doi: 10.36689/uhk/hed/2018-01-011

Business Climate and Production Dynamics Nexus: Empirical Evidence for Bulgarian Manufacturing Sector

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Abstract. The paper presents selected results from an empirical analysis of the interrelation between the industrial dynamics and business climate in industry for the period 2009-2017 in Bulgaria. A vector auto-regression model has been estimated for this purpose using variables for the indexes of production volume and business climate estimated on monthly basis. Data from the short-term business indicators as well as business surveys in industry conducted by the Bulgarian National Statistical Institute have been used. New insights about the hypothesis for positive effects of business climate expectations are suggested concerning the industrial production dynamics during this period. Evidence is provided in respect of the anticipated favorable effect of the business climate, as perceived by the managers in the industrial sector, on the production volume shifts observed at lag one month. Similar short-run effect is found in support of the hypothesis that improved expectations of the industrial managers about the business climate are systematically induced by an expansion of the industrial production.

Keywords: Business Climate, Industrial Growth, Bulgaria.

1 Introduction

Business environment in Bulgaria has been in the focus of the public interest not only in the period of market transition but also after the official EU integration of the country. The specialized literature indicates that market reforms, if combined with macroeconomic stabilization and trade liberalization, are expected to establish an advantageous environment for investment and growth [3]. The importance of the favorable environmental conditions for the facilitation of successful economic reforms is unquestionable. However, the links between institutions and growth are still under comprehensive analysis [3, 5]. A recent study finds that access to infrastructure acts as quite influential component of business environment reflected by the overall economic performance – along with it, the effectiveness of law enforcement, government programs, and market institutions are also key drivers of the entrepreneurial productivity around the world [9].

The turbulent social and economic transformations in Bulgaria during the last 20 years have been induced by major events as the bank system collapse and inflation crisis of 1996-1997, the introduction of Currency Board in 1998, EU accession period

(up to 2006) and all structural shifts incurred due to the opening of Bulgarian economy to the EC common market regime and regulations. The global economic crisis of 2008-2009 additionally generated drastic economic downturn and a following period of stagnation and disruptive resurrection. Nevertheless, the competitive potential of Bulgarian economy proved to survive even in the harsh post-crisis years.

Studies of different supra-national organizations provide a variety of assessments of different aspects of the business climate in a multi-country framework. For example, the World Economic Forum /WEF/ announces its Global Competitiveness Index /GCI/ which measures national competitiveness level evaluated by a set of institutions, policies and factors influencing the national productivity level. According to the up-to-date GCI for 2017-2018 Bulgaria is positioned at rank 49 (of 137 countries) as compared to rank 62 in 2012-13 [11]. In particular, the rank on "Macroeconomic environment" pillar is quite high (25), however, on "Infrastructure" the country rank drops to 76; notably, the rank on "Labor market efficiency" (68) is much more favorable than the rank on "Institutions" (98). According to the Executive Opinion Survey 2017 conducted by WEF the five most problematic factors for doing business in Bulgaria are corruption, inefficient government bureaucracy, tax rates, access to financing, and inadequately educated workforce.

Similarly, the World Bank /WB/ "Doing Business" survey positions Bulgaria at rank 39 among 190 economies [13]. Particularly, in respect of the "ease of getting credit" – related to indicators about how well the credit system and bankruptcy legislation enable the access to bank funding – the country ranks better (rank 32, akin to that of the Czech Republic). According to another WB survey Bulgaria receives unfavorable scores on the majority of governance items (e.g. government accountability, corruption and regulatory enforcement) which had a limiting effect on the enhancement of productivity and overall country's progress in the past decade [14]. Similar results are obtained by the Business Environment and Enterprise Performance Survey (BEEPS) implemented by the European Bank for Reconstruction and Development – a face-to-face survey with enterprise managers that examines the quality of the business environment in 29 transition countries [8]. Bulgaria ranks amongst the countries having highest scores on "Informal sector", second highest score on "Political instability", and among the countries with third highest score on "Corruption".

This paper suggests a selection of results from empirical analysis of the interrelation between industrial dynamics and the shifts in business climate evaluation in Bulgaria for the period 2009-2017. New insights about the expected effects of the business environment are suggested concerning the dynamics of industrial production during the period of interest.

2 Short literature review

Specialized literature provides evidence from various studies that asses the interaction between business climate perceptions and industrial production performance in different countries. A multi-country comparative study explores the options to predict Euro-zone estimated Industrial Production Index (IPI) using data from business surveys conducted in three major EU countries: France, Germany, and Italy [4]. Specifically, results are obtained by forecasting the Italian IPI applying a VAR model using three variables taken in logs: IPI, Business Surveys Production Prospects, and Quantity of Railway Transported Goods evaluated monthly for the period 1985-2002. Bachmann et al. (2013) emphasize on the business-level uncertainty captured by the "mood of decision-makers" evaluated by business survey data from narrowly delineated economic sectors. The authors use data for two major world economies: the monthly IFO Business Climate Survey (for Germany) and the Federal Reserve Bank of Philadelphia's Business Outlook Survey (for the US) for the period 1980-2010. The results from an implemented VAR model show that an impulsive shift in the survey-based measures of uncertainty is significantly correlated with a decline in production and employment in both Germany and the US – yet, the share of output variation explained by changes in the uncertainty proxies is evaluated as modest [2].

Acedański (2013) applies several alternative modeling approaches – autoregressive, leading indicator, factor, and joint models – in order to forecast the IPI in Poland. Three variables are involved as leading indicators in the study: Purchasing Managers' Index (PMI) for Manufacturing, the Survey on General Business Tendency Climate in Manufacturing (executed by the Central Statistical Office), and the IFO Expectations Index (IFO-EI) for Germany. The study finds that models utilizing PMI and IFO-EI as leading indicators deliver best predictions, as far as Germany appears to be the main trading partner of Poland [1]. In their study for Brazil, Simonassi et al. (2013) also utilize an appropriate variable to involve the subjective perception of business outlooks into the modeling of industrial activity dynamics. VAR models are estimated from seasonally adjusted monthly data for 1995-2013 that provide evidence for a high explanatory power of the qualitative/sentiment variable for the business expectations to anticipate trends in industrial production over a 12-months horizon [12].

Recent evidence is provided by Dapkus and Stundziene (2016) in their search for answers to the question "*Are the business survey data suitable for the prediction of economic indicators*?" using German business surveys data. Their study focuses on the nexus between the Industrial Confidence Indicator (ICI) and the production indexes concerning several types of goods as well as industrial sub-sectors for the period 1995-2015. For this purpose, autoregressive distributed lag model are estimated in order to capture the effects of the ICI on production dynamics – the analysis indicates that the variation of indexes of industrial production can be explained by the ICI, however, the confidence indicator appears to be weakly dependent on the current and/or past changes in the industrial production level [6].

3 Information basis of the study

Here the scope of the "industrial sector" includes: Mining and quarrying; Manufacturing; Electricity, gas, steam and air conditioning supply; Water collection, treatment and supply (NACE sections B, C, D and E). Data from two relatively independent data sources within the National Statistical Institute of Bulgaria are utilized in the current study [10]:

- Short-term Business Statistics /SBS/ – which estimates the short-run dynamics indicators of business units production;
- Business Survey in Industry /BSI/ – which estimates indicators reflecting managers or entrepreneurs' opinions about problems perceived, barriers encountered, and expected developments of the businesses they run.

SBS generates monthly data for the Industrial Production Index /IPI/ which measures the monthly relative change in industrial production volume. The monthly measurement of IPI captures:

- The receipts from sales of end products (goods and services);
- The changes in the stock of end products;
- The receipts from resale of goods purchased with such a purpose.

IPI is calculated after deflation of the value of production in order to compensate for price level shifts. This is performed using the "producer price indices" estimated by the regular NSI survey of producer prices.

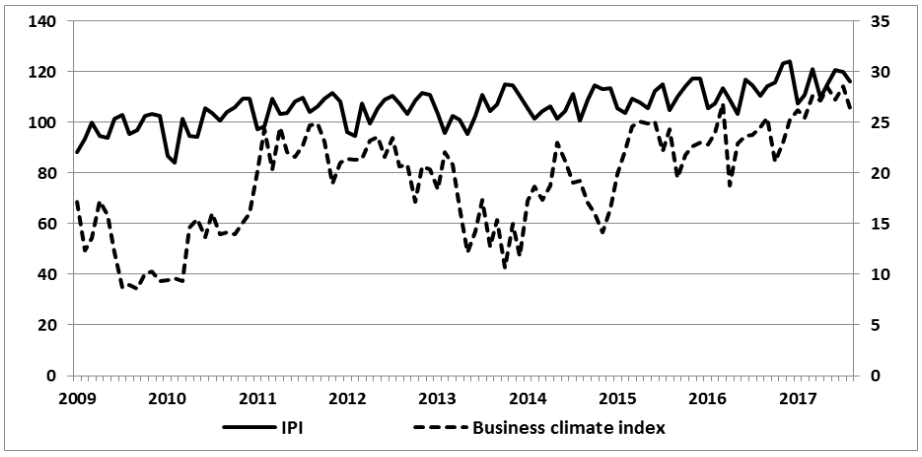

Fig. 1. Dynamics of IPI (2010=100) and Business Climate in Industry index for 2009-2017. Source: [10].

BSI provides monthly information from a sample of representatives of business units (methodological issues of the survey can be found in the Harmonised EU Programme

of Business and Consumer Surveys [7]). A total of 4200 interviews for all sectors, about 10% of which from Manufacturing. This survey requires a set of opinions to be recorded regarding the current situation and prospective development of their business. Ordinal scale based on 3 response categories is used to operate a variety of questions related to issues of interest covered by the survey – e.g. "the expected direction of change of production / competitive position on the market / selling prices, etc. in the next 3 months will: (a) Increase, (b) No change, (c) Decrease". On this basis, the so called "balance of opinions" is calculated monthly for each question /indicator/ as a difference of the relative shares of the positive and negative answers.

Utilizing a set of items, an overall index for the business climate in industry /BCI/ is estimated on monthly basis. The dynamics of the indices of Industrial Production and Business Climate in industry for the period of interest is presented on Fig.1. An obvious upward trend is observed in both series which should be taken into account by the analysis.

4 Interrelation between IPI and BCI: VAR model

The analysis of the interrelation between the two variables is limited to the post-crisis period Jan.2009-Aug.2017 (104 monthly observations) due to the relatively homogeneous dynamics of the indicators, without any shocks or abnormal behavior. A Vector Auto-Regression model is estimated in order to capture the possible impact of the changes in business climate on the actual shifts in industrial production levels, and *vice versa*. The model takes the following general form:

$$\begin{aligned} Y_{1t} &= \beta_{10} + \sum_{i=1}^{p} \beta_{1i} Y_{1t-i} + \sum_{i=1}^{p} \gamma_{1i} Y_{2t-i} + \sum_{j=1}^{11} \delta_{1i} SD[j]_t + \lambda_1 t + \varepsilon_{1t} \\ Y_{2t} &= \beta_{20} + \sum_{i=1}^{p} \beta_{2i} Y_{2t-i} + \sum_{i=1}^{p} \gamma_{2i} Y_{1t-i} + \sum_{j=1}^{11} \delta_{2i} SD[j]_t + \lambda_2 t + \varepsilon_{2t} \end{aligned} \quad (1)$$

The initial hypotheses here are about:

- Inertia effects in the short-run dynamics of IPI with lag "p";
- Inertia effects in the formation of business climate perceptions with lag "p";
- Positive net effects of the improvement of business climate (evaluated by industry managers) on the changes in industrial production, on a short-term basis (1, 2, …, "p" months).

The model includes also seasonal dummy variables SD[j] in order to control for monthly seasonality as well as time trend variable. Parameters have been estimated by ordinary least square method where the standard errors of the parameter estimates are calculated as robust to heteroscedasticity and serial correlation in the residual term (i.e. HAC standard errors). In order to determine the lag order "p" of the VAR model

the Schwarz Bayesian information criterion has been utilized – it showed that the optimal lag length for this model is p=1.

Table 1 presents the parameter estimates, standard errors (heteroscedasticity and autocorrelation consistent) as well as the significance levels of the t-tests (information about the estimates of "delta" and "lambda" parameters is excluded). The parameters for 9 out of 11 seasonal dummy variables as well as the trend parameter have been estimated as significant which proved the necessity for their involvement into the model. This way, the partial effects of the lagged variables of IPI and BCI have been cleared from any distorting effects of the seasonality and secular trend in the time series. The regression model shows quite high explanatory power estimated by the adjusted coefficient of determination amounting to 86%.

Table 1. Empirical results about the VAR model for IPI. Source: Author's calculations.

Variable	Coefficient	Std. Error	t-ratio	p-value
const	73.6138	9.45031	7.7896	<0.0001
indprod_1	0.12244	0.10881	1.1253	0.2635
bclimind_1	0.30040	0.08125	3.6971	0.0004
R-squared	0.8785		Adjusted R-squared	0.8594
F(14, 89)	55.8857		P-value(F)	7.3E-38
Dependent variable: indprod (Industrial Production index)				

The lagged dependent variable did not show any significant effect on the level of IPI although it was initially expected that some inertia could be captured by the VAR model. On the contrary, the lagged variable of the business climate showed the expected positive and strongly significant partial effect (at significance level less than 0.01). This provides evidence in favor of the hypothesis that the expectations of managers in the industrial sector for favorable impacts of the business environment factors correlate with actual positive shifts in the industrial production observed one month later.

Table 2. Empirical results about the VAR model for BCI. Source: Author's calculations.

Variable	Coefficient	Std. Error	t-ratio	p-value
const	−22.2801	5.29184	−4.2103	<0.0001
indprod_1	0.2527	0.06399	3.9483	0.0002
bclimind_1	0.6627	0.06395	10.3619	<0.0001
R-squared	0.8244		Adjusted R-squared	0.7968
F(14, 89)	121.01		P-value(F)	1.47E-51
Dependent variable: bclimind (Business Climate in Industry index)				

Table 2 presents the second equation results. The joint F-test for zero restrictions on the parameters for the seasonal dummy variables has been certainly rejected at negligible level of significance, however, the parameter on the time trend variable was not found significant. The explanatory power of the second equation showed a similar level (80% for the adjusted R-square). Here the autoregression component (i.e. the lagged dependent variable bclimind[t-1]) proved to have a significant partial effect on the level of BCI index which provides evidence in favor of the expectation about inertia in the formation of business climate perceptions of industrial firms' managers. Additionally, the lagged variable of IPI revealed the expected positive and strongly significant net effect. This supports the hypothesis that upward shifts in the expectations of industrial managers about the business climate are systematically induced one month after positive shifts in the industrial production, and *vice versa*.

5 Final remarks

The presented empirical results are indicative about the objectively existing interrelations between business climate expectations of the managers in the industrial sector and its growth. This is shown explicitly by econometric evidence utilizing independent data sources for the variables of interest – Industrial Production Index and the index of Business Climate in Industry. Further more comprehensive analysis is necessary in order to evaluate the impacts of different aspects of the business environment that constitute the integrated measure for the Business Climate index. Nevertheless, governance policies should adopt levers that are capable in alleviating the weaknesses and circumventing the main threats to the national competitiveness – measures that are firmly targeted in improvement of the most problematic business environment components. Especially, policies accelerating the innovation processes, reforming the law enforcement, and restraining the bureaucratic barriers could be most effective for the stabilization of business activities.

Acknowledgements. The support of the grant scheme UNWE-NID, Grant № NI-1-27/2014 "Analysis of the status and dynamics of the business environment in Bulgaria and its impact on economic growth", is acknowledged.

References

1. Acedański, J.: Forecasting industrial production in Poland – A comparison of different methods. Ekonometria, No.1(39), pp.40-51 (2013).
2. Bachmann, R., Elstner, S., and Sims, E. R.: Uncertainty and economic activity: Evidence from business survey data. American Economic Journal: Macroeconomics, Vol. 5 (2), pp. 217-249 (2013).
3. Barro, R. J.: Recent Developments in Endogenous Growth Theory. In: Oosterbaan, M.S. et al. (eds.) Determinants of Economic Growth. Norwell, MA: Kluwer Academic Publishers, pp. 13-38 (2000).

4. Bruno, G., Lupi, C.: Forecasting Euro-area industrial production using (mostly) business surveys data. Istituto di Studi e Analisi Economica, Series “Documenti di Lavoro”, Rome, Working paper No.33 (2003).
5. Chandan, H. C.: Corruption, Business Climate, and Economic Growth. In: Christiansen, B. (ed.) Handbook of Research on Global Business Opportunities, IGI Global, pp. 469-491 (2015).
6. Dapkus, M., Stundziene, A.: The linkage between industrial expectations and production: Which is the cause? In: International Scientific Conference Proceedings “New Challenges of Economic and Business Development – 2016: Society, Innovations and Collaborative Economy”, Riga (Latvia), pp.520-531 (2016).
7. DG-ECFIN: Manual to the Joint Harmonised EU Programme of Business and Consumer Surveys. EC, Directorate-General for Economic and Financial Affairs (2016), http://ec.europa.eu/economy_finance/db_indicators/surveys/documents/bcs_user_guide_en.pdf
8. EBRD: The Business Environment in the Transition Region. Summary Report on “Business Environment and Enterprise Performance Survey” (BEEPS) V. European Bank for Reconstruction and Development, Paris (2017).
9. Holienka, M., Pilková, A., Ostapenko, N.: Entrepreneurial environment and economic growth: What affects the productiveness of business activity at macro level? In: Dudycz, T., et al. (eds.) The Essence and Measurement of Organizational Efficiency. Springer Proceedings in Business and Economics, Springer International Publ., pp.79-95 (2016).
10. NSI: Short-term Business Statistics; Business Survey in Industry (http://www.nsi.bg/en/).
11. Schwab, K. (ed.): The Global Competitiveness Report 2017-2018. Geneva: World Economic Forum, Geneva (2017).
12. Simonassi, A. G., de Albuquerque e Arraes, R., and de Oliveira, D. X. A.: The role of expectations in modeling and forecasting industrial production. Revista Brasileira de Economia de Empresas, Vol. 13 (2), pp.7-24 (2013).
13. The World Bank: Doing Business – A World Bank Group Flagship Report. 14th ed. International Bank for Reconstruction and Development, Washington DC (2017).
14. The World Bank: Productivity in Bulgaria: Trends and Options. International Bank for Reconstruction and Development, Washington DC (2015).