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# *Research on the Relationship between Subjective Norms and Financial Policy Support on Environmental Concerns to Purchase Electric Vehicles*

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***Abstract:*** This study aims to explore the impact of subjective norms and national financial policy support on Chinese consumers' willingness to purchase electric vehicles and their concern for environmental issues. The article elaborates on the research design in detail and outlines the overall methodology and strategy of the study. The study covers the target population and sample selection, and provides a detailed description of the definition of the research subjects and sampling techniques. The data collection method was explained, and the specific ways of obtaining data from respondents were elaborated. Ultimately, the study emphasized the importance of adhering to ethical standards and protecting the rights and interests of participants. This comprehensive methodology overview ensures transparency and clarity in the research process and procedures.

## 1. Research Design

Quantitative research is a systematic investigative method that primarily focuses on quantifying data and generalizing results from a sample to the population of interest. Through the collection of numerical data and subsequent statistical analysis, quantitative research seeks to establish patterns, test hypotheses, and support or reject theoretical propositions[1]. This approach is highly structured, involving instruments such as surveys, questionnaires, or existing databases to collect measurable, numeric data.

One of the chief advantages of quantitative research is its ability to produce statistically valid results that can be generalized to a broader population. This is achieved through the use of large sample sizes and the application of standardized methods, ensuring consistency and minimizing the bias often associated with qualitative research[2]

## 2. Research Strategy

As the researcher, I have designed a comprehensive strategy to explore the impact of subjective norms and national financial policy support on environmental concerns and Purchasing Intentions among Chinese customers purchasing EVs electric vehicles in China. This strategy encompasses the

selection of research design, data collection methods, sample selection, and analytical techniques, each chosen to address the research questions effectively and efficiently.

In conclusion, the research strategy outlined is tailored to address the specific objectives of the study effectively. By combining a cross-sectional survey design with sophisticated analytical techniques, the strategy will enable a thorough examination of how subjective norms and national financial policy support influence environmental concerns and Purchasing Intentions among Chinese EVs customers.

## 3. Research Setting

Given the specific demographic and behavioral characteristics of this population, the researcher has chosen to gather data from major urban centers known for high rates of electric vehicle ownership and a significant presence of Chinese. The cities selected for this study—Beijing, Shanghai, Guangzhou, and Shenzhen—represent major urban centers with significant EVs ownership and robust economic activities that influence consumer behavior and environmental advocacy.

To systematically organize and analyze the potential data sources within these locations, the researcher has developed a EVs user distribution table (As shown in Table 1). This table concentrates of EVs users and potential survey respondents across the selected urban centers, guiding the strategic deployment of questionnaires.

Table 1: EVs User Distribution Table.

| City | Sales volume proportion | City Population |
|---|---|---|
| Beijing | 29% | 21,843,000 |
| Shanghai | 24% | 14,696,300 |
| GuangZhou | 15% | 18,734,100 |
| Shenzhen | 10% | 17,661,800 |

**Source:** https://www.autohome.com.cn/ask/4722967. https://www.stats.gov.cn/

The selection of these specific locations enhances the logistical feasibility of the study, ensuring that data collection is both effective and efficient. These cities offer customer trends in electric vehicle adoption and environmental concerns among Chinese.

## 4. Population and Sample

The population of this quantitative study is mainland Chinese customers who currently own or intend to purchase electric vehicles (EVs). This demographic is targeted because of their potential exposure to both subjective norms and national financial policies supportive of green technologies in China. This group is particularly significant as they represent a consumer segment at the forefront of adopting sustainable practices through their purchasing choices. Their decisions are influenced by a mix of cultural values, social influences, and economic incentives.According to industry reports, EVs is projected to sell a total of 655,000 cars in China in the year 2023. Based on Krejcie and Morgan sample size table[3] (As shown in Figure 1), for a population of 655,000, the recommended sample size to achieve a confidence level of 95% with a margin of error of 5% is 382.

| N | S | N | S | N | S |
|---|---|---|---|---|---|
| 10 | 10 | 220 | 140 | 1200 | 291 |
| 15 | 14 | 230 | 144 | 1300 | 297 |
| 20 | 19 | 240 | 148 | 1400 | 302 |
| 25 | 24 | 250 | 152 | 1500 | 306 |
| 30 | 28 | 260 | 155 | 1600 | 310 |
| 35 | 32 | 270 | 159 | 1700 | 313 |
| 40 | 36 | 280 | 162 | 1800 | 317 |
| 45 | 40 | 290 | 165 | 1900 | 320 |
| 50 | 44 | 300 | 169 | 2000 | 322 |
| 55 | 48 | 320 | 175 | 2200 | 327 |
| 60 | 52 | 340 | 181 | 2400 | 331 |
| 65 | 56 | 360 | 186 | 2600 | 335 |
| 70 | 59 | 380 | 191 | 2800 | 338 |
| 75 | 63 | 400 | 196 | 3000 | 341 |
| 80 | 66 | 420 | 201 | 3500 | 346 |
| 85 | 70 | 440 | 205 | 4000 | 351 |
| 90 | 73 | 460 | 210 | 4500 | 354 |
| 95 | 76 | 480 | 214 | 5000 | 357 |
| 100 | 80 | 500 | 217 | 6000 | 361 |
| 110 | 86 | 550 | 226 | 7000 | 364 |
| 120 | 92 | 600 | 234 | 8000 | 367 |
| 130 | 97 | 650 | 242 | 9000 | 368 |
| 140 | 103 | 700 | 248 | 10000 | 370 |
| 150 | 108 | 750 | 254 | 15000 | 375 |
| 160 | 113 | 800 | 260 | 20000 | 377 |
| 170 | 118 | 850 | 265 | 30000 | 379 |
| 180 | 123 | 900 | 269 | 40000 | 380 |
| 190 | 127 | 950 | 274 | 50000 | 381 |
| 200 | 132 | 1000 | 278 | 75000 | 382 |
| 210 | 136 | 1100 | 285 | **1000000** | **384** |

Figure 1: Krejcie & Morgan Sample Size.

To ensure the representativeness of the sample, stratified random sampling will be employed. The population will be divided into strata based on key demographic factors such as age, gender, and city of residence. This approach ensures that each subgroup within the population is adequately represented in the sample, enhancing the diversity and applicability of the findings across different segments of EVs's customer base in China[4]. Table 2 displays the allocation of samples across different cities based on the sales volume proportions. The cumulative proportion for all the cities adds up to 100%.

Table 2: Sample Allocation.

| City | Sales Volume Proportion | Sample |
|---|---|---|
| Beijing | 29% | 110 |
| Shanghai | 24% | 91 |
| GuangZhou | 15% | 57 |
| Shenzhen | 10% | 38 |
| Other Cities | 22% | 84 |
| Total | 100% | 382 |

Simple random sampling is chosen because it allows each member of the population an equal chance of being selected, minimizing bias and enhancing the generalizability of the findings.

## 5. Research Instruments

The data will be collected in the form of a questionnaire. The questionnaire will be divided into 2 parts. Part A will collect demographic information of the respondents. It will contain (5) questions. Part B will collect data on subjective norm. It will contain 3 questions. Part C will collect data on national financial policy. It will contain 4 questions, which are adapted from Wang et al. (2021). Part D will collect data on subjective norm. It will contain 4 questions, which are adapted from Wang et al.[5]. Part E will collect data on electric vehicles (EVs) purchasing intention. It will contain 3 questions, which are adapted from Wang et al.[5].

This research will employ a 5-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree) for measuring responses towards adapted items concerning subjective norms, national financial policy support, environmental concerns, and purchasing intention. This scale format is chosen as it is widely accepted and effective in capturing the intensity of respondents' attitudes or perceptions towards the given statements or questions.

## 6. Measurement Items

Items to measure all the variables in this study will be adapted from past studies. Table 3 presents the original and adapted items together with the sources of the items. Specifically, All items adapted from Wang et al.[5].

Table 3: Measurement Items of the Variables.

| Construct | Original items | Adapted items | Source |
|---|---|---|---|
| Subjective norm | Most of my friends think that buying green products is the right thing to do. | Most of my friends think that buying an electric vehicle (EV) is the right thing to do. | Wang et al.,2021 |
| | The majority of my colleagues think that buying green products is the right thing to do. | The majority of my colleagues think that buying an electric vehicle (EV) is the right thing to do. | |
| | My family members think that buying green products is the right thing to do. | My family members think that buying an electric vehicle (EV) is the right thing to do. | |
| National financial policy | For adopting BEVs, a government direct subsidy policy is attractive to me. | Government subsidy policy for using electric vehicle is attractive to me. | |
| | For adopting BEVs, toll road exemptions are valuable to me. | Toll road exemptions for using electric vehicles are valuable to me. | |
| | For adopting BEVs, exemption from sales tax is helpful to me. | exemption from sales tax for using electric vehicles is helpful to me. | |
| Environmental concern | I think that environmental problems have become increasingly serious in recent years. | I think that environmental problems have become increasingly serious in recent years. | |
| | I think that human beings should live in harmony with nature to achieve sustainable development. | I think that human beings should live in harmony with nature to achieve sustainable development. | |
| | I do not think that we are doing enough to save scarce natural resource from being used up. | I think that society must do more to save scarce natural resources from being used up. | |
| Electric vehicles (EVs) purchasing intention | I look forward to more BEV brands and models being introduced on the market. | I look forward to more electric vehicles (EVs) brands and models being introduced on the market. | |
| | I will buy a BEV in the future. | I will buy electric vehicles (EVs) in the future. | |
| | If the BEV is good, I will recommend buying one to the friends around me. | I will recommend buying electric vehicles (EVs) to the friends around me. | |

## 7. Pilot Test

The pilot test will be conducted in two stages, namely with experts and potential respondents.

### 7.1 Pilot Testing with Experts

The pilot testing with experts played a crucial role in refining the survey instrument, thereby enhancing the validity and reliability of the data to be collected. This process ensures that the subsequent data collection phase will yield high-quality data that are both representative and aligned with the study's research objectives. In particular, experts in fields related to environmental psychology, consumer behavior, and survey methodology will be carefully selected to provide feedback on the questionnaire. Their insights are vital for identifying any ambiguities or biases in the questions and ensuring that the survey accurately captured the constructs it intended to measure. The process will begin once the experts agree to validate the questionnaire. Then, each expert will be provided with a draft version of the questionnaire and asked to evaluate the questionnaire based on the clarity of the questions, the alignment of the questions with the research objectives, the appropriateness of the Likert scale used, and the overall layout and flow of the questionnaire. They will be also asked to comment on any potential biases or leading questions that could influence the respondents' answers [6]

### 7.2 Pilot Testing with Potential Respondents

Following the pilot test with experts is a pilot test with potential respondents. This is a crucial step aimed at ensuring the survey instrument's effectiveness and clarity from the perspective of the actual target audience. Specifically, a pilot test will be conducted, involving a selected number of potential respondents who mirror the demographic characteristics of the main study population—Chinese customers of electric vehicles (EVs). This phase of the pilot testing is designed to assess how well potential respondents understand and be able to give genuine responses to the questionnaire. It also serves to identify any issues that might not have been evident during the expert review stage.

#### 7.2.1 Validity

Data collected from a pilot test will be used to determine the validity of the items. Validity refers to the extent to which an instrument accurately measures what it is intended to measure. That is, verifying that the survey questions align well with the research objectives and accurately capture the constructs they are meant to measure.Including the KMO measure in the validity assessment provides a more comprehensive evaluation of the data’s structure and the appropriateness of factor analysis, which further supports the reliability and validity of the findings (As shown in Table 4).

Table 4: Reference ranges for fit indices.

| Statistical Measure | Reference Range | Interpretation/Comments |
|---|---|---|
| Chi-Square/df | Less than 3 | Values close to or less than 3 indicate a good model fit. |
| Comparative Fit Index (CFI) | Greater than 0.95 | Values above 0.95 suggest a good fit to the data. |
| Tucker-Lewis Index (TLI) | Close to 0.95 or higher | Higher values indicate a better fit. |
| Root Mean Square Error of Approximation | Less than 0.06 | Values below 0.06 signify a good fit. |
| Kaiser-Meyer-Olkin (KMO) Test | 0.8 to 1.0 | Higher values indicate sampling adequacy for factor analysis. Values between 0.6 and 0.79 are mediocre but acceptable; values below 0.6 suggest inadequacy. |

Construct validity is often validated through exploratory factor analysis (EFA), which assesses the relationship between observed measures and their underlying latent constructs [7]. The KMO test evaluates whether the partial correlations among variables are small, which is crucial for factor analysis. It helps determine the appropriateness of factor analysis on the dataset. KMO values range from 0 to 1, with higher values indicating that factor analysis is more appropriate because the partial correlations between items are relatively low.

In practice, once the data collection is complete, the data will be entered into SPSS, and the aforementioned statistical tests will be applied to assess the validity. The careful application of CFA and reliability analysis using SPSS will aid in verifying that the survey instrument is well-suited for measuring the intended constructs related to subjective norms, policy support, environmental concerns, and purchasing intentions.

### 7.2.2 Reliability

Data collected from a pilot test will also be used to determine the reliability of the instrument. Reliability refers to the degree to which an assessment tool produces stable and consistent results. In research terms, reliability is about the consistency of a measure, indicating the extent to which it is without bias (error) and hence ensures consistent measurement across time and various items within the instrument.

For this study, internal consistency reliability is the primary focus, particularly using Cronbach's alpha coefficient. This statistical test measures the coherence among multiple items of a scale, ensuring they are all measuring the same underlying construct. To determine the acceptable internal consistency reliability, Cronbach's Alpha values must be above 0.7 [8].

## 8. Data Collection Procedures

The data collection technique plays a crucial role in ensuring the reliability and validity of the study. The technique chosen for this study is the administration of structured online questionnaires, aimed at understanding the influences of subjective norms and national financial policy support on environmental concerns and Purchasing Intentions among Chinese EVs customers in China. The data collection process starts by contacting EVs dealerships located in these cities to request their cooperation in facilitating the research by allowing access to customers who visit their dealerships and to explain the research objectives to ensure transparency and gain their support, essential for accessing potential respondents directly at the point of sale or service [5].

## 9. Data Analysis

Data analysis will involve both the descriptive and inferential analysis using Statistical Package for the Social Sciences (SPSS) and Analysis of Moment Structures (AMOS) software, respectively. SPSS is employed for its robust statistical analysis capabilities, particularly for managing large data sets, performing complex manipulations, and conducting basic to advanced statistical analyses. AMOS, on the other hand, will be used to run structural equation modeling (SEM).

### 9.1. Preliminary Analysis

Data screening is an essential preliminary step in the data analysis process of this quantitative study as it will ensure the quality and integrity of the dataset before conducting any substantial statistical analysis. Data screening involves checking the data for errors, and inconsistencies, and ensuring that it meets the assumptions required for various statistical tests, which is crucial for the validity of the study's findings. Conducting these preliminary analyses will ensure that the data

collected for this study are robust and reliable for performing complex statistical tests to examine the impact of subjective norms and national financial policy support on purchasing intentions and enhance the credibility of the findings but also addresses potential data issues proactively, ensuring that subsequent interpretations and conclusions are based on sound data.

### 9.1.1 Missing Value Analysis

This analysis will be conducted to identify cases with missing data and determine patterns of missingness. Using SPSS, the Missing Value Analysis tool helps summarize and visualize missing data patterns. Depending on the pattern, if data are missing completely at random (MCAR), imputation methods or listwise deletion may be appropriate. Significant patterns might require different handling strategies to ensure robust results.

### 9.1.2 Response Bias Analysis

Response bias analysis is essential to identify any systematic bias in the responses, which can distort the findings of the study. Response bias occurs when certain types of respondents are more likely to answer in a particular way, potentially skewing the results. This can be caused by factors such as social desirability, acquiescence, or non-response bias. In SPSS, response bias can be analyzed by conducting tests such as the T-test for independence, which compares the distribution of responses across different groups. If significant differences are found, it indicates the presence of response bias that needs to be addressed.

### 9.1.3 Common Method Variance

This analysis used to determine if variance in responses is attributable more to the measurement method than to the constructs being measured. Common method variance occurs when the measurement method influences the variance rather than the constructs being measured. To assess CMV, Harman's single-factor test will be used. If a single factor explains more than 50% of the variance, CMV may be a concern. Exploratory Factor Analysis (EFA) will also be conducted to identify if the variance is spread across multiple factors, reducing the likelihood of CMV.

### 9.1.4 Multicollinearity Analysis

Multicollinearity is used to check for high correlations between independent variables that could distort the regression analysis. In Amos, variance inflation factor (VIF) and tolerance are used as indicators. VIF values greater than 10 or tolerance values less than 0.1 suggest problematic multicollinearity, which must be addressed to ensure accurate regression results [9]

## 9.2. Structural Equation Modeling (SEM)

SEM is a multivariate statistical analysis technique that is used to analyze structural relationships. This technique combines factor analysis and multiple regression analysis, and it is ideally suited for the analysis of complex relationships among measured and latent variables. Amos facilitates this process by providing a path-based model approach to assess these relationships, allowing for a visual representation of the model which can be more intuitive than coefficient tables[7]. Covariance-based SEM (CB-SEM) and Partial Least Squares SEM (PLS-SEM) are the two primary approaches used in SEM.

### 9.2.1 Validation of the Measurement Model

There are two basic steps in SEM. The first step is validation of the measurement model. This step, which also known as Confirmatory Factor Analysis (CFA), aims to confirm that the measurement model is statistically sound and effectively captures the theoretical constructs under study. It involves specifying the expected relationships between observed variables and their underlying latent constructs, assessing the model fit and determining the reliability and validity of the measurement model. To assess the reliability of the measurement scales, Composite Reliability (CR) values will be examined.

### 9.2.2 Hypotheses Testing

The process begins with specifying the hypothesized model based on the theoretical frameworks guiding this research. This involves detailing expected paths between constructs such as subjective norms, financial policy support, environmental concerns, and purchasing intentions. The model is then identified to ensure statistical solvability and parameters are estimated using the Maximum Likelihood method, known for its robustness across different data distributions and sample sizes [8]. Next, the model fit of the structural model will be assessed using several indices in AMOS, including the Chi-Square statistic, RMSEA, and CFI.

## 10. Summary

This chapter has delineated the comprehensive methodology utilized in assessing the influences of subjective norms and national financial policy support on the environmental concerns and Purchasing Intentions among Chinese electric vehicle (EVs) consumers. The quantitative research design, employing structured questionnaires distributed across major urban centers in China, ensures robust data collection. Statistical analysis is executed using SPSS and AMOS, facilitating detailed investigations through SEM to explore complex relationships between variables and test the proposed hypotheses. This chapter establishes a solid foundation for validating the research model and hypotheses, ensuring the reliability and accuracy of findings derived from this study.

## References

*[1] Mertler, C. A. (2021). Introduction to Educational Research. SAGE Publications. https://books.google.com/ books?id=Mertler2021*
*[2] Denscombe, M. (2020). The Good Research Guide: For Small-Scale Social Research Projects. Open University Press. https://books.google.com/books?id=Denscombe2020*
*[3] Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. Educational and Psychological Measurement, 30, 607-610.*
*[4] Jiang, L. (2020). Stratified sampling design and analysis. Statistical Solutions, 58(1), 22-35*
*[5] Wang, X., Liu, J., & Zhao, L. (2021). Cost-efficient sampling in quantitative research. Quantitative Methods in Psychology, 17(3), 175-189*
*[6] Smith, J., & Davis, R. (2022). Survey Methodology Improvements and Innovations. Field Methods, 34(1), 58-72*
*[7] Brown, T. A. (2021). Confirmatory Factor Analysis for Applied Research. Guilford Press*
*[8] Kline, R. B. (2021). Principles and Practice of Structural Equation Modeling. Guilford publications*
*[9] Chen, G. (2021). Multivariate Data Analysis: A Practical Guide. Routledge.*