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## The Forecasting Power of the ifo Business Survey

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## The Forecasting Power of the ifo Business Survey

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# The Forecasting Power of the ifo Business Survey

## 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.

JEL-Codes: E170, E270, E370, F170, J110.

Keywords: economic forecasting, business surveys, leading indicators.

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# 1. Introduction

The ifo Business Climate Germany is one of the most important leading indicators for the German economy.<sup>1</sup> 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) or 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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<sup>1</sup>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.<sup>2</sup> 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<sup>3</sup> 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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<sup>2</sup>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.

<sup>3</sup>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.<sup>4</sup> 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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<sup>4</sup>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:

$$BC_t = \sqrt{(BS_t + 200)(BE_t + 200)} - 200.$$

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:

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

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,  $BC_t + 200$ , and the average balance of the Business Climate in the base year increased by 200,  $BC^B + 200$ . If, for example, the current value of the Business Climate is  $BC_t = 25$  and the average value of the Business Climate in the base year is  $BC^B = 20$ , the index value amounts to  $BC_t^I = 225/220 = 102.3$ ; 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).

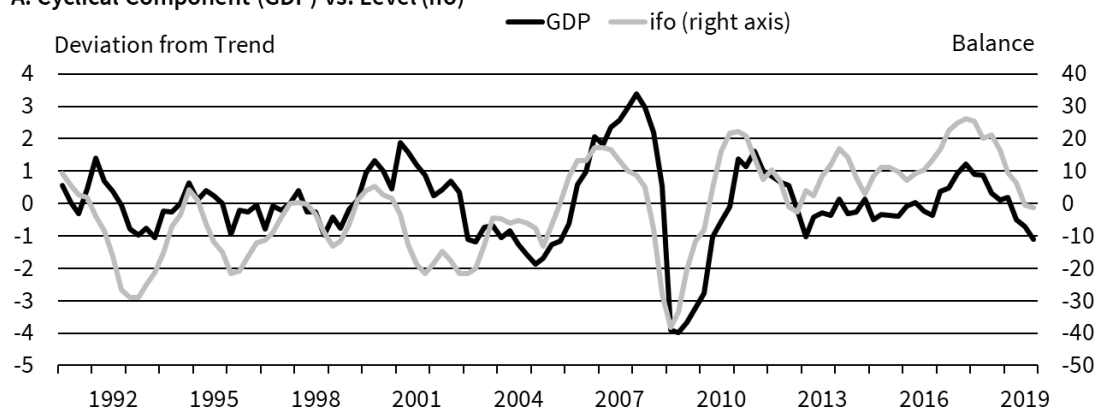
In the public debate, nobody talks about the cyclical component of German GDP. The largest part of medial reporting deals with the development of GDP, namely its percentage change over the same quarter of the previous year. On the opposite, in applied forecasting work GDP is usually transformed into 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**

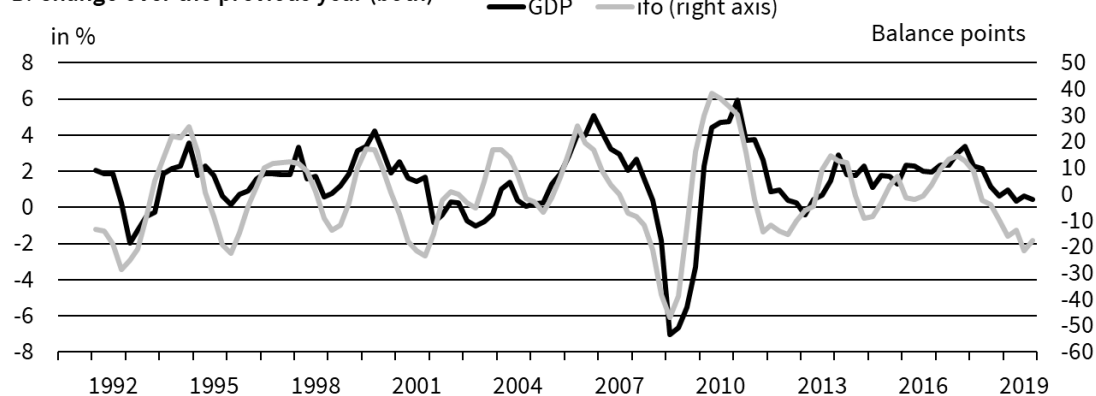
### Comparison between GDP and ifo Business Climate <sup>a</sup>

Three transformations

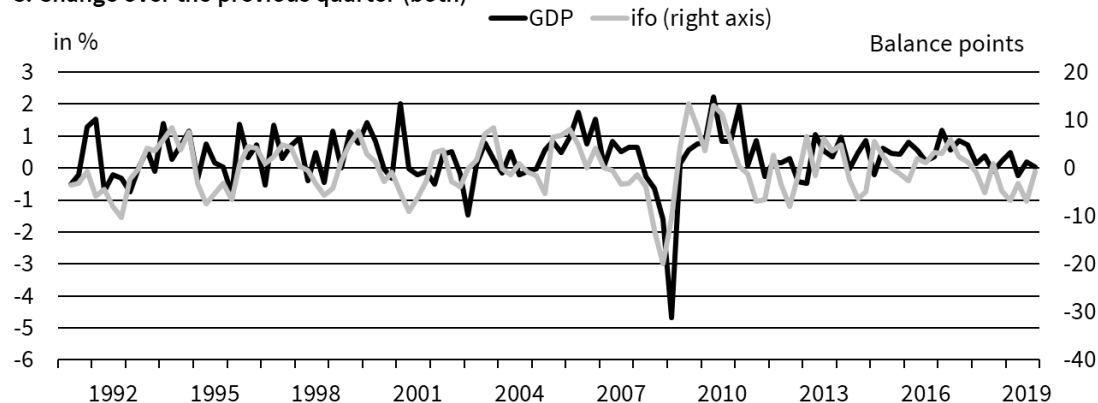
#### A. Cyclical Component (GDP) vs. Level (ifo)



#### B. Change over the previous year (both)



#### C. Change over the previous quarter (both)



<sup>a</sup> 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.<sup>5</sup> On the other hand, the main ifo indicators are regularly selected by the algorithms to enter the factor.

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<sup>5</sup>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)  |
|---|--------------------------------|-------------------|---|--|---|
| Langmantele (1999) <sup>*,†</sup>               | % previous year                | 1963-Q1 – 1998-Q4 | BC MAN West                                 | Granger Causality, ADL models                                      | Business Climate suitable indicator for GDP   |
| Hinze (2003) <sup>*,†</sup>                     | % 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  |
| Langmantele (2004) <sup>*,†</sup>               | % 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) <sup>†</sup>       | % 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) <sup>†</sup>            | % 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) <sup>†</sup> | % 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) <sup>*</sup>           | % previous year                | 1993-Q1 – 2005-Q4 | BC I&T                                      | Graphical analysis   | Business Climate serves as leading indicator  |
| Drechsel and Scheufele (2012a) <sup>†</sup>     | % 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) <sup>†</sup>     | % 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) <sup>†</sup>             | % 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) <sup>†</sup>      | % 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) <sup>†</sup>            | % 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.

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<sup>6</sup> 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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<sup>6</sup>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<sup>7</sup> 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 Hübner 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 Hübner 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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<sup>7</sup>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 <i>et al.</i> (2004)*            | % previous year (GDP)<br>trend-adjusted industrial production | 1992-Q1 – 2002-Q4<br>1969-M1 – 2002-M12 | BC I&T<br>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.

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   |
| Bilharz <i>et al.</i> (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 <i>et al.</i> (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 Wohlraabe (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 <i>et al.</i> (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 <i>et al.</i> (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: ifo 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) <sup>†</sup>   | 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) <sup>†</sup>      | % 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) <sup>†</sup> | % 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 (<sup>†</sup>), 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) <sup>†</sup>                 | 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) <sup>†</sup> | 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  |
| Rumschmidt (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) <sup>†</sup>          | % 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”.<sup>8</sup> 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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<sup>8</sup>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) <sup>†</sup> | % 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.<sup>9</sup> 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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<sup>9</sup>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<br>(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 <i>et al.</i> (2010)*             | cyclical component<br>(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 <i>et al.</i> (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 <i>et al.</i> (2020) <sup>†</sup> | % 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, EE: ifo Employment Barometer, EG: 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  $\Rightarrow$  levels ifo indicator, annual growth target series  $\Rightarrow$  annual differences ifo indicator, and quarterly growth target series  $\Rightarrow$  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 Retail 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   |

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## A. Classifications

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

| Code          | Description  |
|---------------|--|
| <b>WZ08-A</b> | <b>Agriculture, forestry and fishing</b>                           |
| 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  |
| <b>WZ08-B</b> | <b>Mining and quarrying</b>  |
| 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                  |
| <b>WZ08-C</b> | <b>Manufacturing</b>   |
| 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                                    |

*Continued on next page...*

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

| 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.   |

*Continued on next page...*

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

| <b>Code</b> | <b>Description</b>  |
|-------------|---|
| 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  |

*Continued on next page...*

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

| <b>Code</b>   | <b>Description</b>  |
|---------------|---|
| 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                            |
| <b>WZ08-D</b> | <b>Electricity, gas, steam and air conditioning supply</b>                    |
| 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   |
| <b>WZ08-E</b> | <b>Water supply; sewerage, waste management, and remediation activities</b>   |
| 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                    |
| <b>WZ08-F</b> | <b>Construction</b>   |
| 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                                     |
| <b>WZ08-G</b> | <b>Wholesale and retail trade; repair of motor vehicles and motorcycles</b>   |
| 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 |

*Continued on next page...*

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

| <b>Code</b>   | <b>Description</b>   |
|---------------|--|
| 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                                |
| <b>WZ08-H</b> | <b>Transportation and storage</b>  |
| 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  |
| <b>WZ08-I</b> | <b>Accommodation and food service activities</b>                             |
| 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  |

*Continued on next page...*

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

| <b>Code</b>   | <b>Description</b>   |
|---------------|--|
| <b>WZ08-J</b> | <b>Information and communication</b>   |
| 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   |
| <b>WZ08-K</b> | <b>Financial and insurance activities</b>  |
| 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   |
| <b>WZ08-L</b> | <b>Real estate activities</b>  |
| 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  |
| <b>WZ08-M</b> | <b>Professional, scientific and technical activities</b>   |
| 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   |

*Continued on next page...*



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

| <b>Code</b>   | <b>Description</b>  |
|---------------|---|
| 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   |
| <b>WZ08-N</b> | <b>Administrative and support service activities</b>                              |
| 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.  |
| <b>WZ08-O</b> | <b>Public administration and defense; compulsory social security</b>              |
| 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   |

*Continued on next page...*

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

| <b>Code</b>   | <b>Description</b>  |
|---------------|---|
| <b>WZ08-P</b> | <b>Education</b>  |
| 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  |
| <b>WZ08-Q</b> | <b>Human health and social work activities</b>  |
| 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,<br>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  |
| <b>WZ08-R</b> | <b>Arts, entertainment and recreation</b>   |
| 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   |
| <b>WZ08-S</b> | <b>Other service activities</b>   |
| 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   |
| <b>WZ08-T</b> | <b>Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use</b> |
| 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<br>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   |

*Continued on next page...*

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

| Code          | Description  |
|---------------|--|
| <b>WZ08-U</b> | <b>Activities of extraterritorial organizations and bodies</b> |
| 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)          | <b>Question:</b> ‘We assess our current business situation as [...]’ <b>Answers:</b> (+) good, (=) satisfactory, or (–) bad.   | standard | monthly   |
| 2  | Stock of Finished Products (SFP) | <b>Question:</b> ‘We assess our current stock of finished products as [...]’ <b>Answers:</b> (+) too small, (=) sufficient, or (–) too large; (X) no stock-keeping.                            | standard | monthly   |
| 3a | Current Orders (CO)              | <b>Question:</b> ‘We assess our stock of current orders as [...]’ <b>Answers:</b> (+) relatively large, (=) sufficient, or (–) too small.  | standard | monthly   |
| 3b | Foreign Orders (FO)              | <b>Question:</b> ‘We assess our stock of current orders for the export as [...]’ <b>Answers:</b> (+) relatively large, (=) sufficient, or (–) too small; (X) no export activities.             | standard | monthly   |
| 4  | Demand Development (DD)          | <b>Question:</b> ‘Compared to the previous month, our demand situation has [...]’ <b>Answers:</b> (+) improved, (=) remained unchanged, or (–) worsen.   | standard | monthly   |
| 5  | New Orders (NO)                  | <b>Question:</b> ‘Compared to the previous month, our stock of orders has [...]’ <b>Answers:</b> (+) increased, (=) remained almost unchanged, or (–) decreased.                               | standard | monthly   |
| 6  | Production Realization (PR)      | <b>Question:</b> ‘Compared to the previous month, production has [...]’ <b>Answers:</b> (+) increased, (=) remained almost unchanged, or (–) decreased; (X) no remarkable domestic production. | standard | monthly   |
| 7  | Price Development (PRD)          | <b>Question:</b> ‘Compared to the previous month, our prices were [...]’ <b>Answers:</b> (+) raised, (=) unchanged, or (–) lowered.  | standard | monthly   |
| 8  | Employment Development (ED)      | <b>Question:</b> ‘Compared to the previous month, the number of our employees has [...]’ <b>Answers:</b> (+) increased, (=) remained almost unchanged, or (–) decreased.                       | standard | monthly   |
| 9  | Production Expectations (PE)     | <b>Question:</b> ‘In the next 3 months, our production will [...]’ <b>Answers:</b> (+) increase, (=) stay the same, or (–) decrease; (X) no remarkable domestic production.                    | standard | monthly   |
| 10 | Price Expectations (PRE)         | <b>Question:</b> ‘In the next 3 months, our prices will [...]’ <b>Answers:</b> (+) increase, (=) stay the same, or (–) decline.  | standard | monthly   |
| 11 | Export Expectations (EXE)        | <b>Question:</b> ‘In the next 3 months, the extent of our export business will [...]’ <b>Answers:</b> (+) grow, (=) stay the same, or (–) decrease; (X) no export activities.                  | standard | monthly   |

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**Table B1: Questions Asked in Manufacturing (cont.)**

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

*Continued on next page...*

**Table B1: Questions Asked in Manufacturing (cont.)**

| #   | Indicator                               | Description  | Type    | Frequency                |
|-----|---|--|---------|--------------------------|
| 21a | Total Investment Development (TID)      | <b>Question:</b> ‘Our last year’s total investment [...]’<br><b>Answers:</b> (+) increased, (=) remained unchanged, or (–) decreased.  | special | quarterly<br>(2nd month) |
| 21b | Building Investment Development (BID)   | <b>Question:</b> ‘Our last year’s building investment [...]’<br><b>Answers:</b> (+) increased, (=) remained unchanged, or (–) decreased.   | special | quarterly<br>(2nd month) |
| 21c | Equipment Investment Development (EID)  | <b>Question:</b> ‘Our last year’s equipment investment [...]’<br><b>Answers:</b> (+) increased, (=) remained unchanged, or (–) decreased.  | special | quarterly<br>(2nd month) |
| 21d | Software Investment Development (SID)   | <b>Question:</b> ‘Our last year’s software investment [...]’<br><b>Answers:</b> (+) increased, (=) remained unchanged, or (–) decreased.   | special | quarterly<br>(2nd month) |
| 22a | Investment Indicator (II)               | <b>Question:</b> ‘Our total investment in the current year will [...]’ <b>Answers:</b> (+) increase, (=) remain unchanged, or (–) decrease.  | special | quarterly<br>(2nd month) |
| 22b | Building Investment Expectations (BIE)  | <b>Question:</b> ‘Our building investment in the current year will [...]’ <b>Answers:</b> (+) increase, (=) remain unchanged, or (–) decrease.   | special | quarterly<br>(2nd month) |
| 22c | Equipment Investment Expectations (EIE) | <b>Question:</b> ‘Our equipment investment in the current year will [...]’ <b>Answers:</b> (+) increase, (=) remain unchanged, or (–) decrease.  | special | quarterly<br>(2nd month) |
| 22d | Software Investment Expectations (SIE)  | <b>Question:</b> ‘Our software investment in the current year will [...]’ <b>Answers:</b> (+) increase, (=) remain unchanged, or (–) decrease.   | special | quarterly<br>(2nd month) |
| 23  | Overtime (OT)                           | <b>Question:</b> ‘We currently work overtime [...]’ <b>Answers:</b> (+) yes, or (–) no. If yes, more than customary: (+) yes, or (–) no.   | special | quarterly<br>(3rd month) |
| 24  | Short-time Work (STW)                   | <b>Question:</b> ‘We currently apply short-time work [...]’<br><b>Answers:</b> (+) yes, or (–) no.   | special | quarterly<br>(3rd month) |
| 25  | Short-time Work Expectations (STWE)     | <b>Question:</b> ‘In the next 3 months, we expect to apply short-time work [...]’ <b>Answers:</b> (+) yes, or (–) no.  | special | quarterly<br>(3rd month) |
| 26  | Lending Activities (LA)                 | <b>Question:</b> ‘In the previous 3 months, we have been in lending negotiations with banks [...]’ <b>Answers:</b> (+) 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<br>(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)        | <b>Question:</b> ‘We assess our current business situation as [...]’ <b>Answers:</b> (+) good, (=) satisfactory, or (–) bad.  | standard | monthly   |
| 2  | Current Orders (CO)            | <b>Question:</b> ‘We assess our stock of current orders as [...]’ <b>Answers:</b> (+) relatively large, (=) sufficient, or (–) too small.   | standard | monthly   |
| 3  | Order Range (OR)               | <b>Question:</b> ‘Our current orders come up with an average production time of [...]’ <b>Answer:</b> XX months.  | standard | monthly   |
| 4  | Cost Coverage (CC)             | <b>Question:</b> ‘Our construction prices cover [...]’ <b>Answers:</b> (+) more than our production costs, (=) our production costs, or (–) less than our production costs.   | standard | monthly   |
| 5  | Production Obstruction (PO)    | <b>Question:</b> ‘Our production activities are currently obstructed [...]’ <b>Answers:</b> (+) 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)     | <b>Question:</b> ‘Compared to the previous 3 months, our construction activity has [...]’ <b>Answers:</b> (+) increased, (=) remained almost unchanged, or (–) decreased.   | standard | monthly   |
| 7  | Order Development (OD)         | <b>Question:</b> ‘Compared to the previous month, our stock of construction orders [...]’ <b>Answers:</b> (+) increased, (=) remained almost unchanged, or (–) decreased.   | standard | monthly   |
| 8  | Price Development (PRD)        | <b>Question:</b> ‘Compared to the previous month, our construction prices were [...]’ <b>Answers:</b> (+) raised, (=) unchanged, or (–) lowered.  | standard | monthly   |
| 9  | Construction Expectations (CE) | <b>Question:</b> ‘In the next 3 months, our construction activity will [...]’ <b>Answers:</b> (+) increase, (=) stay the same, or (–) decrease.   | standard | monthly   |
| 10 | Price Expectations (PRE)       | <b>Question:</b> ‘In the next 3 months, our construction prices will [...]’ <b>Answers:</b> (+) increase, (=) stay the same, or (–) decline.  | standard | monthly   |
| 11 | Business Expectations (BE)     | <b>Question:</b> ‘In the next 6 months, our business situation will be [...]’ <b>Answers:</b> (+) rather favorable, (=) rather stay the same, or (–) rather unfavorable.  | standard | monthly   |
| 12 | Expectations Forecast (EF)     | <b>Question:</b> ‘Currently, to forecast our business expectations is [...]’ <b>Answers:</b> (+) easy, (+) rather easy, (–) rather difficult, or (–) difficult.   | standard | monthly   |

*Continued on next page...*

**Table B2: Questions Asked in Construction (cont.)**

| #  | Indicator                    | Description  | Type     | Frequency                |
|----|------------------------------|--|----------|--------------------------|
| 13 | Capacity Utilization (CU)    | <b>Question:</b> ‘The current utilization of our machine capacity (customary full use of the capacity = 100%) amounts to [...]’ <b>Answers:</b> 30%, 40%, 50%, 60%, 70%, 75%, 80%, 85%, 90%, 95%, 100%, <i>XX%</i> (if above 100%).  | standard | monthly                  |
| 14 | Employment Expectations (EE) | <b>Question:</b> ‘In the next 3 months, our number of employees will [...]’ <b>Answers:</b> (+) increase, (=) stay the same, or (–) decrease.  | standard | monthly                  |
| 15 | Employment Development (ED)  | <b>Question:</b> ‘Compared to the previous month, the number of our employees has [...]’ <b>Answers:</b> (+) increased, (=) remained almost unchanged, or (–) decreased.   | standard | monthly                  |
| 16 | Lending Activities (LA)      | <b>Question:</b> ‘In the previous 3 months, we have been in lending negotiations with banks [...]’ <b>Answers:</b> (+) 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<br>(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)          | <b>Question:</b> ‘We assess our current business situation as [...]’ <b>Answers:</b> (+) good, (=) satisfactory, or (–) bad.   | standard | monthly   |
| 2 | Stock of Finished Products (SFP) | <b>Question:</b> ‘We assess our current stock of finished products as [...]’ <b>Answers:</b> (+) too small, (=) sufficient, or (–) too large; (X) no stock-keeping.      | standard | monthly   |
| 3 | Turnover Development (TOD)       | <b>Question:</b> ‘Compared to the month of the previous year, our turnover have [...]’ <b>Answers:</b> (+) increased, (=) remained unchanged, or (–) decreased.          | standard | monthly   |
| 4 | Price Development (PRD)          | <b>Question:</b> ‘Compared to the previous month, our selling prices were [...]’ <b>Answers:</b> (+) raised, (=) unchanged, or (–) lowered.                              | standard | monthly   |
| 5 | Employment Development (ED)      | <b>Question:</b> ‘Compared to the previous month, the number of our employees has [...]’ <b>Answers:</b> (+) increased, (=) remained almost unchanged, or (–) decreased. | standard | monthly   |
| 6 | Price Expectations (PRE)         | <b>Question:</b> ‘In the next 3 months, our selling prices will [...]’ <b>Answers:</b> (+) increase, (=) stay the same, or (–) decline.                                  | standard | monthly   |

*Continued on next page...*



**Table B3: Questions Asked in Retail Trade (cont.)**

| #   | Indicator                    | Description   | Type     | Frequency                |
|-----|------------------------------|---|----------|--------------------------|
| 7   | Order Expectations (OE)      | <b>Question:</b> ‘In the next 3 months, our orders will [...]’<br><b>Answers:</b> (+) increase, (=) stay the same, or (–) decrease; (X) no remarkable domestic production.  | standard | monthly                  |
| 8   | Employment Expectations (EE) | <b>Question:</b> ‘In the next 3 months, our number of employees will [...]’ <b>Answers:</b> (+) increase, (=) stay the same, or (–) decrease.   | standard | monthly                  |
| 9   | Business Expectations (BE)   | <b>Question:</b> ‘In the next 6 months, our business situation will be [...]’ <b>Answers:</b> (+) rather favorable, (=) rather stay the same, or (–) rather unfavorable.  | standard | monthly                  |
| 10  | Expectations Forecast (EF)   | <b>Question:</b> ‘Currently, to forecast our business expectations is [...]’ <b>Answers:</b> (+) easy, (+) rather easy, (–) rather difficult, or (–) difficult.   | standard | monthly                  |
| 11  | Turnover Obstruction (TOO)   | <b>Question:</b> ‘Our turnover are currently obstructed [...]’<br><b>Answers:</b> (+) 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<br>(1st month) |
| 12a | Local Footfall (LOFO)        | <b>Question:</b> ‘In the previous quarter, the average footfall at our local position was [...]’ <b>Answers:</b> (+) high, (=) seasonal, or (–) low; (X) no local position.   | special  | quarterly<br>(1st month) |
| 12b | Online Footfall (ONFO)       | <b>Question:</b> ‘In the previous quarter, the average footfall at our online presence was [...]’ <b>Answers:</b> (+) high, (=) seasonal, or (–) low; (X) no online presence.   | special  | quarterly<br>(1st month) |
| 13  | Lending Activities (LA)      | <b>Question:</b> ‘In the previous 3 months, we have been in lending negotiations with banks [...]’ <b>Answers:</b> (+) 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<br>(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)          | <b>Question:</b> ‘We assess our current business situation as [...]’ <b>Answers:</b> (+) good, (=) satisfactory, or (–) bad.   | standard | monthly               |
| 2  | Stock of Finished Products (SFP) | <b>Question:</b> ‘We assess our current stock of finished products as [...]’ <b>Answers:</b> (+) too small, (=) sufficient, or (–) too large; (X) no stock-keeping.  | standard | monthly               |
| 3  | Turnover Development (TOD)       | <b>Question:</b> ‘Compared to the month of the previous year, our turnover have [...]’ <b>Answers:</b> (+) increased, (=) remained unchanged, or (–) decreased.  | standard | monthly               |
| 4  | Price Development (PRD)          | <b>Question:</b> ‘Compared to the previous month, our selling prices were [...]’ <b>Answers:</b> (+) raised, (=) unchanged, or (–) lowered.  | standard | monthly               |
| 5  | Employment Development (ED)      | <b>Question:</b> ‘Compared to the previous month, the number of our employees has [...]’ <b>Answers:</b> (+) increased, (=) remained almost unchanged, or (–) decreased.   | standard | monthly               |
| 6  | Price Expectations (PRE)         | <b>Question:</b> ‘In the next 3 months, our selling prices will [...]’ <b>Answers:</b> (+) increase, (=) stay the same, or (–) decline.  | standard | monthly               |
| 7  | Order Expectations (OE)          | <b>Question:</b> ‘In the next 3 months, our orders will [...]’ <b>Answers:</b> (+) increase, (=) stay the same, or (–) decrease; (X) no remarkable domestic production.  | standard | monthly               |
| 8  | Employment Expectations (EE)     | <b>Question:</b> ‘In the next 3 months, our number of employees will [...]’ <b>Answers:</b> (+) increase, (=) stay the same, or (–) decrease.  | standard | monthly               |
| 9  | Business Expectations (BE)       | <b>Question:</b> ‘In the next 6 months, our business situation will be [...]’ <b>Answers:</b> (+) rather favorable, (=) rather stay the same, or (–) rather unfavorable.   | standard | monthly               |
| 10 | Expectations Forecast (EF)       | <b>Question:</b> ‘Currently, to forecast our business expectations is [...]’ <b>Answers:</b> (+) easy, (+) rather easy, (–) rather difficult, or (–) difficult.  | standard | monthly               |
| 11 | Turnover Obstruction (TOO)       | <b>Question:</b> ‘Our turnover are currently obstructed [...]’ <b>Answers:</b> (+) 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)          | <b>Question:</b> ‘In the previous 3 months, we have been in lending negotiations with banks [...]’ <b>Answers:</b> (+) 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)      | <b>Question:</b> ‘We assess our current business situation as [...]’<br><b>Answers:</b> (+) good, (=) satisfactory, or (–) bad.  | standard | monthly   |
| 2  | Current Orders (CO)          | <b>Question:</b> ‘We assess our stock of current orders as [...]’<br><b>Answers:</b> (+) relatively large, (=) sufficient, or (–) too small.                             | standard | monthly   |
| 3  | Employment Development (ED)  | <b>Question:</b> ‘Compared to the previous month, the number of our employees has [...]’ <b>Answers:</b> (+) increased, (=) remained almost unchanged, or (–) decreased. | standard | monthly   |
| 4  | Price Development (PRD)      | <b>Question:</b> ‘Compared to the previous month, our prices were [...]’ <b>Answers:</b> (+) raised, (=) unchanged, or (–) lowered.                                      | standard | monthly   |
| 5  | Order Development (OD)       | <b>Question:</b> ‘Compared to the previous month, our stock of orders [...]’ <b>Answers:</b> (+) increased, (=) remained almost unchanged, or (–) decreased.             | standard | monthly   |
| 6  | Business Development (BD)    | <b>Question:</b> ‘In the past 3 months, our business situation has [...]’ <b>Answers:</b> (+) improved, (=) remained unchanged, or (–) worsen.                           | standard | monthly   |
| 7a | Turnover Development (TOD)   | <b>Question:</b> ‘Compared to the previous 3 months, our turnover have [...]’ <b>Answers:</b> (+) increased, (=) remained unchanged, or (–) decreased.                   | standard | monthly   |
| 7b | Turnover Development (TOD)   | <b>Question:</b> ‘Compared to the previous month, our turnover have [...]’ <b>Answers:</b> (+) increased, (=) remained unchanged, or (–) decreased.                      | standard | monthly   |
| 8  | Turnover Expectations (TOE)  | <b>Question:</b> ‘In the next 3 months, our turnover will [...]’<br><b>Answers:</b> (+) increase, (=) remain unchanged, or (–) decrease.                                 | standard | monthly   |
| 9  | Employment Expectations (EE) | <b>Question:</b> ‘In the next 3 months, our number of employees will [...]’ <b>Answers:</b> (+) increase, (=) stay the same, or (–) decrease.                            | standard | monthly   |
| 10 | Price Expectations (PRE)     | <b>Question:</b> ‘In the next 3 months, our prices will [...]’<br><b>Answers:</b> (+) increase, (=) stay the same, or (–) decline.                                       | standard | monthly   |
| 11 | Business Expectations (BE)   | <b>Question:</b> ‘In the next 6 months, our business situation will be [...]’ <b>Answers:</b> (+) rather favorable, (=) rather stay the same, or (–) rather unfavorable. | standard | monthly   |

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**Table B5: Questions Asked in Services (cont.)**

| #  | Indicator                  | Description  | Type     | Frequency             |
|----|----------------------------|--|----------|-----------------------|
| 12 | Expectations Forecast (EF) | <b>Question:</b> ‘Currently, to forecast our business expectations is [...]’ <b>Answers:</b> (+) easy, (+) rather easy, (–) rather difficult, or (–) difficult.  | standard | monthly               |
| 13 | Business Obstruction (BO)  | <b>Question:</b> ‘Our business is currently obstructed [...]’ <b>Answers:</b> (+) 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)   | <b>Question:</b> ‘Is it currently possible for you to satisfy an increase in demand with the technical capacity at hand?’ <b>Answers:</b> (+) yes, or (–) no. If yes, we can increase our business activity by XX%.  | special  | quarterly (1st month) |
| 15 | Lending Activities (LA)    | <b>Question:</b> ‘In the previous 3 months, we have been in lending negotiations with banks [...]’ <b>Answers:</b> (+) 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.