

PRODUCTION AND TRADE OF WOODEN PRODUCTS IN BULGARIA FOR THE PERIOD 2007–2021 – QUANTITATIVE ANALYSIS AND FACTORS OF INFLUENCE

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ABSTRACT

This analysis covers Bulgaria's wood product industry over a period of 14 years. It uses quantitative techniques to assess production volumes, export and import trends and trade balance of wooden products. Certain key aspects such as the shift in economic policy or the change in market demand have also been examined in terms of their effects on the sector's performance. Multiples methods of statistics are also used to detect the production and trade anomalies over time, and also major domestic and international events that may have caused a great shift in production dynamics. In mapping the development of Bulgaria's wood product industries, the analysis identifies both the main's determinants and constraints within the industry that can be used in strategic decision-making in the future by the stakeholders.

Key words: wood products, market demand, trends

INTRODUCTION

The forestry sector in Bulgaria employs over 60,000 people and creates over 3% of GDP. According to KID-2008, economic activities in the forest industry fall into the production of furniture and the production of timber and its products: (NSI, KID-2008, 2022). The production of wood products is associated with operations of processing wood raw material such as cutting, planing and impregnation of wood, production of wood products, cork, veneer and wood boards, parquet boards, joinery and wood products for construction, wooden packaging, etc. The production of some of these enterprises is a basic material for the production of furniture. The woodworking industry is strongly related to forestry, furniture production, paper and cardboard production, construction, as well as the production of furniture accessories. (Pelkki and Sherman 2020). As the global demand for wood products is directly related to the market for end products such as furniture. Various crises in recent years directly affect the market for wood products (Muhammad 2021). Industry experts point out that the home remodelling that began during the pandemic continues and the use of wood products continues to increase. As a result of the changes, companies begin to reevaluate their strategies, markets and partners. There are challenges especially for supply chains and the growing role of eco-design (Hightower 2020, Barbu and Tudor 2021, Stanturf and Mansuy 2021). In recent years, the forestry sector in Bulgaria has experienced a serious increase in the prices of raw materials and materials, as a result of the Covid 19 pandemic, the war in Ukraine, as well as some legal restrictions.

Different studies on the Bulgarian forest industry for a long time have been trying to explain the trends in the market supply and demand of wood products and furniture and the factors that drive these trends. Actually, this topic is not quite involved in the research and the studies are scarce. According to the current turbulent environment the scientific questions related to the reasons that cause the production and markets to move in a certain direction never lose their actuality. Zhelev (2013) examined the Bulgarian furniture industry for the period 2003-

2012 regarding its competitiveness. There, he revealed that the industry faced a constant increase in furniture export and was competitive in the international markets. Chobanova, and Popova (2015) analysed different factors that can put obstacles to the positive trend in the Bulgarian Furniture sector. One of them was consumption, which had not recovered after the world financial crisis. Bojnec and Fertó (2014) in their research revealed that Bulgaria like other new member states had low probability to gain relative trade advantage until 2010.

The above analysis reveals that the current research is necessary and topical in the context of the scarcity of similar research dedicated to the Bulgarian forest industry. The study aims to assess the factors influencing the production of wood products in Bulgaria during the period 2007-2021, with a focus on sectors C16 (Manufacture of Wood and of Products of Wood and Cork) and C31 (Manufacture of Furniture). By conducting a quantitative analysis, the research seeks to evaluate how trade dynamics, price fluctuations, and access to bank loans affect production output, providing insights into economic and industrial trends within these sectors.

Study objectives are following:

- Quantifying the relationship between trade volumes and the production of wood products in sectors C16 and C31 in Bulgaria.
- Assessment the impact of price changes on production output within these sectors.
- Analysis how the availability of bank loans influences production levels and sector growth.
- Identification of the key trends and external factors that shaped the production and trade of wood products over the period 2007-2021.

MATERIALS AND METHODS

The analysis of the trade flows investigating the factors of influence enables implementation of variety of methodologies. Cao et al. (2018) use the constant market share methodology when analyse the factors influencing the export growth of China's wood forest products. Sujová et al. (2021) used the OLS regression and pointed that this is a very reliable methodology if so called Gauss-Markov conditions (Larocca, 2005, Jeng and Woods, 1991, Pötscher and Preinerstorfer, 2024) are met. In the current study is used the following methodology

- **Regression Analysis:** Ordinary Least Squares (OLS) regression was used to estimate the relationships between production output in sectors C16 and C31 and the key factors: trade, prices, and bank loans.
- **Multicollinearity Check:** Variance Inflation Factor (VIF) (see Salmerón-Gómez et al., 2024) was employed to detect multicollinearity between independent variables, ensuring the model's integrity by eliminating highly correlated variables.
- **Autocorrelation Test:** The Breusch-Godfrey test (see Arunachalam, 2024) was applied to check for autocorrelation in the residuals, ensuring that the regression errors were not correlated over time.
- **Heteroskedasticity Test:** The Breusch-Pagan test was used to identify heteroskedasticity, verifying whether the variance of the errors was constant across observations.

The overall algorithm of the current study for testing the hypothesis of different influences on the production and trade in Bulgarian C16 and C31 is presented in Figure 1.

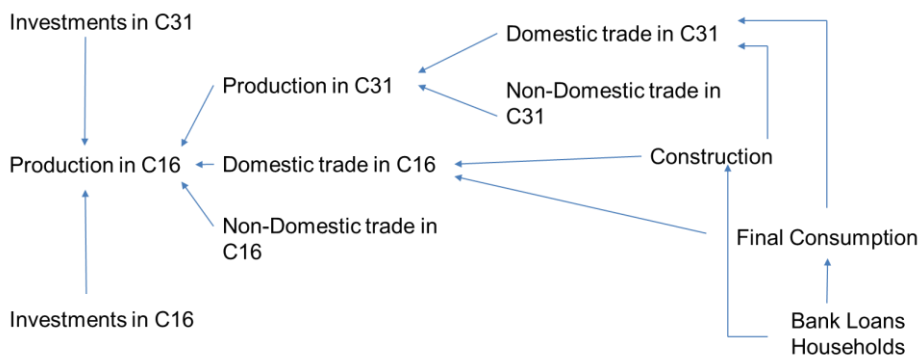


Figure 1: The examined relationships algorithm in the study

Figure 1 presents the algorithm of the investigated relationships in the article between production, trade (domestic and foreign), investments and other economic indicators such as bank loans, construction and final consumption concerning sectors C16 and C31. It visualizes the tested hypothesis how these factors affect the production in the studied sectors for the analyzed period (2007–2021). The methodology followed in the study experimented with regression models within the framework of the specified algorithm in Figure 1 and data from Eurostat and European Central Bank Statistics.

Data Sources for the current study are the following:

- Eurostat Structural Business Statistics (see SBS1 and SBS2): Provided annual data on the production and trade of wood products.
- Short-Term Business Statistics (see STS): Used for capturing quarterly changes in business activity, relevant for assessing shorter-term production trends.
- European Central Bank Statistics (ECB): Data on bank loans, enabling analysis of the impact of financing on production levels.

RESULTS AND DISCUSSION

The results about the trends in the C16 are presented in Figure 2.

The results in Figure 2 show that production and domestic trade in wood products have been decreasing over the period under review. What ensures the efficiency of companies in the sector is export. Some of the possible explanations for the observed trends include production-related factors such as the GFC of 2008-2009, declining local demand, and challenges in competition and efficiency. On the domestic side, changing patterns in consumption and consumer preferences have been found to be other factors affecting the market. Non-domestic, however, talks about the increase in international demand, competitiveness in export markets, and trade agreements.

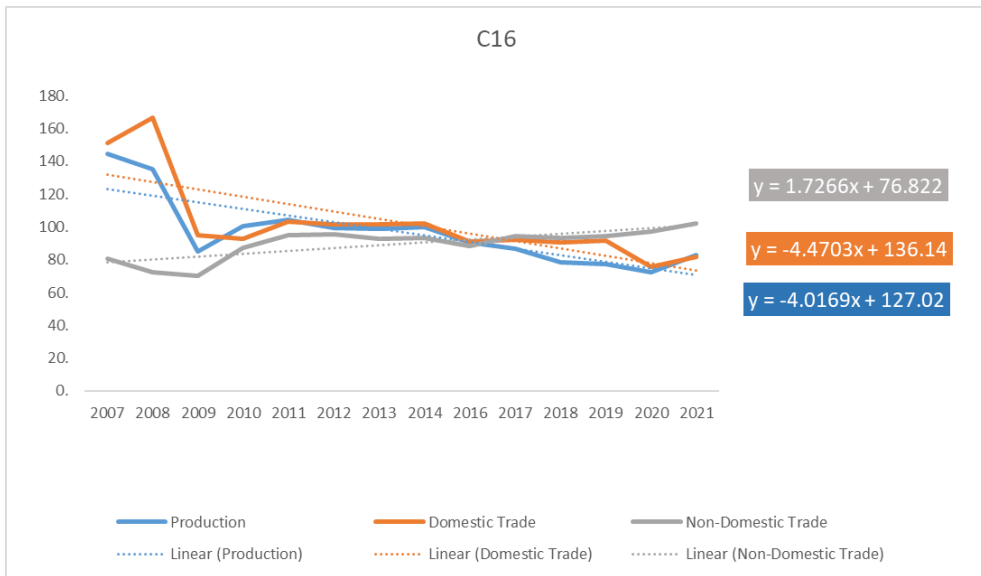


Figure 2: Trends in production and trade in C16 in millions of euro

Production 16	Coefficient	std. err.	t	P-value
R-squared = 0.9097	Robust			
Domestic Trade	0.997	0.131	7.56	0
Non-domestic Trade	0.541	0.192	2.82	0.018
Production c31	-0.331	0.194	-1.7	0.119
_cons	-21.160	20.178	-1.05	0.319

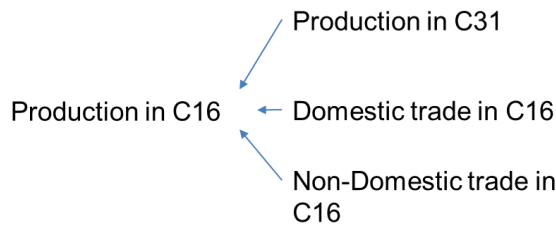


Figure 3: The regression analysis results for C16 production

The results in Figure 3 of the regression analysis on the factors influencing the production in C16 that it could explain, with an R-squared of 0.9097. This means the model accounts for 90.97% of the variation in C16 production levels. Domestic Trade has a big positive impact on C16 production. Its coefficient is 0.997 and its P-value is 0.000 making it a key factor in production. Non-Domestic Trade also has a positive and significant effect, with a coefficient of 0.541 and a P-value of 0.018. However, its link to Production 16 isn't as strong as that of domestic trade. Production c31 has a negative coefficient (-0.331) and isn't significant (P-value.119). This means we can't say for sure that it relates to Production 16 in this model. The constant term (-21.160) also isn't significant (P-value.319).

Domestic Trade C16	Coefficient	std. err.	t	P-value
R-squared = 0.710				
Consumption	1.334	0.728	1.83	0.097
Loans	-0.911	0.287	-3.18	0.01
Construction	0.992	0.215	4.62	0.001
_cons	-31.237	63.727	-0.49	0.635

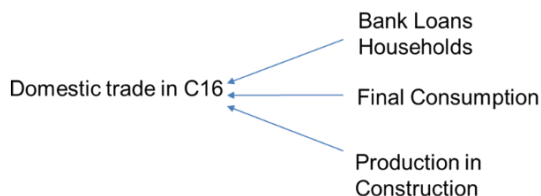


Figure 4: The regression analysis results for domestic trade of C16 like the most significant factor for the production

The regression analysis in Figure 4 for Domestic Trade C16 as the most significant factor affecting the production in this sector presents a R-squared value of 0.710 meaning 71% of the changes in domestic trade are explained by the independent variables. Consumption has a positive coefficient of 1.334 showing a strong link to domestic trade; but its P-value (0.097) suggests the effect isn't significant at the 5% level. Loans, with a negative coefficient of -0.911, have a significant inverse relationship with domestic trade, as shown by the P-value (0.01). Construction has a positive and significant effect, with a coefficient of 0.992 and a P-value of 0.001 highlighting its strong impact. The constant term (_cons) is negative (-31.237) but not significant (P-value 0.635). To sum up, construction and loans are the key factors affecting domestic trade in this model, with loans having a negative impact on it.

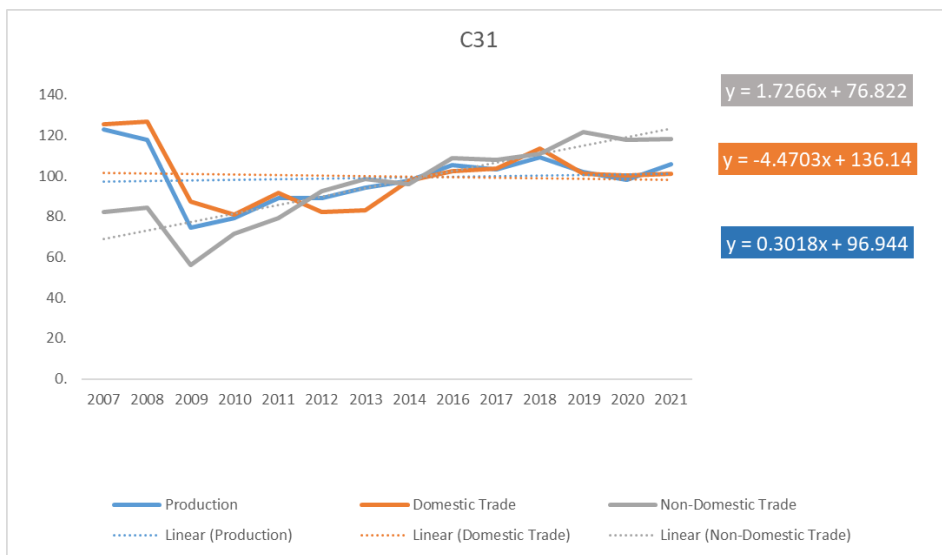


Figure 5: Trends in production and trade in C31 in millions of euro

The Figure 5 shows how Production, Domestic Trade, and Non-Domestic Trade changed for sector C31 from 2007 to 2021. Linear trends point out how each of these areas shifted over time. The Global Financial Crisis caused Production to drop. After that, it bounced back and grew a bit. Domestic trade is going down (coefficient of -4.4703). This might be because there's less demand at home maybe due to more competition other options, and a move towards selling abroad. On the flip side non-domestic trade is on the rise (coefficient of 1.7266). This could be because more people want to buy from other countries, the sector is doing well against competitors, and there's a push for sustainability. Production is growing a little (coefficient of 0.3018), which suggests its evening out. This seems to have more to do with markets outside the country than with demand at home.

Production C31	Coefficient	std. err.	t	P-value
R-squared = 0.898			Robust	
Domestic Trade	0.785	0.105	7.45	0
Non-domestic Trade	0.195	0.082	2.39	0.036
_cons	2.036	11.777	0.17	0.866

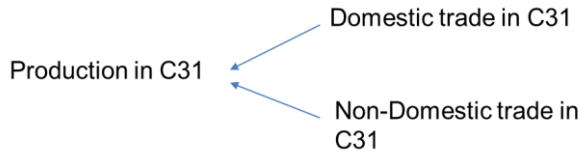
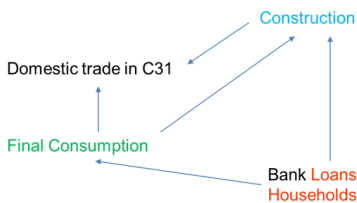


Figure 6: The regression analysis results for C31 production

Regression analysis for Production C31 with R-squared of 0.898 indicates that 89.8% of variation in production of furniture is explained by the independent variables. Domestic Trade has a clear positive impact on Production C31, with coefficient 0.785 and p-value 0.000 which highlight its critical role in increasing production. Non-Domestic Trade also beneficially affects the production with a coefficient of 0.195 and a P-value of 0.036, but it has a smaller impact than the domestic trade. To conclude, domestic trade is identified as the main driver of production in this industry, reinforced by the added value of non-domestic trade.

Construction	Coefficient	Std. err.	t	P>t
R-squared = 0.256				
Final Consumption	-1.058	0.521	-2.03	0.065
_cons	204.661	53.151	3.85	0.002

Domestic Trade C31	Coefficient	Std. err.	t	P>t
R-squared = 0.484				
Construction	0.672	0.213	3.16	0.009
Final Consumption	0.939	0.445	2.11	0.059
_cons	-60.888	58.587	-1.04	0.321



Construction	Coefficient	Std. err.	t	P>t
R-squared = 0.236				
Loans Households	-0.405	0.210	-1.93	0.078
_cons	140.657	23.031	6.11	0

Final Consumption	Coefficient	Std. err.	t	P>t
R-squared = 0.710				
Loans Households	0.336	0.061	5.42	0
_cons	65.589	6.783	9.67	0

Figure 7: The regression analysis results for C31 domestic trade main factors of influence

The Figure 7 addresses the overall quantitative assessment of Bulgaria's wood products trade for the time frame of 2007 to 2021 and was last presented in October 2024 in Plovdiv, Bulgaria. It focuses on the factors affecting both the production and trade and their key dynamics, as well as on the domestic and non domestic trade patterns. The analysis includes regression results that establish a significant correlation between the domestic trade and the production volume with a reasonable support of the non domestic trade. This signifies that the Bulgarian domestic market is a key determinant factor for the volume of production while external market conditions only stimulate production due to the increased competitiveness resulting in higher volumes of exports. In addition, the topic includes significant events of the reviewed period such as the Global Financial Crisis which had adverse effect on production and trade but the recovery from the crisis developed gradually. Trends of domestic trade show negative aspects like lower demand and higher competition but the trend of growth of non domestic trade indicates higher significance of foreign markets and sustainable development efforts. In the bigger picture, the slide presents the health of the wood products sector and its relationship with local consumer purchases and International trade within the Bulgarian economy.

CONCLUSIONS

The current study revealed the need for a more sectoral approach toward augmenting the production and trade performance in both Bulgaria's wood products and furniture industries. As regards the sector of wood products C16, the impetus that appears to give the greatest impetus toward the increment in the value added by this industry arises from domestic trade. It is important again that local stability and improvement be well attained in this area. Non-domestic trade and price competitiveness also contribute positively, though to a lesser extent, which suggests that export opportunities should be explored while ensuring the domestic market remains strong. Price levels further demonstrate the sensitivity of the sector in terms of competitiveness, particularly in foreign markets.

For sector C31 – the manufacture of furniture, investments represent the very engine of production development and have an extremely positive impact. Non-domestic trade also has a stimulating effect on growth in production, but it is much weaker compared to the impact of investment. Price elasticity in export markets is particularly strong for C31: the higher the price, the more considerable the increase in production, which implies the strategic relevance of pricing. The mixed impact of loans also suggests that, while household financing has been supportive of consumption, other forms of financial instruments may be necessary to more adequately support the production process. On the whole, for higher investments, export opportunities, and pricing strategy Sector C31 should be favored, while for domestic market stability and price competitiveness Sector C16 is a vital sector.

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