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A panel approach using Business Survey Data

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Abstract:

This paper presents a first attempt to construct quantitative forecasts for the growth rates of all the German Bundesländer using business survey data (BSD). A panel approach is used on data from 2000 to 2011. It is found that the level and the change in BSD play a significant role in modeling regional growth rates. A novel national benchmark is introduced, which assumes that all Länder will grow according to the expected national growth rate. Results from a pseudo real time out of sample forecasting experiment suggest that forecasts based purely on January BSD can rival the national benchmark, while the April indicator even outperforms this benchmark by more than 10 per cent at the one-year horizon. Interestingly, fixed effects estimation does not improve the forecasting performance for regional growth rates. It is also found that BSD-based models perform less well during the crisis period from 2008-2011. The analysis suggests that the forecasting performance of BSD models is driven primarily by accurately accounting for national trends, rather than regional ones.

Content

1 | Introduction

This paper aims to contribute to the existing literature on German regional growth by introducing business survey data (BSD) for the 16 German Bundesländer. The dataset is used to forecast annual regional growth rates in a panel framework. Being able to generate reliable forecasts at the regional level is particularly important in federal states like Germany, where much of the fiscal policy takes place at regional level. Furthermore, many private enterprises, like banks, have a strong interest in regional forecasts. However, the academic literature on this topic has been relatively scarce with most of the focus lying on national analysis. Hence, this paper intends to reduce the uncertainty surrounding regional growth rates by investigating to what extent BSD can help in their forecasting.

In Germany availability of data at the level of the Bundesländer has been a significant obstacle to research and policy making. Key regional data series are only published annually with the first release occurring at the end of March of the subsequent year[1]. To make things worse, significant revisions can be expected. The latest revision included changes in regional growth rates of more than 100% for the year 2009[2] and any results presented in this paper must thus be considered preliminary. Other data series, particularly on the demand side, are not published at all on the level of the Länder. Finally, regional data application is further complicated by the German unification, which taints data prior to 1996 and thus further reduces the available data.

This problematic data situation is reflected in the scarcity of literature on the topic. There is a strong sentiment that quarterly data publication is paramount for improved analysis at the regional level (Kholodilin et al., 2008), because this would quadruple the number of data points and facilitate the determination of economic turning points. In the absence of official publications several researchers have attempted to generate quarterly data independently. Quarterly GDP data has been produced for a number of German Länder including Hamburg (Bandholz & Funke, 2003), Berlin (Dreger & Kholodilin, 2006), Sachsen (Nierhaus, 2012) and Baden-Württemberg (Vullhorst, 2008). These estimates are based on sub-annual time series data and rely on factor analysis and temporal disaggregation to distil an approximation of quarterly GDP.

While the quarterly data series for Berlin and Hamburg have been discontinued, the ones for Sachsen and Baden-Württemberg are still estimated and available with short delays. Particularly Sachsen has thus received a disproportionate amount of attention. In addition to regular forecasts for Sachsen (e.g. Arent et al., 2011), the performance of

[1] GDP growth rates are also published for the 1st half of the year, but the data is not reliable and no coherent time series exist

[2] Bremen's growth rate was revised from -3,3% to -7.6%

BSD for the crisis period around 2009 has been investigated by Lehmann et al. (2010). It is found that the BSD revealed the turning points and anticipated the recession, while generally performing well relative to official business cycle data for Sachsen. A very recent publication by Lehmann & Wohlrabe (2012) attempts to forecast quarterly growth rates for Sachsen, Baden-Württemberg and eastern Germany by pooling regression results from various specifications including over 300 explanatory variables, including BSD. This is based on previous work by Vogt (2010) and finds significant forecasting gains relative to an autoregressive benchmark in the short- and long-run.

The only notable attempt at estimating regional growth for all the German Länder in a single panel was produced by Kholodilin et al. (2007). They used an autoregressive model with spatial dependence, which suggests that growth in a specific Bundesland depends on its growth in the past, as well as the growth of the neighbouring Länder. As the time frame under investigation covers the period from 1990-2006 a growth-interacted boom dummy is included as well, which captures the high growth rates of the new Bundesländer in the wake of unification. While this paper "strongly recommends" the use of spatial regressions due to a 10% improvement for the first year forecast, this is compared to an autoregressive benchmark with limited explanatory power. Consequently, the authors reviewed their opinion in a subsequent article (Kholodilin et al., 2008) stating that their model's forecasting ability was very limited and was outperformed by a naïve benchmark based on the lag of national growth.

In conclusion, there are currently no systematic forecasts of growth rates for most Bundesländer and economic agents are generally operating in an information vacuum concerning regional growth. As regional business cycle convergence is not complete (Schirwitz et al., 2009), regional growth rates are heterogeneous and can differ significantly from the national average. Hence, the national forecast is not always a useful expectation at the regional level. This paper addresses the issue by introducing BSD for all the Bundesländer and is the first to systematically forecast growth rates for all the Bundesländer based on BSD.

The remainder of the paper will be structured as follows. Section 2 will elucidate the dataset used in this analysis, while Section 3 will outline the methodology. Subsequently, Section 4 will present the results of the data analysis and their interpretation. Finally, Section 5 will summarize the results and propose directions for further research.

2 | Data

The central element of this analysis is BSD for the 16 German Bundesländer, which has been gathered from the year 2000 to April 2012, depending on availability (see Appendix A1). All but one Indicator in the dataset have been retrieved from the chambers of commerce (“Industrie- und Handelskammern”, IHK). One indicator (Nordrhein-Westfalen) is published by the IFO-institute in cooperation with the NRW Bank and is methodologically similar[3] to the ones of the IHK. The BSD is allocated to 4 time slots per year; one for each season[4]. The most common surveys currently provide 3 readings a year, while Brandenburg provides only a single reading (Table A1). The indicators used in this analysis are constructed as an average of the replies to questions about the current and expected (12-months horizon) business environment (see Appendix 2 for details), which can range from 0 and 200. BSD has some crucial advantages, which include its rapid availability, sub-annual publication and the absence of revisions. The indicators are standardized, seasonally adjusted and comparable across regions, according to the IHKs.

Nonetheless, several minor methodological differences appear to persist despite continued attempts at standardization. Upon request it was revealed that there are slightly different approaches to sampling for and construction of the indicator. While some regions reflect the sectorial structure of GDP in the survey recipients, others account for it explicitly in the weighting of responses. Furthermore, the treatment of the hospitality sector differs across regions, as it sometimes included and sometimes considered separately. It is generally the case that the surveys focus on large enterprises and do not manage to survey many small enterprises, which would probably more strongly reflect regional dynamics. Additionally, the weighting of survey replies is primarily done by company turnover and employment, which gives more weight to companies with a superregional scope. Thus, it is possible that the IHK data contains a national or even supranational bias, which is partly due to selection and partly due to construction.

The data for real regional GDP growth have been retrieved from the German Federal Statistical Office in May of 2011 and are chain-linked real growth rates using the classification “WZ 2008” (Summary in Appendix). Diagram 1 summarizes the data by displaying the unweighted average of the January BSD indicator for a given year and comparing it to the unweighted average of regional growth rates. A good fit is apparent and especially the direction of growth is well reflected. Interestingly, there appears to be a band between 75 and 130 within which the BSD indicators tends to

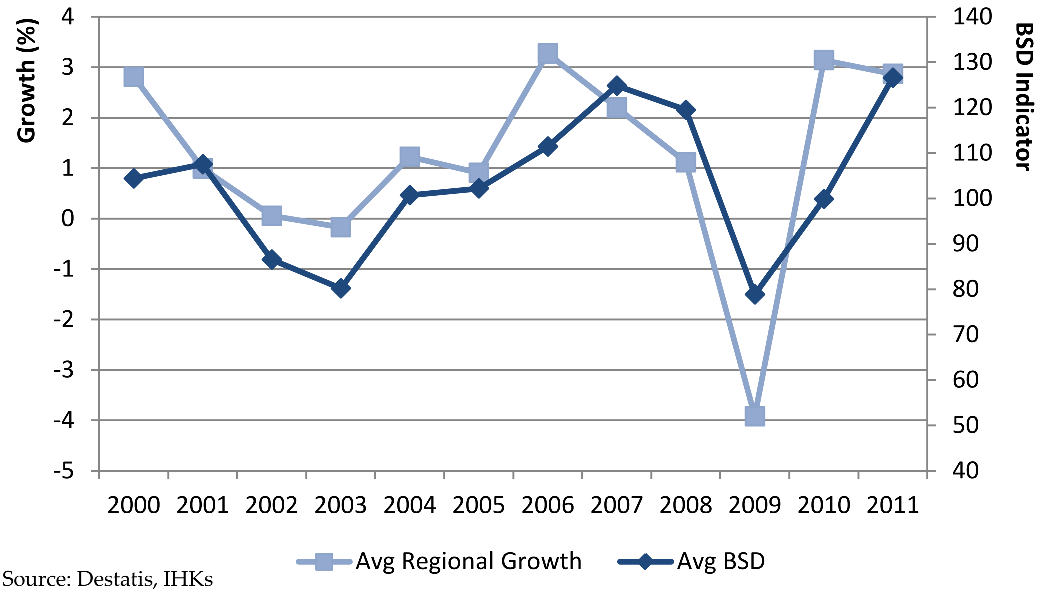
[3] The questions and the construction of the indicator are identical, but the weighting of answers and sample selection are different.

[4] The time of publication is heterogenous. Not all Indicators included in the April category are published in April

fluctuate. Finally, the HWWI annual national growth forecasts from the beginning of the year are included in the dataset.

Diagram 1

Average BSD Indicator vs. Average Regional Growth



Source: Destatis, IHKs

3 | Methodology

This analysis is based on a panel data approach which assumes a similar relationship between BSD and growth for the various Bundesländer. Hence, BSD is assumed to be a proxy for a number of determinants of growth and is used to generate forecasts of annual regional growth rates. While quarterly growth rates may be preferable, their availability remains limited. Initially, the seasonal BSD will be tested to determine the predictive capacity at different point in time. This is done in a pooled model with the BSD and the first difference of the BSD as explanatory variables. Including the first difference of BSD addresses some of the measurement issues in the BSD, as the growth forecast does not solely rely on the level of the indicator, which may be biased.

Equation 1

Pooled Model

$$growth_{it} = \alpha + \beta_1 BSD_{it} + \beta_2 (BSD_{it} - BSD_{it-1}) + \varepsilon_{it} ,$$

where "i" is the region and "t" is the time period. Subsequently, fixed effects estimation will be used to allow for region-specific intercepts and assess whether accounting for structural differences improves the model's explanatory power.

Equation 2

Fixed Effects Model

$$growth_{it} = \alpha + \beta_1 BSD_{it} + \beta_2 (BSD_{it} - BSD_{it-1}) + f_i + \varepsilon_{it} ,$$

where f_i is a set of regional dummies capturing fixed regional effects. In order to compare the predictive capacity of the models in Equations 1 and 2 a benchmark is needed for comparison. A sensible benchmark should only contain information available at the beginning of the year, which limits the number of available indicators. Traditionally, a simple AR(1) model is used (e.g. Kholodilin et al. (2007)) and this paper uses a pooled AR model as shown in Equation 3 for comparison.

Equation 3

Autoregressive Benchmark

$$growth_{it} = \alpha + \beta_1 growth_{it-1} + \varepsilon_{it} .$$

As an alternative benchmark we include a model, which assumes that the growth rates of all the Bundesländer will be equal to the expected national growth rate, as captured by the HWWI national growth forecast and the lag of national growth. This model is shown in Equation 4. While the HWWI national forecast may not be the most accurate one, it is a fair representation of expectations and is readily available to the author.

Equation 4

National Benchmark

$$growth_{it} = \alpha + \beta_1 growth_{Dt-1} + \beta_2 HWWI_{Dt} + \varepsilon_{it} .$$

To assess the forecasting accuracy of the various models recursive pseudo real time out of sample forecasts are generated for the time period from 2005-2011. As the BSD is intended as a short term indicator of economic sentiment the 1-year horizon is clearly the most interesting one. For Investigative purposes, this assessment will also include a horizon of 2 years. The forecasts will be estimated using only data which would have been available at the time of estimation (barring revisions). Hence the forecast for 2005 will be based on data from 2000-2004. For every subsequent year the sample is extended accordingly. Equation 5 shows the model for forecasting the pooled model at horizon "h". The process is comparable for the Equations 2 to 4.

Equation 5

Forecasting

$$growth_{it+h} = \alpha + \beta_1 BSD_{it} + \beta_2 (BSD_{it} - BSD_{it-1}) + \varepsilon_{it},$$

In order to assess the forecasting capabilities of the BSD and the various models an error estimate is required. These tend to be some variation of the mean square forecast error (MSFE) in the literature to date (e.g. Lehmann & Wohlrabe, 2012). Hence, this paper will rely on the root mean square forecast error (RMSFE), the formula for which is summarized in Equation 6. "FE" stands for forecast error and is the difference between the estimated growth rate and the realized one over all the regions and years at a given horizon.

Equation 6

RMSFE

$$RMSFE = \sqrt{\left(\frac{1}{n}\Sigma_{i=1}^{n}\left(FE_i\right)^2\right)}.$$

4 | Analysis

The first step of the analysis is to test which BSD indicators throughout the year are most significant in explaining annual regional growth. Hence, Equation 1 is executed for the various sub-annual time slots of the BSD over the full time period. The results give some insights into the ability of the BSD to model regional growth and are reported in Table 1.

Table 1

Pooled OLS Regression 2000-2011

	Lag Oct	Jan	April	July	Oct
Constant					
BSD	-.024	.024	.047	.072	.104
	(1.38)	(2.76)	(5.59)	(5.03)	(7.17)
Δ BSD	.103	.076	.058	.041	-0.003
	(6.62)	(10.14)	(8.05)	(3.01)	(-0.21)
N	121	150	131	77	135
R2	0.316	0.623	0.670	0.516	0.347
RMSE	2.10	1.48	1.43	1.67	1.99

Dependent Variable: Annual Regional Growth
t-statistics in parentheses

Using the BSD indicator from October of the previous year contains limited information about growth in the current year. The leading indicator published at the beginning of the year (Jan) explains 62 per cent of the in-sample variations in growth, while the one in spring (April) accounts for as much as 67 per cent. The July indicator also has relatively strong explanatory power, but is published later in the year and only in selected Länder. The October value appears even later and is thus not practical, in addition to providing little information on the current year's growth rate. This is confirmed by the respective in–sample root mean squared errors (RMSE). These results appear intuitive as the indicator captures current sentiment as well as a short-term outlook. Thus, the January and April indicator reflect mainly developments and expectations in the current year, while the July and particularly the October indicators may contain expectations about subsequent years.

Interestingly, there is a trend in the coefficients of the BSD and change in BSD. For the October estimate of the previous year it is primarily the change in BSD that is significant and has a high coefficient while the level of BSD is not significant and slightly negative. As the year progresses these roles reverse and the level of the indicator attains a high coefficient and significance, while the change in BSD attains a slightly negative non-significant coefficient.

The focus in forecasting will lie on the January and April indicator, as they allow insights into regional developments prior to any official publication and are widely available. Earlier estimates will be available using the January indicator, while the April indicators offer improved explanatory power at the cost of later availability. An additional benefit of the January indicator is that it is available for all the Bundesländer, which is not the case for the April indicator.

In the following step, two specifications of Equation 1 and 2 will be compared using robust standard errors. The results are reported in Table 2 and display only marginal differences between the pooled and fixed effects model, which is reflected in the insignificance of fixed effects for all Bundesländer[5]. Furthermore, they highlight one of the problems in estimating annual growth rates, as the January and April model specifications can yield significantly different results, especially when economic turning points occur. Caution is advised in interpreting these results as the year 2009 has a significant impact on the results, particularly the coefficient on the change in BSD.

Table 2

Pooled Model vs. Fixed Effects, 2000-2011

	Pool Jan	FE Jan	Pool April	FE April
Constant				
BSD	.024	.029	.047	.053
	(2.92)	(2.56)	(6.10)	(6.40)
Δ BSD	.076	.073	.058	.055
	(9.05)	(6.00)	(7.82)	(4.99)
N	150	150	131	131
R2	0.623	0.622	0.670	0.669
RMSE	1.48	1.44	1.43	1.39

Dependent Variable: Annual Regional Growth
t-statistics in parentheses
Robust standard errors

Subsequently, the forecasting performance of these models will be assessed in a pseudo out of sample forecasting exercise. For reference, the results of regressing Equations 3 and 4 over the full time period are reported in the Appendix (Table A3). Intriguingly, the commonly used autoregressive approach has no explanatory power in this sample (R^2 of 0.000), drawing into question its appropriateness as a benchmark for annual regional growth. The national benchmark performs well and manages to explain a significant portion of the variation in the sample.

These results translate into the forecasting performance of the respective benchmarks. Table 3 reports the RMSFEs of the various model specifications for horizons of 1 and 2 years, based on Equation 5. The autoregressive benchmark performs significantly worse at the 1-year horizon than any other specification. It is not an appropriate benchmark for annual regional growth forecasts at short horizons. The

[5] relative to Baden-Württemberg

performance actually improves at the 2-year horizon where it performs relatively well. It appears that it is hence a more suitable benchmark for medium or long term exercises. The national benchmark performs significantly better in one year ahead out of sample forecasts than the autoregressive model, which comes as no surprise given the inclusion of an explicit national growth forecast. Despite its assumption of equal growth rates, this appears the more suitable benchmark and is hence used to assess the forecasting performance of the other models.

Table 3

RMSFE, 2005-2011

	AR Benchmark	National Benchmark	Pool Jan	FE Jan	Pool April	FE April
h=1 (N≥96)	3.05	1.96 (1.00)	1.90 (0.97)	1.97 (1.01)	1.71 (0.87)	1.75 (0.89)
h=2 (N≥82)	2.80	2.80 (1.00)	3.25 (1.16)	3.50 (1.22)	3.12 (1.09)	3.17 (1.11)

Ratio of RMSFE relative to National Benchmark in parentheses

Table 3 shows that the April indicators are preferable to the January indicators and that pooled models are preferable to fixed effects models. The former comes as no surprise, while the latter is not as intuitive. Traditionally, structural causes are expected to play a significant role in determining growth rates. However, this result confirms the finding of Kholodilin et al. (2007), who also do not observe forecasting gains through fixed effects. They suggest that this is due to the short time frame of the data, which impedes "a precise estimation of region specific intercepts" (p.11).

The results suggest that one year forecasts based on January indicators are as reliable as the National Benchmark, while the April indicators can outperform the benchmark by more than 10%[6]. This is likely due to additional information becoming available. As the benchmark assumes equal growth rates for the Länder it is not clear whether the forecasting gains arise primarily from more precise estimation of national growth or actually explaining the differences in growth rates between the Länder. At a forecasting horizon of 2, all the BSD-based models perform worse than both benchmarks, suggesting that the BSD is indeed a short-term indicator and not suitable, by itself, for horizons beyond one year.

To assess the performance of the BSD around the crisis year of 2009 a separate forecasting analysis is conducted for the time from 2008 to 2011. The results for a one year ahead out of sample forecast are reported in Table 4. Most noticeably, all models

[6] Improvements against the autoregressive benchmark are significantly larger

perform worse when regarding this time frame, primarily due to the increased focus on the large deviations in growth in 2009. However, there is also a relative change in forecasting accuracy. The national benchmark now outperforms the January BSD and is roughly on par with the April BSD model. Hence, forecasts based on BSD were outperformed during this time period by this naïve national benchmark. On the other hand this implies that the BSD based models performed even better during the period from 2005-2007, which might be a more informative time frame in the absence of crisis.

Table 4

RMSFE, 2008-2011

	AR Benchmark	National Benchmark	Pool Jan	FE Jan	Pool April	FE April
h=1 (N=64)	3.78	1.99 (1.00)	2.11 (1.06)	2.15 (1.08)	2.00 (1.01)	1.97 (0.99)

Ratio of RMSFE relative to National Benchmark in parentheses

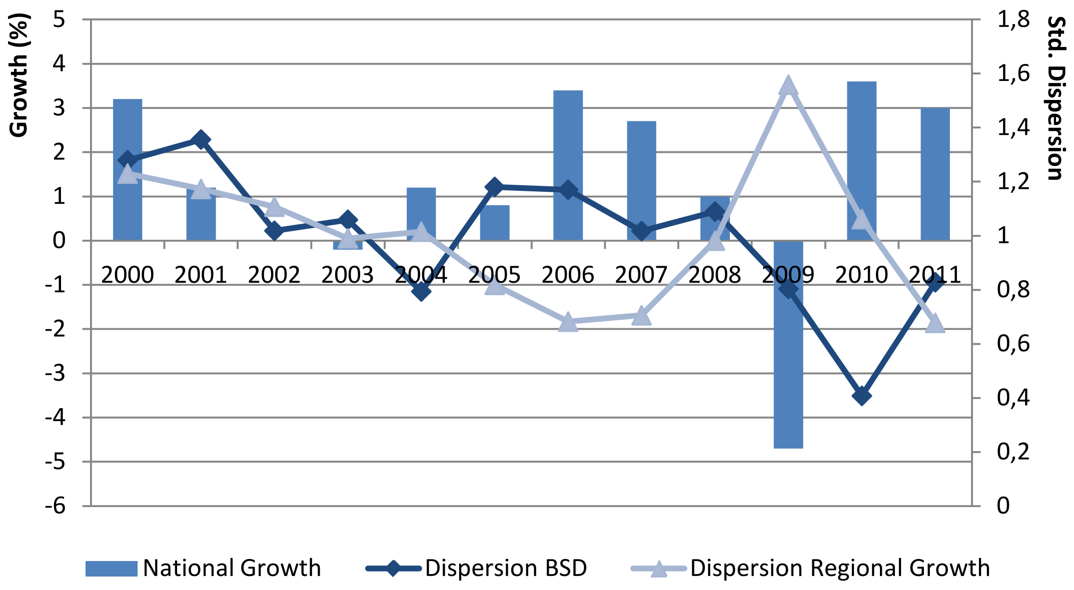
The reasons for the decrease in forecasting accuracy when focusing on the period from 2008 to 2011 can be found primarily in the increased weighting of the year 2009. When inspecting Diagram 1, it is found that average BSD in 2009 was similar to the one in 2003, while the growth rates were -4.7 and -0.2 per cent respectively. Visual inspection suggests that an average BSD around 50 would have been a more appropriate indication of the growth rate in 2009. Hence, it might be worth investigating whether a practical lower bound exists for the BSD indicators, since the lowest reported value in the entire sample is 60. Thus it appears, the BSD indicators are by construction not suited to model growth extremes.

A second issue observed in the data is that the dispersion of BSD and growth across the Bundesländer move in opposite directions as shown in Diagram 2. Assuming that the dispersion in regional growth rates is positively correlated to national business cycle intensity (e.g. Basile et al., 2012), this suggests that the BSD indicators converge in times of very high or very low national growth. Diagram 2 only finds partial support. It appears that the regional growth dispersion, moves opposite to national growth, while BSD dispersion is positively correlated with national growth. These effects are particularly pronounced for the period after 2004. It is notable that the dispersion in growth rates is relatively high from 2008 to 2011, while the dispersion in BSD is relatively low[7]. While this phenomenon is difficult to explain it is likely that it contributes to the decrease in forecasting performance of the model in the crisis years.

[7] This also holds true, though less pronounced, when investigating April indicators

Diagram 2

Dispersion of Regional Growth, BSD vs National Growth



Standardized Dispersion is the Std. Deviation for the year divided by the average Std. Deviation for the sample
BSD indicators from January
Source: Destatis, IHKs, own calculations

Despite these shortcomings, models based on BSD manage to model the growth rates of the Bundesländer relatively well, as shown in Diagram A1 of the Appendix. The fact that the national benchmark is outperformed in the forecasting exercise from 2005-2011 is quite remarkable and suggests that business surveys contain a similar amount of information on the growth in the coming year as explicit national forecasts, like the one of the HWWI. The drop in relative forecasting performance in the crisis years is problematic, as this period had particularly high deviations in regional growth. This proposes that the BSD does not reflect regional differences as well as would be desirable. In an attempt to investigate whether the forecasting performance of the BSD models is driven by accurate prediction of the national average or by successfully modeling the differences between the Länder, Table 5 shows the results of regressing the various models on the difference between national and regional growth for a given year. Hence the relative growth performance of each Bundesland is modeled.

Table 5

Modeling Relative Growth, 2005-2011

	National Benchmark	Pool Jan	Pool April	FE Jan	FE April
Constant					
BSD		.006 (0.69)	-.001 (0.04)	-.001 (0.02)	-.006 (1.20)
Δ BSD		-.017 (1.96)	-.010 (1.33)	-.014 (1.08)	-.007 (0.73)
HWWI	-.321 (2.20)				
Lag National Growth	.052 (1.18)				
N	112	109	96	109	96
R2	0.058	0.033	0.021	0.063	0.040
RMSE	1.21	1.20	1.24	1.13	1.13

Dependent Variable: Difference between regional and national growth rate
t-statistics in parentheses
Robust standard errors

The findings in Table 5 propose that there is no significant difference between assuming equal growth rates and modeling using BSD. This is an indication that the forecasting performance of BSD models is driven by successfully modeling national trends rather than regional ones. The lack of significance for the level of BSD in pooled models suggests that the value of the BSD does not reflect the relative growth performance of a given Bundesland. The BSD is hence not directly comparable in levels across regions. This is accounted for in the fixed effects estimations, which perform marginally better in modeling relative regional growth rates. However, none of the models achieve satisfactory results in this exercise, further strengthening the notion that national trends drive BSD-based forecasting performance, likely due to a national bias in the BSD.

5 | Conclusion

This paper has presented a first attempt to construct quantitative forecasts for the growth rates of all the German Bundesländer using BSD. A panel approach was used on data from 2000 to 2011. It was found that the level and the change in BSD play a significant role in modeling regional growth rates. A novel national benchmark was introduced, which assumes that all Länder will grow according to the expected national growth rate. This is theoretically appealing and performs significantly better than an autoregressive benchmark, which has severely limited explanatory and predictive capacities for one-year horizons. Results from a pseudo real time out of sample forecasting experiment suggest that forecasts based purely on January BSD can rival the national benchmark, while the April indicator even outperforms this benchmark by more than 10 per cent at the one-year horizon. For any horizon beyond one, BSD is not useful by itself. Interestingly, fixed effects estimation did not improve the forecasting performance for regional growth rates, even though it did model regional growth rates relative to national ones slightly better. It is also found that BSD-based models perform less well during the crisis period from 2008-2011. The analysis suggests that the forecasting performance of BSD models is driven primarily by accurately accounting for national trends, rather than regional ones. This is likely due to a national bias and the BSD set used in this analysis thus has limited explanatory power at the regional level.

Nonetheless, regional BSD may prove a valuable asset in understanding and forecasting regional growth. For one, the models presented rely purely on BSD, but could be extended to include further explanatory variables from the regional, national or international level. This is likely to further improve forecasting performance. Second, it is debatable how sensible it is to forecast annual data, given that BSD from January and April can results in significantly different estimates. Hence, quarterly data would be an interesting point of comparison. Third, the quality of the data may be enhanced to more accurately reflect regional developments. Perhaps revisions to the data can correct for the national bias. Distinguishing between the assessment of the current situation and expectations might also prove beneficial.

Finally, updated data will be crucial for further assessment. The German Federal Statistical Office is currently revising the regional data from 1991 to 2008, which might lead to considerable changes.

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7 | Appendix

7.1 | Tables

Table A 1

Business Survey Data Sample

	First Year in Dataset	Frequency	Average BSD Indicator
Baden-Württemberg	2000	4,3	111.5
Bayern	2000	3	109.1
Berlin	2001	3	113.9
Brandenburg	2000	1	97.5
Bremen	2000	4	107.9
Hamburg	2000	4	109.5
Hessen	2003	4,3	103.4
Mecklenburg-Vorpommern	2006	3	106.6
Niedersachsen	2000	4	102.4
Nordrhein-Westfalen	2000	12	94.2
Rheinland-Pfalz	2003	4,3	106.8
Saarland	2003	12	108.8
Sachsen	2000	2,3	101.2
Sachsen-Anhalt	2004	4	106.7
Schleswig-Holstein	2000	4	103.1
Thüringen	2000	3	98.1

Source: IHKs, NRW-Bank

Table A 2

Annual Regional Growth Sample

	Min	Avg	Max	Std Dev
Baden-Württemberg	-7.08	1.53	5.53	3.4
Bayern	-4.68	1.89	5.51	2.46
Berlin	-2.18	0.7	3.72	2.17
Brandenburg	-1.64	1.41	4.08	1.68
Bremen	-3.32	1.51	4.19	1.96
Hamburg	-3.46	1.1	4.06	2.29
Hessen	-4.14	1.42	3.58	2.19
Mecklenburg-Vorpommern	-2.42	1.02	3.36	1.57
Niedersachsen	-4.41	1.15	3.44	2.17
Nordrhein-Westfalen	-5.58	0.97	3.39	2.36
Rheinland-Pfalz	-4.3	1.23	4.8	2.37
Saarland	-7.39	1.47	4.75	3.27
Sachsen	-3.45	1.46	4.36	1.89
Sachsen-Anhalt	-4.8	0.91	3.2	2.06
Schleswig-Holstein	-1.95	1.1	3.03	1.58
Thüringen	-3.82	1.5	3.47	2.07

Table A 3

Benchmark Regression, 2000-2011

	Autoregressive	National
Constant		
Lag Regional	.009	
Growth	(0.13)	
HWWI		1.674
Forecast		(15.00)
Lag National		-0.280
Growth		(5.24)
N	192	192
R2	0.000	0.544
RMSE	2.26	1.53

Dependent Variable: Regional Growth
t-statistics in parentheses

7.2 | Construction of BSD Index

1. "How does your company assess its current situation?"
2. "Which developments does your company expect in the next 12 months?"

a. Good b. Satisfactory c. Bad

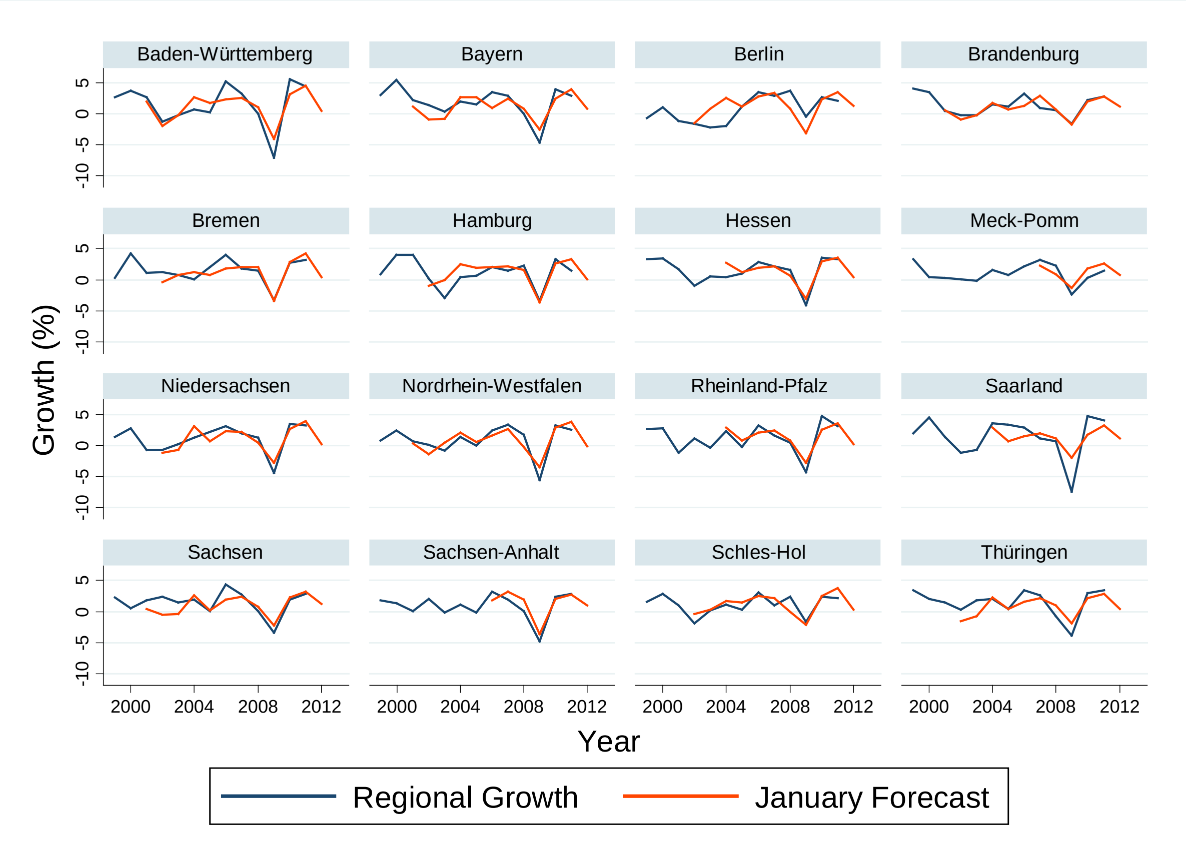
Answers weighted

BSD Indicator = $\sqrt{\left(\left(\frac{(1a-1c)*100}{Total\ Replies}\right)+100\right)*\left(\left(\frac{(2a-2c)*100}{Total\ Replies}\right)+100\right)}$

7.3 | Diagrams

Diagram A 1

Official Regional Growth vs Model Forecast, 2000-2012



Ex-post estimation of January BSD
Source: Destatis, own calculations

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