

Warsaw, 17.09.2022

**Review of the doctoral dissertation of Cordula Welte-Bardtholdt
entitled "The Effect of Economic, Social and Psychological Factors on
the Transport Behavior of Polish Citizens A Conjoint Analysis Approach",
written under the supervision of dr hab. Michał Suchanek, prof. UG at
the University of Gdańsk.**

1. The basis for preparing the review

The basis for the review has been assigned by the resolution of the Council of Economics and Finance Discipline, University of Gdańsk of July 28, 2022, appointing me as the reviewer of the above dissertation, about which I was notified by letter by the Chairman of the Council of Economics and Finance Discipline, dr hab. Przemysław Borkowski, professor of the University of Gdańsk, on September 1, 2022, in a letter dated July 28, 2022.

2. Evaluation of the formal and editorial aspect of the dissertation

The subject of the review is the printed version of the manuscript in English in bound form, with a total volume of 325 pages, including: title page in English, summary in Polish (2 pages), summary in English (2 pages), acknowledgments in English, list of publications in English, table of contents in English (2 pages), introduction in English (6 pages), substantive chapters in English (209 pages), conclusions (13 pages), bibliography (55 page), list of 75 tables, list of 48 figures, list of abbreviations (6 pages), and 2 appendices (appendix - questionnaire form in English, 8 pages, and appendix - questionnaire form in Polish, 8 pages). The total volume of work is significant. The strength of the thesis is the presentation of the structure of the issues discussed at the beginning of each chapter and subsection.

The actual content of the work has been divided into 4 chapters, with the following volumes: 37 pages, 61 pages, 40 pages, 71 pages. Conclusions cover 13 pages. The layout of the content is clear and logically embeds empirical research into the current state of knowledge. Dissertation of Cordula Welte-Bardtholdt is strongly embedded in the first two substantive chapters, the research method is described in Chapter 3, the results are presented in Chapter 4, and the Conclusions in the last part of the work. The bibliography includes 468 items.

The formal side of the work deserves a positive evaluation, because the work has been edited legibly, the graphic materials have been carefully prepared, the lists and footnotes meet the standards of scientific

studies. There are minor editorial imperfections, too long sentences appear, unfinished sentences, colloquial expressions appear. The wording on page 156 of the work is incorrect, as there is a reference to the questionnaire form in German, while there is no annex in this language - both Polish and English versions are available.

3. Research problem and thesis of the work

The work is part of a broader area of theoretical and empirical research on the influence of factors determining the behavior of participants in mobility processes. Particular emphasis in the analysis was placed on the identification of economic, social and psychological aspects determining transport preferences in Poland. Because of the subject, the work has significant application values in the practice of shaping the policy of sustainable development and sustainable mobility.

The aim of the study was "to study the impact of economic, social and psychological factors on the transport behavior of Polish citizens, using a *conjoint analysis approach*". In the reviewer's opinion, this goal was planned quite unfortunate - the impact analysis is a means leading to the goal, which in accomplished categories, may be to get knowledge about the measured phenomenon. According to the author's declaration, the development of the research goal is to analyze the extent to which the respondents' statements regarding the hypothetical situation of consumer choices related to mobility correspond to their actual behavior. It may suggest that the aim of the study would be rather an attempt to identify factors that have a real impact on the choice of means of transport by consumers .

The following main research question was derived from the main purpose of the work:

" Do personal circumstances, emotions, drivers' issues, gender and policy instruments have an effect on transport behavior?"

One gets the impression that the above formulation of the research question is too obvious and general. Perhaps the intention of the author, which is not precisely expressed, is rather to answer the question: what circumstances or which factors influence transport behavior the most? One wonders why in the research's formulation question, referring to the title of the dissertation itself, the term factors was not used? The paper also does not explain convincingly why these specific factors were considered, what were the reasons for their selection and rejection of other variables, which may also have a high probability of influencing transport behavior. There was no reference to the models of analysis of external factors (e.g. PESTE or PESTLE) and internal factors (e.g. concepts of stakeholder behavior) and no deeper reaching into the literature on the subject.

Doubts related to the formulation of the main research question are partially explained by sub-questions:

- 1.1 Do changes in life circumstances and job situation have an impact on transport behavior?
- 1.2 Do the mental state/experienced feelings have an impact on transport behavior?



- 1.3 Does the possession of a driver's license have an impact on transport behavior?
- 1.4 Does car-sharing experience have an impact on transport behavior?
- 1.5 Does gender have an impact on transport behavior?
- 1.6 Do policy instruments have an impact transport behavior?
- 1.7 Do employers incentives have an impact on actual transport behavior?
- 1.8 Does the non-availability of a car have an impact on actual transport behavior?

Partial questions became the basis for the formulation of the main hypotheses and sub-hypotheses:

H1 Changes in life circumstances and job situation within the previous 24 months have a significant effect on transportation behavior.

H1a Changes in life circumstances and job situation within the previous 24 months have a significant effect on transport mode choice if employers offer incentives to switch to environmentally friendly transport modes.

H1b Changes in life circumstances and job situation within the previous 24 months have a significant effect on transport mode choice if no car is available to get home.

H2 Emotions such as mental states/experienced feelings while traveling with the current mode of transportation have a significant effect on transport behavior.

H2a Emotions such as mental state/experienced feelings while traveling with the current mode of transportation have a significant effect on transport mode choice if employers offer incentives to switch to environmentally friendly transport modes.

H2b Emotions such as mental state and experienced feelings while traveling with current mode of transportation have a significant effect on transport mode choice if no car is available to get home.

H3 Drivers' issues such as the possession of a driver's license and car sharing experience have a significant effect on transport behavior.

H3a Having a driver's license has a significant effect on transport mode choice if employers offer incentives to switch to environmentally friendly transport modes.

H3b Having a driver's license has a significant effect on transport mode choice if no car is available to get home.

H3c Carsharing experience has a significant effect on transport mode choice if employers offer incentives to switch to environmentally friendly transport modes.

H3d Carsharing experience has a significant effect on the transport mode choice if no car is available to get home.

H4 Gender has a significant effect on transport behavior.



H4a Gender has a significant effect on the choice of transport mode if employers offer incentives to switch to environmentally friendly transport modes.

H4b Gender has a significant effect on transport mode choice if no car is available to get home.

H5 Transport policy instruments have a significant effect on transport behavior.

H5a Transport policy instruments have a significant effect on transport behavior if employers offer incentives to switch to environmentally friendly transport modes.

H5b Transport policy instruments in terms of punishment and incentives have a significant effect on transport behavior if no car is available to get home.

H6 Employers incentives have a significant effect on actual transport behavior.

H7 The non-availability of the car to get home has a significant effect on actual transport behavior.

H8 Having a driver's license has a significant effect on actual travel behavior.

Note that numerous hypotheses and sub-hypotheses have been formulated, but the degree to which the sub-hypotheses are related to the hypotheses has not been established.

Empirical research was conducted to verify hypotheses and answer detailed research questions. The results are presented in Chapter 4 and, besides the exhaustive verbal description, shown in a clear graphical and tabular form. Conclusions containing information on the verification of research hypotheses are included in the next chapter, which makes it difficult to directly link the got results with the verification of individual hypotheses.

Despite these imperfections, the dissertation has clear empirical values, which result in a positive assessment of issues related to the research problem and theses. It is also worth emphasizing that the author referred extensively to the current and classical theoretical literature and the practical achievements of numerous trends within the discussed considerations indicating knowledge of the subject and erudition.

4. Research methods

In the doctoral dissertation Cordula Welte-Bardtholdt applied research methods adequate to the planned scientific problem, based on the *conjoint* analysis. The methodological choices made by the PhD candidate are described in Chapter 3. The author presents the high quality of the scientific workshop, freely moving between econometric models, many research methods, both in original form and hybrid variants, up to advanced modeling techniques. In the reviewer's opinion, the choice of PLS-SEM modeling was correctly selected because SEM is a well-known technique that allows the detection of correlation between latent variables and determination of the significance of each hidden attribute.

Certain difficulties in identifying the PhD candidate's research intentions result from the lack of

a complete model and research mode covering the full scope of the work. Presentation of the research assumptions as a process map, starting from the initial literature review, formulating research questions and hypotheses, methods of empirical verification, leading to the formulation of final conclusions, would allow for a clear assumptions of the work and would create an aim justification for the choice of issues made by the author in chapters 1 and 2.

Noteworthy is the clear determination of the research assumptions in Chapter 3, the precise definition of the modeling path and stages, dependent and independent variables in direct connection with the research questions. A presentation of developed methods of verifying the achievement of partial goals and an exceptionally detailed model of the presentation of results should be distinguished. Doubts are only raised by the author's wording in the last paragraph of Chapter 3, in which the doctoral candidate writes about research in the future as if they were yet to be carried out. Meanwhile, it would be logical to assume that the statements relate to the research already done, described further in Chapter 4, and not to the author's future research intentions.

The size of the research sample is also a significant advantage of the work. The author got 918 correct answers using CATI and CAWI methods. LimeSurvey software version 3.17.0 was used to obtain empirical data . The data was statistically processed using Statistica 64, version 13.1. To analyze mobility behavior, socio-economic characteristics were collected together with psychographic data. The applied approach allowed for the triangulation of research methods.

5. Work structure

The thesis is characterized by the correct structure. As mentioned in the assessment of the formal and editorial side of the work, its structure comprises an introduction, four chapters, conclusions, as well as bibliography, lists and attachments. Individual chapters form a logical set.

The introduction to the dissertation seems to be quite extensive and contains most of the elements necessary for scientific work: a brief justification of the dissertation, presentation of the main purpose of the dissertation, key research question and partial questions, a long list of research hypotheses, presentation of the work structure. The layout of the introduction is not typical. In the reviewer's opinion, a drawback seems too general justification of taking up the dissertation without a clear reference to the scientific achievements of other authors and literature research on the phenomena analyzed by the author. The characteristics of the research gap have not been sufficiently exposed, there is no clear sign of the originality of the dissertation against the background of previous research in this area and emphasizing the PhD candidate's contribution to the development in social sciences in the discipline of economics and finance. The introduction also does not describe the research limitations in the approach adopted by the author.

The first chapter summarizes the challenges of mobility. The author identifies three problem areas: concerning the genesis and consequences of the functioning of mobility systems based on motor vehicles, relating to durability and sustainable mobility, and the phenomena that determine both the present and future shape of sustainable development and the prospects of sustainable mobility. This chapter creates an interesting background for the author's further considerations, making a kind of attempt to systematize the factors determining the current balance of successes and failures in mobility. The doctoral candidate mainly refers to the achievements in shaping the mobility policy, in particular to the strategic documents of the European Commission and the theses and implications resulting from them. It seems debatable not to notice the criticisms of the forced solutions in EU climate policy, which have an impact, in particular, on urban mobility. With the doctoral dissertation, one could expect a stronger emphasis on the author's opinion on the presented phenomena, preceded by a multilateral and critical analysis of scientific considerations on the real impact of car traffic on climate change or the correctness of assumptions and completeness of the models for calculating the CO₂ emissions of different technologies in means of transport.

The chapter seems eclectic. It addresses the problems of modern cities, such as the emergence of unsustainable mass mobility and its impact on people's lives and health. Efforts to increase road safety in Poland and other EU countries are characterized. The chapter also includes references to the COVID-19 pandemic situation and the prospects for changes related to the unsustainable and massive nature of mobility. The author follows the evolution of the concept of sustainable development and presents alternatives for sustainable mobility. The first chapter also focuses on the issues of autonomous vehicles and different levels of automation, in this context presenting several projects related to the attempts to autonomize mobility.

While discussing various threads, it would be better to emphasize the author's intentions as to the choice and characteristics of the phenomena in this chapter. What criteria determined the applied structure of the division and the selection of issues raised. Leaving the reader without trying to summarize these broad and contextual considerations makes it somewhat difficult to find the main idea of the work and, a link to the following chapters.

However, this does not detract from the substantive value of the chapter, in which the author shows great erudition, broad theoretical knowledge, and the ability to present complex issues in an interesting manner. This creates a valuable, though still imperfect, starting point for further scientific argument.

The second chapter is devoted to the issues of rationality and irrationality in decision making. In this part of the thesis, the various decision models and their evolution have been identified in the literature and widely described. The author presents a historical outline of economic theory and a change in attitude to decision-making processes, with particular emphasis on the role of socio-cognitive models

in predicting human behavior. The content of the presented issues has been enriched with figures that make it easier to read the author's intentions. Much emphasis in this chapter is placed on the Engel-Blackwell Miniard model, because it serves as a theoretical basis for modeling the behavior of participants in the mobility process in the subsequent chapters of the dissertation. The author's erudite view of human behavior, combining various scientific paradigms and an interdisciplinary narrative perspective, deserves a special mention. The choice of a broad contextual orientation, however, gave the impression of chaos, wandering from the main idea of the work. The description of some issues leaves a certain qualitative insufficiency as to the depth of considerations. This applies, for example, to the analysis of the phenomenon of motivation or the key barriers to rational decision-making in presented models. These are such complex issues that their synthetic presentation requires not only analytical skills and knowledge, but also the ability to prioritize and consistently build a narrative. As in the first chapter, the second chapter lacks a summary of the ongoing scientific discussion - an intellectual clamp that closes this rich review of literature and concepts, allowing to focus attention on the author's research intentions presented in the following chapters. Despite these deficits, the author clearly shows great orientation in the problem's literature and the ability to describe it synthetically.

The third chapter is devoted to methodological issues. The author justifies the choice of the research method used in the dissertation based on the *conjoint analysis*, i.e. the analysis using combined questions, based on the questionnaire forms, an advanced method of market research analysis, which aims to explain how respondents make complex choices. *Conjoint analysis*, belonging to the group of mixed methods (*mixed-method approach*) is based on advanced statistical methods allowing for more flexible options for designing the assessment, with the possibility of combining evidence in various ways, depending on the purpose and subject of the study. The author presents the various *conjoint analysis* and discusses the pros and cons of each. It presents an overview of modeling and estimation techniques justifying the choice of the SEM modeling technique for further considerations. After assigning individual parameters to the four stages, signaled in the second chapter and here developed EBM model, the next steps of SEM modeling are explained. The great advantage of the third chapter is the detailed explanation by the author of the methodological concept of the survey, based on which the empirical data for the dissertation was obtained. The survey tool used comprises 37 questions, divided into six sections (Part A - Part F). First, the individual sections were described, and then the relationship between the survey questions and the theoretical basis of their formulation was characterized. The proposed research method was correctly adopted by the PhD candidate as the basis for further considerations.

Chapter four presents the main conclusions of the research, starting with the characteristics of the respondent population, then presenting plans to buy or sell a car and estimated monthly travel costs. The respondents' experiences of sharing modes of transport are further presented, as well as the reasons a mode of transport is not preferred. In the next step, an assessment of policy instruments as incentives



and penalties aimed at changing the preferences of means of transport was indicated. Then, the results of two combined analyzes of the choice of means of transport in the two previously mentioned hypothetical situations are presented. Next, the comparison and interpretation of the results are given by identifying the correlations between the variables using the chi-square test. ANOVA analyzes examining the influence of independent variables (individual psychological factors) on dependent variables were presented and a factor analysis was performed. Finally, fewest squares structural equation modeling (PLS-SEM) was developed and interpreted. The individual stages of the research analysis are presented as detailed tabular with the performed calculations and verification activities. Chapter four has a special cognitive value because it presents the original research method and synthetic results of empirical research undertaken by the author and allows to formulate conclusions in the next chapter.

The conclusions finish the substantive part of the dissertation and contain a summary of the results of the research, while referring to the verification of hypotheses, achievement of the main goal, as well as answers to research questions.

Despite the raised doubts about the scope and method of wording in the introduction and the content of individual chapters of the work, its advantages include a clear structure that allows the author to narrate smoothly. The introduction leads the reader to the issues raised in the thesis, while the conclusions logically correspond to the opening issues and present the main reflections resulting from the research.

6. Selection and use of sources

In the work's content, rich and sufficient literature on the subject was used, as far as the number of items is concerned. Although the PhD candidate did not declare the number of publications on which she based her deliberations, the bibliographic items were given in the final list 468. The structure of sources is dominated by scientific articles and documents related to shaping EU public policy. The bibliography seems to be varied in terms of publication dates - the thesis refers to older items, which can be classic canon for the issues discussed, and the current achievements. The literature of Polish authors has been used to a small extent.

Except for the introduction, in which not all of the author's theses are supported by a reference to bibliographic sources, the literature selected for the dissertation is adequate to the topic of the thesis and was correctly used in the dissertation. The author skilfully draws on the achievements of literature relevant to the field of social sciences in the discipline of economics and finance.

The sources in the work were used under the rules of editing and citing appropriate for the Oxford style. The author uses this style correctly.

7. Polemic remarks

The reviewed doctoral dissertation meets the substantive and formal requirements for this type of work. It is an original study in which a comprehensive solution to the research problem was proposed, at a high substantive level. Like most studies relating to a vast research problem, and therefore covering a complex research concept, it induces some polemical remarks. These include:

No criticism in assumption that the road traffic is responsible for climate change to a large extent. Criticism of the current climate policy, especially the one pushed by the EU and international organizations, in the opinion of an increasing number of researchers and economic experts, may be based on incorrect assumptions, e.g. as to the actual impact on the level of CO₂ emissions of individual sectors and branches of the economy, including road transport.

No explanation about criteria used to identify the factors influencing transport behavior and which were adopted as the basis for formulating research questions and hypotheses. In addition, some factors (e.g. social and psychological) treated as disjoint ones may in fact be correlated with each other, which would reduce the credibility of the model described in the thesis.

Regarding life and professional circumstances (hypothesis H1), is it possible to isolate the factors influencing transport behavior in the last 24 months and distinguish the factors that occurred earlier and had a lasting impact on the current consumer behavior?

However, the above comments do not limit the positive assessment of the submitted dissertation. They may occur in the author's future research fields.

8. Recommendation

Based on the detailed remarks listed above, and in particular the selection of a significant research problem for the discipline of economics and finance, synthetic and competent theoretical argument, detailed justification of methodological choices, skilful application of data collection, analysis techniques and correct inference, I conclude that **the thesis of Cordula Welte-Bardtholdt entitled "The Effect of Economic, Social and Psychological Factors on the Transport Behavior of Polish Citizens - A Conjoint Analysis Approach"** meets the requirements of Art. 187 of the Law on Higher Education and Science of July 20, 2018. (Journal of Laws 2018, No. 65, item 1668). On the basis of what is stated above, I recommend that the permission for a public defence of the dissertation can be granted.

(-) Bartosz Grucza

