Germany. The reasons for revisions are manifold and not only driven by incomplete information: new classifications, protection of data privacy, new aggregation methods etc. In advance, one can ask why we should focus on this strand of the literature and why should there be a connection between revisions and leading indicators. One answer lies in the composition of the samples. In case that the ifo sample is representative for the German economy but the sample of the Federal Statistical Office of Germany for its first release is not, the ifo indicators should be able to track each revision taking place due to new data entering the official series. This suggestion seems to be supported by looking at the articles in Table 11.

Table 11: Power of ifo Indicators to Predict Revisions

Article	Transformation	Period	ifo Indicator(s)	Method(s)	Main Result(s)
Jacobs and Sturm (2005)*,†	% previous month (IP)	1995-M12 – 2003-M8	BS MAN, PR MAN	Regressions, ADL models	ifo Business Situation can explain revisions, higher performance compared to final vintage of industrial production
Boysen-Hogrefe and Neuwirth (2012)*,†	% previous quarter (GDP)	1992-Q1 – 2007-Q2	BS I&T	Test on forecast rationality, ADL models	ifo Business Situation with valuable information to forecast GDP revisions
Bührig and Wohlrabe (2015, 2016)*,†	% previous month (IP)	2001-M6 – 2013-M4	BS MAN, PR MAN	Regressions, ADL models	ifo Business Situation can explain revisions for different vintages, models with the ifo Business Situation perform better compared to simple benchmark models
Wollmershäuser (2016)*	% previous quarter (Inventories)	1991-Q1 – 2015-Q2	SFP MAN	Cross-correlations, regressions	ifo Inventories indicator can explain revisions of nominal inventories, usable for forecasting

Abbreviations: ADL: Autoregressive Distributed Lags, BS: ifo Business Situation, IP: Industrial production, I&T: Industry and trade, PR: ifo Production Realizations, MAN: Manufacturing, SFP: ifo Stock of Finished Products. *Note*: The studies either focus on in-sample (*), out-of-sample (†), or both forms of analyses.

Jacobs and Sturm (2005) as well as Bührig and Wohlrabe (2015, 2016) analyze the revisions in industrial production for different time periods. Strictly speaking, the articles by Bührig and Wohlrabe are follow-up studies to the one by Jacobs and Sturm as they explicitly rely on that article. This is why Bührig and Wohlrabe can investigate whether the results of Jacobs and Sturm are stable over time or only hold for their investigated time period. All three studies find that the *ifo Business Situation Manufacturing* is the best indicator to forecast revisions in industrial production, thus, Bührig and Wohlrabe confirm the findings of Jacobs and Sturm as they also apply the same methodological approaches.

Boysen-Hogrefe and Neuwirth (2012) focus on quarterly GDP growth instead of monthly IP growth. They show that the *ifo Business Situation Industry and Trade* exhibits a high informative content for revisions in German GDP and can thus be used to early asses and forecast its changes due to new data material.

The last article in this section is the one by Wollmershäuser (2016). In Section 4.4 I presented the studies that focus on the forecasting performance of ifo indicators for changes in quarterly inventories. Wollmershäuser (2016), however, analyzes the indicators' power to predict the revisions in inventories. He bases his analysis on cross-correlations and a battery of regressions and shows that the *ifo Stock of Finished Products Manufacturing* indicator has high explanatory power for the patterns in inventory revisions. Similar to the service sector, this field of research seems promising in the future.

5. Conclusion

The overall conclusion on the forecasting power of the ifo indicators turns out to be very positive. Table 12 summarizes the main ifo indicators that have been proven in the literature to be good leading indicators. The spectrum of economic variables that can be forecasted by using ifo indicators ranges from GDP over supply- and demand-side variables up to labor market outcomes and industry-specific figures. Apart from the performance for the German economy, the ifo Institute also publishes its indicators for the German states. A small but growing literature certifies the regional ifo indicators a high forecasting performance.

What remains in the end is an enumeration of current developments in the academic literature and an outlook. Obviously, the ifo indicators incorporate a high forecasting power for various economic variables of Germany. The current literature, however, rather deals with the development of new methods for large data sets instead of analyzing single indicators. This is highly connected with the keyword 'Big Data'. Next to rather traditional methods such as factor models of forecast combinations ('Pooling of Forecasts'), new methods such as Boosting, Neural Networks, Least-Angle Regressions (LARS), Machine Learning Algorithms etc. are established in the recent academic literature. It is, however, unclear whether there is an overall superior method or how these methods behave in different phases of the business cycle. The ifo Business Survey is a source of large data and it might be an interesting

research field to check whether such a mass of data is really able to significantly reduce the forecast errors compared to rather simple methods.

Another field of research might be the dating of turning points for the German economy over a longer period of time. The main advantage of the ifo Business Survey compared to official statistics is the consistency of its questionnaire over time. The question regarding the current business situation is the same since more than 40 years. Official statistics, however, are always subject to changes in classifications, methodological improvements, regional boundaries etc. which leads to continuous data revisions. This might be one of the main reasons why most of the time series for Germany are only available since reunification. The advantage of the consistency in the ifo Business Survey can be used to publish a German / Western German business cycle chronology since the 1960s. Sommer and Wohlrabe (2016a,b) worked up old data sets of the ifo Institute and published long time series for the different main industries; Sauer (2020) provides an overview of the pool of available time series. For the four main industries, the following starting points of data are available: construction 1963-M1, retail trade and wholesale 1960-M1, manufacturing 1962-M1 (see Sommer and Wohlrabe, 2016b). Next to the simple dating of turning points, one could also execute—given longer series of official statistics—forecast experiments based on longer time series.

Directly connected to the dating of turning points is the calculation of potential output and the corresponding output gap. Official statistics do not provide any measure on the capacity utilization of an economy. The ifo Institute introduced such a measure based on survey data (see Wohlrabe and Wollmershäuser, 2017b). Similar to the study by Abberger and Nierhaus (2008a), follow-up studies can test the leading properties of this newly developed indicator.

Furthermore, the literature on regional economic forecasting can be extended to the Free State of Bavaria and North Rhine-Westphalia as for these German states longer survey time series are available from the ifo Institute. Currently, only studies focusing on Baden-Württemberg, the Free State of Saxony or Eastern Germany are available. The main challenge is to find suitable target series to forecast from official statistics. Unfortunately, regional industrial production is only officially available for a small number of German states and regional real GDP is only published on an annual frequency. As business cycle analysis and forecasts are highly interesting for regional decision-maker, an extension of available data for the German states would be preferable.

The last point in this outlook deals again with the transformation of the target series to forecast. All ifo indicators are, by definition and how they are calculated, business cycle indicators. Every user that applies ifo indicators to forecast economic variables should transform the indicators in the following way to not suppress their leading properties: cyclical component target series ⇒ levels ifo indicator, annual growth target series ⇒ annual differences ifo indicator, and quarterly growth target series ⇒ quarterly differences ifo indicator. Future studies might set up a forecasting experiment that compares the outcomes of a forecast

either based on the disaggregation into cycle and trend or based on the conventional way via quarter-over-quarter growth rates. Maybe the very good forecasting properties of the ifo indicators can further be improved by moving in this direction of analysis.

Table 12: Summary of the Forecasting Power of ifo Indicators for Various Target Series

Target Series	ifo Indicator(s)
Real GDP	ifo Business Climate Industry and Trade, ifo Business Situation Industry and Trade, ifo Business Expectations Industry and Trade
Industrial Production	ifo Business Climate Manufacturing, ifo indicators for real GDP
Real Equipment Investment	ifo Business Climate Investment Goods Producers, ifo Business Expectations Investment Goods Producers, ifo Business Expectations Leasing, ifo Investment Indicator Leasing
Real Exports	ifo Export Expectations, ifo Export Climate
Real Imports	ifo Import Climate
Real Private Consumption	ifo Business Expectations Retail Trade Durable Goods, ifo Business Expectations Retail Trade Non-Durable Goods
Inventories	ifo Inventories Indicator
Business and Property Income	ifo Business Climate Industry and Trade
Prices (Producer or Consumer)	ifo Price Expectations (sub-indices or industry and trade)
Employment Subject to Social Security	ifo Employment Barometer (sub-indices or total)
Total Employment	ifo Employment Barometer (sub-indices or total)
Turnover (Retail Trade, Wholesale, Accommodation and Food Service, Services)	ifo Business Climate Retails Sales, ifo Business Climate Wholesale Trade, ifo Turnover Expectations Accommodation and Food Service, ifo Business Expectations Services
Production of various industries	ifo Business Climate Manufacturing and sub-industries, ifo Production Expectations, ifo Current Orders
Real GVA Manufacturing	ifo Capacity Utilization Manufacturing
Real GVA Information and Communication	ifo Business Climate Information and Communication
Economic Variables Baden-Württemberg	ifo Demand Situation Manufacturing, ifo Turnover Development Wholesale, ifo Current Orders Construction, ifo Employment Expectations (all measured for Baden-Württemberg)
Economic Variables Saxony	ifo Employment Barometer, ifo Business Climate Manufacturing, ifo Business Expectations Manufacturing, ifo Business Climate Machinery and Equipment, ifo Business Situation Construction (all measured for Saxony)
Economic Variables Eastern Germany	ifo Employment Barometer, ifo Business Expectations Manufacturing, ifo Business Situation Construction (all measured for Eastern Germany)
Revisions (GDP, IP, Inventories)	ifo Business Situation Industry and Trade, ifo Business Situation Manufacturing, ifo Inventories Indicator Manufacturing

References

Abberger, K. (2004). Nonparametric Regression and the Detection of Turning Points in the Ifo Business Climate, CESifo Working Paper No. 1283.

— (2005a). Ein Vergleich der Zeitreihen der Erzeugerpreise und der Preiserwartungen im ifo Konjunkturtest für das verarbeitende Gewerbe. *ifo Schnelldienst*, **58** (14), 50–51.

— (2005b). Eine Anmerkung zum ifo Geschäftsklima im Einzelhandel. *ifo Schnelldienst*, **58** (3), 31–32.

— (2005c). Eine Anmerkung zum ifo Geschäftsklima im Großhandel. *ifo Schnelldienst*, **58** (21), 47–48.

— (2005d). ifo Konjunkturtest zeigt noch kein Ende des Beschäftigtenabbaus im verarbeitenden Gewerbe an. *ifo Schnelldienst*, **58** (7), 44.

— (2006a). ifo Geschäftsklima und Produktionsindex im verarbeitenden Gewerbe. *ifo Schnelldienst*, **59** (21), 42–45.

— (2006b). Qualitative Business Surveys in Manufacturing and Industrial Production – What can be Learned from Industry Branch Results?, ifo Working Paper No. 31.

— (2007). Qualitative business surveys and the assessment of employment – A case study for Germany. *International Journal of Forecasting*, **23** (2), 249–258.

— (2008). Das ifo Beschäftigungsbarometer: Ein Druckmesser für den deutschen Arbeitsmarkt. *ifo Schnelldienst*, **61** (9), 19–22.

—, Birnbrich, M. and Seiler, C. (2009). Der „Test der Tests" im Handel – eine Metaumfrage zum ifo Konjunkturtest. *ifo Schnelldienst*, **62** (21), 34–41.

—, Flaig, G. and Nierhaus, W. (eds.) (2007). *ifo Konjunkturumfragen und Konjunkturanalyse: Ausgewählte methodische Aufsätze aus dem ifo Schnelldienst*. ifo Forschungsberichte No. 33, ifo Institute, Munich.

— and Nierhaus, W. (2007a). Das ifo Geschäftsklima: Ein zuverlässiger Frühindikator der Konjunktur. *ifo Schnelldienst*, **60** (5), 25–30.

— and — (2007b). Das ifo Geschäftsklima und Wendepunkte der deutschen Konjunktur. *ifo Schnelldienst*, **60** (3), 26–31.

— and — (2008a). Die ifo Kapazitätsauslastung – ein gleichlaufender Indikator der deutschen Industriekonjunktur. *ifo Schnelldienst*, **61** (16), 15–23.

— and — (2008b). Die ifo Konjunkturuhr: Ein Präzisionswerk zur Analyse der Wirtschaft. *ifo Schnelldienst*, **61** (23), 16–24.

— and — (2008c). Markov-Switching und ifo Geschäftsklima. *ifo Schnelldienst*, **61** (10), 25–30.

— and — (2010a). Die ifo Konjunkturuhr: Zirkulare Korrelation mit dem Bruttoinlandsprodukt. *ifo Schnelldienst*, **63** (5), 32–43.

— and — (2010b). Markov-Switching and the Ifo Business Climate: The Ifo Business Cycle Traffic Lights. *OECD Journal: Journal of Business Cycle Measurement and Analysis*, **7** (2), 1–13.

— and — (2010c). The Ifo Business Cycle Clock: Circular Correlation with the Real GDP, CESifo Working Paper No. 3179.

— and — (2011). ifo Geschäftsklima, Produktion und Ertragslage in der gewerblichen Wirtschaft. *ifo Schnelldienst*, **64** (3), 21–24.

— and — (2015). Vorratsinvestitionen im Spiegel der Statistik. *ifo Schnelldienst*, **68** (15), 33–37.

— and WOHLRABE, K. (2006). Einige Prognoseeigenschaften des ifo Geschäftsklimas – Ein Überblick über die neuere wissenschaftliche Literatur. *ifo Schnelldienst*, **59** (22), 19–26.

AUERSWALD, H. and LEHMANN, R. (2011). Auswirkungen des Klimawandels auf das Verarbeitende Gewerbe – Ergebnisse einer Unternehmensbefragung. *ifo Dresden berichtet*, **18** (2), 16–22.

BANDHOLZ, H. and FUNKE, M. (2003). In Search of Leading Indicators of Economic Activity in Germany. *Journal of Forecasting*, **22** (4), 277–297.

BENNER, J. and MEIER, C.-P. (2004). Prognosegüte alternativer Frühindikatoren für die Konjunktur in Deutschland. *Journal of Economics and Statistics*, **224** (6), 639–652.

— and — (2005). Was leisten Stimmungsindikatoren für die Prognose des realen Bruttoinlandsprodukts in Deutschland? Eine Echtzeit-Analyse. *Die Weltwirtschaft*, **56** (3), 341–355.

BERLEMANN, M., JAHN, V. and LEHMANN, R. (2018). Auswege aus dem Dilemma der empirischen Mittelstandsforschung. *ifo Schnelldienst*, **71** (23), 22–28.

BILLHARZ, A., ELSTNER, S. and JÜPPNER, M. (2012). Methoden der ifo Kurzfristprognose am Beispiel der Ausrüstungsinvestitionen. *ifo Schnelldienst*, **65** (21), 24–33.

Boysen-Hogrefe, J. and Neuwirth, S. (2012). The Impact of Seasonal and Price Adjustments on the Predictability of German GDP Revisions, Kiel Working Paper 1753.

Breitung, J. and Jagodzinski, D. (2001). Prognoseeigenschaften alternativer Indikatoren für die Konjunkturentwicklung in Deutschland. *Konjunkturpolitik*, **47** (4), 292–314.

Bührig, P. and Wohlrabe, K. (2015). Revisionen der deutschen Industrieproduktion und die ifo Indikatoren. *ifo Schnelldienst*, **68** (21), 27–31.

— and — (2016). Forecasting Revisions of German Industrial Production. *Applied Economics Letters*, **23** (15), 1062–1064.

Carstensen, K., Heinrich, M., Reif, M. and Wolters, M. H. (2020). Predicting Ordinary and Severe Recessions with a Three-State Markov-Switching Dynamic Factor Model: An Application to the German Business Cycle. *International Journal of Forecasting*, **forthcoming**.

—, Henzel, S. R., Mayr, J. and Wohlrabe, K. (2009). IFOCAST: Methoden der ifo-Kurzfristprognose. *ifo Schnelldienst*, **62** (23), 15–28.

Chernis, T., Cheung, C. and Velasco, G. (2020). A three-frequency dynamic factor model for nowcasting Canadian provincial GDP growth. *International Journal of Forecasting*, **forthcoming**.

Claudio, J. C., Heinisch, K. and Holtemöller, O. (2020). Nowcasting East German GDP growth: a MIDAS approach. *Empirical Economics*, **58**, 29–54.

Döpke, J. (1999). Predicting Germany's recessions with leading indicators: Evidence from probit models, Kiel Working Paper No. 944.

Drechsel, K. and Scheufele, R. (2012a). The Financial Crisis from a Forecaster's Perspective. *Kredit und Kapital*, **45** (1), 1–26.

— and — (2012b). The performance of short-term forecasts of the German economy before and during the 2008/2009 recession. *International Journal of Forecasting*, **28** (2), 428–445.

Dreger, C. and Schumacher, C. (2005). Out-of-sample Performance of Leading Indicators for the German Business Cycle: Single vs. Combined Forecasts. *Journal of Business Cycle Measurement and Analysis*, **2** (1), 71–87.

Elstner, S., Grimme, C. and Haskamp, U. (2013). Das ifo Exportklima – ein Frühindikator für die deutsche Exportprognose,. *ifo Schnelldienst*, **66** (4), 36–43.

European Commission (2007). Commission regulation (EC) No 656/2007, Brussels, available at: `https://eur-lex.europa.eu/eli/reg/2007/656/oj`.

Federal Statistical Office of Germany (2008). Classification of Economic Activities, Edition 2008 (WZ 2008), Wiesbaden, available at: `https://www.destatis.de/DE/Methoden/Klassifikationen/Gueter-Wirtschaftsklassifikationen/Downloads/klassifikation-wz-2008-englisch.html`.

Fritsche, U. (1999). Vorlaufeigenschaften von Ifo-Indikatoren für Westdeutschland, DIW Diskussionspapier Nr. 179.

— and Kuzin, V. (2005). Prediction of Business Cycle Turning Points in Germany. *Journal of Economics and Statistics*, **225** (1), 22–43.

— and Stephan, S. (2002). Leading Indicators of German Business Cycles: An Assessment of Properties. *Journal of Economics and Statistics*, **222** (3), 289–315.

Funke, M. (1997). Predicting Recessions: Some Evidence for Germany. *Weltwirtschaftliches Archiv*, **133** (1), 90–102.

Goldrian, G. (2003a). Kurzfristige Branchenprognosen auf Basis von Ergebnissen des ifo Konjunkturtests. *ifo Schnelldienst*, **56** (8), 31–33.

— (2003b). Zur Aussagekraft der Ergebnisse des ifo Konjunkturtests auf regionaler Ebene. *ifo Schnelldienst*, **56** (11), 30–33.

Grimme, C. and Lehmann, R. (2019). The ifo Export Climate – A Leading Indicator to Forecast German Export Growth. *CESifo Forum*, **20** (4), 36–42.

—, — and Nöller, M. (2018a). Das ifo Importklima – ein erster Frühindikator für die Prognose der deutschen Importe. *ifo Schnelldienst*, **71** (12), 27–32.

—, — and — (2018b). Forecasting Imports with Information from Abroad, CESifo Working Paper No. 7079.

—, Seiler, C. and Wohlrabe, K. (2014). Der Konflikt in der Ukraine und die Ergebnisse der ifo Unternehmensbefragungen. *ifo Schnelldienst*, **67** (18), 46–48.

— and Wohlrabe, K. (2014). Die ifo Exporterwartungen – ein neuer Indikator zur Lage der Exportindustrie in Deutschland. *ifo Schnelldienst*, **67** (23), 64–65.

Gürtler, J. (2004). Ein Frühindikator für die Ausrüstungsinvestitionen. In G. Goldrian (ed.), *Handbuch der umfragebasierten Konjunkturforschung*, ifo Beiträge zur Wirtschaftsforschung 15, ifo Institute, Munich, pp. 359–363.

Hartmann, N., Schmidt, J. and Oltmanns, E. (2005). Schnellschätzungen für das Bruttoinlandsprodukt: Ergebnisse einer Machbarkeitsstudie. *Wirtschaft und Statistik*, **7**, 682–699.

HEINISCH, K. and SCHEUFELE, R. (2019). Should Forecasters Use Real-Time Data to Evaluate Leading Indicator Models for GDP Prediction? German Evidence. *German Economic Review*, **20** (4), e170–e200.

HENZEL, S. and WOHLRABE, K. (2014). Das ifo Beschäftigungsbarometer und der deutsche Arbeitsmarkt. *ifo Schnelldienst*, **67** (15), 35–40.

HENZEL, S. R., LEHMANN, R. and WOHLRABE, K. (2015). Nowcasting Regional GDP: The Case of the Free State of Saxony. *Review of Economics*, **66** (1), 71–98.

— and RAST, S. (2013). Prognoseeigenschaften von Indikatoren zur Vorhersage des Bruttoinlandsprodukts in Deutschland. *ifo Schnelldienst*, **66** (17), 39–46.

HINZE, J. (2003). Prognoseleistung von Frühindikatoren: Die Bedeutung von Frühindikatoren für Konjunkturprognosen – Eine Analyse für Deutschland, HWWA Discussion Paper 236.

HOTT, C. and KUNKEL, A. (2004). Ein ifo Beschäftigungsindikator. *ifo Schnelldienst*, **57** (6), 53–57.

—, — and NERB, G. (2004). Die Eignung des ifo Geschäftsklimas zur Prognose von konjunkturellen Wendepunkten. In G. Goldrian (ed.), *Handbuch der umfragebasierten Konjunkturforschung*, ifo Beiträge zur Wirtschaftsforschung 15, ifo Institute, Munich, pp. 334–358.

HÜFNER, F. P. and SCHRÖDER, M. (2002a). Forecasting Economic Activity in Germany – How Useful are Sentiment Indicators?, ZEW Discussion Paper No. 02-56.

— and — (2002b). Prognosegehalt von ifo-Geschäftserwartungen und ZEW-Konjunkturerwartungen: Ein ökonometrischer Vergleich. *Journal of Economics and Statistics*, **222** (3), 316–336.

HUTTER, C. and WEBER, E. (2015). Constructing a new leading indicator for unemployment from a survey among German employment agencies. *Applied Economics*, **47** (33), 3540–3558.

JACOBS, J. and STURM, J.-E. (2005). Do Ifo Indicators Help Explain Revisions in German Industrial Production? In J.-E. Sturm and T. Wollmershäuser (eds.), *Ifo Survey Data in Business Cycle and Monetary Policy Analysis*, Physica-Verlag, Heidelberg, pp. 93–114.

KHOLODILIN, K. A., KOOTHS, S. and SILIVERSTOVS, B. (2008). A Dynamic Panel Data Approach to the Forecasting of the GDP of German Länder. *Spatial Economic Analysis*, **3** (2), 195–207.

— and SILIVERSTOVS, B. (2006). On the Forecasting Properties of the Alternative Leading Indicators for the German GDP: Recent Evidence. *Journal of Economics and Statistics*, **226** (3), 234–259.

KNETSCH, T. A. (2005). Evaluating the German Inventory Cycle Using Data from the Ifo Business Survey. In J.-E. Sturm and T. Wollmershäuser (eds.), *Ifo Survey Data in Business Cycle and Monetary Policy Analysis*, Physica-Verlag, Heidelberg, pp. 61–92.

KOPOIN, A., MORAN, K. and PARÉ, J.-P. (2013). Forecasting Regional GDP with Many Factor Models: How Useful are National and International Data? *Economics Letters*, **121** (2), 267–270.

KROLAGE, C. and WOHLRABE, K. (2018). Auswirkungen der US-Steuerreform auf deutsche Unternehmen – Ergebnisse einer Unternehmensumfrage. *ifo Schnelldienst*, **71** (7), 74–76.

KUDYMOWA, E. and WOHLRABE, K. (2014a). Konjunkturtest im Fokus: Die Herstellung von Druckerzeugnissen; Vervielfältigung von bespielten Ton-, Bild- und Datenträgern. *ifo Schnelldienst*, **67** (6), 31–35.

— and — (2014b). Konjunkturtest im Fokus: Herstellung von Gummi- und Kunststoffwaren. *ifo Schnelldienst*, **67** (7), 23–26.

LANGMANTEL, E. (1999). Das ifo Geschäftsklima als Indikator für die Prognose des Bruttoinlandsprodukts. *ifo Schnelldienst*, **52** (16–17), 16–21.

— (2004). Kann der Geschäftsklima-Indikator einen Beitrag zur kurzfristigen Prognose des BIP leisten? In G. Goldrian (ed.), *Handbuch der umfragebasierten Konjunkturforschung*, ifo Beiträge zur Wirtschaftsforschung 15, ifo Institute, Munich, pp. 319–333.

LEHMANN, R. (2010). Der ostdeutsche Arbeitsmarkt: Kann das ifo Beschäftigungsbarometer dessen konjunkturelle Dynamik abbilden? *ifo Dresden berichtet*, **17** (6), 27–32.

—, LEISS, F., LITSCHE, S., SAUER, S., WEBER, M., WEICHSELBERGER, A. and WOHLRABE, K. (2019). Mit den ifo-Umfragen regionale Konjunktur verstehen. *ifo Schnelldienst*, **72** (9), 45–49.

—, NIERHAUS, W. and REIF, M. (2016). Eine Flash-Schätzung für die privaten Konsumausgaben in Deutschland. *ifo Schnelldienst*, **69** (21), 36–41.

— and REIF, M. (2020). Tracking and Predicting the German Economy: ifo vs. PMI, CESifo Working Paper No. 8145.

—, SHARIK, A. and WEBER, M. (2014). Der Erklärungsgehalt der regionalen ifo-Indikatoren am Beispiel der Industrie- und Bauumsätze. *ifo Dresden berichtet*, **21** (4), 18–24.

—, SPEICH, W.-D., STRAUBE, R. and VOGT, G. (2010). Funktioniert der ifo Konjunktur-test auch in wirtschaftlichen Krisenzeiten? Eine Analyse der Zusammenhänge zwischen ifo Geschäftsklima und amtlichen Konjunkturdaten für Sachsen. *ifo Dresden berichtet*, **17** (3), 8–14.

— and WOHLRABE, K. (2014a). Forecasting gross value-added at the regional level: Are sectoral disaggregated predictions superior to direct ones? *Review of Regional Research*, **34** (1), 61–90.

— and — (2014b). Regional Economic Forecasting: State-of-the-Art Methodology and Future Challenges. *Economics and Business Letters*, **3** (4), 218–231.

— and — (2015). Forecasting GDP at the regional level with many predictors. *German Economic Review*, **16** (2), 226–254.

— and — (2017a). Boosting and regional economic forecasting: The case of Germany. *Letters in Spatial and Resource Sciences*, **10** (2), 161–175.

— and — (2017b). Experts, firms, consumers or even hard data? Forecasting employment in Germany. *Applied Economics Letters*, **24** (4), 279–283.

— and WOLLMERSHÄUSER, T. (2017). Die Inflation kommt zurück! Immer mehr Firmen in Deutschland wollen ihre Preise anheben. *ifo Schnelldienst*, **70** (5), 16–21.

LITSCHE, S. and WOJCIECHOWSKI, P. (2016). Konjunkturtest im Fokus: Maschinenbau. *ifo Schnelldienst*, **69** (5), 33–37.

MARJENKO, A., SAUER, S. and WOHLRABE, K. (2020). Methodische Grundlagen der ifo Befragungen. In S. Sauer and K. Wohlrabe (eds.), *ifo Handbuch der Konjunkturumfragen*, ifo Beiträge zur Wirtschaftsforschung 88, ifo Institute, Munich, pp. 9–28.

NIERHAUS, W. and ABBERGER, K. (2014). Zur Prognose von konjunkturellen Wendepunkten: Dreimal-Regel versus Markov-Switching. *ifo Schnelldienst*, **67** (16), 21–25.

— and — (2015). ifo Konjunkturampel revisited. *ifo Schnelldienst*, **68** (5), 27–32.

— and STURM, J.-E. (2004). Methoden der Wirtschaftsprognose und Konjunkturindikatoren. In G. Goldrian (ed.), *Handbuch der umfragebasierten Konjunkturforschung*, ifo Beiträge zur Wirtschaftsforschung 15, ifo Institute, Munich, pp. 273–301.

REIF, M. and STÄDTLER, A. (2017). Gute Konjunkturaussichten noch kein Treiber für die Investitionen. *ifo Schnelldienst*, **70** (9), 43–47.

RUMSCHEIDT, S. (2017). Die ifo Konjunkturumfrage im Großhandel – Frühindikator für die wirtschaftliche Entwicklung der Branche? *ifo Schnelldienst*, **70** (11), 49–54.

RUSCHINSKI, M. (2005). Die Rolle von Frühindikatoren bei Exportprognosen. *ifo Schnelldienst*, **58** (13), 13–19.

SAUER, S. (2020). ifo Konjunkturumfragen: Ein Überblick über die verfügbaren Zeitreihen. *ifo Schnelldienst*, **73** (2), 45–48.

—, WEBER, M. and WOHLRABE, K. (2018). Das neue ifo Geschäftsklima Ostdeutschland und Sachsen: Hintergründe und Anpassungen. *ifo Dresden berichtet*, **25** (3), 20–24.

— and WOHLRABE, K. (2018a). Das neue ifo Geschäftsklima Deutschland. *ifo Schnelldienst*, **71** (7), 54–60.

— and — (2018b). The New ifo Business Climate Index for Germany. *CESifo Forum*, **19** (2), 3–8.

— and — (eds.) (2020). *ifo Handbuch der Konjunkturumfragen*. ifo Beiträge zur Wirtschaftsforschung No. 88, ifo Institute, Munich.

SCHARSCHMIDT, A. and WOHLRABE, K. (2011). Sektorale Prognosen im Verarbeitenden Gewerbe. *ifo Schnelldienst*, **64** (22), 27–35.

SCHUMACHER, C. and DREGER, C. (2004). Estimating Large-Scale Factor Models for Economic Activity in Germany: Do They Outperform Simpler Models? *Journal of Economics and Statistics*, **224** (6), 731–750.

SEILER, C. and WOHLRABE, K. (2013). Das ifo Geschäftsklima und die deutsche Konjunktur. *ifo Schnelldienst*, **66** (18), 17–21.

SINN, H.-W. and ABBERGER, K. (2006). Zur Prognosekraft des ifo Indikators. *ifo Schnelldienst*, **59** (4), 35–36.

SOMMER, V. and WOHLRABE, K. (2016a). Historical Ifo Bussiness Cycle Data. *CESifo Forum*, **17** (2), 45.

— and — (2016b). Historische ifo-Konjunkturzeitreihen. *ifo Schnelldienst*, **69** (14), 36–37.

VACCARA, B. N. and ZARNOWITZ, V. (1978). Forecasting with the Index of Leading Indicators, NBER Working Paper No. w0244.

VOGT, G. (2007). Analyse der Prognoseeigenschaften von ifo-Konjunkturindikatoren unter Echtzeitbedingungen. *Journal of Economics and Statistics*, **227** (1), 87–101.

— (2008). Ein Beschäftigungsbarometer für die sächsische Wirtschaft. *ifo Dresden berichtet*, **15** (1), 41–43.

WEBER, M. (2019). Mehr Dienstleister im ifo Geschäftsklimaindex. *ifo Dresden berichtet*, **26** (1), 20–22.

WOHLRABE, K. (ed.) (2011). *Konstruktion von Indikatoren zur Analyse der wirtschaftlichen Aktivität in den Dienstleistungsbereichen.* ifo Forschungsberichte No. 55, ifo Institute, Munich.

— (2012). Prognose des Dienstleistungssektors in Deutschland. *ifo Schnelldienst*, **65** (1), 31–39.

— and WOJCIECHOWSKI, P. (2014). Die ifo Konjunkturbefragungen im Dienstleistungssektor – Hintergründe, Erklärungen und Performance. *ifo Schnelldienst*, **67** (21), 47–53.

— and WOLLMERSHÄUSER, T. (2017a). Über die richtige Interpretation des ifo Geschäftsklimas als konjunktureller Frühindikator. *ifo Schnelldienst*, **70** (15), 42–46.

— and — (2017b). Zur Konstruktion einer gesamtwirtschaftlichen ifo Kapazitätsauslastung. *ifo Schnelldienst*, **70** (15), 26–30.

WOJCIECHOWSKI, P. (2015a). Konjunkturtest im Fokus: Gastgewerbe. *ifo Schnelldienst*, **68** (18), 62–66.

— (2015b). Konjunkturtest im Fokus: Information und Kommunikation. *ifo Schnelldienst*, **68** (7), 57–60.

WOLLMERSHÄUSER, T. (2016). Vorhersage der Revisionen der Vorratsveränderungen mit Hilfe der ifo Lagerbeurteilung. *ifo Schnelldienst*, **69** (7), 26–32.

— (2018). Die ifo Investitionserwartungen – ein neuer Frühindikator für die Investitionstätigkeit deutscher Unternehmen. *ifo Schnelldienst*, **71** (23), 32–35.

— and NIERHAUS, W. (eds.) (2016). *ifo Konjunkturumfragen und Konjunkturanalyse: Band II.* ifo Forschungsberichte No. 72, ifo Institute, Munich.

A. Classifications

Table A1: German Classification of Economic Activities, Edition 2008 (WZ 2008)

Code	Description
WZ08-A	**Agricutlure, forestry and fishing**
WZ08-A-01	Crop and animal production, hunting and related service activities
WZ08-A-01.1	Growing of non-perennial crops
WZ08-A-01.2	Growing of perennial crops
WZ08-A-01.3	Plant propagation
WZ08-A-01.4	Animal production
WZ08-A-01.5	Mixed farming
WZ08-A-01.6	Support activities to agriculture and post-harvest crop activities
WZ08-A-01.7	Hunting, trapping and related service activities
WZ08-A-02	Forestry and logging
WZ08-A-02.1	Silviculture and other forestry activities
WZ08-A-02.2	Logging
WZ08-A-02.3	Gathering of wild growing non-wood products
WZ08-A-02.4	Support services to forestry
WZ08-A-03	Fishing and aquaculture
WZ08-A-03.1	Fishing
WZ08-A-03.2	Aquaculture
WZ08-B	**Mining and quarrying**
WZ08-B-05	Mining of coal and lignite
WZ08-B-05.1	Mining of hard coal
WZ08-B-05.2	Mining of lignite
WZ08-B-06	Extraction of crude petroleum and natural gas
WZ08-B-06.1	Extraction of crude petroleum
WZ08-B-06.2	Extraction of natural gas
WZ08-B-07	Mining of metal ores
WZ08-B-07.1	Mining of iron ores
WZ08-B-07.2	Mining of non-ferrous metal ores
WZ08-B-08	Other mining and quarrying
WZ08-B-08.1	Quarrying of stone, sand and clay
WZ08-B-08.9	Mining and quarrying n.e.c.
WZ08-B-09	Mining support service activities
WZ08-B-09.1	Support activities for petroleum and natural gas extraction
WZ08-B-09.9	Support activities for other mining and quarrying
WZ08-C	**Manufacturing**
WZ08-C-10	Manufacture of food products
WZ08-C-10.1	Processing and preserving of meat and production of meat products
WZ08-C-10.2	Processing and preserving of fish, crustaceans and mollusks
WZ08-C-10.3	Processing and preserving of fruit and vegetables
WZ08-C-10.4	Manufacture of vegetable and animal oils and fats
WZ08-C-10.5	Manufacture of dairy products
WZ08-C-10.6	Manufacture of grain mill products, starches and starch products
WZ08-C-10.7	Manufacture of bakery and farinaceous products
WZ08-C-10.8	Manufacture of other food products
WZ08-C-10.9	Manufacture of prepared animal feeds
WZ08-C-11	Manufacture of beverages
WZ08-C-11.0	Manufacture of beverages
WZ08-C-12	Manufacture of tobacco products
WZ08-C-12.0	Manufacture of tobacco products

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Code	Description
WZ08-C-13	Manufacture of textiles
WZ08-C-13.1	Preparation and spinning of textile fibers
WZ08-C-13.2	Weaving of textiles
WZ08-C-13.3	Finishing of textiles
WZ08-C-13.9	Manufacture of other textiles
WZ08-C-14	Manufacture of wearing apparel
WZ08-C-14.1	Manufacture of wearing apparel, except fur apparel
WZ08-C-14.2	Manufacture of articles of fur
WZ08-C-14.3	Manufacture of knitted and crocheted apparel
WZ08-C-15	Manufacture of leather and related products
WZ08-C-15.1	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery and harness; dressing and dyeing of fur
WZ08-C-15.2	Manufacture of footwear
WZ08-C-16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
WZ08-C-16.1	Sawmilling and planing of wood
WZ08-C-16.2	Manufacture of products of wood, cork, straw and plaiting materials
WZ08-C-17	Manufacture of paper and paper products
WZ08-C-17.1	Manufacture of pulp, paper and paperboard
WZ08-C-17.2	Manufacture of articles of paper and paperboard
WZ08-C-18	Printing and reproduction of recorded media
WZ08-C-18.1	Printing and service activities related to printing
WZ08-C-18.2	Reproduction of recorded media
WZ08-C-19	Manufacture of coke and refined petroleum products
WZ08-C-19.1	Manufacture of coke oven products
WZ08-C-19.2	Manufacture of refined petroleum products
WZ08-C-20	Manufacture of chemicals and chemical products
WZ08-C-20.1	Manufacture of basic chemicals, fertilizers and nitrogen compounds, plastics and synthetic rubber in primary forms
WZ08-C-20.2	Manufacture of pesticides and other agrochemical products
WZ08-C-20.3	Manufacture of paints, varnishes and similar coatings, printing ink and mastics
WZ08-C-20.4	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations
WZ08-C-20.5	Manufacture of other chemical products
WZ08-C-20.6	Manufacture of man-made fibers
WZ08-C-21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
WZ08-C-21.1	Manufacture of basic pharmaceutical products
WZ08-C-21.2	Manufacture of pharmaceutical preparations
WZ08-C-22	Manufacture of rubber and plastic products
WZ08-C-22.1	Manufacture of rubber products
WZ08-C-22.2	Manufacture of plastics products
WZ08-C-23	Manufacture of other non-metallic mineral products
WZ08-C-23.1	Manufacture of glass and glass products
WZ08-C-23.2	Manufacture of refractory products
WZ08-C-23.3	Manufacture of clay building materials
WZ08-C-23.4	Manufacture of other porcelain and ceramic products
WZ08-C-23.5	Manufacture of cement, lime and plaster
WZ08-C-23.6	Manufacture of articles of concrete, cement and plaster
WZ08-C-23.7	Cutting, shaping and finishing of stone
WZ08-C-23.9	Manufacture of abrasive products and non-metallic mineral products n.e.c.

Table A1: Classification of Economic Activities, Edition 2008 (WZ 2008, cont.)

Code	Description
WZ08-C-24	Manufacture of basic metals
WZ08-C-24.1	Manufacture of basic iron and steel and of ferro-alloys
WZ08-C-24.2	Manufacture of tubes, pipes, hollow profiles and related fittings, of steel
WZ08-C-24.3	Manufacture of other products of first processing of steel
WZ08-C-24.4	Manufacture of basic precious and other non-ferrous metals
WZ08-C-24.5	Casting of metals
WZ08-C-25	Manufacture of fabricated metal products, except machinery and equipment
WZ08-C-25.1	Manufacture of structural metal products
WZ08-C-25.2	Manufacture of tanks, reservoirs and containers of metal
WZ08-C-25.3	Manufacture of steam generators, except central heating hot water boilers
WZ08-C-25.4	Manufacture of weapons and ammunition
WZ08-C-25.5	Forging, pressing, stamping and roll-forming of metal; powder metallurgy
WZ08-C-25.6	Treatment and coating of metals; machining
WZ08-C-25.7	Manufacture of cutlery, tools and general hardware
WZ08-C-25.9	Manufacture of other fabricated metal products
WZ08-C-26	Manufacture of computer, electronic and optical products
WZ08-C-26.1	Manufacture of electronic components and boards
WZ08-C-26.2	Manufacture of computers and peripheral equipment
WZ08-C-26.3	Manufacture of communication equipment
WZ08-C-26.4	Manufacture of consumer electronics
WZ08-C-26.5	Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks
WZ08-C-26.6	Manufacture of irradiation, electromedical and electrotherapeutic equipment
WZ08-C-26.7	Manufacture of optical instruments and photographic equipment
WZ08-C-26.8	Manufacture of magnetic and optical media
WZ08-C-27	Manufacture of electrical equipment
WZ08-C-27.1	Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus
WZ08-C-27.2	Manufacture of batteries and accumulators
WZ08-C-27.3	Manufacture of wiring and wiring devices
WZ08-C-27.4	Manufacture of electric lighting equipment
WZ08-C-27.5	Manufacture of domestic appliances
WZ08-C-27.9	Manufacture of other electrical equipment
WZ08-C-28	Manufacture of machinery and equipment n.e.c.
WZ08-C-28.1	Manufacture of general-purpose machinery
WZ08-C-28.2	Manufacture of other general-purpose machinery
WZ08-C-28.3	Manufacture of agricultural and forestry machinery
WZ08-C-28.4	Manufacture of metal forming machinery and machine tools
WZ08-C-28.9	Manufacture of other special-purpose machinery
WZ08-C-29	Manufacture of motor vehicles, trailers and semi-trailers
WZ08-C-29.1	Manufacture of motor vehicles
WZ08-C-29.2	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers
WZ08-C-29.3	Manufacture of parts and accessories for motor vehicles
WZ08-C-30	Manufacture of other transport equipment
WZ08-C-30.1	Building of ships and boats
WZ08-C-30.2	Manufacture of railway locomotives and rolling stock
WZ08-C-30.3	Manufacture of air and spacecraft and related machinery
WZ08-C-30.4	Manufacture of military fighting vehicles
WZ08-C-30.9	Manufacture of transport equipment n.e.c.
WZ08-C-31	Manufacture of furniture
WZ08-C-31.0	Manufacture of furniture

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Table A1: Classification of Economic Activities, Edition 2008 (WZ 2008, cont.)

Code	Description
WZ08-C-32	Other manufacturing
WZ08-C-32.1	Manufacture of jewellery, bijouterie and related articles
WZ08-C-32.2	Manufacture of musical instruments
WZ08-C-32.3	Manufacture of sports goods
WZ08-C-32.4	Manufacture of games and toys
WZ08-C-32.5	Manufacture of medical and dental instruments and supplies
WZ08-C-32.9	Manufacturing n.e.c.
WZ08-C-33	Repair and installation of machinery and equipment
WZ08-C-33.1	Repair of fabricated metal products, machinery and equipment
WZ08-C-33.2	Installation of industrial machinery and equipment
WZ08-D	**Electricity, gas, steam and air conditioning supply**
WZ08-D-35	Electricity, gas, steam and air conditioning supply
WZ08-D-35.1	Electric power generation, transmission and distribution
WZ08-D-35.2	Manufacture of gas; distribution of gaseous fuels through mains
WZ08-D-35.3	Steam and air conditioning supply
WZ08-E	**Water supply; sewerage, waste management, and remediation activities**
WZ08-E-36	Water collection, treatment and supply
WZ08-E-36.0	Water collection, treatment and supply
WZ08-E-37	Sewerage
WZ08-E-37.0	Sewerage
WZ08-E-38	Waste collection, treatment and disposal activities; materials recovery
WZ08-E-38.1	Waste collection
WZ08-E-38.2	Waste treatment and disposal
WZ08-E-38.3	Materials recovery
WZ08-E-39	Remediation activities and other waste management services
WZ08-E-39.0	Remediation activities and other waste management services
WZ08-F	**Construction**
WZ08-F-41	Construction of buildings
WZ08-F-41.1	Development of building projects
WZ08-F-41.2	Construction of residential and non-residential buildings
WZ08-F-42	Civil engineering
WZ08-F-42.1	Construction of roads and railways
WZ08-F-42.2	Construction of utility projects
WZ08-F-42.9	Construction of other civil engineering projects
WZ08-F-43	Specialized construction activities
WZ08-F-43.1	Demolition and site preparation
WZ08-F-43.2	Electrical, plumbing and other construction installation activities
WZ08-F-43.3	Building completion and finishing
WZ08-F-43.9	Other specialized construction activities
WZ08-G	**Wholesale and retail trade; repair of motor vehicles and motorcycles**
WZ08-G-45	Wholesale and retail trade and repair of motor vehicles and motorcycles
WZ08-G-45.1	Sale of motor vehicles
WZ08-G-45.2	Maintenance and repair of motor vehicles
WZ08-G-45.3	Sale of motor vehicle parts and accessories
WZ08-G-45.4	Sale, maintenance and repair of motorcycles and related parts and accessories

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Table A1: Classification of Economic Activities, Edition 2008 (WZ 2008, cont.)

Code	Description
WZ08-G-46	Wholesale trade, except of motor vehicles and motorcycles
WZ08-G-46.1	Wholesale on a fee or contract basis
WZ08-G-46.2	Wholesale of agricultural raw materials and live animals
WZ08-G-46.3	Wholesale of food, beverages and tobacco
WZ08-G-46.4	Wholesale of household goods
WZ08-G-46.5	Wholesale of information and communication equipment
WZ08-G-46.6	Wholesale of other machinery, equipment and supplies
WZ08-G-46.7	Other specialized wholesale
WZ08-G-46.9	Non-specialized wholesale trade
WZ08-G-47	Retail trade, except of motor vehicles and motorcycles
WZ08-G-47.1	Retail sale in non-specialized stores
WZ08-G-47.2	Retail sale of food, beverages and tobacco in specialized stores
WZ08-G-47.3	Retail sale of automotive fuel in specialized stores
WZ08-G-47.4	Retail sale of information and communication equipment in specialized stores
WZ08-G-47.5	Retail sale of other household equipment in specialized stores
WZ08-G-47.6	Retail sale of cultural and recreation goods in specialized stores
WZ08-G-47.7	Retail sale of other goods in specialized stores
WZ08-G-47.8	Retail sale via stalls and markets
WZ08-G-47.9	Retail trade not in stores, stalls or markets
WZ08-H	**Transportation and storage**
WZ08-H-49	Land transport and transport via pipelines
WZ08-H-49.1	Passenger rail transport, interurban
WZ08-H-49.2	Freight rail transport
WZ08-H-49.3	Other passenger land transport
WZ08-H-49.4	Freight transport by road and removal services
WZ08-H-49.5	Transport via pipeline
WZ08-H-50	Water transport
WZ08-H-50.1	Sea and coastal passenger water transport
WZ08-H-50.2	Sea and coastal freight water transport
WZ08-H-50.3	Inland passenger water transport
WZ08-H-50.4	Inland freight water transport
WZ08-H-51	Air transport
WZ08-H-51.1	Passenger air transport
WZ08-H-51.2	Freight air transport and space transport
WZ08-H-52	Warehousing and support activities for transportation
WZ08-H-52.1	Warehousing and storage
WZ08-H-52.2	Support activities for transportation
WZ08-H-53	Postal and courier activities
WZ08-H-53.1	Postal activities under universal service obligation
WZ08-H-53.2	Other postal and courier activities
WZ08-I	**Accommodation and food service activities**
WZ08-I-55	Accommodation
WZ08-I-55.1	Hotels and similar accommodation
WZ08-I-55.2	Holiday and other short-stay accommodation
WZ08-I-55.3	Camping grounds, recreational vehicle parks and trailer parks
WZ08-I-55.9	Other accommodation
WZ08-I-56	Food and beverage service activities
WZ08-I-56.1	Restaurants and mobile food service activities
WZ08-I-56.2	Event catering and other food service activities
WZ08-I-56.3	Beverage serving activities

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Table A1: Classification of Economic Activities, Edition 2008 (WZ 2008, cont.)

Code	Description
WZ08-J	**Information and communication**
WZ08-J-58	Publishing activities
WZ08-J-58.1	Publishing of books, periodicals and other publishing activities
WZ08-J-58.2	Software publishing
WZ08-J-59	Motion picture, video and television program production, sound recording and music publishing activities
WZ08-J-59.1	Motion picture, video and television program activities
WZ08-J-59.2	Sound recording and music publishing activities
WZ08-J-60	Programming and broadcasting activities
WZ08-J-60.1	Radio broadcasting
WZ08-J-60.2	Television programming and broadcasting activities
WZ08-J-61	Telecommunications
WZ08-J-61.1	Wired telecommunications activities
WZ08-J-61.2	Wireless telecommunications activities
WZ08-J-61.3	Satellite telecommunications activities
WZ08-J-61.9	Other telecommunications activities
WZ08-J-62	Computer programming, consultancy and related activities
WZ08-J-62.0	Computer programming, consultancy and related activities
WZ08-J-63	Information service activities
WZ08-J-63.1	Data processing, hosting and related activities; web portals
WZ08-J-63.9	Other information service activities
WZ08-K	**Financial and insurance activities**
WZ08-K-64	Financial service activities, except insurance and pension funding
WZ08-K-64.1	Monetary intermediation
WZ08-K-64.2	Activities of holding companies
WZ08-K-64.3	Trusts, funds and similar financial entities
WZ08-K-64.9	Other financial service activities, except insurance and pension funding
WZ08-K-65	Insurance, reinsurance and pension funding, except compulsory social security
WZ08-K-65.1	Insurance
WZ08-K-65.2	Reinsurance
WZ08-K-65.3	Pension funding
WZ08-K-66	Activities auxiliary to financial services and insurance activities
WZ08-K-66.1	Activities auxiliary to financial services, except insurance and pension funding
WZ08-K-66.2	Activities auxiliary to insurance and pension funding
WZ08-K-66.3	Fund management activities
WZ08-L	**Real estate activities**
WZ08-L-68	Activities auxiliary to financial services and insurance activities
WZ08-L-68.1	Buying and selling of own real estate
WZ08-L-68.2	Renting and operating of own or leased real estate
WZ08-L-68.3	Real estate activities on a fee or contract basis
WZ08-M	**Professional, scientific and technical activities**
WZ08-M-69	Legal and accounting activities
WZ08-M-69.1	Legal activities
WZ08-M-69.2	Accounting, bookkeeping and auditing activities; tax consultancy
WZ08-M-70	Activities of head offices; management consultancy activities
WZ08-M-70.1	Activities of head offices
WZ08-M-70.2	Management consultancy activities
WZ08-M-71	Architectural and engineering activities; technical testing and analysis
WZ08-M-71.1	Architectural and engineering activities and related technical consultancy
WZ08-M-71.2	Technical testing and analysis

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Table A1: Classification of Economic Activities, Edition 2008 (WZ 2008, cont.)

Code	Description
WZ08-M-72	Scientific research and development
WZ08-M-72.1	Research and experimental development on natural sciences and engineering
WZ08-M-72.2	Research and experimental development on social sciences and humanities
WZ08-M-73	Advertising and market research
WZ08-M-73.1	Advertising
WZ08-M-73.2	Market research and public opinion polling
WZ08-M-74	Other professional, scientific and technical activities
WZ08-M-74.1	Specialized design activities
WZ08-M-74.2	Photographic activities
WZ08-M-74.3	Translation and interpretation activities
WZ08-M-74.9	Other professional, scientific and technical activities n.e.c.
WZ08-M-75	Veterinary activities
WZ08-M-75.0	Veterinary activities
WZ08-N	**Administrative and support service activities**
WZ08-N-77	Rental and leasing activities
WZ08-N-77.1	Renting and leasing of motor vehicles
WZ08-N-77.2	Renting and leasing of personal and household goods
WZ08-N-77.3	Renting and leasing of other machinery, equipment and tangible goods
WZ08-N-77.4	Leasing of intellectual property and similar products, except copyrighted works
WZ08-N-78	Employment activities
WZ08-N-78.1	Activities of employment placement agencies
WZ08-N-78.2	Temporary employment agency activities
WZ08-N-78.3	Other human resources provision
WZ08-N-79	Travel agency, tour operator and other reservation service and related activities
WZ08-N-79.1	Travel agency and tour operator activities
WZ08-N-79.9	Other reservation service and related activities
WZ08-N-80	Security and investigation activities
WZ08-N-80.1	Private security activities
WZ08-N-80.2	Security systems service activities
WZ08-N-80.3	Investigation activities
WZ08-N-81	Services to buildings and landscape activities
WZ08-N-81.1	Combined facilities support activities
WZ08-N-81.2	Cleaning activities
WZ08-N-81.3	Landscape service activities
WZ08-N-82	Office administrative, office support and other business support activities
WZ08-N-82.1	Office administrative and support activities
WZ08-N-82.2	Activities of call centers
WZ08-N-82.3	Organization of conventions and trade shows
WZ08-N-82.9	Business support service activities n.e.c.
WZ08-O	**Public administration and defense; compulsory social security**
WZ08-O-84	Public administration and defense; compulsory social security
WZ08-O-84.1	Administration of the State and the economic and social policy of the community
WZ08-O-84.2	Provision of services to the community as a whole
WZ08-O-84.3	Compulsory social security activities

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Code	Description
WZ08-P	**Education**
WZ08-P-85	Education
WZ08-P-85.1	Pre-primary education
WZ08-P-85.2	Primary education
WZ08-P-85.3	Secondary education
WZ08-P-85.4	Higher education
WZ08-P-85.5	Other education
WZ08-P-85.6	Educational support activities
WZ08-Q	**Human health and social work activities**
WZ08-Q-86	Human health activities
WZ08-Q-86.1	Hospital activities
WZ08-Q-86.2	Medical and dental practice activities
WZ08-Q-86.9	Other human health activities
WZ08-Q-87	Residential care activities
WZ08-Q-87.1	Residential nursing care activities
WZ08-Q-87.2	Residential care activities for mental retardation, mental health and substance abuse
WZ08-Q-87.3	Residential care activities for the elderly and disabled
WZ08-Q-87.9	Other residential care activities
WZ08-Q-88	Social work activities without accommodation
WZ08-Q-88.1	Social work activities without accommodation for the elderly and disabled
WZ08-Q-88.9	Other social work activities without accommodation
WZ08-R	**Arts, entertainment and recreation**
WZ08-R-90	Creative, arts and entertainment activities
WZ08-R-90.0	Creative, arts and entertainment activities
WZ08-R-91	Libraries, archives, museums and other cultural activities
WZ08-R-91.0	Libraries, archives, museums and other cultural activities
WZ08-R-92	Gambling and betting activities
WZ08-R-92.0	Gambling and betting activities
WZ08-R-93	Sports activities and amusement and recreation activities
WZ08-R-93.1	Sports activities
WZ08-R-93.2	Amusement and recreation activities
WZ08-S	**Other service activities**
WZ08-S-94	Activities of membership organizations
WZ08-S-94.1	Activities of business, employers and professional membership organizations
WZ08-S-94.2	Activities of trade unions
WZ08-S-94.9	Activities of other membership organizations
WZ08-S-95	Repair of computers and personal and household goods
WZ08-S-95.1	Repair of computers and communication equipment
WZ08-S-95.2	Repair of personal and household goods
WZ08-S-96	Other personal service activities
WZ08-S-96.0	Other personal service activities
WZ08-T	**Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use**
WZ08-T-97	Activities of households as employers of domestic personnel
WZ08-T-97.0	Activities of households as employers of domestic personnel
WZ08-T-98	Undifferentiated goods- and services-producing activities of private households for own use
WZ08-T-98.1	Undifferentiated goods-producing activities of private households for own use
WZ08-T-98.2	Undifferentiated service-producing activities of private households for own use

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Table A1: Classification of Economic Activities, Edition 2008 (WZ 2008, cont.)

Code	Description
WZ08-U	**Activities of extraterritorial organizations and bodies**
WZ08-U-99	Activities of extraterritorial organizations and bodies
WZ08-U-99.0	Activities of extraterritorial organizations and bodies

Source: Federal Statistical Office of Germany (2008). *Note:* n.e.c.: not elsewhere classified.

Table A2: Main Industrial Groupings

Group	Economic Activities
Intermediate goods	WZ08-B-07, WZ08-B-08, WZ08-B-09, WZ08-C-10.6, WZ08-C-10.9, WZ08-C-13.1, WZ08-C-13.2, WZ08-C-13.3, WZ08-C-16, WZ08-C-17, WZ08-C-20.1, WZ08-C-20.2, WZ08-C-20.3, WZ08-C-20.5, WZ08-C-20.6, WZ08-C-22, WZ08-C-23, WZ08-C-24, WZ08-C-25.5, WZ08-C-25.6, WZ08-C-25.7, WZ08-C-25.9, WZ08-C-26.1, WZ08-C-26.8, WZ08-C-27.1, WZ08-C-27.2, WZ08-C-27.3, WZ08-C-27.4, WZ08-C-27.9
Energy	WZ08-B-05, WZ08-B-06, WZ08-C-19, WZ08-D-35, WZ08-E-36
Capital goods	WZ08-C-25.1, WZ08-C-25.2, WZ08-C-25.3, WZ08-C-25.4, WZ08-C-26.2, WZ08-C-26.3, WZ08-C-26.5, WZ08-C-26.6, WZ08-C-28, WZ08-C-29, WZ08-C-30.1, WZ08-C-30.2, WZ08-C-30.3, WZ08-C-30.4, WZ08-C-32.5, WZ08-C-33
Consumer durables	WZ08-C-26.4, WZ08-C-26.7, WZ08-C-27.5, WZ08-C-30.9, WZ08-C-31, WZ08-C-32.1, WZ08-C-32.2
Consumer non-durables	WZ08-C-10.1, WZ08-C-10.2, WZ08-C-10.3, WZ08-C-10.4, WZ08-C-10.5, WZ08-C-10.7, WZ08-C-10.8, WZ08-C-11, WZ08-C-12, WZ08-C-13.9, WZ08-C-14, WZ08-C-15, WZ08-C-18, WZ08-C-20.4, WZ08-C-21, WZ08-C-32.3, WZ08-C-32.4, WZ08-C-32.9

Source: European Commission (2007).

B. The ifo Questionnaire

B.1. Manufacturing

Table B1: Questions Asked in Manufacturing

#	Indicator	Description	Type	Frequency
1	Business Situation (BS)	**Question:** 'We assess our current business situation as [...]' **Answers:** (+) good, (=) satisfactory, or (−) bad.	standard	monthly
2	Stock of Finished Products (SFP)	**Question:** 'We assess our current stock of finished products as [...]' **Answers:** (+) too small, (=) sufficient, or (−) too large; (X) no stock-keeping.	standard	monthly
3a	Current Orders (CO)	**Question:** 'We assess our stock of current orders as [...]' **Answers:** (+) relatively large, (=) sufficient, or (−) too small.	standard	monthly
3b	Foreign Orders (FO)	**Question:** 'We assess our stock of current orders for the export as [...]' **Answers:** (+) relatively large, (=) sufficient, or (−) too small; (X) no export activities.	standard	monthly
4	Demand Development (DD)	**Question:** 'Compared to the previous month, our demand situation has [...]' **Answers:** (+) improved, (=) remained unchanged, or (−) worsen.	standard	monthly
5	New Orders (NO)	**Question:** 'Compared to the previous month, our stock of orders has [...]' **Answers:** (+) increased, (=) remained almost unchanged, or (−) decreased.	standard	monthly
6	Production Realization (PR)	**Question:** 'Compared to the previous month, production has [...]' **Answers:** (+) increased, (=) remained almost unchanged, or (−) decreased; (X) no remarkable domestic production.	standard	monthly
7	Price Development (PRD)	**Question:** 'Compared to the previous month, our prices were [...]' **Answers:** (+) raised, (=) unchanged, or (−) lowered.	standard	monthly
8	Employment Development (ED)	**Question:** 'Compared to the previous month, the number of our employees has [...]' **Answers:** (+) increased, (=) remained almost unchanged, or (−) decreased.	standard	monthly
9	Production Expectations (PE)	**Question:** 'In the next 3 months, our production will [...]' **Answers:** (+) increase, (=) stay the same, or (−) decrease; (X) no remarkable domestic production.	standard	monthly
10	Price Expectations (PRE)	**Question:** 'In the next 3 months, our prices will [...]' **Answers:** (+) increase, (=) stay the same, or (−) decline.	standard	monthly
11	Export Expectations (EXE)	**Question:** 'In the next 3 months, the extent of our export business will [...]' **Answers:** (+) grow, (=) stay the same, or (−) decrease; (X) no export activities.	standard	monthly

#	Indicator	Description	Type	Frequency
12	Employment Expectations (EE)	**Question:** 'In the next 3 months, our number of employees will [...]' **Answers:** (+) increase, (=) stay the same, or (−) decrease.	standard	monthly
13	Business Expectations (BE)	**Question:** 'In the next 6 months, our business situation will be [...]' **Answers:** (+) rather favorable, (=) rather stay the same, or (−) rather unfavorable.	standard	monthly
14	Expectations Forecast (EF)	**Question:** 'Currently, to forecast our business expectations is [...]' **Answers:** (+) easy, (+) rather easy, (−) rather difficult, or (−) difficult.	standard	monthly
15	Order Range (OR)	**Question:** 'Our current orders come up with a production time of [...]' **Answer:** *XX* months.	special	quarterly (1st month)
16	Capacity Utilization (CU)	**Question:** 'The current utilization of our equipment (customary full use of the capacity = 100%) amounts to [...]' **Answers:** 30%, 40%, 50%, 60%, 70%, 75%, 80%, 85%, 90%, 95%, 100%, *XX*% (if above 100%).	special	quarterly (1st month)
17	Technical Capacity (TC)	**Question:** 'Given our current stock of orders and expected new orders in the next 12 months, our technical capacity is [...]' **Answers:** (+) more than sufficient, (=) sufficient, or (−) not sufficient.	special	quarterly (1st month)
18	Production Obstruction (PO)	**Question:** 'Our production activities are currently obstructed [...]' **Answers:** (+) yes, or (−) no. If yes, because of the following factors: insufficient orders, lack of employees, lack of specialists, financing bottleneck, lack of material, insufficient technical capacity, and other factors.	special	quarterly (1st month)
19a	Competitive Position Domestic (CPD)	**Question:** 'In the last 3 months, our competitive position on the domestic market has [...]' **Answers:** (+) increased, (=) remained unchanged, or (−) decreased.	special	quarterly (1st month)
19b	Competitive Position inside EU (CPIEU)	**Question:** 'In the last 3 months, our competitive position inside the European Union has [...]' **Answers:** (+) increased, (=) remained unchanged, or (−) decreased; (X) no export activities.	special	quarterly (1st month)
19c	Competitive Position outside EU (CPOEU)	**Question:** 'In the last 3 months, our competitive position outside the European Union has [...]' **Answers:** (+) increased, (=) remained unchanged, or (−) decreased; (X) no export activities.	special	quarterly (1st month)
20a	Return on Sales Surplus (ROSS)	**Question:** 'Our last year's return on sales (in % of net turnover) was in case of a surplus [...]' **Answers:** up to 1%, above 1% to 2%, above 2% to 3%, above 3% to 4%, above 4%, in fact ca. *XX*%.	special	quarterly (2nd month)
20b	Return on Sales Deficit (ROSD)	**Question:** 'Our last year's return on sales (in % of net turnover) was in case of a deficit [...]' **Answers:** 0% to -1%, below -1% to -2%, below -2% to -3%, below -3% to -4%, below 4%, in fact ca. *XX*%.	special	quarterly (2nd month)

#	Indicator	Description	Type	Frequency
21a	Total Investment Development (TID)	**Question:** 'Our last year's total investment [...]' **Answers:** (+) increased, (=) remained unchanged, or (−) decreased.	special	quarterly (2nd month)
21b	Building Investment Development (BID)	**Question:** 'Our last year's building investment [...]' **Answers:** (+) increased, (=) remained unchanged, or (−) decreased.	special	quarterly (2nd month)
21c	Equipment Investment Development (EID)	**Question:** 'Our last year's equipment investment [...]' **Answers:** (+) increased, (=) remained unchanged, or (−) decreased.	special	quarterly (2nd month)
21d	Software Investment Development (SID)	**Question:** 'Our last year's software investment [...]' **Answers:** (+) increased, (=) remained unchanged, or (−) decreased.	special	quarterly (2nd month)
22a	Investment Indicator (II)	**Question:** 'Our total investment in the current year will [...]' **Answers:** (+) increase, (=) remain unchanged, or (−) decrease.	special	quarterly (2nd month)
22b	Building Investment Expectations (BIE)	**Question:** 'Our building investment in the current year will [...]' **Answers:** (+) increase, (=) remain unchanged, or (−) decrease.	special	quarterly (2nd month)
22c	Equipment Investment Expectations (EIE)	**Question:** 'Our equipment investment in the current year will [...]' **Answers:** (+) increase, (=) remain unchanged, or (−) decrease.	special	quarterly (2nd month)
22d	Software Investment Expectations (SIE)	**Question:** 'Our software investment in the current year will [...]' **Answers:** (+) increase, (=) remain unchanged, or (−) decrease.	special	quarterly (2nd month)
23	Overtime (OT)	**Question:** 'We currently work overtime [...]' **Answers:** (+) yes, or (−) no. If yes, more than customary: (+) yes, or (−) no.	special	quarterly (3rd month)
24	Short-time Work (STW)	**Question:** 'We currently apply short-time work [...]' **Answers:** (+) yes, or (−) no.	special	quarterly (3rd month)
25	Short-time Work Expectations (STWE)	**Question:** 'In the next 3 months, we expect to apply short-time work [...]' **Answers:** (+) yes, or (−) no.	special	quarterly (3rd month)
26	Lending Activities (LA)	**Question:** 'In the previous 3 months, we have been in lending negotiations with banks [...]' **Answers:** (+) yes, or (−) no. If yes, the banks behaved: (+) accommodating, (=) normal, or (−) restrictive. If no, because: (1) no credit demand, or (2) other reasons.	special	quarterly (3rd month)

Source: ifo Business Survey Manufacturing; own translations.

B.2. Construction

Table B2: Questions Asked in Construction

#	Indicator	Description	Type	Frequency
1	Business Situation (BS)	**Question:** 'We assess our current business situation as [...]' **Answers:** (+) good, (=) satisfactory, or (−) bad.	standard	monthly
2	Current Orders (CO)	**Question:** 'We assess our stock of current orders as [...]' **Answers:** (+) relatively large, (=) sufficient, or (−) too small.	standard	monthly
3	Order Range (OR)	**Question:** 'Our current orders come up with an average production time of [...]' **Answer:** *XX* months.	standard	monthly
4	Cost Coverage (CC)	**Question:** 'Our construction prices cover [...]' **Answers:** (+) more than our production costs, (=) our production costs, or (−) less than our production costs.	standard	monthly
5	Production Obstruction (PO)	**Question:** 'Our production activities are currently obstructed [...]' **Answers:** (+) yes, or (−) no. If yes, because of the following factors: insufficient orders, order cancellation, lack of employees, lack of specialists, financing bottleneck, lack of material, unfavorable weather conditions, and other factors.	standard	monthly
6	Construction Activity (CA)	**Question:** 'Compared to the previous 3 months, our construction activity has [...]' **Answers:** (+) increased, (=) remained almost unchanged, or (−) decreased.	standard	monthly
7	Order Development (OD)	**Question:** 'Compared to the previous month, our stock of construction orders [...]' **Answers:** (+) increased, (=) remained almost unchanged, or (−) decreased.	standard	monthly
8	Price Development (PRD)	**Question:** 'Compared to the previous month, our construction prices were [...]' **Answers:** (+) raised, (=) unchanged, or (−) lowered.	standard	monthly
9	Construction Expectations (CE)	**Question:** 'In the next 3 months, our construction activity will [...]' **Answers:** (+) increase, (=) stay the same, or (−) decrease.	standard	monthly
10	Price Expectations (PRE)	**Question:** 'In the next 3 months, our construction prices will [...]' **Answers:** (+) increase, (=) stay the same, or (−) decline.	standard	monthly
11	Business Expectations (BE)	**Question:** 'In the next 6 months, our business situation will be [...]' **Answers:** (+) rather favorable, (=) rather stay the same, or (−) rather unfavorable.	standard	monthly
12	Expectations Forecast (EF)	**Question:** 'Currently, to forecast our business expectations is [...]' **Answers:** (+) easy, (+) rather easy, (−) rather difficult, or (−) difficult.	standard	monthly

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#	Indicator	Description	Type	Frequency
13	Capacity Utilization (CU)	**Question:** 'The current utilization of our machine capacity (customary full use of the capacity = 100%) amounts to [...]' **Answers:** 30%, 40%, 50%, 60%, 70%, 75%, 80%, 85%, 90%, 95%, 100%, *XX*% (if above 100%).	standard	monthly
14	Employment Expectations (EE)	**Question:** 'In the next 3 months, our number of employees will [...]' **Answers:** (+) increase, (=) stay the same, or (−) decrease.	standard	monthly
15	Employment Development (ED)	**Question:** 'Compared to the previous month, the number of our employees has [...]' **Answers:** (+) increased, (=) remained almost unchanged, or (−) decreased.	standard	monthly
16	Lending Activities (LA)	**Question:** 'In the previous 3 months, we have been in lending negotiations with banks [...]' **Answers:** (+) yes, or (−) no. If yes, the banks behaved: (+) accommodating, (=) normal, or (−) restrictive. If no, because: (1) no credit demand, or (2) other reasons.	special	quarterly (3rd month)

Source: ifo Business Survey Construction; own translations.

B.3. Retail Trade

Table B3: Questions Asked in Retail Trade

#	Indicator	Description	Type	Frequency
1	Business Situation (BS)	**Question:** 'We assess our current business situation as [...]' **Answers:** (+) good, (=) satisfactory, or (−) bad.	standard	monthly
2	Stock of Finished Products (SFP)	**Question:** 'We assess our current stock of finished products as [...]' **Answers:** (+) too small, (=) sufficient, or (−) too large; (X) no stock-keeping.	standard	monthly
3	Turnover Development (TOD)	**Question:** 'Compared to the month of the previous year, our turnover have [...]' **Answers:** (+) increased, (=) remained unchanged, or (−) decreased.	standard	monthly
4	Price Development (PRD)	**Question:** 'Compared to the previous month, our selling prices were [...]' **Answers:** (+) raised, (=) unchanged, or (−) lowered.	standard	monthly
5	Employment Development (ED)	**Question:** 'Compared to the previous month, the number of our employees has [...]' **Answers:** (+) increased, (=) remained almost unchanged, or (−) decreased.	standard	monthly
6	Price Expectations (PRE)	**Question:** 'In the next 3 months, our selling prices will [...]' **Answers:** (+) increase, (=) stay the same, or (−) decline.	standard	monthly

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#	Indicator	Description	Type	Frequency
7	Order Expectations (OE)	**Question:** 'In the next 3 months, our orders will [...]' **Answers:** (+) increase, (=) stay the same, or (−) decrease; (X) no remarkable domestic production.	standard	monthly
8	Employment Expectations (EE)	**Question:** 'In the next 3 months, our number of employees will [...]' **Answers:** (+) increase, (=) stay the same, or (−) decrease.	standard	monthly
9	Business Expectations (BE)	**Question:** 'In the next 6 months, our business situation will be [...]' **Answers:** (+) rather favorable, (=) rather stay the same, or (−) rather unfavorable.	standard	monthly
10	Expectations Forecast (EF)	**Question:** 'Currently, to forecast our business expectations is [...]' **Answers:** (+) easy, (+) rather easy, (−) rather difficult, or (−) difficult.	standard	monthly
11	Turnover Obstruction (TOO)	**Question:** 'Our turnover are currently obstructed [...]' **Answers:** (+) yes, or (−) no. If yes, because of the following factors: weak demand, lack of employees, lack of specialists, financing bottleneck, lack of real estate, insufficient office equipment, unfavorable weather conditions, and other factors.	special	quarterly (1st month)
12a	Local Footfall (LOFO)	**Question:** 'In the previous quarter, the average footfall at our local position was [...]' **Answers:** (+) high, (=) seasonal, or (−) low; (X) no local position.	special	quarterly (1st month)
12b	Online Footfall (ONFO)	**Question:** 'In the previous quarter, the average footfall at our online presence was [...]' **Answers:** (+) high, (=) seasonal, or (−) low; (X) no online presence.	special	quarterly (1st month)
13	Lending Activities (LA)	**Question:** 'In the previous 3 months, we have been in lending negotiations with banks [...]' **Answers:** (+) yes, or (−) no. If yes, the banks behaved: (+) accommodating, (=) normal, or (−) restrictive. If no, because: (1) no credit demand, or (2) other reasons.	special	quarterly (3rd month)

Source: ifo Business Survey Retail Trade; own translations.

B.4. Wholesale

Table B4: Questions Asked in Wholesale

#	Indicator	Description	Type	Frequency
1	Business Situation (BS)	**Question:** 'We assess our current business situation as [...]' **Answers:** (+) good, (=) satisfactory, or (−) bad.	standard	monthly
2	Stock of Finished Products (SFP)	**Question:** 'We assess our current stock of finished products as [...]' **Answers:** (+) too small, (=) sufficient, or (−) too large; (X) no stock-keeping.	standard	monthly
3	Turnover Development (TOD)	**Question:** 'Compared to the month of the previous year, our turnover have [...]' **Answers:** (+) increased, (=) remained unchanged, or (−) decreased.	standard	monthly
4	Price Development (PRD)	**Question:** 'Compared to the previous month, our selling prices were [...]' **Answers:** (+) raised, (=) unchanged, or (−) lowered.	standard	monthly
5	Employment Development (ED)	**Question:** 'Compared to the previous month, the number of our employees has [...]' **Answers:** (+) increased, (=) remained almost unchanged, or (−) decreased.	standard	monthly
6	Price Expectations (PRE)	**Question:** 'In the next 3 months, our selling prices will [...]' **Answers:** (+) increase, (=) stay the same, or (−) decline.	standard	monthly
7	Order Expectations (OE)	**Question:** 'In the next 3 months, our orders will [...]' **Answers:** (+) increase, (=) stay the same, or (−) decrease; (X) no remarkable domestic production.	standard	monthly
8	Employment Expectations (EE)	**Question:** 'In the next 3 months, our number of employees will [...]' **Answers:** (+) increase, (=) stay the same, or (−) decrease.	standard	monthly
9	Business Expectations (BE)	**Question:** 'In the next 6 months, our business situation will be [...]' **Answers:** (+) rather favorable, (=) rather stay the same, or (−) rather unfavorable.	standard	monthly
10	Expectations Forecast (EF)	**Question:** 'Currently, to forecast our business expectations is [...]' **Answers:** (+) easy, (+) rather easy, (−) rather difficult, or (−) difficult.	standard	monthly
11	Turnover Obstruction (TOO)	**Question:** 'Our turnover are currently obstructed [...]' **Answers:** (+) yes, or (−) no. If yes, because of the following factors: weak demand, lack of employees, lack of specialists, financing bottleneck, lack of real estate, insufficient office equipment, unfavorable weather conditions, and other factors.	special	quarterly (1st month)
12	Lending Activities (LA)	**Question:** 'In the previous 3 months, we have been in lending negotiations with banks [...]' **Answers:** (+) yes, or (−) no. If yes, the banks behaved: (+) accommodating, (=) normal, or (−) restrictive. If no, because: (1) no credit demand, or (2) other reasons.	special	quarterly (3rd month)

Source: ifo Business Survey Wholesale; own translations.

B.5. Services

Table B5: Questions Asked in Services

#	Indicator	Description	Type	Frequency
1	Business Situation (BS)	**Question:** 'We assess our current business situation as [...]' **Answers:** (+) good, (=) satisfactory, or (−) bad.	standard	monthly
2	Current Orders (CO)	**Question:** 'We assess our stock of current orders as [...]' **Answers:** (+) relatively large, (=) sufficient, or (−) too small.	standard	monthly
3	Employment Development (ED)	**Question:** 'Compared to the previous month, the number of our employees has [...]' **Answers:** (+) increased, (=) remained almost unchanged, or (−) decreased.	standard	monthly
4	Price Development (PRD)	**Question:** 'Compared to the previous month, our prices were [...]' **Answers:** (+) raised, (=) unchanged, or (−) lowered.	standard	monthly
5	Order Development (OD)	**Question:** 'Compared to the previous month, our stock of orders [...]' **Answers:** (+) increased, (=) remained almost unchanged, or (−) decreased.	standard	monthly
6	Business Development (BD)	**Question:** 'In the past 3 months, our business situation has [...]' **Answers:** (+) improved, (=) remained unchanged, or (−) worsen.	standard	monthly
7a	Turnover Development (TOD)	**Question:** 'Compared to the previous 3 months, our turnover have [...]' **Answers:** (+) increased, (=) remained unchanged, or (−) decreased.	standard	monthly
7b	Turnover Development (TOD)	**Question:** 'Compared to the previous month, our turnover have [...]' **Answers:** (+) increased, (=) remained unchanged, or (−) decreased.	standard	monthly
8	Turnover Expectations (TOE)	**Question:** 'In the next 3 months, our turnover will [...]' **Answers:** (+) increase, (=) remain unchanged, or (−) decrease.	standard	monthly
9	Employment Expectations (EE)	**Question:** 'In the next 3 months, our number of employees will [...]' **Answers:** (+) increase, (=) stay the same, or (−) decrease.	standard	monthly
10	Price Expectations (PRE)	**Question:** 'In the next 3 months, our prices will [...]' **Answers:** (+) increase, (=) stay the same, or (−) decline.	standard	monthly
11	Business Expectations (BE)	**Question:** 'In the next 6 months, our business situation will be [...]' **Answers:** (+) rather favorable, (=) rather stay the same, or (−) rather unfavorable.	standard	monthly

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#	Indicator	Description	Type	Frequency
12	Expectations Forecast (EF)	**Question:** 'Currently, to forecast our business expectations is [...]' **Answers:** (+) easy, (+) rather easy, (−) rather difficult, or (−) difficult.	standard	monthly
13	Business Obstruction (BO)	**Question:** 'Our business is currently obstructed [...]' **Answers:** (+) yes, or (−) no. If yes, because of the following factors: weak demand, lack of employees, lack of specialists, financing bottleneck, lack of technical capacity, insufficient office equipment, unfavorable weather conditions, and other factors.	special	quarterly (1st month)
14	Demand Satisfaction (DS)	**Question:** 'Is it currently possible for you to satisfy an increase in demand with the technical capacity at hand?' **Answers:** (+) yes, or (−) no. If yes, we can increase our business activity by $XX\%$.	special	quarterly (1st month)
15	Lending Activities (LA)	**Question:** 'In the previous 3 months, we have been in lending negotiations with banks [...]' **Answers:** (+) yes, or (−) no. If yes, the banks behaved: (+) accommodating, (=) normal, or (−) restrictive. If no, because: (1) no credit demand, or (2) other reasons.	special	quarterly (3rd month)

Source: ifo Business Survey Services; own translations.