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The ifo Export Climate – A Leading Indicator to Forecast German Export Growth

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INTRODUCTION

Over the last 25 years there has been an exceptionally large increase in trade globalization. The increase in globalization is mainly reflected in a higher interconnectedness of value-added chains between economies. Therefore, export and import developments have become increasingly important for the growth of gross domestic product (GDP). Focusing on Germany, a very open economy, exports are the second largest component of GDP after private consumption. In addition, comparing the standard deviations of the different GDP components, export growth is extremely volatile and thus heavily influences fluctuations in GDP. Therefore, accurately forecasting exports has become increasingly important in applied forecasting work.[1]

Particularly in short-term forecasting, monthly indicators help us to generate precise export forecasts for the current and the next quarter. Indicators have the advantage that they are released at a higher frequency compared to national account figures, which are available only on a quarterly basis and published with a delay of about two months after the end of the current quarter. In contrast, hard indicators, such as foreign new orders or monthly foreign trade, are released much sooner. Particularly interesting for forecasting is survey data, which is published even earlier and is not usually subject to revisions.

This study presents the ifo Export Climate, a leading indicator for forecasting German exports.[2] The ifo Export Climate is based on business and consumer confidence of Germany's main trading partners and also takes into account Germany's international price competitiveness. By modelling international demand and the relative price of German products, the ifo Export Climate reflects changes in foreign demand for German goods.

To assess the performance of the ifo Export Climate in forecasting German exports, its predictive quality is evaluated using statistical and econometric methods. It turns out that the ifo Export Climate performs well for current-quarter forecasts and is the best-performing indicator for next-quarter forecasts. Therefore, the ifo Export Climate provides a valuable indicator for short-term forecasting of German exports. The indicator is updated monthly and published on the ifo homepage. The underlying idea of the ifo Export Climate was also adopted by Lehmann (2019) for a set of 18 European countries. He finds that the Export Climates are among the best performing survey-based indicators.

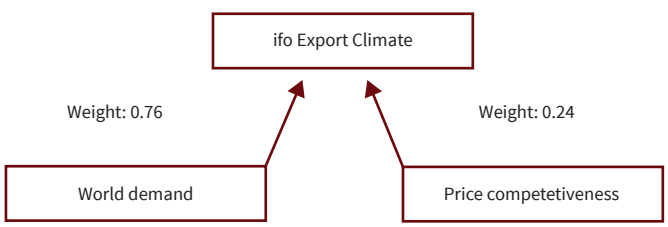
The next section presents the construction of the ifo Export Climate. In the third section, we analyze the forecasting performance of the ifo Export Climate. First, we discuss further potential leading indicators. Second, using cross-correlations, we look at common fluctuations of the indicators and export growth. We also describe the issue of publication lags. Afterwards, we evaluate the forecasting performance of the ifo Export Climate based on a pseudo out-of-sample forecasting exercise. The final section concludes.

CONSTRUCTION OF THE IFO EXPORT CLIMATE

The ifo Export Climate consists of two components. The first part is world demand, which is proxied by global business and consumer sentiment of Germany's most important export markets. The construction of world demand is described in detail below. The second sub-chapter tackles the price competitiveness of Germany. This measure indicates how competitive the German economy is in comparison to its trading partners. Figure 1 shows the structure of the ifo Export Climate in graphical form. Both components are weighted differently in the ifo Export Climate. The computation of these weights is also explained below.

Figure 1

Construction of the ifo Export Climate



Note: The weights were determined based on a regression in which exports are explained by the two components of the ifo Export Climate.
Source: Authors' compilation.

[1] See Hanslin and Scheufele (2019) for Swiss and German exports, Lehmann (2019) for a study on European countries, and Keck et al. (2009) for the OECD 25. Grimme et al. (2019) analyze the performance of different indicators in forecasting imports for six different countries.

[2] The ifo Export Climate has already been presented in a German article by Elstner et al. (2013). We thank Maximilian Müller-Bardorff for his valuable research assistance.

Construction of the World Demand Proxy

Global world demand is proxied by business and consumer sentiment of a total of 44 countries, covering more than 90 percent of the sales markets for German exports.[3] The business confidence of each country is approximated by an industrial confidence indicator. For the European countries, we use the industrial confidence indicators (ICI) from the European Commission, which are harmonized across the member states (European Commission 2016). For most of the other countries outside Europe, we mostly use Business Confidence Indexes (BCI) provided by national sources. To approximate business confidence in the United States and China, we rely on the Purchasing Managers' Index (PMI) from the Institute for Supply Management (ISM) and the National Bureau of Statistics China, respectively; for Thailand, we use the BCI provided by the Bank of Thailand. The consumer confidence indicators are taken from the European Commission for the European countries and from national sources for all remaining countries. Both confidence indicators – business and consumer – are seasonally adjusted and standardized to have zero mean and a standard deviation of one.

The construction of world demand is determined in two steps. First, we proxy a trading partner's overall demand by weighting its business and consumer sentiment. The weights are calculated as the ratio of the volume of exports of consumption goods from Germany to the respective trading partner and the sum of German exports of consumption and investment goods to the respective trading partner. Country-specific weights for business and consumer sentiment are used to reflect the differences in the relative importance of German exports of consumer and investment goods across its trading partners. Country-specific export data is extracted from the UN Comtrade Database. This database allows us to split a country's exports with respect to destination and broad economic categories (BEC).[4]

Second, country-specific demand is aggregated using country-specific weights to form world demand. The weights reflect the importance of a trading partner for Germany's exports and is computed as the volume of exports from Germany to the trading partner divided by the total volume of exports by Germany. The data is taken from the IMF's Direction of Trade Statistics.

Figure 2 displays the construction of a country's demand using the example of the two countries France and China. Germany's total exports to China are comprised of consumption goods only to a small extent (7%), while 93% of the exports are investment goods. In contrast, about 17% of Germany's exports to France are consumer goods and 83% are investment goods. Overall, France enters world demand with a higher share, because the total share of German exports to France (about 9%) is larger than the corresponding share for China (about 8%).[5]

Price Competitiveness

The proxy for German price competitiveness is the real effective exchange rate (REER) with respect to Germany's 36 major trading partners. The REER is the nominal effective exchange rate, taking into account the ratio of foreign to Germany's consumer prices. The data is taken from the Deutsche Bundesbank.[6]

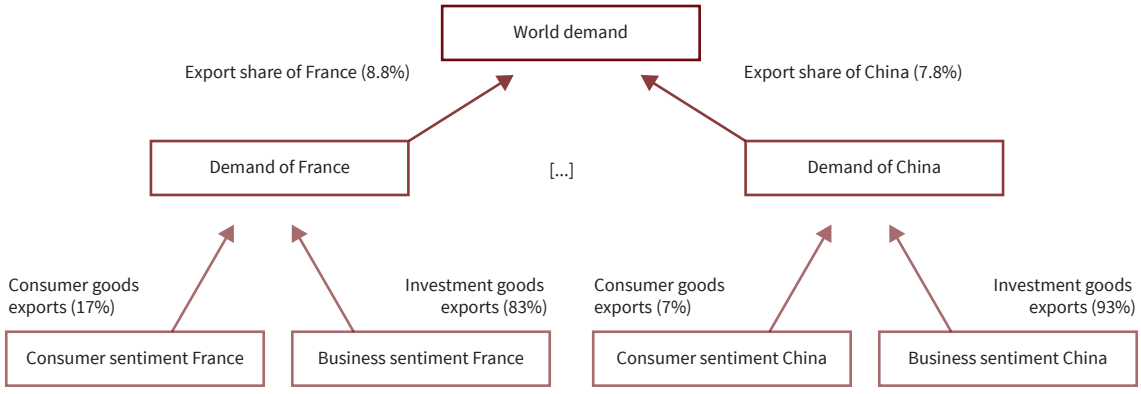
[3] The 44 countries comprise all member states of the European Union (except Croatia), Israel, Norway, the Russian Federation, Switzerland, Turkey, a selection of North and South American countries (Brazil, Chile, Mexico, and the United States), a number of Asian countries (China, India, Indonesia, Japan, South Korea, and Thailand), Australia and New Zealand, and South Africa.

[4] As we are interested in consumer versus investment goods exports, we rely on the consumer goods definition by the UN. Based on this definition, consumer goods are mainly the sum of food and beverages for household consumption, processed fuels and lubricants, non-industrial transport equipment, and consumer goods that are not specified in any other BEC. Investment goods are capital goods and industrial transport equipment.

[5] Since about 90 percent of all export markets are included in the ifo Export Climate, the country shares of total German exports are transformed to 100 percent.

[6] Since the time series is only available starting in 1993, the years

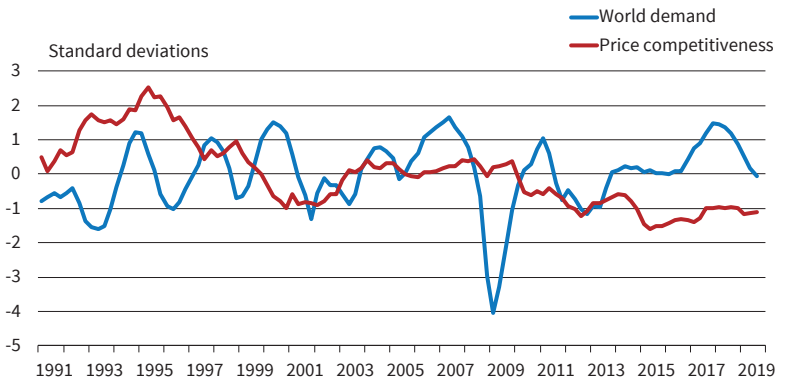
Figure 2
Example for Construction of World Demand



Notes: Export shares are for 2018; consumer and investment goods shares are for 2016, computed from the latest data available.
Source: Authors' compilation.

Figure 3

Components of ifo Export Climate



Notes: World demand is computed based on business and consumer sentiment of Germany's 44 major trading partners. Price competitiveness is the real effective exchange rate with respect to Germany's 36 major trading partners; the series is obtained from the Deutsche Bundesbank. Both series are standardized to have zero mean and a standard deviation of one.
Source: Deutsche Bundesbank; European Commission; national sources; authors' calculations. © ifo Institute

Figure 3 plots both the price competitiveness and world demand. To improve readability, both time series are standardized to achieve uniform scaling. World demand is subject to cyclical fluctuations and thus captures the demand for German products, which is strongly dependent on the global economy. In contrast, price competitiveness is much flatter. It reflects the comparatively slow-moving price component of German exports in the ifo Export Climate.[7] In the following, both world demand and the change in price competitiveness enter the ifo Export Climate using their standardized values.

The weights of the Export Climate's two components – the combined confidence indicators and the price competitiveness – are computed following the two-step procedure by Kilian et al. (2007). In the first step, we estimate a regression, in which the quarterly growth rates of exports ($\Delta Export$) is the dependent variable. The explanatory variables are the current value and four lags of the change in the price competitiveness (ΔPC):

$$(1)\quad \Delta Export_t = \alpha + \beta_1 \Delta PC_t + \ldots + \beta_5 \Delta PC_{t-4} + \varepsilon_t$$

Including lags, this takes into account that there is a delayed response of exports to changes in relative prices. The estimation of equation (1) yields an adjusted R^2 of 17 percent. This indicates that 17 percent of the variation $\Delta Export$ of is explained by ΔPC. In the second step, equation (1) is extended to include world demand (ΔWD) using its current value and four lags:

$$(2)\quad \Delta Export_t = \alpha + \beta_1 \Delta PC_t + \ldots + \beta_5 \Delta PC_{t-4} + \gamma_1 WD_t + \ldots + \gamma_5 WD_{t-4} + \varepsilon_t$$

1991 and 1992 are extrapolated using the rates of change of the price competitiveness with respect to 26 trading partners. For an evaluation of different competitiveness indicators, see Ca'Zorzi and Schnatz (2007).

[7] The plot also shows that price competitiveness is a non-stationary variable. Therefore, in the following, this variable is included in log differences in the ifo Export Climate.

The adjusted R^2 increases to 69 percent. Due to the much higher explanatory power, world demand is more important for the dynamics of German exports. This is in line with Danninger and Joutz (2008); and Grimme and Thürwächter (2015), who show that price competitiveness explains only a comparatively small part of Germany's export growth. Finally, the weight of the price competitiveness is computed by dividing the adjusted R^2 from equation (1) to that of equation (2). This yields a weight of 25 percent for the price competitiveness. Therefore, the price competitiveness and world demand enter the ifo Export Climate with a weight of 0.25 and 0.75, respectively.

Figure 4 plots the ifo Export Climate together with German export growth. Both series display a strong co-movement.

FORECASTING PERFORMANCE OF THE IFO EXPORT CLIMATE

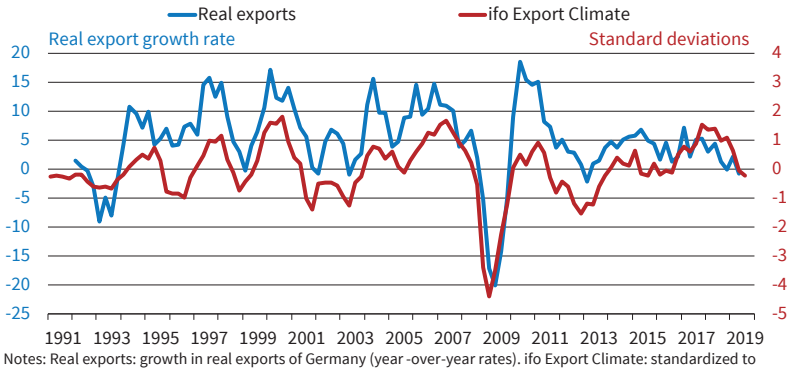
Further Potential Predictors

To judge the relevance of the ifo Export Climate for applied export forecasting, we need to compare its forecasting performance to the performance of other predictors. All predictors are seasonally adjusted.

- Exports – special trade classification: the most straightforward quantitative indicator is export in delimitation of special trade, which is released monthly by the German Statistical Office. It solely captures traded goods that have been produced or processed in Germany. This series represents a large component of exports in delimitation of national accounts. Since the special trade figures are published only in nominal terms, we deflate them using the monthly available export price index released by the Deutsche Bundesbank. To do so, we first shift the price index back by one month and use this lagged series to deflate nominal exports. The resulting series has a slightly higher correlation with real exports in delimitation of national accounts than when exports in delimitation of special trade are deflated with the contemporaneous price index. This is because prices are collected once the contract has been signed, while national accounting standards measure traded goods at the time of the border crossing.
- New foreign orders: another prominent indicator is new orders in the German manufacturing indus-

Figure 4

ifo Export Climate and Real Exports



Notes: Real exports: growth in real exports of Germany (year -over-year rates). ifo Export Climate: standardized to have zero mean and a standard deviation of one.
Source: German Statistical Office; computation of authors.

try from abroad released by the German Statistical Office. Since orders must be processed first, they may be a good indicator for future exports.

- Price competitiveness: in addition to the indicators describing the real economy, we also rely on a price measure. As exports are directly linked to the relative price competitiveness position of the domestic economy within the world market, information about relative prices should contain signals that may help forecast export growth. We use the real effective exchange rate based on consumer prices against 37 industrial countries, which is released monthly by the Deutsche Bundesbank.
- ifo New Foreign Orders assessment: each month the ifo Institute asks firms to assess their current foreign order-book levels.
- ifo Export Expectations: each month the ifo Institute asks firms about their export expectations for the next three months.

Correlation Analysis and Publication Lags

The evaluation of the indicators starts with a cross-correlation analysis. Cross-correlations provide information on whether and to what extent or in which direction there is a correlation between the indicators and export growth. Before, all indicators are converted to quarterly frequency by averaging the monthly values; new orders, the real effective exchange rate, and exports in delimitation of special trade are transformed to growth rates. Table 1 shows the cross-correlations.

The first row shows that the auto-correlation of exports – the correlation of exports in delimitation of national accounts with its own lags – is not very high. This is another indication that export growth is not very persistent, but probably more volatile. The second row displays the very high contemporaneous correlation between exports in delimitation of national accounts and exports in delimitation of special trade with a correlation coefficient of 0.95. New orders have a high contemporary correlation with exports (0.65). The indicator also exhibits a strong lead correlation of one quarter with exports (0.58). In contrast, the price competitiveness – measured by the real effective exchange rate – is weakly negatively correlated with exports, since an increase in the exchange rate means an appreciation of the domestic currency, which translates into a deterioration of the price competitiveness. The contemporaneous correlation with exports is relatively low as are the lead correlations. ifo New Orders have a high contemporary correlation with exports (0.66) and a good lead correlation of one quarter (0.50). The ifo Export Expectations have, in addition to a high contemporary correlation (0.59), leading properties for one quarter (0.35). Finally, the ifo Export Climate has a contemporary correlation coefficient of 0.50. Therefore, the correlation analysis gives a first indication that the ifo Export Climate may be a good indicator for German exports.

When interpreting correlation coefficients, one needs to take into account that the monthly time series are available with different time delays.

Table 1

Cross-Correlation of Indicators and Real Exports (National Accounts)

	Lead of indicator					Lag of indicator			
	4	3	2	1	0	– 1	– 2	– 3	– 4
Real export (national accounts)	– 0.01	0.05	0.18	0.29	1.00	0.29	0.18	0.05	– 0.01
Nominal export (special trade)	– 0.06	0.06	0.14	0.33	0.95	0.19	0.02	0.06	0.06
Real export (special trade)	– 0.09	0.10	0.17	0.38	0.95	0.17	0.01	0.05	0.06
Foreign new orders	0.04	0.14	0.33	0.58	0.65	0.22	0.03	– 0.07	– 0.14
Real eff. exchange rate	– 0.09	– 0.05	– 0.11	– 0.13	– 0.32	– 0.02	– 0.13	0.03	0.15
ifo Foreign Orders	– 0.07	0.05	0.27	0.50	0.66	0.52	0.23	0.05	– 0.21
ifo Export Expectations	– 0.22	– 0.14	0.01	0.35	0.59	0.62	0.50	0.34	0.13
ifo Export Climate	– 0.23	– 0.17	– 0.01	0.29	0.50	0.58	0.56	0.44	0.24

Notes: The cross-correlations are calculated between the quarterly growth rates of real exports (in delimitation of national accounts) and the respective indicator. The indicators special trade exports, foreign new orders, and exchange rate are in quarterly log-differences, ifo Foreign Orders are in quarterly differences, and ifo Export Expectations and ifo Export Climate are not transformed.

Source: Calculations of the authors.

Table 2

Availability of Indicators for ifo Business Cycle Forecasts

Indicator	Ifo Business Cycle forecasts			
	Spring (March)	Summer (June)	Autumn (September)	Winter (December)
Export special trade	Jan.	April	July	Oct.
Foreign orders	Jan.	April	July	Oct.
Exchange rate	Jan., Feb.	April, May	July, Aug.	Oct., Nov.
ifo Orders	Jan., Feb.	April, May	July, Aug.	Oct., Nov.
ifo Export Expectations	Jan., Feb.	April, May	July, Aug.	Oct., Nov.
ifo Export Climate	Jan., Feb.	April, May	July, Aug.	Oct., Nov.

Note: The months listed for each indicator shows how many months of the current quarter are available at the time of the ifo business cycle forecasts.

Source: German Statistical Office, Deutsche Bundesbank, ifo Institute.

Table 2 shows the availability of the monthly indicators for the quarterly economic forecasts that are released by the ifo Institute. The months in the columns indicate which values of the current quarter are available for the respective indicator. Typically, indicators based on survey data, such as the three ifo variables, are available for the first two months of the current quarter, while indicators based on hard data, such as foreign new orders and exports in delimitation of special trade, are available only for the first month. This means that real exports in delimitation of special trade may still not be the best predictor, even though this series has the highest contemporaneous correlation with real exports in delimitation of national accounts. As a result, the ifo indicators have an informational advantage over the hard indicators, which may be particularly valuable due to the volatility of exports.

Out-of-sample Forecasting Performance

In this section, we assess the performance of each of the indicators with respect to forecasting the quarterly growth rates of German exports in the current and the following quarters. We use the following forecasting model for the current quarter:

$$(3)\ \widehat{\Delta Export_t} = \widehat{\alpha_1^1} + \widehat{\beta_1^1} Indicator_t + \ldots + \widehat{\beta_{p+1}^1} Indicator_{t-p},$$

where $\widehat{\Delta Export_t}$ is the forecast of quarter-on-quarter real export growth, $Indicator_t$ denotes the current quarterly value of one of the leading indicators, while $Indicator_{t-p}$ is lag p of the leading indicator. The monthly leading indicators are transformed to quarterly frequency. As described in the previous section, for some of the indicators only the first month of the current quarter is available, for others the first two months are known. We take this into account in the conversion to quarterly values, so that the current quarterly value contains only the average of the available months. Finally, the indicators export special trade, foreign new orders, and exchange rate enter as log-differences, respectively; ifo Foreign Orders are considered in first differences; and ifo Export Expectations and ifo Export Climate are not transformed.

For the forecast of the following quarter, the forecasting model must be slightly changed since we do not have any values for the leading indicator in $t + 1$:

$$(4)\ \widehat{\Delta Export_{t+1}} = \widehat{\alpha_1^2} + \widehat{\beta_1^2} Indicator_t + \ldots + \widehat{\beta_{q+1}^1} Indicator_{t-q}$$

The evaluation of the forecasting performance of the models is based on pseudo-out-of-sample forecasts.[8] Out-of-sample means that the period for the estimation of the models' parameters does not include the forecasted quarter. The term pseudo illustrates that the forecasts refer to periods for which realized data is already available. In our case, the first estimation period is from 1991:Q1 to 2005:Q1. Using models (3) and (4), forecasts are produced for the current quarter (2005:Q2) and the next quarter (2005:Q3) using one particular leading indicator. These forecasts are then compared to the actual values to determine forecast errors for the current and the next quarter. Then, the estimation period is extended by one quarter to cover 1991:Q1 to 2005:Q2, forecasts are generated for the third and fourth quarter of 2005, and forecast errors are computed using the actual values. This procedure is repeated up to the most recent data point, so that the last estimation sample covers the period 1991:Q1 to 2019:Q2. In sum, 57 forecast errors for the current quarter and 56 forecast errors for the next quarter are produced for each leading indicator.[9]

We assess the forecast errors separately for the current quarter ($h=0$) and the next quarter ($h=1$) for each indicator (IND) based on the root mean squared errors ($RMSE$):

$$(5)\ RMSE_h^{IND} = \sqrt{\frac{1}{T_h}\sum_{t\in T_h}(\widehat{\Delta Export_{t+h}} - \Delta Export_{t+h})^2},$$

[8] The choice of the number of lags p and q of the leading indicator in models (3) and (4) is based on the Bayesian Information Criterion (BIC). The parameters of the models are estimated with OLS.

[9] We use real-time data for this exercise. Using the final vintage data does not change our main findings. Also, using exports of goods instead of exports of goods and services does not change the main results. We also experimented with including lags of export growth in models (3) and (4), which does not change the main findings; however, using own lags results in a deterioration of the absolute forecast performance of the indicators. This is because export growth is not very persistent (see the first row of Table 3).

where T_h denotes the number of forecasts produced for each horizon. The forecast error for quarter $t+h$ is the squared difference of the forecast ($\Delta\widehat{Export}_{t+h}$) and actual export growth ($\Delta Export_{t+h}$). The difference is squared to capture the absolute size, since a forecast may prove to be too high or too low, resulting in a forecast error being either positive or negative. Squaring the forecast error also means that large errors are weighted more heavily. Summing over all forecast errors for horizon *h*, dividing by the number of forecasts T_h, and taking the squared root yields the average forecast error. The lower the *RMSE*, the better the forecasting performance of the respective indicator.

To assess the relative performance of an indicator, we calculate the relative *RMSE* or *Theil's U* as the ratio of the RMSE of the indicator model and that of a specific reference model:

$$(6)\ Theil´s\ U_h^{IND} = \frac{RMSE_h^{IND}}{RMSE_h^{REF}}$$

where $RMSE_h^{REF}$ is derived by replacing $\Delta\widehat{Export}_{t+h}$ with $\Delta\widehat{Export}_{t+h}^{REF}$ in Equation (5), $\Delta\widehat{Export}_{t+h}^{REF}$ denotes the forecast of a reference model. The further the Theil's U lies below a value of 1, the more accurate the indicator model forecasts compared to a reference model. As reference models we use an AR(r)-model and a random walk model.[10]

Table 3 shows the results from the pseudo-out-of-sample forecasts for the current quarter (at the top) and for the next quarter (at the bottom). Bold values show a good forecasting performance (*RMSE < 3*, *Theil's U << 1*). For the forecast of the current quarter, most of the indicators have much lower *RMSEs* compared to both reference models. Therefore, indicators such as special trade, foreign new orders, and the three ifo variables are good predictors for forecasting export growth in the current quarter. In contrast, price competitiveness, as proxied by the real effective exchange rate, have a similar *RMSE* value as the two reference models, so that this indicator is of only limited use as an instrument for the current-quarter forecast. For the forecast of the next quarter, the ifo indicators, and especially the ifo Export Climate, perform much better than the rest of the indicators. In contrast to the other indicators, the *RMSEs* of the ifo indicators are clearly below those of the reference models. Therefore, the ifo Export Climate and the other two ifo indicators are the most reliable predictors for the forecast of export growth for the next quarter.

[10] An AR(r)-model for forecast horizon *h* is: $\Delta\widehat{Export}_{t+h}^{REF} = \hat{\alpha} + \hat{\beta}_1^h \Delta Export_{t-1} + \ldots + \hat{\beta}_r^h \Delta Export_{t-r}$; the lag length *r* is based on the Bayesian Information Criterion (BIC). For both forecast horizons, a random walk model yields: $\Delta\widehat{Export}_{t+h}^{REF} = \Delta Export_{t-1}$.

Table 3

Pseudo-out-of-sample Forecasting Performance of Different Indicators for Export Growth

	Current quarter		
		Theil's U	
Indicator	RMSE	against AR(p)	against random walk
Nominal export special trade	**2.26**	**0.64**	**0.62**
Real export special trade	**2.32**	**0.66**	**0.64**
Foreign new orders	**2.24**	**0.64**	**0.62**
Real eff. exchange rate	3.50	1.00	0.96
ifo Foreign Orders	**2.28**	**0.65**	**0.63**
ifo Export Expectations	**2.14**	**0.61**	**0.59**
ifo Export Climate	**2.35**	**0.67**	**0.65**
Univariate AR(r)	3.52		
Random walk	3.63		
	Next quarter		
		Theil's U	
Indicator	RMSE	against AR(p)	against random walk
Nominal export special trade	3.58	1.02	**0.80**
Real export special trade	3.59	1.02	**0.80**
Foreign new orders	3.26	0.93	**0.73**
Real eff. Exchange Rate	3.71	1.06	**0.83**
ifo Foreign Orders	**2.92**	**0.83**	**0.65**
ifo Export Expectations	**2.87**	**0.81**	**0.64**
ifo Export Climate	**2.68**	**0.76**	**0.60**
Univariate AR(r)	3.52		
Random walk	4.48		
Standard deviation of export growth	2.47		

Notes: The target series to forecast are real-time quarterly growth rates of total exports in delimitation of national accounts. The forecast errors are computed with respect to the first release. Bold values indicate a good forecasting performance of the respective indicator ($RMSE < 3, Theil's\ U \ll 1$). The top shows results for the current quarter (*h=0*), the bottom for the next quarter (*h=1*). The lag length of the reference AR(r)-model is BIC-optimized. For the current quarter, only the first month is available for special trade exports and foreign new orders; for the ifo indicators and the real effective exchange rate, the first two months are available. Special trade exports, foreign new orders, and the real effective exchange rate are in log-differences, ifo Orders are in differences, and ifo Export Expectations and ifo Export Climate are not transformed.

Source: Calculations by authors.

CONCLUSION

This study presents a leading indicator for export forecasting: the ifo Export Climate. This indicator is constructed using survey data from business and consumer surveys and also includes a measure for price competitiveness. Using the example of Germany, we show that this indicator performs well for short-term forecasting. In particular, we find that the ifo Export Climate is the best-performing indicator for the forecast of the next quarter. Due to the good performance of the indicator, the ifo Institute has been using the ifo Export Climate as a predictor for German exports in all its business cycle forecasts for many years.

REFERENCES

Ca' Zorzi, M. and B. Schnatz (2007), "Explaining and Forecasting Euro Area Exports – Which Competitiveness Indicator Performs Best?", *European Central Bank Working Paper* 833.

Danninger, S. and F. Joutz (2008), "What Explains Germany's Rebounding Export Market Share?", *CESifo Economic Studies* 54, 681–714.

Elstner, S., C. Grimme and U. Haskamp (2013), "Das ifo Exportklima – ein Frühindikator für die deutsche Exportprognose", *ifo Schnelldienst* 66(4), 36–42.

European Commission (2016), *The Joint Harmonised EU Programme of Business and Consumer Surveys – User Guide,* Brussels.

Grimme, C., R. Lehmann and M. Nöller (2019), "Forecasting Imports with Information From Abroad", *ifo Working Paper* 294.

Grimme, C. and C. Thürwächter (2015), "Der Einfluss des Wechselkurses auf den deutschen Export – Simulationen mit Fehlerkorrekturmodellen", *ifo Schnelldienst* 68(20), 35–38.

Hanslin, S. and R. Scheufele (2019), "PMIs: Reliable Indicators for Exports?", *Review of International Economics* 27, 711–734.

Keck, A., A. Raubold and A. Truppia A. (2009), "Forecasting International Trade: A Time Series Approach", *OECD Journal: Journal of Business Cycle Measurement and Analysis* 2009(2), 157–176.

Kilian, L., A. Rebucci and N. Spatafora (2009), "Oil Shocks and External Balances", *Journal of International Economics* 77, 181–194.

Lehmann, R. (2019), "Forecasting Exports across Europe: What Are the Superior Survey Indicators?", *CESifo Working Paper* 7846.