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EXPLORING THEORETICAL AND METHODOLOGICAL APPROACHES FOR ANALYZING STRUCTURAL CHANGES IN AGRICULTURE: A FOCUS ON BULGARIA

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Abstract
This paper presents a comprehensive framework for analyzing structural changes in Bulgaria's agricultural sector, focusing on the period following the country's accession to the European Union (EU). The integration into the EU has brought major transformation in the country, especially in the agricultural sector, as the country implemented the Common Agricultural Policy (CAP) and adapted its regulatory and economic governance. The framework developed in this study is based on an extensive literature review and uses analysis and synthesis as the main scientific methods to explore the multifaceted evolution of the sector. The study presents an initial assessment of the current changes and identifies key drivers utilizing statistical and comparative analysis. The index, structural and correlation assessments revealed key trends including a decline in the number of agricultural holdings and a simultaneous increase in the average size of farms. These structural changes indicate a process of land consolidation and resulted in a dualistic structure, driven by the market forces and policy incentives. Furthermore, there have been significant shifts in production specialization, including increased specialization in certain crop types and a decline in livestock production which led to imbalanced crop and animal output, mainly due to the direct payments. These shifts are accompanied by ongoing challenges in competitiveness, particularly in smaller farms that struggle to integrate into the market, and financial support distribution remains uneven. Moreover, the lack of young skilled workers led to demographic changes and declined agricultural employment. Thus, important key drivers and their effect on the productivity, size of the farms, and the economic development are identified. The analysis conducted in this study offers valuable insights and a comprehensive understanding of these complex and multifaceted changes. It is suitable to support the foundation for informed policy-making and strategic planning and signify the importance of targeted policies directed at ensuring fair distribution of financial support, enhancing competitiveness, and addressing inequalities to achieve balanced economic development.
Key words: Structural Changes, Specialization Pattern, EU Accession, Agricultural Policy
JEL: Q10, Q15

Introduction

Agriculture has historically been a cornerstone of economic and social development worldwide. Over the past decades, the sector has undergone significant structural changes driven by technological and technical progress, governmental and policy reforms, and market, and environmental concerns. In Eastern Europe, the shift from centrally planned to market-oriented economies after 1989 has introduced further complexity to these changes. Bulgaria, in particular, underwent specific development patterns during these transformative periods. The agricultural sector has faced

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incremental structural changes since the fall of communism, accelerated after the country's accession to the EU in 2007. Upon joining the European Union (EU), the implementation of the Common Agricultural Policy (CAP) introduced a new regulatory framework, and financial support targeted the effectiveness of the sector's development. It resulted in the emergence and development of new structures of farming enterprises as the transformation continues with specific adjustments of these structural changes. Therefore, many researchers have studied these developments and specific aspects of the transitions. However, the structural changes are a continuous complex process, which requires capturing their multifaceted nature constantly.

This paper aims to present theoretical and methodological approaches for analyzing structural changes in agriculture, with emphasis on current developments in Bulgaria. It is built on a literature survey, with analysis and synthesis as scientific procedures. The paper also provides a preliminary assessment of current trends and highlights drivers through statistical and comparative analysis. In the following sections, an integrated review of literature, theoretical and methodological approaches relevant to this study is introduced first. Next, the chosen methods and the analysis of the obtained results are presented. Finally, a summary of the findings and conclusions are provided.

Literature Review

Structural changes in agriculture

Structural changes in agriculture involve shifts at different levels, namely micro, meso, and macro, and have an impact on farm sizes, productivity, and economic development (Van Neuss, 2019; Mann, 2021; Deininger et al., 2022a). These developments are shaped by multiple factors and driving forces including technology, government policies, and societal perspective (Jurkėnaitė, 2021; Tyapkina et al., 2021; Grabowski & Self, 2022). One of the key changes relates to the use of labor-saving technology, which leads to the reduction of labor in agriculture, affecting both rural and urban areas. Simultaneously, this contributes to overall productivity growth and structural transformation (Porzio et al., 2022; Grabowski & Self, 2022; Eckert & Peters, 2022). In addition, governmental support can result in the agricultural sector changes, impacting the balance between farms. Furthermore, it can stimulate investments, enhance productivity, and improve marketing efficiency in the agricultural sector. (Tyapkina et al., 2021; Cervantes-Godoy, 2022). Understanding these processes is essential for achieving sustainable agricultural development and economic growth, highlighting the interdependence of various levels within the agricultural system.

In this regard, many studies have been done in the European Union (EU) to examine the evolving structure of agriculture, focusing on various regions. These studies have examined the evolving role of agriculture in the economy, changes in farm

sizes, the impact of natural conditions, agricultural prices, subsidies, and macroeconomic factors on farm structures, and the prolonged effects of financial and economic crises on European farms. (Martinho, 2019; Bożek et al., 2020; Jurkėnaitė, 2021) Comparable studies have been conducted in Bulgaria in recent decades due to significant changes in the agricultural sector, as already mentioned primarily driven by the country's transition to a market-based economy and its accession to the EU (Van Herck & Swinnen, 2015; Kostadinova, 2017; Atanasov et al., 2023). The continuous transformation of Bulgarian agriculture is characterized by the overall shift towards sustainability, mechanization, digitization, and multifunctionality (Doitchinova et al., 2019).

Theoretical Frameworks

The theory of structural changes in agriculture is a diverse and complex topic that has been extensively studied in academia. The existing research highlights many factors that contribute to the ongoing transformations within the sector, both in developed and developing economies. The process of structural transformation in agriculture, characterized by the movement of labor from agriculture to non-agricultural sectors and the associated increase in farm size, has been a central theme in the economic development literature, including the role of wage gaps, policy-induced barriers, trade costs, and technical change (Deininger & Ma, 2022b).

Next, the theoretical framework used to analyze structural changes in agriculture is the structure-conduct-performance model from industrial organization economics (Gali et al., 2000). However, Gali et al. (2000) noted that this model is limited in its ability to capture the rapid changes caused by technological advancements, consumer preferences, etc., and proposed an alternative analytical framework that explores the wider range of internal and external factors, including institutional, societal, technological, economic, human capital, and financial drivers of change.

Other studies explain how technology and economies of scale influence agricultural structures. Neuenfeldt et al. (2019) and MacDonald & McBride (2009) discuss how both have led to increased farm size and concentration of output in larger, more specialized units, particularly in the livestock industry. Several other studies have emphasized the importance of the specialized nature of farms when examining structural change. Evenson & Huffman (1997) first proposed a framework that explores how input prices, public and private research, public extension, and government programs can, directly and indirectly, influence changes in farm size, farm specialization, and part-time farming, thereby affecting total factor productivity.

Furthermore, the impact of government policies on farm structure has been intensively studied, with a focus on how interventions affect farm consolidation, the adoption of new technologies, and the overall structure of the agricultural sector

(Pagel et al., 2002; Huettel & Jongeneel, 2011). In the literature has also been explored the implications of structural changes in agriculture for rural communities, the environment, and overall economic development (Andersson, 2005).
The theory of structural changes in agriculture encompasses a diverse range of factors, including technological advancements, economies of scale, policy interventions, and socio-economic dynamics considered in the current study.

Methodological Approaches

The academic literature has also explored various methodologies for analyzing and studying the structural changes occurring in the agricultural sector. The methods and techniques aim to capture the complex and multifaceted nature of the adjustments taking place in farm size, specialization, productivity, and the overall structure of the agriculture. Some of the main approaches used in different research include taxonomy, generalization methods, comparative analysis, etc. (Jurkėnaitė, 2021). Mathematical statistical methods, such as estimating the arithmetic weighted average and using the Pearson criterion, along with qualitative analysis, are used to evaluate the importance and suitability of changes in organizational structures (Kleiber, 2018). Furthermore, in the context of statistical tests, structural change tests play a crucial role in assessing parameter invariance, with the empirical fluctuation process and permutation approaches are advanced techniques to standard approximations for obtaining the sampling distribution, enhancing the test's power and validity (Kleiber, 2018). The latter group of methods includes time series analysis widely used in various economic studies, which is employed in current analysis for assessment of the current changes and key drivers of structural changes in the agricultural sector in Bulgaria.

Research Process and Findings

Materials and Methods

Analyzing structural changes in agriculture in Bulgaria involves understanding shifts in various aspects of the agricultural sector. Therefore, this paper uses the following data sets: farm number (at the national), average farm size (national level), production specialization (crop output and livestock output), and agricultural employment (employed workforce). The conducted analysis uses standardized data from the National Statistical Institute and the Ministry of Agriculture and Food, enabling us to examine Bulgaria's agricultural sector in a wider context and identify key trends in comparison to the EU. The research makes use of a wide range of reports, studies, and publications from Bulgarian academia, along with government and policy documents, to facilitate the discussion and deep understanding of specific issues. The current analysis covers the period from 2010 to the last available data sets. The timeframe is important for assessing the changes induced by EU membership and proposing data-driven decisions for the future.

The essential tools used to understand the complex changes occurring in Bulgaria's agricultural sector are indexed, structural, and correlation analysis. The indexed analysis offers a broad overview of the trends using indices, allowing for tracking changes over time and measuring agricultural development simultaneously. This approach also provides assessments for comparative analysis of different time periods and production sub-sectors. Structural analysis provides detailed insights into the production composition and organization of the agricultural sector, while correlation analysis uncovers the relationships between the mentioned key variables of production and employment. To examine the strength and direction of the relationship between these variables, the most common metric of Pearson correlation coefficient[1], which ranges between –1 (indicates a perfect negative relationship) and +1 (indicates a perfect positive relationship).

Results and Discussion

Since joining the EU, Bulgaria has adopted the CAP framework, leading to significant changes in the agricultural sector. One notable development is the trend toward land consolidation. Previously, Bulgarian agriculture was characterized by numerous small farms, as evident in Figure 1, with an average size of 1.1 hectares (relevant to the data available for 2010). According to Kostadinova (2017), the agricultural sector has seen a decline in the number of farms, but a rise in the average size of farms. This has resulted in a dualistic structure, with a few large farms that specialize in specific areas, and many small farms that focus on subsistence farming. Pressures from the EU market and the availability of subsidies favoring more intensive operations have prompted some small farmers to sell or lease their land to larger agricultural enterprises.

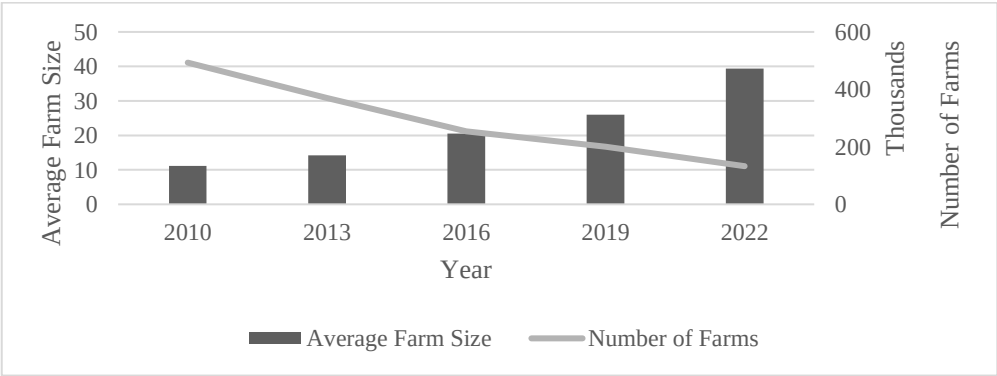

Figure. 1. Average Farm Size, Number of Farms by Year

Source: National Statistical Institute

[1] Microsoft Excel was utilized for all data calculations, analysis, and visualization.

Scientists from the Institute for Economic Research at the Bulgarian Academy of Sciences argue that the allocation and management of financial resources within the agricultural sector have also led to structural issues and inefficiencies. These include the concentration of land and capital, the formation of monopolies in leasing farmland, and declining livestock, among others (as cited in Rangelova & Vladimirova, 2017) This has resulted in a decrease in the number of small farms and an increase in the average farm size up to 4 ha (Figure 1). Consequently, farmers who have accessed the necessary resources have been able to enhance their businesses through CAP subsidies and financial assistance mechanisms.

It is important to consider the consistent decline in the number of farms and the increasing pace of this decline. The index analysis, using the chain index technique, highlights the more pronounced changes in the number of farms during the transition from one programming period to the next, specifically in 2013 and 2020 (Figure 2) for the current analysis. These periods typically involve adjustments and significant revisions of policies, as well as indicating other unusual events, such as economic shocks and major market movements.

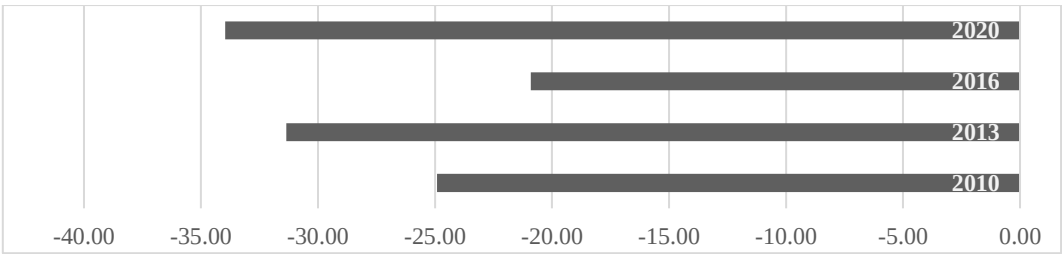

Figure 2. Index analysis of number of farms, 2010 – 2020, %

Source: own calculations

Technological modernization has played a significant role in the structural development of Bulgarian agriculture. Access to EU funds for agriculture and rural development has enabled farmers to invest in machinery and advanced technologies, increasing production and efficiency. This shift has also changed agricultural production patterns, with a greater emphasis on high-value commodities from the crop sector such as cereals and oilseeds. Usually, the crops often yield higher profits in the EU market. Direct payment is heavily concentrated on crop production rather than livestock, and limited support for livestock farms (Bachev, H, 2011). Beluhova-Uzunova, R., Hristov, K., & Shishkova, M. (2018) stated that the increased production of cereals and industrial crops is mainly related to the direct payments that are beneficial to extensive crop producers. Resulting in rapidly increasing crop production output and gradually decreasing livestock, leading to an

unfavorable effect on the agricultural sector of Bulgaria (Figure 3). These developments contribute to the decrease in animal output due to the shift of farmers' focus to arable crops, leading to a decrease in animal population along with other challenges.

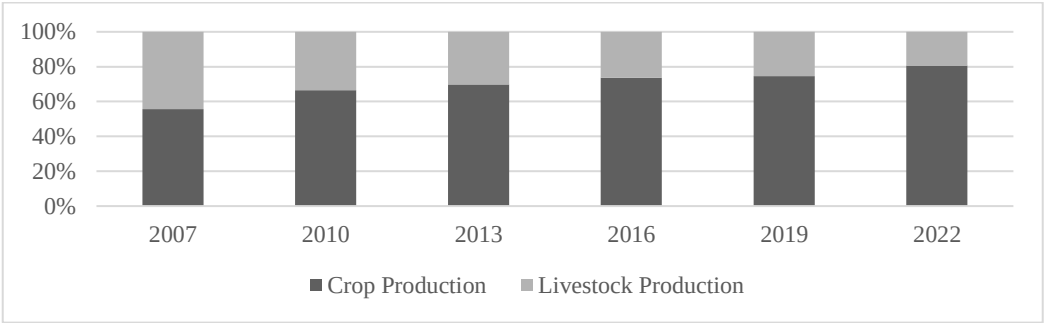

Figure. 3. Crop Production and Livestock Production by Year

Source: National Statistical Institute

The next significant indicator of structural transformation is the share of GVA from agriculture in Bulgaria's national GVA. The clear trend of its decline (see Figure 4) since the accession to the EU reflects overall economic trends, including intensification, industrialization, and the increasing dominance of the services sector. However, it remains high compared with those in other EU-28 countries where in most cases is already under 3% (Rangelova, R., & Vladimirova, K., 2017). The country's economy has experienced substantial growth in industry and services, which have expanded, attracted investments, and generated employment. These processes have also led people away from agricultural jobs, further challenging sustainable agricultural development. Simultaneously, farmland consolidation and CAP funds utilization have increased efficiencies and competitiveness, but they have also exacerbated inequalities, and smaller farms have fewer opportunities to develop and provide viable businesses for local communities, which further contributed to the demographic challenges facing Bulgarian agriculture. The demographic changes in rural areas, including aging populations and outmigration, have also weakened the agricultural sector.

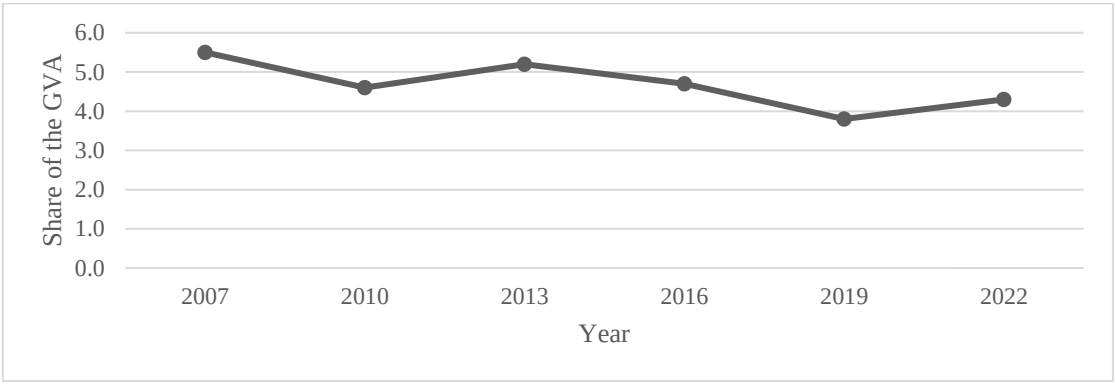

Figure. 4. Share of the GVA
Source: National Statistical Institute

Thus, another notable change in Bulgarian agriculture after EU accession has been the steady decline in agricultural employment seen in Figure 5. According to the existing studies, highly degraded educational and age structure is related to a lack of young and skilled workers in the agricultural sector (Beluhova-Uzunova, R., Hristov, K., & Shishkova, M.,2018).

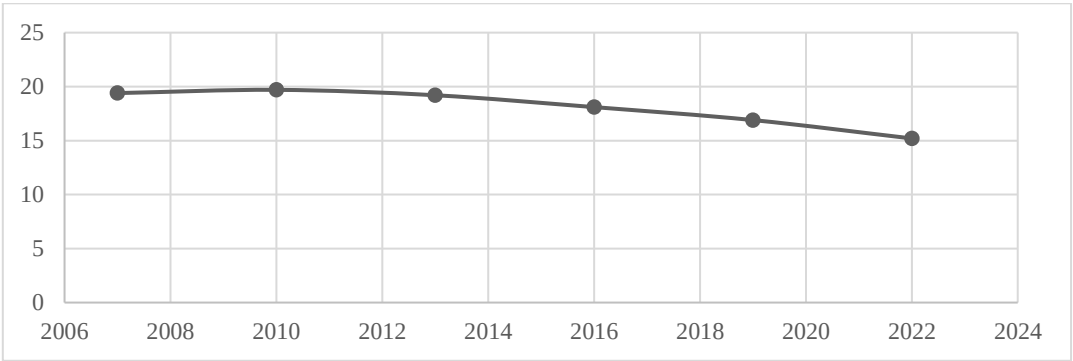

Figure. 5. Share of the Agricultural sector Employment
Source: National Statistical Institute

As mentioned in the official ministry's report, 24% of permanently employed agricultural workers were aged 65 and over, and 11% were under 35 years of age (Ministry of Agriculture and Food, 2022). The correlation analysis revealed a strong negative (correlation coefficient = –0.84) relationship between employment and agricultural output. This strong interrelation reflects the fact that increased productiv-

ity resulted from modernization and shifts in agricultural work (intensified production typically requires fewer, but more skilled workers). Our correlation analysis shows also that the GVA and employment in the sector have a positive strong relation (correlation coefficient = 0.69), therefore, it proves that the reduction of the younger workers has a negative effect on both the GVA and the share of the agricultural employment.

Conclusion

Since the country became a member of the EU, Bulgarian agriculture has undergone a significant transformation in its organization and operations. This transformation has been primarily driven by the introduction of new policies, the adoption of advanced technologies, and the impact of market dynamics. The outcomes of these changes include notable improvements in productivity and the modernization of agricultural practices. However, these developments have also given rise to challenges. These challenges encompass the need to ensure sustainable agricultural practices, address inequalities within the agricultural sector, and navigate evolving labor demographics. Achieving balanced and sustainable economic development requires addressing these challenges through targeted policies that bolster both the ongoing progress of agriculture and the overall economic growth of the country.

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AI (Grammarly) was used to correct grammar, spelling, and punctuation and shorten sentences.

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