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REVIEW
of the doctoral dissertation by mgr Cordula Welte-Bardtholdt
entitled
The Effect of Economic, Social and Psychological Factors on the Transport Behavior of Polish Citizens. A Conjoint Analysis Approach

1. Basis

The dissertation has been reviewed on the basis of official document E001.6110.82.2022 of 28 July 2022 by dr hab. Przemysław Borkowski, Professor at the University of Gdańsk, Chair of the Discipline Council for Economics and Finance.

2. Assessment of the dissertation layout

The doctoral dissertation submitted for review by mgr Cordula Welte-Bardtholdt is *The Effect of Economic, Social and Psychological Factors on the Transport Behavior of Polish Citizens. A Conjoint Analysis Approach*. The dissertation supervisor was dr hab. Michał Suchanek, Professor at the University of Gdańsk.

The dissertation is 325 pages long and consists of an abstract, an introduction, four chapters, conclusions, bibliography, a list of tables, a list of figures, a list of abbreviations, and an appendix (a survey questionnaire in English and Polish).

The author has briefly substantiated her choice of the paper subject, purpose, research questions and hypotheses in the introduction. The first chapter addresses various mobility-related challenges, starting with a historical view of the development of the automotive sector, introducing the concept of sustainable transport, and finally indicating

the contemporary forms of mobility and the solutions supporting it (such as Mobility as a Service, electromobility, or autonomous vehicles). In this part of the dissertation, the importance of the research problem tackled by the author is also highlighted in more detail. The next chapter provides an overview of different behavioural models and the available theories on habits, as well as identification of various factors which affect decision making. The models discussed by the author in this section include the Engel-Blackwell-Miniard model which, once adequately adapted, has also been used further on in the dissertation. In chapter three, the author has presented the methodology and the chosen conjoint analysis approach (preceded with an analysis of different variants). She also discusses the plan of her research, identifies the relevant parameters and the associations between them, and presents the questions comprising the research questionnaire. The final chapter is an analysis of the research results, analysed in a breakdown into socio-demographic and emotional aspects. The conclusions section not only provides a summary of the dissertation, but also confirms or rejects the individual research hypotheses. There are also suggestions on the ways to affect the transport mode choices made by the travelling population with reference to the research results and experiences from other countries.

I have found the dissertation layout to be clear and well-structured.

The literature cited in the dissertation comprises 468 items, of which sources from the last decade represent about a half. The publications referenced in the dissertation address all the aspects it covers, including transport, economics, sociology, and psychology. They include European Union guidelines or statistical data sets. In my opinion, the literature review should be considered comprehensive.

The author's analysis of the literature on the subject and her efficient handling of concepts derived from the field of transport systems, including transport behaviour patterns or transport economy, as well as the use of analogies with consumer choices all imply that **the author has good general theoretical knowledge.**

3. Assessment of the assumptions and the research process

The doctoral candidate has demonstrated the rationale behind the research of the chosen subject in the dissertation. The large proportion of travels made by passenger cars is

one of the causes of congestion, noise, and air pollution. The choice of this transport mode can be attributed to a number of reasons, and identifying them is not an easy task. At the same time, sustainable development requires travelling to be unconstrained, but also demands availability of more environment-friendly forms of travel. Mobility plans should focus not on passenger cars but on accessibility and quality of life. Therefore, transport system planning and designing should be integrated with spatial planning, social needs, etc.

One way to improve this situation is by addressing the need to influence the decisions made by the travelling population. Such influence will be all the more effective if the decision-making process, and so its economic, social, or psychological rationale, can be identified.

The research assumptions are derived directly from its purpose, i.e. *“to study the impact of economic, social and psychological factors on the transport behaviour of Polish citizens, using a conjoint analysis approach,”* as well as from the research questions posed – the primary one: *“Do personal circumstances, emotions, drivers’ issues, gender and policy instruments have an effect on transport behaviour?”* and the intermediate questions: *“Do changes in life circumstances and job situation have an impact on transport behaviour?”* *“Do the mental state/experienced feelings have an impact on transport behaviour?”* *“Does the possession of a driver’s license have an impact on transport behaviour?”* *“Does car-sharing experience have an impact on transport behaviour?”* *“Does gender have an impact on transport behaviour?”* *“Do policy instruments have an impact transport behaviour?”* *“Do employers’ incentives have an impact on actual transport behaviour?”* and *“Does the non-availability of a car have an impact on actual transport behaviour?”* The dissertation also provides eight primary hypotheses and more than a dozen secondary hypotheses (twenty in total), either confirmed or rejected with reference to the research results at the end of the dissertation.

The author’s research process addressed in the dissertation is correct, comprising the following elements: an extensive literature review, formulation of the research problem, choice and adaptation of the research tool to the needs of the problem identified, the research itself, and interpretation of its results. The analyses performed in the course of the research were supported by statistical methods, including Chi-square tests and variance analysis.

Both the assumptions and the research process adopted by the author should be assessed as correct. Having considered the fulfilment of the objectives consecutively defined, as presented in the dissertation, I conclude that **the dissertation demonstrates the author's capacity to perform independent scientific work.**

4. Originality and practical relevance of the dissertation

In my opinion, there are several important aspects to the originality of the dissertation, including the adaptation of the Engel-Blackwell-Miniard model to the specifics of the research problem addressed in the dissertation, i.e. the travelling mode choices, along with the structural equation modelling (PLS-SEM) based analysis, and the comprehensive approach to the decision making problem taking economic, social, and psychological conditions into account.

The practical dimension of the dissertation is mainly offering local authorities or decision-makers a possibility of using the approach proposed in the paper to study transport behaviours (and the decision-making process in particular) as well as the research results themselves while developing transport systems, which may improve the effectiveness of the activities related to changing the way people travel as well as to designing and promoting new behaviour patterns. However, this requires further research.

Given the choice of the tool and its adaptation to the needs of the research problem posed, as well as the analyses and surveys conducted by the author, there is no doubt that **the reviewed doctoral dissertation represents an original solution to the scientific problem at hand.**

5. Remarks to the dissertation content

The remarks and questions provided below do not alter the positive assessment of the dissertation. They are only intended to provide guidance to the author for future publication efforts.

Remarks and questions to the author of the dissertation:

1. On page 19, the author has written that the transport sector provides about 11 million jobs. However, the specific area to which the information refers is not detailed. A similar problem pertains to the values provided on page 51 regarding projections for the development of autonomous vehicles.
2. On page 20, the author states that the invention of car can be considered the beginning of the mobility era. How then does the author define mobility?
3. Page 20 reads that the given subsection describes the evolution of mobility in the European Union, and particularly in Poland, while the history of motorisation has been practically limited to Germany. Why is that so? Also the electric cars developed at the turn of the 20th century have been disregarded.
4. In Table 1 on page 22, the number of new cars registered for the first time in the year in question should be added. This would demonstrate the scale of the used car registration problem.
5. When discussing road traffic safety in Poland, in addition to the number of accidents (as in Figure 7 on page 29) one should add information on the number of road accident fatalities as this would make it possible to establish the accident severity factor.
6. Page 47 contains an example from Australia for which a cost is given, but without a unit.
7. On page 48, the author states without any word of introduction that the electric vehicle charging infrastructure in Munich is sufficient. The sentence seems to be an off-topic interjection as the paragraph does not refer to other cities, while it pertains to vehicle charging at large.
8. The survey respondents were asked in the questionnaire if the distance to the nearest public transport (implicitly, a public transport stop) they had to cover was less or more than 400 metres (see page 143). For what reason did the author assume this particular value?
9. Why is the *Actual behaviour* item assigned to *Choice* in Figure 42 (page 154), while in Figure 41 (page 153), *Current travel status* is linked with *Pre-choice alternative evaluation*?

10. The acronyms and abbreviations used in the paper are indexed at the end of the dissertation. However, on page 130, the author refers to the *choice-based conjoint analysis* as CBC, while the acronym provided in the index is CBCA.
11. The practical section of the doctoral dissertation mentions the structural equation model (PLS-SEM) as the one used in the research, while on page 136, having described other methods, the author recommends that the reader should refer to other literature for guidance on the application of this method.
12. On page 156, the author writes that the expected number of completed questionnaires is nearly 950. Why this particular number?
13. Did the author estimate the measurement error?
14. The results described on page 163 prove that people who own a car spend more on travel. Did the author check how this aspect can be compared with regard to employed people and others?
15. Page 164 reads that only 0.1% of the respondents choose to travel by bicycle. This value is lower than the one typically reported by the transport surveys conducted in Poland. How can the author explain this discrepancy of results?
16. The problems discussed in the opening sections include the development of autonomous vehicles and their acceptance models. Why did the author decide not to include this transport mode in the survey?
17. The survey question concerning monthly expenses on transport provides only car use related expenditure in the examples. Why is that so?
18. The survey does not define the term *environmentally friendly mode of transport*, while it contains a question about switching from car to such a mode. Was the meaning of this notion explained to the respondents during the survey? How does the author define environmentally friendly mode of transport?
19. One of the survey questions requires that the following statement be evaluated: "*I am concerned about the environmental impact of car and freight traffic.*" Does the author believe that all freight transport is environmentally unfriendly?
20. The research was conducted during the pandemic, when significant changes in the use of different modes of transport could be observed and when vehicle sharing services in individual towns in Poland were partially discontinued. Therefore,

repeating the study in the future and comparing the results by taking this factor into account would be worthwhile.

21. On several occasions, the author makes a reference to a figure using a colon ":" (e.g. on pages 58 and 84). Figures are elements independent from the main body of the text, and as such they may be rearranged at the editing stage, which is why this convention is unadvisable. Elsewhere, there are points at which a figure has been placed before a reference in the text. In similar publications, a figure is typically preceded by the reference.
22. Page 225 reads: *"From the frequency table, it can be seen that regardless of whether a respondent has carsharing experience or not, most respondents without experience would switch to car/taxi sharing, followed by public transport. Respondents with carsharing experience would choose car/taxi sharing first, followed by public transportation."* Is the paragraph missing information about an additional difference identified in the research?

6. Final conclusions

The peer-reviewed thesis by mgr Cordula Welte-Bardtholdt meets all the requirements assumed for doctoral dissertations. I conclude that the author has demonstrated good general theoretical knowledge, and that the research results provided in the dissertation represent an original solution to a scientific problem and confirm the author's capacity to conduct independent scientific work.

In light of the foregoing, I request that the doctoral dissertation entitled *The Effect of Economic, Social and Psychological Factors on the Transport Behavior of Polish Citizens. A Conjoint Analysis Approach* by mgr Cordula Welte-Bardtholdt be accepted for further proceedings as well as for public defence.

