

Report on Bachelor / Master Thesis

Institute of Economic Studies, Faculty of Social Sciences, Charles University in Prague

Student: Bc. Ines Horvathova

Advisor: Mgr. Milan Ščasný, Ph.D.

Title of the thesis: Willingness to pay for electricity-driven passenger vehicles

OVERALL ASSESSMENT (provided in English, Czech, or Slovak):

Please provide your assessment of each of the following four categories. The minimum length of the report is 300 words.

The work of Ines Horvathova "Willingness to pay for electricity-driven passenger vehicles" represents a high quality master thesis outperforming even within a cohort of well skilled and highly qualified IES master level students. A tremendous amount of time and effort devoted to the elaboration of the topic can be seen through all chapters. Ines analyses consumer preferences for four types of passenger vehicles (conventional "versus" three types of electric vehicles) using a top-quality survey dataset professionally conducted by Millward Brown in Poland in 2014. Data from this discrete choice experiment are elaborated first employing the conditional and mixed logit model as these are natural choices for this type of data and have been standardly used in the literature. However, because of unmet assumptions for the former and excessive heterogeneity in preferences revealed using the latter, finally a more sophisticated (but also more complicated to specify) latent class model is introduced to distinguish between various preferential groups in the population. The results are exhaustive and will be commented on more in the "contribution" section below. Aside some socio-demographic findings that often follow common sense, the main contribution of the thesis is the translation of econometric results into monetary equivalents using the concept of the willingness to pay. The main finding that consumers on average require some compensation to switch to electric vehicles is not surprising (this result might have been generally expected simply because of a considerably higher purchasing price compared to the same quality-class of conventional vehicles and potential disutility from their operation), but its specific estimation might be very important for policy makers in their effort to promote electromobility. Much more interestingly, specific consumer segments would be willing to pay relatively large amounts for this switch. The interpretation of this (counterintuitive to my mind) result is not completely clear to me and it will thus be also discussed into more detail below.

Literature

Put simply, **this is the far far best literature survey I have ever read**. On one hand, it is rather long and comprehensive but it reads very well because Ines provides an advanced clustering of works and results based on selected monetary and technical attributes, she structures scientific papers into well arranged tables making the most important information clearly comparable across the literature, and further covers interconnected topics such as various policies influencing market penetration of electric vehicles or strong heterogeneity of preferences within population of consumers.

Methods

In the theoretical section Ines thoroughly describes all modelling approaches employed further in the analysis as well as some related concepts that appeared important based on the literature review. I highly appreciate that stress is also put on a serious discussion of potential drawbacks of given methods. In the empirical part, Ines then first employs the conditional and mixed logit models (results are put into Appendix for interested readers) but correctly tests for an important "Independence of Irrelevant Alternatives" assumption of the conditional logit and refuses this modelling approach as it is not met. Results from mixed logic are also considered not representative because strong hypothesised heterogeneity of preferences makes them uncertain (large standard deviations of some point estimates).

Finally, various specifications of the latent class model that is specifically designed to allow for unobserved preference heterogeneity in the consumer population are compared based on information criteria and the models with 3 and 5 classes are selected as optimal for final analysis based on a trade-off between decreasing criteria vs. problematic interpretability of results of high-class models. As the latent class model nests the previously estimated logit models, a direct check was used to confirm that it clearly outperforms the "refused" models.

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Ines also thoroughly describes the dataset structure and the design of the experimental survey. This is a very informative part because the computer-assisted web interviews using an e-panel was conducted by a professional agency Millward Brown and a large number of 2613 adults representing the Poland population were interviewed. But since the survey itself was not part of works on the thesis, I will not further focus on this aspect in my report.

Contribution

This section is mainly related to the Chapter 5 "Empirical results" which is the only part I was not convinced about its comparable quality to other chapters of the thesis. Thus I will state through this section several question or suggestions that the author can take the advantage of for her presentation or that can be discussed during the defense.

In general, the Chapter is correctly technically elaborated and overall contribution might be potentially very high also from the practical point of view especially for policy makers in their efforts to promote electromobility, emission reduction in cities, etc. The monetary equivalents of compensations to switch to electric vehicles, empirical identification of important decision-influencing attributes, or identification of consumer segments willing to pay (!) for this switch might make the "green policies" much more effective.

However, I also have several concerns here. Very first, I was surprised by distribution of choices in Table 5.1. showing an enormous support for electric vehicles that absolutely does not correspond to real fractions of passenger vehicles among population. The same holds for results of the 2-class model. Could the author advocate these seemingly unreal figures? Generally, the author often reports considerably different results between sample A and sample B as well as between the 3-class and 5-class model. This was very confusing for me as a reader and thus this section would definitely benefit from missing attempts to explain the potential causes of these differences, not only stating that results differ between these four combination. Moreover, as I understand from the description, samples A and B mostly differ in the fractions of people intending to purchase an old or a new car. But this fraction is not specified for sample B, it is only said that it is representative for Polish population (i.e. old>new). A specific figure might support the interpretation of differences in results between these two samples. Further, I would definitely appreciate more structured and analytical approach when evaluating such a large volume of combination of results, especially after a third dimension for interpretation (various types of vehicles) is added into discussion. In fact I simply got lost between the not completely clear terms such as "electric vehicles", "hybrid vehicles", AFV, EV, or "battery electric car" in the same paragraph (e.g. pg. 57). Put simply, I was not convinced by the statement in the Conclusion that "The qualitative results turned out not to differ between the two samples." as the author strongly focuses on quantitative analysis through the work and results differ considerably in some cases.

When it comes to the key results related to the willingness to pay, the differences are often very large even when averages are taken into account. Some the WTP results are also very far from those estimated previously in the literature. Moreover, I would be happy for some more intuitive explanation what the reported WTP numbers mean. Consider one of the main results: average compensation is estimated EUR 5,311 but about a quarter of respondents would be actually willing to pay EUR 2,417 for the switch from a conventional car to pure hybrid. Does this mean that assuming the purchasing price of a pure hybrid car e.g. EUR 20,000, the first group would be willing to purchase it for EUR 14,689 (and less) while the second group would accept a price even up to EUR 22,417? If the interpretation of reported numbers is different than this example, please, explain it during the defense. Some socio-demographic results are relatively obvious ("people in favour of hybrid vehicles favour new technologies more that people preferring conventional vehicles" etc) but it is definitely contributive to have them strongly empirically backed.

Finally, I was confused by the individual-level densities of a 5-classes model reported in Appendix C. Multimodality is clearly there but while for some parameters five modes are observable, for other parameters we only see three or even two modes. Do you have some explanation (hypothesis) for this interesting behaviour? Why there is a normal density (in red) depicted? It does not make good sense to put it there, it would rather make sense to inset 5 different normal densities specified by the estimated mean and SD for each mode/spike.

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Manuscript form

The aim of the work, working hypotheses, and the design of the econometrics part are clearly stated and carefully elaborated. The work (except Chapter 5) is well structured and meets high academic standards also in terms of academic English and text-editing quality. I also appreciate very detailed and (must-be) time consuming elaboration of all tables. I only found circa 3 or 4 typos within the entire text. Citing is very well elaborated, I would only suggest to add a citation for some specific technical details such as recharging time (pg. 15-16). The only aspect I am not fully satisfied with is the structure of Chapter 5 "Empirical results". Compared e.g. to the literature review, it is not structured at all, making it very difficult for the reader to follow the stream of results. It is also confusing how the results based on two datasets combined with two specifications of the model are always interpreted together over and over. Honestly, I felt lost in a tremendous amount of numerical results from which only a small part is really interpreted. E.g. Tables 5.10-5.13 covering 8 pages are only interpreted within one short paragraph (three sentences). This is a highly unbalanced approach and these results should definitely be placed in Appendix.

Summary

All in all, I do find this thesis **outperforming academic standards for master theses written at IES**. Personally considered, the top quality elaboration of the literature review and overall detailed (but exhaustive) empirical elaboration of a very interesting dataset plus a contribution potentially practically important for policy makers are the most distinctive qualities of the work.

Moreover, in case of considering eventual application to the Ph.D. program, it would be my pleasure to encourage and support Ines in this decision. I honestly believe that she demonstrated qualities to manage doctoral studies well and that the presented work constitutes a sound foundation for further research in the field of electromobility, "green" policies, or environmental economics in general.

I am very pleased **I can strongly recommend the thesis of Ines Horvathova to defense at the IES FSV UK. I suggest the grade "1", i.e. "excellent"**.

SUMMARY OF POINTS AWARDED (for details, see below):

CATEGORY	POINTS
<i>Contribution</i> (max. 30 points)	24
<i>Methods</i> (max. 30 points)	29
<i>Literature</i> (max. 20 points)	20
<i>Manuscript Form</i> (max. 20 points)	17
TOTAL POINTS (max. 100 points)	90
GRADE (1 – 2 – 3 – 4)	1

NAME OF THE REFEREE: Jiri Kukacka

DATE OF EVALUATION: 14. 6. 2017

Referee Signature

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EXPLANATION OF CATEGORIES AND SCALE:

LITERATURE REVIEW: The thesis demonstrates author's full understanding and command of recent literature. The author quotes relevant literature in a proper way.

Strong	Average	Weak
20	10	0

METHODS: The tools used are relevant to the research question being investigated, and adequate to the author's level of studies. The thesis topic is comprehensively analyzed.

Strong	Average	Weak
30	15	0

CONTRIBUTION: The author presents original ideas on the topic demonstrating critical thinking and ability to draw conclusions based on the knowledge of relevant theory and empirics. There is a distinct value added of the thesis.

Strong	Average	Weak
30	15	0

MANUSCRIPT FORM: The thesis is well structured. The student uses appropriate language and style, including academic format for graphs and tables. The text effectively refers to graphs and tables and disposes with a complete bibliography.

Strong	Average	Weak
20	10	0

Overall grading:

TOTAL POINTS	GRADE		
81 – 100	1	= excellent	= výborně
61 – 80	2	= good	= velmi dobře
41 – 60	3	= satisfactory	= dobře
0 – 40	4	= fail	= nedoporučuji k obhajobě