



REVIEW OF THE DOCTORAL DISSERTATION

of master Abdel-Rahman Fakhani

under the title:

"A comparative research of urban mobility in Poland and Germany.

On the behavior of different generations"

1. Preliminary remarks

The basis for the review is the Resolution of the Discipline Council of Economics and Finance of the Faculty of Economics of the University of Gdańsk of 23 of February 2023 on the appointment of reviewers in the doctoral dissertation of master Abdel-Rahman Fakhani and the letter No. E001.6110.18.2023 of the Chairman of the Discipline Council of Economics and Finance Przemysław Borkowski, professor at the University of Gdańsk, dated on 23 of February 2023, to which a copy of the doctoral dissertation was attached.

Legal basis: Act of 20 of July 2018 "*Law on Higher Education and Science*" (consolidated text, Journal of Laws of 2022, item 574, as amended).

The reviewed doctoral dissertation concerns the issue of comparative studies of urban mobility in Poland and Germany in the field of behavior of different people generations. The work submitted for review includes:

- 289 pages of the study, including 205 pages of the main text, 41 pages of bibliography, 1 page of summary in Polish, 1 page of summary in English, 1 page of lists of publications, 1 page of acknowledgments, 2 pages of lists of tables presented in the text of the dissertation, 1 page list of figures presented in the text of the dissertation, 4 pages Appendix A called "Details to basic figures and key mobility indicators", 11 pages Appendix B called "Questionnaire", 5 pages Appendix C called "Details variables", 1 page Appendix D called

- "Details analysis from the multinomial logistic regression of the daily commute model",
3 pages Appendix E called "Details statistical results of the city comparison: Warsaw vs. Berlin", 5 pages Appendix F called "Details statistical results of the city comparison",
7 pages Appendix G called "Details statistical results of the generational comparison",
- 29 figures in the main text, which are numbered and described,
 - 59 tables in the main text, which were also numbered and described,
 - a bibliography consisting of 730 items of scientific literature on the subject, mainly in English, a few items in German language,

The supervisor of the doctoral dissertation is Ph.D. D.Sc. Michał Suchanek, Professor at the University of Gdańsk.

2. Assessment of the selection of the dissertation topic

The subject of Abdel-Rahman Fakhani's doctoral dissertation focuses on issues related to comparative studies of urban mobility in Poland and Germany in the field of behavior of different generations. Generational changes in urban mobility is a multithreaded process that consists of a whole range of activities, experiences and solutions worth replicating due to their beneficial impact on conditions and broadly understood traffic safety and urban mobility.

On the basis of the study of the scientific literature, the Ph.D. Student showed that the undertaken topic is widely developed and elaborated in detail in the scientific literature on the subject in terms of many different characteristics related to the movement of people.

Mobility is a transport service enabling movement of people using shared vehicles in an organized IT system, complementing traditional public transport and implementing the idea of sustainable mobility. However, there is not enough research, both academic and practical, on the urban mobility behavior of different generations, especially when combined with cross-city comparisons between different countries. This became the premise for master Abdel-Rahman Fakhani to undertake the topic of the dissertation on comparative studies of urban mobility in Poland and Germany in the field of behavior of different generations. The main goal of the doctoral dissertation was primarily to identify similarities, but also differences along with the underlying behavioral attitudes. The results of such work will provide the basis for future actions at the micro- and macroeconomic levels aimed at developing future-oriented urban mobility towards sustainable development, embedded in a holistic smart city concept.

Therefore, the subject of the doctoral dissertation is of great importance both in scientific and utilitarian terms. The scientific aspect is, above all, in addition to the extensive review of

the literature on the subject, conducting surveys that allowed the Ph.D. Student to obtain new insights from an in-depth data analysis. With regard to selected generations, the Ph.D. Student included study participants aged from 18 to 56. On the basis of the initial factor analysis, he conducted a multinomial logistic regression analysis and significance tests along with determining the size of the effects. These activities allowed the Ph.D. Student to state that the city of Berlin is more advanced than Warsaw in terms of the development of sustainable mobility, as well as to confirm in the case of Berlin the assumed hypothesis that younger generations pay more attention to sustainable development in the area of mobility and also more often use alternatives to the car. Moreover, despite the fact that the car is a status symbol in Warsaw rather than in Berlin, the research did not confirm a general trend of the decline of the importance of the car in the studied areas. The strong striving towards sustainable urban planning and expansion of public transport in the future can be taken as an indicator of the decreasing share of car owners when sufficient alternative mobility offers are available. The study conducted by the Ph.D. Student confirms the fact that the process of sustainable mobility transformation is still at a fairly early stage of development.

On the other hand, the utilitarian aspect is obtaining new insights on the mobility behavior of different generations in Warsaw and Berlin. Practical knowledge of the mobility behavior of different generations can be used to develop incentives for sustainable mobility behavior and thus make a significant contribution to clean, safe, and healthy urban mobility. So far, there are no detailed guidelines in this regard. The concept of sustainable mobility should also be included in the smart city strategy and thus enable the improvement of the quality of life for all inhabitants. This knowledge can be used in future design and expert work in this area.

Taking up dissertation issues related to the analysis of the results of surveys on urban mobility of different generations, the Ph.D. Student perfectly fits into the needs of both theoreticians and practitioners who search for tools to monitor rational travel, i.e. choosing other means of transport than a car, especially over short distances that dominate in travelling around the city. Thus, I believe that the research problem undertaken by master Abdel-Rahman Fakhani in the thesis is absolutely justified, and the wording of the subject of the doctoral dissertation is appropriate.

3. The criteria for the evaluation of the doctoral dissertation

Bearing in mind the requirements of the Act of 20 July 2018 "*Law on Higher Education and Science*" (consolidated text, Journal of Laws of 2022, item 574, as amended), when

assessing the doctoral dissertation of master Abdel-Rahman Fakhani, I adopted the following criteria assessment of the dissertation: the importance and originality of the topic taken into account, the degree of the Ph.D. Student's understanding of the researched topic, the correctness of formulating the research goals and hypotheses, the validity of the research methodology, the consistency of the dissertation structure, its workshop side, and master Abdel-Rahman Fakhani original publications.

4. Analysis of the scope, purpose, and content of the dissertation

Based on the analysis of master Abdel-Rahman Fakhani's doctoral dissertation, I conclude that the research problem posed by the Ph.D. Student is dissertable and fully refers to modern achievements and the needs of science and practice in the field of urban mobility of different generations in Poland and Germany.

The content of the following chapters is related to the title of the dissertation and corresponds to the research hypotheses set out in the Introduction, formulated on the basis of a review of the scientific literature on the subject. These hypotheses are as follows:

"H1: In Berlin, sustainable modes of transport are more developed than in Warsaw, which means that they are also used more frequently in comparison".

"H2: There is a trend that younger generations have a more environmentally conscious lifestyle and thus exhibit more sustainable mobility behaviors".

"H3: The younger the generation, the more likely it is to use alternative modes of transport to the car, such as bicycles or mobility sharing offerings".

"H4: There is a general trend among all generations of a high willingness to use more sustainable transport modes if a sufficient mobility offering is provided".

In the dissertation, the Ph.D. Student also formulated 7 research questions. They are as follows:

- 1. What are the main factors influencing mobility behavior in daily commuting?*
- 2. What is the living situation and how satisfied are the citizens with respect to the living environment?*
- 3. What are the differences and trends in mobility behavior between the two cities in general?*
- 4. What are the general differences and trends in mobility behavior between the generations?*

5. *What are the differences and trends in mobility behavior between the different generations within both cities of Warsaw and Berlin?*
6. *What are the differences and trends in the mobility behavior of the respective generations in a direct comparison between Warsaw and Berlin?*
7. *How do the trends in mobility behavior of different generations affect future planning for sustainable transportation infrastructure?*

In order to achieve the assumed goals, the Ph.D. Student:

- collected the data from 537 participants as part of the research survey and analyzed them in relation to the target groups. In the data collection process, the Ph.D. Student used a computer (online) survey. Then, the collected data was cleaned by the Ph.D. Student depending on the type of question, and the type of the obtained data. Then the data was properly processed and analyzed using appropriate statistical methods,
- in order to ensure the best representativeness of the sample in the case of gender and generation distribution, the Ph.D. Student selected the appropriate weights for the research sample based on real population numbers in Warsaw and Berlin,
- applied the appropriate statistical methodology, performed statistical analysis based on the final data set. In order to reduce the dimensions of the different variables with the identification of related patterns, Ph.D. Student applied an initial exploratory factor analysis to all questions with a 5-point Likert scale to group the different interdependent variables,
- in order to analyze the factors affecting the choice of means of transport for daily commuting, the Ph.D. Student used a multinomial logistic regression model,
- in order to examine the correlations and differences between the studied cities and generations, the Ph.D. Student used dependency analyses, such as Pearson's χ^2 test and one-way analysis of variance (Anova),
- Ph.D. Student determined the effect strength and thus the degree of the influence of certain variables on decision-making was carried out either with Cramer's V or eta. Depending on the type of variable or scale,
- presented the established models from consumer research which are then analyzed with reference to urban mobility,
- considered the models in the scientific context as well as in relation to practical application in terms of urban life and urban mobility.

The doctoral dissertation contains a total of five chapters, with the main content of the dissertation contained in the fourth and fifth chapters. The content of the following chapters is related to the title of the dissertation and corresponds to the assumed purpose of the dissertation, which the Ph.D. Student formulated as:

"The aim is to identify similarities but also differences together with underlying behavior attitudes to provide a basis for future measures on a micro- and macroeconomic level to develop a future-oriented urban mobility towards sustainability embedded into a holistic smart city concept".

The first chapter "***Urban Mobility in a Small City in the Light of Sustainable Development Paradigm***" (44 pages) focuses on the literature review and puts urban mobility into the overall context of a smart city with respect to sustainable development, thus constituting the first part of the theoretical basis. The Ph.D. Student concisely presented an overview of the scientific literature on the subject. Thereby, in the first section, the foundation is laid with the framework condition and definition of a sustainable smart city with its most important aspects and the basic conceptual approach. Furthermore, the various smart city areas are introduced by showing how they affect the daily lives of all citizens in urban areas. In addition, the essential elements and concepts of urban mobility in the light of worldwide smart city developments were illustrated. The second section of this chapter then defines how sustainable transportation is defined in literature, followed by the investigation of key figures, and main challenges with respect to urban transportation. Since sustainable urban planning has a significant impact on daily commute behavior, essential concepts are shown, followed by a critical view on current policies in the light of sustainability at the end of the section. The third part of this chapter first describes the most important elements necessary for urban mobility from an environmental perspective. This is followed by an outline of current trends in the area of mobility. Then the concept of Mobility-as-a-Service (MaaS) is explained and how the different means of transport can be linked with the integration of technology. The focus is placed on the use of transport modes in the context of a shared economy. Finally, an efficient political framework for the development towards a future-oriented mobility plays an essential role, which is why the concept of Sustainable Urban Mobility Planning (SUMP) with its core elements is explained.

Chapter 2 "***Irrationality of transport behavior***" (32 pages) offers a theoretical approach to the irrationality of transport behavior by first explaining classical and modern consumer theories. From the field of behavioral economics, the foundations are laid to bridge the gap between the psychological underpinnings of human action and economic facts. Behavioral

theories, consumer behavior patterns, and decision-making models underlie the decision processes by consumers, provide some clarity on how consumers act, and thus influence the choice of transport mode. The origin of all economic and social behavior has been studied by the traditional economic theories presented by Adam Smith and Alfred Marshall, and is the foundation for the classical theories of behavior such as the Veblenian social-psychological model and the Freudian psychoanalytical model. Later developed models of consumer behavior such as the Howard-Sheth model and the Engel-Blackwell-Miniard model emerged later and are referred to in this dissertation as modern models of consumer behavior. Since many modern decision-making models are strongly free market oriented, most focus on consumer influence to increase sales and maximize profit margins, which can be derived from neoclassical theories. Therefore, these theories and models are placed in the overall context of transport behavior with respect to a sustainable and modern urban mobility. Thus, these insights into human behavior form an essential basis for the main section when it comes to analyzing transportation decisions and related issues in the context of a smart and sustainable development of urban areas.

Chapter 3 "*Behavioral Patterns of Different Generations*" (18 pages) rounds up the literature review by investigating the transport patterns of different generations. After defining the generations in the first part, essential differences in behavioral patterns between them and trends in the light of mobility are explained. Therewith, besides conducting a comparison of the attitude towards car ownership, the different transport mode choices of the generations and which underlying main reasons were investigated. The third subchapter presents typical characteristics of urban lifestyles in contrast to rural lifestyles and other influencing factors such as socio-demographics. Finally, it is indicated how different urban architectures and planning design can have an impact on urban mobility and transport mode choice.

Chapter 4 "*Methodology of Urban Mobility Behavior*" (33 pages) provides the basis for the data analysis of the data obtained from the survey. First, essential information and key figures on urban were shown regarding mobility in the two considered countries Poland and Germany with their capitals Warsaw and Berlin. This includes describing the characteristics of urban life in each of the two cities, such as the general economic conditions and the general quality of life. In addition, previous developments in the field of smart cities and in the context of urban mobility were outlined. The research design is then described in detail. This includes an explanation of the process of developing the questionnaire design and the procedure for conducting the survey with the target group. The findings from the pre-test and how these were used in the finalization of the questionnaire are also shown. Furthermore, the

structure with reference to the original survey questionnaire was shown. The next step presents the data cleaning process and the obtained sample, which serves as the basis for the data analysis. Finally, the applied statistical methods were described, which are used in the further course to answer the research questions.

Chapter 5 "*Urban Mobility Behavior of Different Generations - A Model Approach*" (58 pages) presented the results of the statistical evaluation based on the established research design and procedure model, so that the research questions defined in the introduction can be answered and the established hypotheses can be verified. In doing so, two different research models are used for the analysis of the generation related to daily commuting and related to urban living and transport behavior. In addition, a preliminary factor analysis is conducted, the results of which are taken into account in the further process of the evaluation. In the second part, the two cities of Warsaw and Berlin are first compared on the basis of personal living situations. This includes daily commuting distance and travel time, satisfaction with the living environment as well as urban mobility, but also expectations for future developments. In addition, various personality traits were compared based on questions in the areas of professional life, career and education, daily life and social environment, and use of technology in everyday life. The subsequent focus on urban mobility initially includes the basic own mobility resources (e.g., own car and monthly ticket for public transport) as well as underlying reasons for the choice of transport. In the further course of the study, the perceived comfort of car drivers and the use of sharing services are evaluated. After a sound basis has been created with the comparison of the cities, the generations are compared according to the following procedure: Investigation of generational differences with respect to the total sample; Investigation of differences between generations within Berlin and within Warsaw; Investigation of differences between the cities according to the individual generations (Gen X, Gen Y, and Gen Z). It should be emphasized that statistical significance is determined for the similarities and differences between the generations, and the effect strength is determined for the power of the significance.

The dissertation ends with the chapter titled "*Conclusions*" (7 pages), which contains a summary of the dissertation and conclusions resulting from the conducted considerations. In this chapter, the Ph.D. Student also included a description of the possibilities of practical use of the results of the dissertation and indicated directions for further research.

5. Evaluation of the doctoral dissertation

I believe that the reviewed doctoral dissertation contains the necessary ingredients of the scientific method. The selection of literature sources, the scope of the research, the methods and research tools used, the types of analyzes and the presentation of the results are appropriate and comprehensive in terms of achieving the goal of the work. Master Abdel-Rahman Fakhani showed a very good knowledge of the subject of research and mastery of experimental and analytical methods and techniques used in the field of social sciences, in the discipline of economics and finance. The fundamental, original, and most important achievements of the Ph.D. Student include:

- developing a synthesis of existing studies on urban mobility in a smart city in the light of sustainable development, including the organization of theoretical knowledge in this field,
- obtaining new conclusions dedicated to mobility behavior of different generations in Warsaw and Berlin,
- determination of the main factors influencing mobility behavior in daily commuting to work in Berlin and Warsaw,
- determination of the conditions of living situation and the level of satisfaction of citizens with the respect to the living environment,
- identifying the general differences and trends in mobility behavior between Warsaw and Berlin,
- identifying the general differences and trends in mobility behavior between generations,
- identifying the differences and trends in mobility behavior between different generations in both cities, Warsaw and Berlin,
- determination the differences and trends in mobility behavior of individual generations in a direct comparison of Warsaw and Berlin,
- determining how the trends in mobility behavior of different generations affect future planning of sustainable transport infrastructure.

The results presented in this dissertation can be used to create incentives for sustainable mobility behavior and thus make a significant contribution to clean, safe and healthy urban mobility. A sustainable mobility concept should also be embedded in the smart city strategy and thus enable an increased quality of life for all residents. Hence, these results can be used in many studies conducted in the field of social sciences in the discipline of economics and finance.

In turn, the main recipients of the research results presented in the doctoral dissertation may be political and private sector decision-makers, city authorities, metropolitan associations as organizers of public transport, offices, companies, and design companies dealing with urban mobility issues. The utilitarian nature of the dissertation determines the correct approach of the Ph.D. Student to conducting scientific research. The implementation and verification of the proposed approach confirms the possibility of practical application of the proposed solutions in the field of urban mobility of different generations. On the other hand, the conclusions resulting from the conducted research are right and valuable, especially for practitioners in the field of social sciences in the discipline of economics and finance, as well as in the field of transport in the planning of urban mobility, because the implementation of new technological transport concepts must take into account the different historical and cultural backgrounds of societies.

Based on the analysis presented in the doctoral dissertation, I conclude that that master Abdel-Rahman Fakhani moves freely in the researched subject, demonstrates the ability to independently define scientific problems as well as conduct research, interpret and justify the results and verify hypotheses based on the assumptions made. The considerations presented in the empirical part of the dissertation confirmed the high scientific maturity of the Ph.D. Student.

The issues I would like master Abdel-Rahman Fakhani to address during his public defense of the doctoral dissertation are as follows:

1. In the dissertation, the Ph.D. Student took Warsaw and Berlin as the cities for comparison. Which was the basis for comparing Warsaw and Berlin. Why did the Ph.D. Student choose these two cities as the subject of his research?
2. Whether the number of surveys collected by the Ph.D. Student in Warsaw and Berlin was sufficient from the statistical point of view, and whether it met the condition of the minimum size of the research sample for conducting statistical analyzes?
3. During the research conducted by the Ph.D. Student the corona pandemic took place. The lockdowns are likely to have disrupted mobility behaviors. Can the Ph.D. Student determine to how and to what extent the outbreak of this pandemic affected the collected data and the obtained results?
4. When identifying the main factors affecting daily commute, the Ph.D. Student took into account factors related to different areas: distance (km) and mobility resources, personality, satisfaction, urban living, future urban mobility and way of living, socio-demographics, city (Warsaw, Berlin), and generation (Z, Y, X). In the opinion of the Ph.D.

Student, are these all potential determinants or have any of them been omitted? If so, why have they not been included in multinomial logistics regression?

When assessing the structure of the dissertation, it should be stated that its general form and scope result from the implementation of the dissertation's objectives. The layout of the work is correct, the content of the chapters is consistent with the titles given to them, and the subsequent chapters are a logical development of the main theme of the dissertation.

Summing up the assessment of the dissertation of master Abdel-Rahman Fakhani, I state that the structure of the dissertation and the method of elaborating the empirical material, as well as the form of the analysis and the adopted research methodology are very good and appropriate for this type of work. The Ph.D. Student showed general theoretical knowledge, very good knowledge of the subject of research and mastery of experimental and analytical methods used in the scientific discipline of economics and finance.

6. Detailed remarks

Despite many advantages, and a very good assessment of the doctoral dissertation in terms of substantive content, the dissertation has certain shortcomings. However, they do not diminish the substantive value of the work, but only make it difficult to understand its certain parts. I present some of them below:

- In the work, the Ph.D. Student uses abbreviations denoting individual variables of the model. Unfortunately, the Ph.D. Student did not include a list of the symbols used in the thesis. Presenting the reader with a list of abbreviations used in the work would improve the readability of the content of the dissertation.
- The work contains minor stylistic and linguistic mistakes, e.g.:
 - page 190, sentence: ..."To gain an insight into the preferences of the citizens of Warsaw and Berlin and on how these differ, four different basic orientations and related measures in the context of sustainable urban development were provided for selection."... (should be without "on"),
 - page 204, sentence: ..."As a basis for the target group analysis, data was collected by means of a computer-assisted (online) survey." (is was should be "were")...,
 - page 204, sentence: ..."This finding is somewhat surprising, since based on the literature research, public transport in Warsaw is less well developed than in Berlin."... (should be "well-developed"),

- A Ph.D. Student sometimes uses mental shortcuts or formulates sentences with unfinished thoughts.

7. Final conclusion of the doctoral dissertation evaluation

I believe that the doctoral dissertation submitted for review, despite the several critical remarks presented above, which do not undermine the main achievements of the Ph.D. Student, was made at a very good substantive level. The scientific problem was correctly defined and described, and the goals of the dissertation set by master Abdel-Rahman Fakhani were achieved using the appropriate mathematical apparatus.

Evaluating the entire dissertation, I express the opinion that it is an original solution to the scientific problem, indicating the appropriate level of theoretical knowledge of its Author in the field of social sciences in the discipline of economics and finance, very good knowledge of the subject of research, the ability to take an analytical look at the problem under consideration, and the ability to conduct scientific research independently.

I state that the research results presented in the thesis are the original scientific achievements of the Ph.D. Student, and the results of the work can be used in practice for research and analysis of urban mobility in Poland and Germany on the behavior of different generations.

To sum up, I state that the reviewed doctoral dissertation by master Abdel-Rahman Fakhani, entitled "*A comparative research of urban mobility in Poland and Germany. On the behavior of different generations*" meets the conditions for doctoral dissertations set out in the Act of July 20, 2018. "*Law on Higher Education and Science*" (consolidated text, Journal of Laws of 2022, item 574, as amended). Therefore, I submit a motion to accept the study presented for review - as a doctoral dissertation of master Abdel-Rahman Fakhani for the degree of doctor of social sciences in the scientific discipline of economics and finance, and the Ph.D. Student may be admitted to public defence.

Elzbieta Malinowska