

REVIEW

**for the acquisition of educational and scientific degree “Doctor”
in scientific specialty “Statistics and demography”**

Reviewer: Assoc. prof. Margarita Stefanova Shopova, PhD, scientific specialty “Statistics and demography”, “D. A. Tsenov” Academy of Economics – Svishtov

Author of the dissertation: Diana Ivanova Markova, PhD candidate in doctoral program “Statistics and demography”, Department of Statistics and Applied Mathematics, “D. A. Tsenov” Academy of Economics – Svishtov

Title of the dissertation: “Statistical survey of demographic processes in Bulgaria – regional aspects”

Grounds for writing the review: Order №76/09.02.2024 of the Rector of “D. A. Tsenov” Academy of Economics – Svishtov, the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria (ZRASRB), the Regulations for the implementation of ZRASRB in “D. A. Tsenov” Academy of Economics – Svishtov, and the decision from the meeting of the scientific jury held on 16.02.2024.

I. General presentation of the dissertation

In terms of format and volume, the submitted dissertation complies with the requirements of Article 27, Paragraph 2 of the Regulations for the implementation of the Law on the Development of the Academic Staff in the Republic of Bulgaria. The dissertation comprises a title page (1 page), table of contents (1 page), introduction (3 pages), exposition in three chapters (165 pages); conclusion – summary of the obtained results (4 pages); declaration of originality (1 page); bibliography (16 pages). The total volume of the dissertation is 223 pages. The author’s theses and analyses are supported in the main text with 20 tables and 21 figures. The bibliography comprises 169 titles – 137 in Cyrillic, 9 in Latin, and 23 in normative documents. In 22 appendices in tabular form, the data used for the conducted statistical analysis (10 appendices) and the obtained results (12 appendices) are presented.

II. Assessment of the dissertation format and content

The relevance of the research is determined by the important role that the ongoing demographic processes and the demographic state of the population in

Bulgaria play in its successful socioeconomic development. The problems of the demographic situation in Bulgaria after 1990, especially in the last 10-15 years, and the imbalances in the socioeconomic development of the regions and districts of the country have led to the corresponding demographic disproportions. The capabilities of statistical methods for analysis allow for identifying patterns, factors, and regional differences in the development of demographic processes. This determines the relevance of the dissertation's topic and the usefulness of the results obtained.

In the dissertation's introduction, the study's object and subject are correctly defined, and the aim is clearly formulated. The *object* of the study is the demographic processes in Bulgaria in a regional aspect for the period 2000–2021, while the *subject* is the regional differences and patterns in the development of demographic processes in Bulgaria. The *aim* of the dissertation is a theoretical, methodological and empirical study of the state and development of demographic processes in Bulgaria for the period 2000–2021 at the national and regional levels, establishment of regularities, and establishment of factor influences on demographic processes.

The six research *tasks* formulated correspond to the content of the dissertation. The *research thesis* that “there are differences between the regions in the country in terms of the state and dynamics of demographic processes, and these differences were deepened under the influence of demographic and socioeconomic factors” is proven based on the results of the analysis conducted. The *research methodology* is outlined – both universal scientific and specific statistical methods. The *restrictive conditions* precisely delineate the boundaries of the research in terms of time, territory, and scope. The *information base* of the study is formed from official statistical sources.

Chapter One is theoretical in nature and provides a foundation for studying the problem in subsequent chapters. The *first paragraph* is dedicated to the essence and features of demographic processes in Bulgaria and the necessity for their study. It covers the main concepts in demography – population, demographic event, demographic state, demographic process, and demographic situation in their dialectical unity. The content of the demographic processes under study – birth rate, mortality, and migration – is presented, and indicators for their measurement are systematically outlined. The *second paragraph* is a literature review of scientific publications related to the study of demographic processes, focusing on publications from the last 25 years. Five directions in the publications are distinguished – a comprehensive analysis of the

overall demographic picture; reproduction, reproductive behaviour, and marriage; population ageing; mortality of the population; migration processes. The largest relative share of publications is dedicated to migration processes. The *third paragraph* systematises the factors influencing the development of demographic processes. They are divided into two groups – those affecting the natural and the mechanical movement of the population. The *fourth paragraph* presents the statistical methods suitable to be adapted and used for analysing the dynamics of demographic processes and measuring the influence of various factors.

Chapter Two is devoted to the *information assurance* of the statistical surveys on demographic processes. The *first paragraph* presents population censuses as the most extensive periodic comprehensive special surveys, providing the primary data for the population's number, composition, territorial distribution, and demographic and economic features. The specific tasks accomplished by the censuses after 1989 are discussed. The *second paragraph* examines current demographic statistics in its role as a source for updating data on demographic processes between two censuses, describing the structure and functions of the ESGRAON system. The *third paragraph* is related to the specifics of the statistical study of demographic processes at the regional level. The exposition includes a description of the territorial units in Bulgaria according to the NUTS classification.

Chapter Three is empirical in nature. Based on official statistical data, it provides a statistical analysis of the demographic processes in Bulgaria – at the national level and their regional aspects through a time series study. For the analysis of fertility and mortality in the first and second *paragraphs*, a similar scheme is used – average level, descriptive indicators of development (absolute growth and growth rate with chain base), testing the presence of a trend, overtaking coefficient, modelling the trend through time models, forecasting the time series for a 4-year horizon. In the *first paragraph*, the dynamics and regional differences of fertility in Bulgaria are examined based on the fertility rate, the total fertility rate, the average age at childbirth and the average age at first childbirth. The dynamics and regional variations of mortality are examined in the second paragraph using the absolute number of deaths, the mortality rate and the infant mortality rate. A particular feature of modelling the trend in mortality through the mortality ratio is using dummy variables to reflect its extreme values in the wake of the Covid-19 pandemic. The third paragraph analyses internal

migration using the coefficient of settled persons, the coefficient of evicted persons and the absolute number of settled and evicted persons by region. In the *fourth paragraph*, factor effects at the national and regional levels are modelled using multivariate linear regression. Quantifiable factors for which there are official data with guaranteed quality are selected.

In the **conclusion**, the main results from the research conducted in the dissertation are summarised.

The dissertation examines a relevant problem that requires an objective analysis using precise methods, such as statistical methods. The work is sufficiently voluminous, has a clear structure, and follows the logic of a complex scientific investigation. There is a balance in the size of the individual chapters. The exposition is built in a logical sequence that allows the development of research ideas, the proof of the author's hypotheses, and the achievement of the corresponding contributions. The number of cited sources and the well-structured literature review demonstrate a deep knowledge of the contemporary scientific developments on the topic from the last 25 years. The schemes, tables, and graphical representations used are in sufficient quantity and appropriately illustrate the exposition and essential conclusions. They are prepared according to the rules in statistical theory. The formulated conclusions at the end of each paragraph and each chapter reinforce the impression of a clear thought and plan to carry out the research and are seen as a transition to the following exposition. The in-depth empirical analysis carried out through the correct use of statistical methods to analyse dynamics and factor influences adds to the comprehensiveness of the research. The presentation of the raw data and intermediate results in the appendices makes the main text and analysis results more straightforward to understand. The exposition uses a scientific style, with precise and correct use of both demographic and statistical terminology. There are no repetitions of texts and logical contradictions. The expression of the author's opinion is clear and balanced, without falling into unnecessary criticism. Scientific ethics are respected, and the literature sources are correctly cited. A very good language culture is demonstrated.

The verification of the text through the anti-plagiarism analysis system used at "D. A. Tsenov" Academy of Economics – Svishtov confirms the accuracy of the declaration for originality and authenticity signed by the PhD candidate.

In support of the dissertation, a total of 5 scientific papers have been published in journals and proceedings with scientific peer review, including 1 study (co-authored), 3 articles (sole-authored), and 1 report (sole-authored). These, along with the PhD candidate's participation in 3 scientific forums, are grounds to conclude that the results of the scientific research have been disseminated. The publications have been credited with **32,1** points, with a minimum requirement of 30 points. Along with the developed dissertation, this **fulfils the minimum national requirements** according to Article 2b of the Law on the Development of the Academic Staff in the Republic of Bulgaria.

The author's summary is 43 pages long. Structurally, it contains the necessary elements. Its content accurately and thoroughly reflects the dissertation, as well as the main contributions of the author.

III. Scientific and scientific-applied contributions of the dissertation.

The dissertation submitted for review is of a theoretical-applied nature. The contributions correctly elaborated by the PhD candidate can be divided into two groups.

1. Theoretical-methodological contributions:

- The essence of demographic processes is clarified, and their key indicators are presented;
- A systematic analysis of scientific publications on the topic of demographic processes was carried out, and five problem areas were identified;
- After a critical analysis of the problems of demographic processes, the main factors influencing them are outlined and united into three groups – demographic, socioeconomic, and psychological factors, and the specific impact of individual groups of factors.

2. Practical-applied contributions:

- The existence of trends and regional differences in birth and mortality has been proven, and deepening differences in the dynamics of migration processes and the structure of migrants have been identified;
- Multifactorial models are compiled and the impact on the demographic processes of birth and mortality of selected factors – gross domestic product per capita,

age dependency ratio, employment rate, and average gross salary of employees under labour contract is assessed.

In my opinion, the contributions as formulated represent an enrichment to some extent of both the theory and practice related to the topic of the dissertation.

IV. Critical notes, questions, and recommendations on the dissertation.

In accordance with the stated aim and tasks of the research, I do not find any deficiencies in the dissertation submitted for review. I would like to point out that a more in-depth study, in my opinion, is needed on migration processes, given their active course in Bulgaria and their impact on the demographic situation not only in the country as a whole but also at the regional level.

In examining the factor determination of demographic processes, the text notes that the criteria for selecting factors are their quantitative measurability and the availability of official statistical information. In this context, I would like to ask the following questions:

1. Besides the four factor variables considered, which other factors, according to the PhD candidate, would have a significant influence on demographic processes?
2. If factors that are not quantitatively measurable are included, what statistical methods would be used to assess their effect on demographic processes?
3. What recommendations does the PhD candidate have regarding the improvement of surveys on demographic processes in order to ensure sufficient information of the necessary quality for a more detailed study of their factor determination?

I would recommend the PhD candidate to aim for publishing the results of their research on demographic processes in specialised scientific publications indexed in global databases such as Scopus and Web of Science.

The notes and recommendations made do not diminish the value of the presented dissertation and would be useful for the future research of the PhD candidate.

V. Overall conclusion and opinion.

The reviewed dissertation entitled **“Statistical survey of demographic processes in Bulgaria – regional aspects”**, developed by PhD candidate Diana Ivanova Markova, represents a comprehensive and complete independent scientific

research of a theoretical-applied nature. I believe that the set aim and tasks have been achieved, and the obtained results allow for the corresponding scientific and applied contributions to be drawn.

Conclusion: I express a *positive assessment* of the dissertation and *recommend* to the esteemed members of the scientific jury to vote “in favour “*of awarding Diana Ivanova Markova the educational and scientific degree of “Doctor “*in the field of higher education 3. Social, economic, and legal sciences, professional direction 3.8. “Economics “, scientific specialty “Statistics and demography

Date: 01.03.2024

Svishtov

Reviewer:

(assoc. prof. M. Shopova, PhD)