FORECAST SCENARIOS OF THE ROMANIAN MANUFACTURING INDUSTRY OUTPUT IN THE CONTEXT OF THE IMPACT OF THE PANDEMIC AND THE WAR IN UKRAINE

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Abstract. *The Romanian manufacturing industry was significantly impacted by COVID-19 pandemic leading to an output contraction. Global value chain disruptions and fluctuating domestic and foreign demand were contributing factors. The war in Ukraine further harmed the economy, especially the manufacturing industry. The inflationary shock generated by the economic and geopolitical consequences of the war impacted the cost structure of manufacturing industry, affecting its competitiveness. The present paper presents three scenarios for Romania's manufacturing industry from 2023 to 2026, considering key macroeconomic variables like GDP and exports. The baseline scenario suggests a limited contribution of the manufacturing industry to GDP growth in the short and medium term. Moreover, if the war in Ukraine has a stronger impact on the economy, the manufacturing industry output may experience a reduction of approximately 12.3* percent *compared to the baseline scenario by 2026.*

Keywords: *manufacturing industry, low-technology activities, exogenous shock, VAR model, impulse response function*

1. Introduction

Romania's economy, along with the rest of Europe, has been significantly impacted by the dual economic shock caused by the COVID-19 pandemic and the war in Ukraine. The manufacturing sector has faced a notable contraction due to various factors such as disrupted global value chains, sharp rises in commodity prices, and heightened volatility in domestic and international demand. These challenges have further affected the industry's cost structure and competitiveness. Industrial production prices in Romania and EU27 countries have increased more

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than the consumer price index, primarily driven by soaring energy prices (Eurostat 2023).

The manufacturing industry continues to play a crucial role in the economy by driving economic development through a strong correlation between manufacturing production and GDP growth. Recent studies highlight that countries witnessing the highest per capita GDP growth are the ones experiencing increases in the share of value added and employment of the manufacturing industry as a part of the overall economy (Gabriel and De Santana 2019, Haraguchi et al. 2019, Su and Yao 2017).

In the context of significant economic shocks and heightened uncertainty the current paper builds a multivariate regression model and proposed three scenarios regarding the evolution of manufacturing industry output between 2023 and 2026.

2. The impact of recent economic shocks on the Romanian economy

Romania's economy returned to pre-COVID-19 levels in the second quarter of 2021 after experiencing the strongest quarterly contraction since 1995, with a decline of 10.1% in the second quarter of 2020. The lower level of health restrictions in 2021 supported the services sector, which grew by 9.9% in 2021 and 6.7 percent in 2022 after contracting by 6.4 percent in 2020. The Accommodation and food service activities a recorded a record contraction of 65.2 percent in the second quarter of 2020. Statistical data indicates a recovery to pre-COVID-19 levels starting from the second quarter of 2021.

Due to reduced international trade and the shock to global value chains, industrial production contracted by 6.5 percent in 2020, while the manufacturing industry contracted by 8.1 percent. With the economic recovery, the industry grew by 6.6 percent in 2021, while the manufacturing industry grew by 12.9 percent. Significant headwinds, mainly through the energy price shock affected industry in 2022, leading to a contraction of 2.3 percent. The sectoral dynamics were similar in the case of the EU27 compared to Romania. In this regard, the services sector, especially the Accommodation and food service activities, experienced the strongest contraction. The EU27 industry, on average, had a lower contraction compared to Romania, reflecting, among other factors, structural differences, particularly the lower share of high-tech activities in Romania (see Figures 1 and 2).

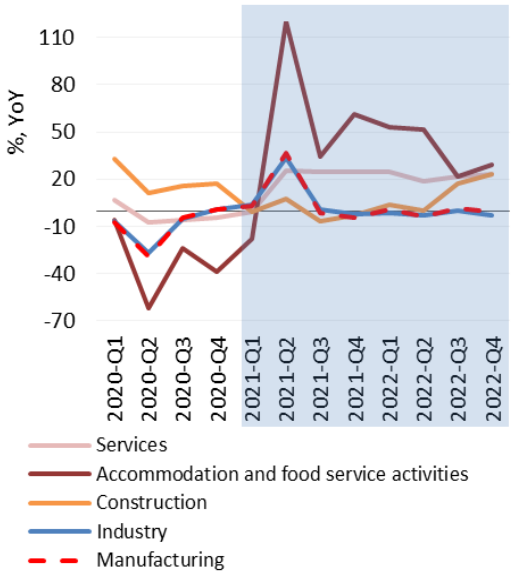

Figure 1. *The impact of COVID-19 on the sectorial output of the Romanian economy (percentage change, y-o-y).*

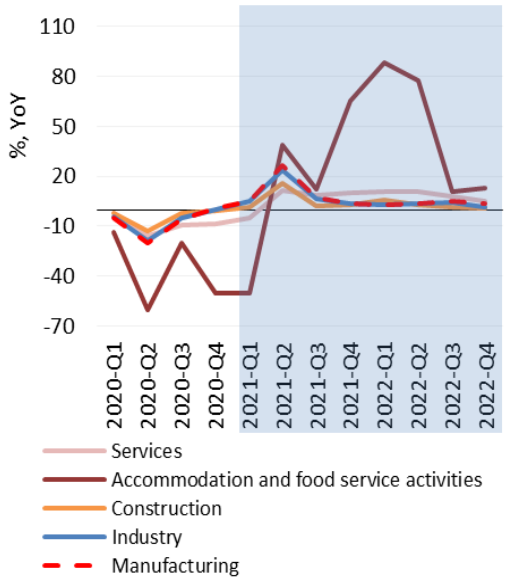

Figure 2. *The impact of COVID-19 on the sectorial output of the EU27 economy (percentage change, y-o-y).*

Source: Eurostat

Note: Calculated based on constant 2015 prices

What significantly differentiates Romania from the EU27 average is the dynamics of the construction sector, especially in 2020. A reallocation of investments towards construction occurred in an environment characterized by reduced investment opportunities coupled with quantitative easing and lower interest rates. Several specific factors in Romania further supported the sector's dynamics. The return of Romanians who were working abroad, many of whom were in the construction sector, led to a strong increase in the labor supply. At the same time, the construction market in Romania experienced significant positive momentum prior to the COVID-19-induced crisis, with several ongoing projects in major urban centers. In this context, the construction sector grew by 10.9 percent in the second quarter of 2020. In comparison, construction in the EU27 contracted by 12.7 percent during the same period. In 2021, the construction sector rebounded in the EU27, recording a positive growth rate of 4.5 percent. In Romania, however, construction remained stagnant, and the sector's dynamics even turned negative in the third quarter of 2021. Nevertheless, it can be observed (see Figure 3) that construction output remains higher than the pre-COVID-19 shock level and started to pick-up pace in 2022.

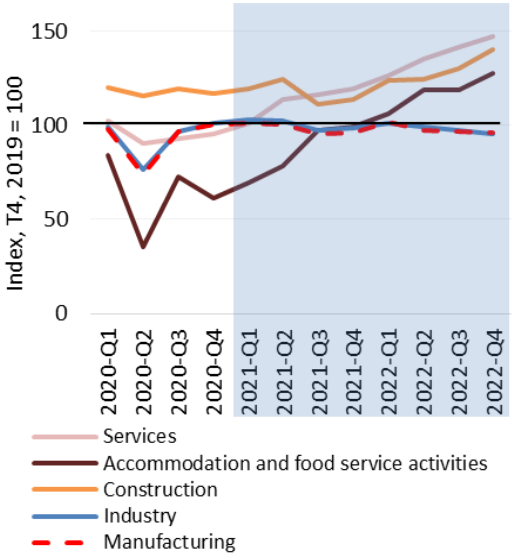

Figure 3. *The impact of COVID-19 on the sectorial output of the Romanian economy (Index T4, 2019 = 100).*

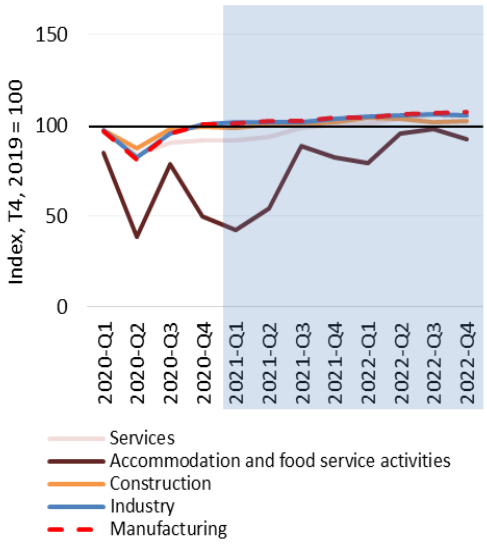

Figure 4. *The impact of COVID-19 on the sectorial output of the EU27 economy (Index T4, 2019 = 100).*

Source: Eurostat

Note: Calculated based on constant 2015 prices

Against the backdrop of easing restrictions and the economy's increased capacity to adapt to subsequent waves of COVID-19, sectors of the economy experienced milder contractions in the second half of 2020 and a return to pre-COVID-19 levels in 2021. The services sector adjusted to the new health conditions. For example, the Accommodation and food service activities contracted by 42.7 percent in the fourth quarter, compared to 65.2 percent in the second quarter of 2020. The economic recovery and reduced health restrictions helped the Accommodation and food service activities return to pre-COVID-19 levels starting from the third quarter of 2021.

The contraction in production was less pronounced in the overall industry and the manufacturing industry. The industry returned to pre-COVID-19 levels starting from the fourth quarter of 2020. However, the sharp increases in commodity prices have impacted industrial activity. The industry contracted by 0.3 percent in the fourth quarter of 2021, while the manufacturing industry contracted by 0.2 percent. Additional quarterly contractions were registered in 2022 as the economic shock induced by the war in Ukraine, especially through the energy price shock took its toll.

3. Forecast scenarios for the manufacturing industry within an economic context marked by high uncertainty

The double economic shock generated by the pandemic and the war in Ukraine has induced heightened volatility, impacting the short and medium-term trajectory of the economy. The European Commission has revised its GDP growth forecasts downward in its official estimates in the summer of 2023 compared to projections made in the spring of the same year. Given this significant uncertainty, we have proposed three scenarios for the evolution of the Romanian manufacturing industry. These scenarios have been anchored in the official forecasts of the National Strategy and Forecast Commission, the main institution responsible for macroeconomic projections in Romania, as well as the projections of representative international institutions.

Table 1.
Official forecasts of real GDP growth

	2019	**2020**	**2021**	**2022**	**2023p**	**2024p**	**2025p**	**2026p**
National Strategy and Forecast Commission	3.9	-3.7	5.8	4.7	2.8	4.2	5.0	4.6
European Commission	3.9	-3.7	5.8	4.7	3.2	3.5	n.a.	n.a.
GEP (World Bank)	4.2	-3.7	5.8	4.7	1.8	3.7	3.9	n.a.
International Monetary Fund	4.2	-3.7	5.8	4.7	2.4	3.7	3.8	3.7

Source: Official documents CNSP, EC, WBG, IMF

The comparative analysis of the official forecasts in Table 1 reveals a common pattern in the short-term GDP dynamics during the period 2023-2024. In this regard, all the aforementioned institutions project a reduction in economic growth for 2023 due to the war in Ukraine.

In forecasting the short and medium-term evolution of the Romanian manufacturing industry, we have taken into account its close relationship with several important macroeconomic variables. The monthly time series of industrial production is one of the main leading indicators used in projecting the quarterly GDP, highlighting the strong correlation between these indicators. The significance of this statistical relationship can also be observed in Table 2. The t-value for GDP, as an explanatory variable, is the highest among all the variables considered.

Romania's economy is strongly integrated into European and global trade flows. In this context, we have also considered goods exports as an

explanatory variable. Several indicators capturing price dynamics have also been taken into account: the consumer price index, the consumer price index for energy components, the industrial producer price index for the overall industry and the manufacturing industry. Various functional forms have been estimated for these variables, but no statistically significant results have been obtained.

The economic process is influenced by its past evolution. Therefore, we have also considered the previous dynamics of manufacturing industry production as an explanatory factor. The summary of the estimated regression equation is presented in the table below.

Table 2.

Statistical results of the regression equation used in the forecast of manufacturing industry production

Variable	**Coeficient**	**Eroare standard**	**t-Statistic**	**Probabilitatea**
dmanuf(-1)	-0.332885	0.156428	-2.128043	0.0492
dgdp	0.939186	0.271056	3.464909	0.0032
dexports_goods(-1)	0.214042	0.112591	1.901058	0.0755
c	0.166480	0.295494	0.563395	0.5810
R^2	0.618167	Media specifică variabila dependentă		1.034223
R^2 ajustat	0.546574	Deviația standard specifică variabila dependentă		0.070201
Eroare standard regresie	0.047271	Criteriul Akaike info		-3.088986
Suma pătrată a rezidurilor	0.035753	Criteriul Schwarz		-2.889839
Log likelihood	34.88986	Criteriul Hannan-Quinn		-3.050110
F-statistic	8.634390	Statistica Durbin-Watson		1.693710
Probabilitatea (F-statistic)	0.001226			

Source: Author's calculations using Eviews 12

Note: dmanuf – difference stationary series of manufacturing production, dgdp – difference stationary series of gross domestic product, dexports_goods (-1) – difference stationary series of exports of goods

The projection of the manufacturing industry's output in Romania was based on the estimated regression equation in Table 2. In the baseline scenario, the GDP dynamics for the period 2023-2026 relied on the consensus of official forecasts from Table 1. Accordingly, for each year, we used the arithmetic mean of the projections as the forecasted value. The

dynamics of goods exports for the period 2023-2026 were based on the forecasts of the National Prognosis Commission.

In the baseline scenario, the dynamics of manufacturing industry production is lower than the GDP dynamics. In recent years, the industry has been one of the most important factors with a significant contribution to GDP dynamics. The projection specific to the baseline scenario suggests that this contribution will be reduced. The estimated impact of the war in Ukraine can also be observed (see Table 1 and Figure 5). The shock affects GDP particularly in 2023, but the manufacturing industry is significantly impacted as well, experiencing a delayed recovery in 2024.

Figure 5. *Forecast of manufacturing industry output – Baseline scenario.*

a. Index 2015 = 100 b. Percentage change, y-o-y

Source: Author's calculations using Eviews 12.

In the pessimistic scenario, a negative shock induced by the war in Ukraine was taken into account, with an impact in 2023 and 2024. For each explanatory variable, the size of the shock was represented by the standard deviation calculated based on the historical trends from 2000 to 2021. It was considered that the war-induced shock would be stronger in 2023 compared to 2024. In this context, a shock equal to two standard deviations was applied in 2023 and one standard deviation in 2024. The results indicate that industrial production will contract in 2023 and 2024.

The return to positive territory would only occur from 2025 onwards (see Figure 6). The negative impact of the war in the pessimistic scenario would result in a production volume approximately 12.3 percent smaller compared to the baseline scenario by the year 2026.

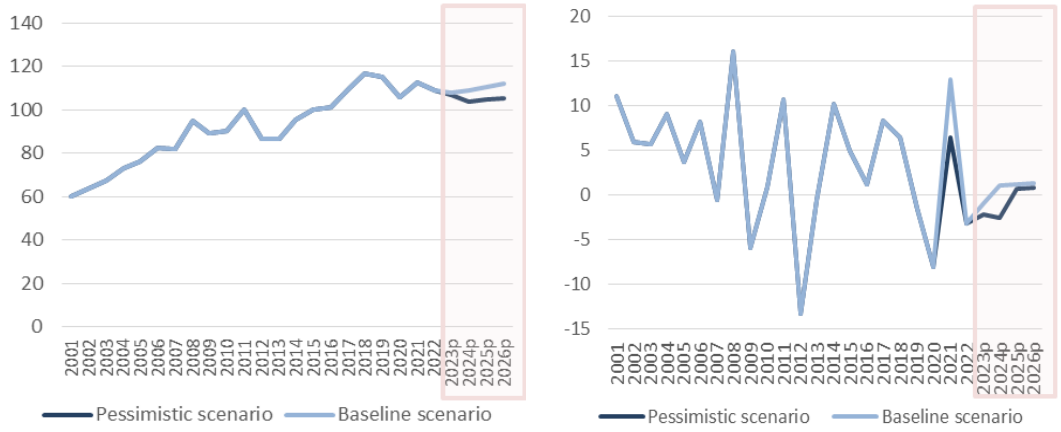

Figure 6. *Forecast of manufacturing industry output – Pessimistic scenario*.
a. Index 2015 = 100 b. Percentage change, y-o-y

Source: Author's calculations using Eviews 12

In the optimistic scenario, a lower economic impact and a shorter duration of the war in Ukraine were considered. This would result in a superior dynamic specific to the manufacturing industry production compared to the baseline scenario. For each explanatory variable, a positive shock was applied in 2023 and 2024. The significant risks associated with the current economic context justified the application of an asymmetric shock between the two scenarios, namely the pessimistic and the optimistic scenarios. In this regard, it was preferred to apply a positive shock equal to one standard deviation for 2023 and 2024. The results indicate that industrial production will experience a robust recovery in 2023 and 2024 (see Figure 7). This recovery would lead to a production volume approximately 8.7 percent higher in the optimistic scenario compared to the baseline scenario by the year 2026.

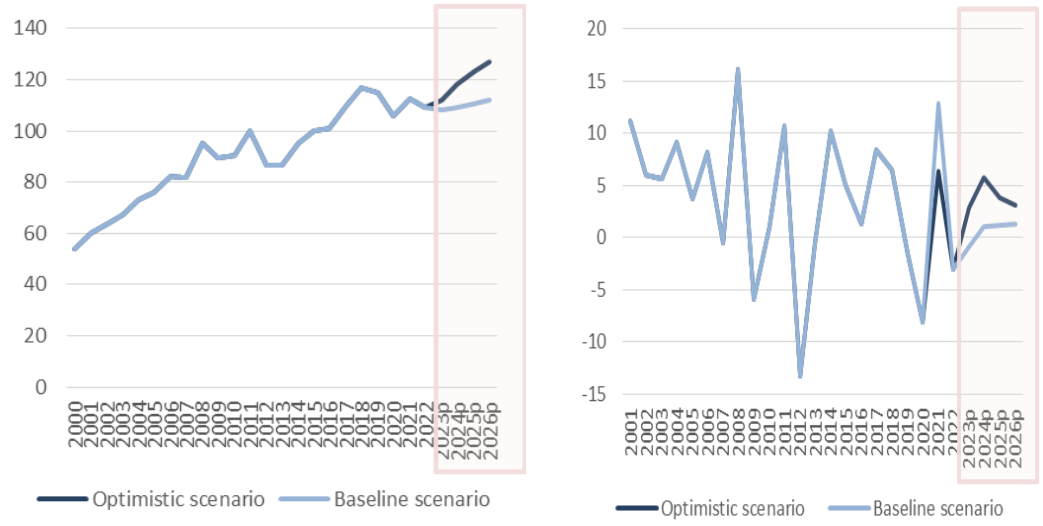

Figure 7. *Forecast of manufacturing industry output – Optimistic scenario*.

a. Index 2015 = 100 b. Percentage change, y-o-y.

Source: Author's calculations using Eviews 12

The evolution scenarios indicate that the manufacturing industry will have a reduced contribution to the growth of the gross domestic product in the short and medium term. This suggests that although the industry has been more resilient compared to services in the shock induced by COVID-19, it will be less resilient to the shock induced by the war in Ukraine.

4. Conclusions

The double economic shock caused by the COVID-19 pandemic and the war in Ukraine has had a significant impact on Romania's economy. The industrial activity has experienced a strong contraction due to a combination of factors, including disruptions in global value chains, sharp increases in commodity prices, and increased volatility in both domestic and external demand.

In the short and medium term, the economic outlook is affected by the heightened uncertainty generated by the dual economic shock of the COVID-19 pandemic and the war in Ukraine. In this context, the study has proposed three scenarios for the evolution of the manufacturing industry in Romania from 2023 to 2026, taking into account the impact and future trends of important macroeconomic variables such as gross domestic product and goods exports. The baseline scenario suggests that the manufacturing industry will have a reduced contribution to the growth of

the gross domestic product in the short and medium term. However, in the case of a higher impact of the war in Ukraine on the economy, the manufacturing industry could produce approximately 12.3 percent less compared to the baseline scenario by the year 2026.

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