

Linking Behavioral Constructs and Choice Modeling: An Integrated Choice and Latent Variable Approach to Explain Choice Behavior in Mobile Plans

Jasmin Ebert-Pappert
University of Applied Sciences Wiesbaden
Till Dannewald
Wiesbaden Business School

Cite as:

Ebert-Pappert Jasmin, Dannewald Till (2026), Linking Behavioral Constructs and Choice Modeling: An Integrated Choice and Latent Variable Approach to Explain Choice Behavior in Mobile Plans. *Proceedings of the European Marketing Academy*, 55th, (132320)

Paper from the 55th Annual EMAC Conference, Bath, United Kingdom, June 2-5, 2026



Linking Behavioral Constructs and Choice Modeling: An Integrated Choice and Latent Variable Approach to Explain Choice Behavior in Mobile Plans

Abstract:

This study analyzes decision-making and willingness to pay (WTP) by combining behavioral constructs and Choice-Based Conjoint analysis (CBC) within an Integrated Choice and Latent Variable model (ICLV). The focus is on mobile plans as a mass consumer good, enabling realistic consumer choices. We conducted an online experiment (N = 509) in Germany, evaluated by exploratory and confirmatory factor analysis (EFA/CFA) and ICLV estimation. As expected, price dominates consumer choice, while behavioral constructs add explanatory power. Engagement shows a significant negative relation to price, indicating that engaged consumers make more price-sensitive decisions. In contrast, the subjective norm (SN) has a significant positive relationship with the preference for larger data volumes. The results highlight the explanatory value of behavioral constructs for consumer choices, offering implications for marketing and pricing strategies for consumer goods in highly competitive markets.

Keywords: Behavioral Constructs, Integrated Choice and Latent Variable Model, Willingness to Pay

Track: Consumer Behavior

1. Introduction

The Theory of Planned Behavior (TPB) and CBC analysis are both established and widely used approaches in marketing and consumer behavior research. While CBC analysis captures preferences for product attributes/levels, the TPB explains latent behavioral factors. Previous research has frequently applied these concepts separately, for example, to investigate WTP for developing pricing strategies. However, studies that integrate latent behavioral constructs into preference-based choice models to examine WTP remain scarce. Thus, there is a risk that WTP estimates determined using standard methods oversimplify actual consumer behavior. As our systematic literature review (section 2) shows, previous economic and acceptance models neglect behavioral economic and socio-psychological aspects when measuring WTP. This gap is particularly evident for consumer goods, as existing studies mainly focus on sustainable, public, or otherwise non-marketable goods, where the lack of real market prices requires direct WTP measurements (e.g., contingent valuation). These product categories are less suitable for CBC because they are challenging to operationalize and difficult for study participants to grasp, which increases hypothetical bias (section 2). To the best of our knowledge, no previous study has applied an ICLV model incorporating TPB-inspired behavioral constructs to a consumer service context, such as mobile plans. By doing so, we respond to Vij and Walker's (2016) call for studies that demonstrate how ICLV models provide deeper insights into choice behavior. In addition, we analyze relations between behavioral and product parameters (e.g., price) through hypotheses, partly derived from the TPB. This integration reveals how behavioral constructs shape economic/product preferences, which prior studies could not identify. By simultaneously estimating latent factors and choice parameters, ICLV models provide a more comprehensive explanation of choice behavior and WTP than isolated behavioral or preference-based models (Vij & Walker, 2016).

This online experiment focuses on realistic consumers' choices in mobile plans in Germany. The mobile sector is characterized by intense competition and high customer churn (Leckie et al., 2016). To remain attractive in a largely homogeneous market (Wirtz, 2023), providers increasingly rely on socially embedded offers such as family or multi-user plans (Telekom, n.d.), which require marketers to address not only technical but also emotional aspects. Smartphone penetration is high, with 109 million active personal SIM cards in Germany (BNetzA, 2025). This ubiquity may intensify consumer *engagement* with mobile plans, which involve recurring contract choices shaped by prior experiences, providing a suitable empirical setting for studying latent behavioral constructs that develop and manifest

over time. The choice of mobile plans has traditionally been seen as primarily price-driven (Klein & Jakopin, 2014), leaving latent behavioral factors understudied.

To close this gap, we examine: (1) To what extent do latent behavioral factors influence consumers' choice behavior, including WTP/price sensitivity, when choosing a mobile plan? (2) How do latent behavioral factors enhance the explanation of consumer choice behavior within an ICLV model? This study contributes theoretically and methodologically by embedding latent behavioral factors into a choice model, applicable beyond mobile plans to other comparable (subscription-based) consumer services such as information goods (Klein & Jakopin, 2014) or media products (Wirtz, 2023). First, this work contributes to WTP research by demonstrating how behavioral factors influence consumers' choices in a mass-market setting. Second, it provides managerial implications for understanding how these factors affect choice behavior and WTP beyond a purely utility-based CBC analysis.

2. Research Background

Since the 1980s, researchers across disciplines have investigated the determinants of WTP, which we categorized into consumer-, product-, and method-related factors. Consumer-related factors include technological affinity, social environment, or consumer characteristics, while product-related aspects focus on price, utility, or brand effects. Method-related factors involve hypothetical bias (i.e., when measured exceeds actual WTP) or anchoring effects. Based on our systematic review of WTP literature (N = 182), we found evidence that prior studies neglect behavioral or socio-psychological aspects (e.g., user motives) when examining WTP (or payment) behavior (Ajzen, 2020; O'Brien et al., 2020; Liebe et al., 2011). We integrate socio-psychological factors (partly derived from the TPB). Prior TPB-based WTP studies focus primarily on new, sustainable, environmental, public, or other non-marketable goods, for which socio-psychological factors are theoretically central (e.g., Boronat-Navarro & Pérez-Aranda, 2020; Irfan et al., 2020; López-Mosquera, 2016). Despite their widespread use and economic relevance, everyday consumer goods remain underexplored.

The TPB has been widely applied in marketing and consumer research (Ajzen, 2020). It conceptualizes three core determinants: attitude toward the behavior (ATB), SN, and perceived behavioral control (PBC). ATB reflects the evaluation of performing a behavior, SN captures perceived social pressure, and PBC describes the perceived self-efficacy or the ease/difficulty in performing a behavior (Ajzen, 1991). The Theory of Reasoned Action (TRA) is a predecessor of the TPB, focusing on only two latent predictors (ATB and SN) in

contexts where a potential loss of control plays a negligible role. Accordingly, PBC is expected to be less relevant in the mobile plan context, as decisions are habitual and involve low risk. Thus, we do not formulate a specific PBC hypothesis (although we still test its usefulness for mobile plan choice in section 4). Prior studies (see above) show that SN affects consumer behavior and WTP across various fields, including the TPB context. Current developments in the (German) mobile market also suggest the relevance of SN, as providers increasingly promote family or multi-user plans (Telekom, n.d.). We investigate whether such corporate strategies can be empirically tested and reflect actual consumer behavior. Previous TPB-based WTP studies typically rely on contingent valuation to estimate WTP, thereby introducing a greater hypothetical bias. Instead, we derive price sensitivity from the price coefficient of the CBC utility function, which also allows us to examine the influence of data volume. Based on literature and practice and adapted to the German mobile market, where price and data volume are strongly connected, we develop the following hypotheses:

H1: Higher SN decreases consumers' price sensitivity in mobile plan choice.

H2: Higher SN increases consumers' preferences for larger data volumes.

We mentioned the growing role of smartphones, which could be related to high consumer engagement. Given the increased attention to engagement (Ng et al., 2020), it is essential to analyze its explanatory role in consumer behavior. Engagement has been conceptualized in various ways (Lim et al., 2022; Ng et al., 2020). We treat it as a unidimensional independent predictor of behavior. Attitude and engagement are closely related (Brodie et al., 2011, citing ARF, 2006), but the latter can be translated more directly into purchase intention (Leckie et al., 2016). ETB is not part of the TPB, but Ajzen (2020) emphasizes its flexibility to add variables. Substituting ATB with engagement toward the behavior (ETB) can be supported by prior work showing that engagement predicts consumer behavior, which is particularly relevant in highly competitive service markets (e.g., the mobile sector) with high churn rates and increasing variety of providers and products (Leckie et al., 2016; Hollebeek et al., 2014).

H3: Higher ETB decreases consumers' price sensitivity in mobile plan choice.

H4: Higher ETB increases consumers' preferences for larger data volumes.

Based on the literature review, the behavioral constructs can be classified as consumer-related factors. There are certain analogies to the TPB. However, we only refer to the TPB as

a rough guide as we adapted the behavioral constructs. For completeness, we also test the following basic assumptions:

H5: Lower prices increase consumers' utility in mobile plan choice.

H6: Higher data volumes increase consumers' utility in mobile plan choice.

3. Methodology

This study applies an ICLV that integrates TPB-inspired latent factors into a CBC model, thereby capturing potential discrepancies between behavioral constructs and observed choices (i.e., attitude-behavior gaps). A representative online experiment with smartphone users in Germany was conducted (N = 509). The questionnaire covered items on the current mobile plan, a CBC, behavioral items, and socio-demographics. CBC attributes/levels were derived from 47 postpaid plans from 11 German providers. We segmented the sample into five groups (XS-XL) based on current monthly expenses to ensure realistic prices and data volumes. Each respondent completed six choice tasks with three alternatives and a no-choice option. Given the high number of attributes/levels and prohibitions reflecting real market plans, a fully orthogonal design was not feasible. Instead, a randomized design was implemented. We derived behavioral items from validated scales of studies and measurement repositories (e.g., ZIS, see Döring, 2023: 401) using 7-point Likert scales. We operationalized engagement through three items and SN through two items. PBC was initially tested using three items. The ICLV model enables the simultaneous estimation of latent behavioral factors and choice parameters, including WTP, thereby extending the standard CBC. It consists of (1) a latent variable model and (2) a CBC model capturing choices between mobile plans. The ICLV estimation was performed in SAS (PROC NLMIXED) using maximum likelihood, following the approach of Wall (2009) and Patefield (2002).

4. Results

The adjusted data set (after exclusions based on the attention test) includes 509 completed questionnaires. The sample comprises 52.46% women, 47.15% men, and 0.39% diverse genders. The distribution of age groups is: under 20 years: 1.58%, 20-29: 15.78%, 30-39: 15.58%, 40-49: 14.99%, 50-59: 19.53%, 60-69: 22.09%, and 70 years and older: 10.45%. Based on their current expenses, we grouped the sample into the segments: XS (n = 148), S

(n = 160), M (n = 135), L (n = 46), and XL (n = 20). Regarding the CBC results, the monthly price is the most relevant feature (except for XL) according to relative importance, followed by contract duration and data volume. Mobile technology is most relevant for the XL group.

Although the TPB is established, we conducted EFA/CFA (using SPSS Statistics and Smart PLS) due to our literature-based adjustment (ETB) and to ensure construct validity in the mobile context. The data proved to be suitable for EFA/CFA, as indicated by KMO (0.702), Bartlett's test (<.001), and Anti-Image Correlation (all MSA values >0.5). We excluded four items (one ETB and three PBC) with cross, low factor (<0.3), or theoretically mismatched loadings. Thus, we fully eliminated the PBC construct, which is consistent with theoretical expectations that choosing a mobile plan is not a major financial decision. The respondents appeared familiar with such choice processes and did not experience a loss of control, which is consistent with the TRA logic (without PBC). The final structure for the ICLV includes three ETB and two SN items. Descriptive results show that ETB seems to have a high impact on choice behavior (mean: 5.646/7.000), as well as SN (mean: 4.232/7.000; Table 1). The CFA confirms the two-factor structure, with acceptable (most critical: ETB 3 = 0.453) to good factor loadings (Table 1). We retain the factor structure due to a suitable model fit (e.g., RMSEA: 0.053, SRMR: 0.031, CFI: 0.988). The CFA also revealed a moderate correlation of 0.399 between ETB and SN, confirming discriminant validity.

Table 1. Results of the behavioral constructs, including Confirmatory Factor Analysis (CFA)

Latent behavioral construct	Item	Mean per item (7-point Likert scale)	Standard deviation	Mean per latent construct	CFA
Engagement Toward the Behavior (ETB)	ETB 1	5.348	1.542	5.646	0.713
	ETB 2	5.379	1.428		0.675
	ETB 3	6.212	1.153		0.453
Subjective Norm (SN)	SN 1	4.283	1.881	4.232	0.738
	SN 2	4.181	1.838		0.829

For the ICLV model, we removed small segments (L/XL), resulting in a sample size of n = 433. Based on the ICLV results, consumers' preferences were primarily shaped by price, contract-related costs (i.e., connection fees), mobile technology, data volume, and device subsidy costs (i.e., one-time payments) (all p <.0001). In line with economic expectations and relative importance, price had the strongest, statistically significant negative effect ($\beta_p = -1.09$, p <.0001), confirming price sensitivity as the primary decision factor (thus supporting H5). Data volume had a positive, statistically significant effect on utility ($\beta_{dv} = 0.0076$, p <.0001), indicating that consumers value larger data volumes, supporting

H6. Further cost attributes, such as contract-related ($\beta = -0.0138$, $p < .0001$) and device subsidy costs ($\beta = -0.0007$, $p < .0001$), also reduced utility. Mobile technology ($\beta = -0.31$, $p < .0001$) significantly influenced preferences, with 5G being preferred over 4G, despite potential cost or contract implications.

ETB and SN were integrated as potential behavioral drivers of choice. The relationship between ETB and price was negative and significant ($\beta = -0.3352$, $p = .0002$), implying that stronger engagement increases price sensitivity (thus rejecting H3). In contrast, the relationship between SN and price was negative but not significant ($\beta = -0.0740$, $p = .17$), suggesting limited social influence on price sensitivity (thus rejecting H1). Therefore, consumers may perceive mobile plan choices as primarily private and economically rational decisions. Regarding data volume, ETB showed a marginally significant, positive relationship with preferences for larger data volumes ($\beta = 0.0026$, $p = .09$), offering weak evidence for H4. In contrast, SN had a significant positive effect ($\beta = 0.0023$, $p = .01$), supporting H2. Based on the findings, social influence increases consumers' preferences for larger data volumes, possibly reflecting the social pressure for continuous connectivity and data sharing. Figure 1 sums up the results. The model exhibits adequate fit indices (AIC and BIC), indicating an appropriate balance between explanatory power and model complexity.

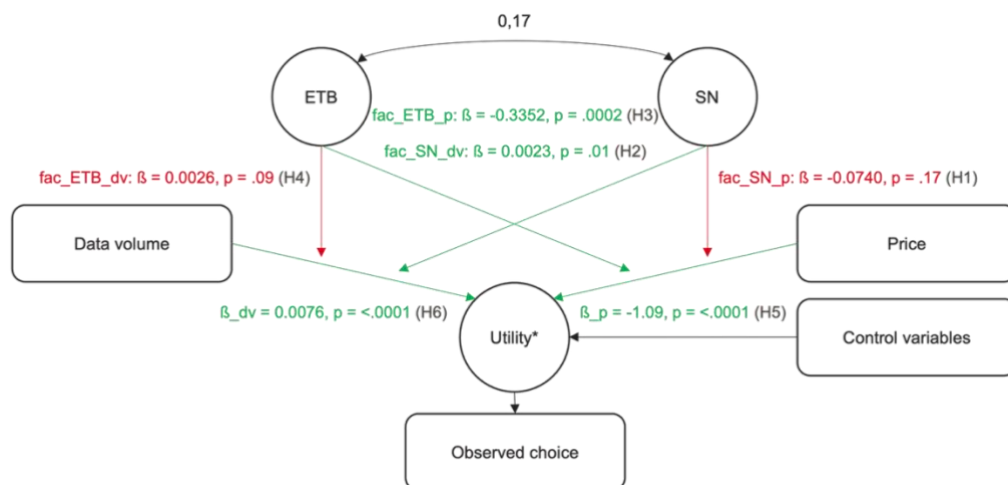


Figure 1. Significant (= green) and insignificant (= red) results of the ICLV model (*We also controlled for conditional variables (mobile technology, contract duration, device subsidy))

5. Discussion and Conclusion

This study integrated (partly TPB-inspired) latent behavioral constructs into a CBC framework using an ICLV model to explain choice behavior in a consumer goods context.

Applying the model to mobile plans revealed that consumer decisions are primarily economically driven, while latent behavioral factors add explanatory power.

The exclusion of PBC (based on EFA/CFA) empirically supports the applicability of the TRA to examine WTP in the context of consumer goods (preferably over the successor TPB). Thus, PBC appears negligible in ‘routine’ purchase situations, such as everyday consumer goods, e.g., mobile plans, where consumers seem to experience little uncertainty or difficulty. The significant negative effect of the newly integrated ETB, based on the literature, contrasts with the positive association typically assumed by the TPB. This result demonstrates that highly engaged consumers behave more price-sensitively, consistent with prior research showing that such information-seeking consumers are better able to identify lower prices and make more cost-conscious choices (Calzada et al., 2023; Haan, 2018; Salop & Stiglitz, 1977; Stigler, 1961). The findings may also imply a discrepancy between self-reported and revealed behavior, a phenomenon often discussed as the aforementioned hypothetical bias, or attitude-behavior gap, in stated preference research. Thus, strong behavioral engagement does not necessarily increase WTP but rather reflects a more price-sensitive evaluation process.

Theoretically, the study advances choice modeling by integrating latent behavioral constructs into a CBC model, demonstrating their relevance for explaining choice behavior and WTP variance. In past WTP research, the TPB has primarily been used in sustainability or public-good contexts. This research extends the applicability of the TPB/TRA to routine, everyday consumer goods. Although we do not integrate the original TPB model, but instead draw analogies, our results indicate promising directions for future TPB research. Practically, the findings suggest that providers of everyday consumer goods should tailor pricing and advertising strategies to differences in consumer engagement and social influence, as these factors may moderate the effects of price sensitivity and product preferences on consumer choice. Highly engaged mobile customers show a higher price sensitivity, while social influence increases preferences for larger data volumes, indicating potential for family/multi-user plans. Methodologically, we demonstrate how ICLV models can be applied to consumer services by embedding TPB-inspired latent factors into preference-based choice models.

Limitations include the focus on one national market and the small L/XL segments. Replacing ATB with ETB is appropriate for our context but may constrain comparability with traditional TPB studies. Future research could further examine a) TPB-based ICLV models in other consumer sectors, where PBC and ATB may play a stronger role, and b) the construct engagement in areas such as insurance, financial services, healthcare, or education (van Doorn, 2010).

References

- Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211.
- Ajzen, I. (2020). The theory of planned behavior: Frequently asked questions. *Human Behavior and Emerging Technologies*, 2(4), 1-11.
- Boronat-Navarro, M., & Pérez-Aranda, J. A. (2020). Analyzing willingness to pay more to stay in a sustainable hotel. *Sustainability*, 12(9), 3730.
- Brodie, R. J., Hollebeek, L. D., Juric, B., & Ilic, A. (2011). Customer Engagement: Conceptual Domain, Fundamental Propositions, and Implications for Research. *Journal of Service Research*, 14(3), 252-271.
- BNetzA (2025). *Aktive SIM-Profil* [Active SIM profiles]. Retrieved from https://www.bundesnetzagentur.de/DE/Fachthemen/Datenportal/1_Digitales_Telekommunikation/_svg_TK/TK_Mobilfunk/Aktive%20SIM%20Karten/Aktive%20SIM%20Karten.html. (Last accessed: October 17, 2025). (in German).
- Calzada, J., García-Mariñoso, B. & Suárez, D. (2023). Do telecommunications prices depend on consumer engagement? *Information Economics and Policy*, 62, 101018.
- Döring, N. (2023). *Forschungsmethoden und Evaluation in den Sozial- und Humanwissenschaften* [Research methods and evaluation in the social and human sciences]: 6th edition Berlin, Heidelberg: Springer. (in German).
- Haan, M. A., Moraga-González, J. L., Petrikaitė, V. (2018). A Model of Directed Consumer Search. *International Journal of Industrial Organization*, 61, 223-255.
- Hollebeek, L. D., Glynn, M. S., & Brodie, R. J. (2014). Consumer Brand Engagement in Social Media: Conceptualization, Scale 2 Development and Validation. *Journal of Interactive Marketing*, 28(2), 149-165.
- Irfan, M., Zhao, Z.Y., Li, H., & Rehman, A. (2020). The influence of consumers' intention factors on willingness to pay for renewable energy: A structural equation modeling approach. *Environmental Science and Pollution Research*, 27(3), 21747-21761.
- Klein, A., & Jakopin, N. (2014). Consumers' willingness-to-pay for mobile telecommunication service bundles. *Telematics and Informatics*, 31(3), 410-421.
- Leckie, C., Nyadzayo, M. W., & Johnson, L. W. (2016). Antecedents of consumer brand engagement and brand loyalty. *Journal of Marketing Management*, 32(5-6), 558-578.

- Liebe, U., Preisendörfer, P., & Meyerhoff, J. (2011). To pay or not to pay: Competing theories to explain individuals' willingness to pay for public environmental goods. *Environment and Behavior*, 43(1), 106-130.
- Lim, W. M., Rasul, T., Kumar, S., & Ala, M. (2022). Past, present, and future of customer engagement. *Journal of Business Research*, 140, 439-458.
- López-Mosquera, N. (2016). Gender differences, theory of planned behavior and willingness to pay. *Journal of Environmental Psychology*, 45, 165-175.
- Ng, S. C., Sweeney, J. C., & Plewa, C. (2020). Customer engagement: A systematic review and future research priorities. *Australasian Marketing Journal*, 28(4), 235-252.
- O'Brien, D., Wellbrock, C.-M., & Buschow, C. (2020). Bestandsaufnahme: Stand der Forschung zur Zahlungsbereitschaft für digitalen Journalismus [Review: State of research on willingness to pay for digital journalism]. In C.-M. Wellbrock, & C. Buschow (eds.), *Money for nothing and content for free? Paid Content, Plattformen und Zahlungsbereitschaft im digitalen Journalismus* [Paid content, platforms, and willingness to pay in digital journalism] (pp. 23-37). Baden-Baden: Nomos. (in German).
- Patefield, M. (2002). Fitting non-linear structural relationships using SAS procedure NLMIXED. *Journal of the Royal Statistical Society Series D*, 51(3), 355-366.
- Salop, S. & Stiglitz, J. (1977). Bargains and Ripoffs: A Model of Monopolistically Competitive Price Dispersion. *The Review of Economic Studies*, 44 (3), 493-510.
- Stigler, G. J. (1961). The Economics of Information. *The Journal of Political Economy*, 69 (3), 213-225.
- Telekom (n.d.). Partnerkarten der Telekom [Telekom partner cards]. Retrieved from <https://www.telekom.de/unterwegs/tarife-und-optionen/partnerkarten> (Last accessed: November 15, 2025). (in German).
- Van Doorn, J., Lemon, K. N., Mittal, V., Nass, S., Pick, D., Pirner, P., & Verhoef, P. C. (2010). Customer Engagement Behavior: Theoretical Foundations and Research Directions. *Journal of Service Research*, 13(3), 253-266.
- Vij, A. & Walker, J. L. (2016). How, when and why integrated choice and latent variable models are latently useful. *Transportation Research Part B*, 90, 192-217.
- Wall, M. M. (2009). Maximum likelihood and Bayesian estimation for nonlinear structural equation models. In R. E. Millsap, & A. Maydeu-Olivares (eds.), *The Sage handbook of quantitative methods in psychology* (pp. 540-567). Sage Publications Ltd.
- Wirtz, B. W. (2023). *Medien- und Internetmanagement* [Media and Internet management]. 11th rev. and exp. ed. Wiesbaden: Springer Gabler. (in German).