Received: 1 July 2024 | Revised: 25 July 2025 | Accepted: 30 July 2025

DOI: 10.1111/csp2.70130

CONTRIBUTED PAPER

Conservation Science and Practice
A journal of the Society for Conservation Biology
Open Access
WILEY

Predicting consumer intention to buy tiger bone glue in Vietnam: A comparison between the theory of planned behavior and the social cognitive theory

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Funding information
Global Initiative against Transnational Organized Crime; Icelandic Research Fund, Grant/Award Number: 2511374-051

Abstract

Demand for tiger parts and products, especially tiger bone glue, has fuelled the illegal tiger trade and the proliferation of tiger farms in some Asian countries. Despite the importance of understanding demand, insights into consumer motivations and determinants of demand remain limited. This study compared the theory of planned behavior (TPB) and the social cognitive theory (SCT) to examine the relative effects of different social-psychological factors and informational treatments on consumers' intention to buy tiger bone glue in Vietnam, a traditional medicine primarily made of tiger bone. Using structural equation models, results showed that the perceived behavioral control in the TPB ($f^2 = 0.58$) and self-efficacy in the SCT ($f^2 = 0.72$) were the most important determinants. Respondents were also influenced by media information ($f^2 = 0.09$) about the conditions of captive-bred tigers, the prevalence of fake and low-quality products, and legal sanctions and health risks when buying and using tiger bone glue. However, information about alternatives to tiger bone glue had no significant effects. The study supports using the SCT as an alternative to the TPB to increase the ability to capture the complexity of factors driving the consumption of endangered wildlife products. We developed recommendations for behavior change campaigns using social marketing to reduce tiger bone glue demand.

KEYWORDS

demand reduction, self-efficacy, social cognitive theory, tiger bone, traditional medicine, wildlife trade

1 | INTRODUCTION

Wildlife trade is a global phenomenon driven by the demand for wildlife products used for various purposes (Thomas-Walters et al., 2021). While some trade is sustainable, illegal and unsustainable wildlife trade (IWT) is a threat to conservation ('t Sas-Rolfes et al., 2019) and public health through the spread of zoonotic pathogens (Nijman, 2021; Chomel et al., 2007). The potential consequences of the IWT highlight the urgency

of understanding consumer motivations and demand, especially for endangered species such as tigers (Dang et al., 2022).

Despite the international ban on the trade of wild tigers (*Panthera tigris*) instated in 1975 (Abbott & van Kooten, 2011), the global tiger population halved from 1990 to 2014 (Goodrich et al., 2015), and the illegal tiger trade keeps growing (Goodrich et al., 2015; Indenbaum, 2018). Hence, the trade ban has failed to protect wild tigers (Graham-Rowe, 2011). Simultaneously, tiger farming is proliferating in South Africa and several countries in East and Southeast Asia to supply the demand for tiger parts and products in Asian markets (Dang et al., 2022; Nowell, 2010; EIA, 2013). As a result, the number of captive-bred tigers is now more than double the number of tigers in the wild (EIA, 2017).

Vietnam has long been considered a hub for the illegal tiger trade because of a confluence of supply and demand (Cowan, 2021; Dang & Nielsen, 2022; Goodrich et al., 2015; Hong & Tran, 2022a, 2022b). Tiger products are sourced from neighboring countries in Southeast Asia, including Lao PDR, Thailand, and Malaysia. Vietnamese consumers are also offered 'hunting tours' to South Africa, where they can shoot captive tigers in breeding facilities, whereafter tiger bone glue will be produced and transported by air to Vietnam under the guise of jelly (Cowan, 2021). Tigers are also bred on illegal farms in Vietnam to supply the domestic market (Hong & Tran, 2022a). Notably, in August 2021, 17 tigers were found in small cages in the basements of two households in the central region of Vietnam (Hong & Tran, 2022a). They were carrying a high disease load, and some had never seen sunlight. It is believed that many similar and larger illegal tiger farms are operating under the radar (Cowan, 2021). Demand for tiger parts and products is popular among high-income consumers for use in traditional medicine, as curios, decoration, for display, and as meat (Broad & Damania, 2010; Dang et al., 2022).

Every part of a tiger is sold in the black market, with tiger bone being the most valuable product, representing a distinct market segment in its own right (Coals et al., 2020; Davis et al., 2020; Broad & Damania, 2010). Tiger bone has been used in Chinese and Vietnamese traditional medicine for centuries, based on perceived anti-inflammatory and pain-killing effects, to improve general health conditions and treat diseases related to the muscles and bones despite the lack of any scientific evidence (Cheung et al., 2021; Dinerstein et al., 2007; Lapointe et al., 2007; Wong, 2015). In Vietnam, the product of tiger bone glue typically includes other ingredients, such as saiga antelope bone, deer antler velvet, turtle shell, herbs, and opium, cooked together for 2–3 days in high-pressure cookers into a glue-like substance with limited or no attention to food safety concerns (Dang et al., 2022; Hong & Tran, 2022b). According to an undercover investigation, producers cheat buyers by replacing tiger bones with cheaper bones from other animals, such as lions or dogs (Hong & Tran, 2022b). It has proven impossible to identify tiger DNA in the final product (*Cao hổ* in Vietnamese) due to denaturing, making it challenging for law enforcement officials to prosecute suppliers and consumers of tiger bone glue (Cowan, 2021). This difficulty persists despite increased crackdowns on the wildlife trade following the COVID-19 pandemic, driven by concerns over its role in zoonotic pathogen transmission and mounting pressure from foreign embassies and conservation organizations (see Directive No. 29/CT-TTg issued on 24 July, 2020).

There are many factors that influence individuals' decision to use endangered wildlife products, such as rhino horn and tiger bone for health-related purposes. Some factors are apparent, such as their belief in the product's efficacy and disposable income. Other factors are case-specific and less clear, including exposure to media information and peer pressure, that is, the pressure to comply with norms and expectations of peers in one's networks (Wong & Ahuvia, 1998). Some factors relate to the larger socio-economic, historical, and cultural environment in which individuals live (Doughty et al., 2021). To identify the most important factors, a range of behavioral theories have been used, notably the Theory of Planned Behavior (TPB), the Theory of Interpersonal Behavior (TIB), the Social Cognitive Theory (SCT), the Health Belief Model, the Model of Pro-Environmental Behavior, and the Value-Belief-Norm Theory (Eyster et al., 2022). Of these theories, the TPB has been applied to investigate a variety of wildlife-related behaviors (Miller, 2017), and it has been combined with the TIB to study the intention to buy rhino horn in Vietnam (Dang & Nielsen, 2022). The main criticisms of the TPB highlight the unclear link between intention and actual behaviors and the model's failure to include non-cognitive determinants such as emotions and habits (Russell et al., 2017; Klöckner, 2013), as well as the influence of the media in society (Bandura, 2009). Doughty et al. (2021) compared the merits and limitations of the most well-evidenced theories and selected the SCT for studying drivers of saiga horn consumption in Singapore to design behavior change interventions. The SCT provides a framework for investigating socio-psychological mechanisms underlying human thought, affect, and behavior (Bandura, 1986), laying the foundation for various behavior change interventions, counseling, and education (Glanz et al., 2002). The theory states that the self is the reciprocal result of interaction with

environmental factors (e.g., social norms) and the behavior itself. Bandura referred to the links between self-concepts, behavior, and the environment (physical and social factors) as a 'triadic reciprocity' (Bandura, 1986). An advantage of the SCT is that it explains how media communication influences human thought, affect, and behavior (Bandura, 2009). It has therefore been used for studying media effects (e.g., Pajares et al., 2009; Nabi & Clark, 2008). However, the SCT is more complex to operationalize in research (Bandura, 2001). It can be challenging to measure all its components effectively and simultaneously. Particularly, none of the theories have been applied to study tiger bone consumption.

This study aims to generate insights about the determinants of demand for tiger bone glue among Vietnamese consumers while testing which model best predicts the intention to buy this product. Rather than selecting a model deductively based on theoretical fit, we take a comparative and pragmatic strategy using the TPB as a benchmark and exploring whether SCT offers improved explanatory power in our empirical setting. The TPB is the most widely applied model in this domain, which offers a strong empirical benchmark—despite its known limitations. In contrast, SCT has been suggested as a promising alternative due to its broader conceptualization of agency and self-efficacy. Selecting these models allows us to compare a well-established theoretical framework with a less commonly applied yet theoretically rich alternative. This reflects an inductive reasoning process in which we draw on existing patterns of usage and performance in the literature. The results will contribute to optimizing the design of behavior change interventions using the social marketing approach to reduce tiger bone glue demand.

2 | THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 | Theory of planned behavior

The TPB was developed from the Theory of Reasoned Action by adding a third determinant of behavioral intention—perceived behavioral control (PBC) (Ajzen & Fishbein, 1980). It posits that attitude, subjective norms, and PBC determines behavioral intention, a direct antecedent of behavior (Ajzen, 1991). Attitude is composed of outcome beliefs (i.e., beliefs about the consequences of the behavior) and outcome evaluations (i.e., evaluations of the consequences of the behavior). Subjective norms include normative beliefs (i.e., beliefs about the expectations of significant 'referents' such as family members, friends, and colleagues) and the motivation to comply with these (i.e., the degree of motivation to meet those referents' expectations). PBC consists of control beliefs (i.e., beliefs about the presence of barriers and enablers of the behavior) and power of control (i.e., the perceived ability to overcome the barriers or use the enablers) (Ajzen, 1991). According to the TPB, the more positive attitude toward a behavior, the more favorable subjective norms, and the greater PBC, the more likely an individual will intend to perform the behavior. According to Ajzen (1991, p. 181), "the stronger the intention to engage in a behavior, the more likely should be its performance" (see Figure 1).

The TPB has been used to investigate wildlife-related behaviors in various contexts (e.g., Belinga et al., 2021; Wang et al., 2021; Veríssimo et al., 2020b; St. John et al., 2018; Amit & Jacobson, 2017), and recently the intention to buy rhino horn in Vietnam (Dang & Nielsen, 2022). The TPB offers three key advantages. First, its constructs are relatively easy to measure, and the theory is inherently parsimonious (i.e., provides the best explanation with the least variables). Second, it provides a flexible framework that can be adapted to different behaviors (Miller, 2017). Third, the TPB can be easily understood and has clear implications for policies and interventions (Ajzen & Fishbein, 1980; Manfredo, 2008). Despite its limitations, as noted above (i.e., the unclear link between intentions and actual behaviors, the inability to capture media influence), the TPB is widely used in the human dimensions of wildlife literature. However, it has not been applied to predict the intention to buy tiger parts and products. Tiger bone glue is a luxury product in Vietnam, with an average black market price of US $12,000 per kilogram, meaning that lower-income consumers cannot afford this product (Dang et al., 2022). Studying high-income consumers' sensitive behaviors, such as the use of endangered wildlife products, represents a significant challenge. We recruited research assistants with extensive networks built through shared hobbies and interests with high-income consumers (e.g., antique collectors, luxury watch enthusiasts, golf clubs, tennis clubs), leveraging our experience from interviews with over 1,000 endangered wildlife consumers (Dang, 2021).

2.2 | Social cognitive theory

The SCT has been successfully applied to explain various health-related behaviors, including exercise, stress management, and condom use (Young et al., 2005). According to the SCT, an individual's behavioral intention may be affected by various personal, environmental and behavioral aspects. Moreover, it is the result of interactions

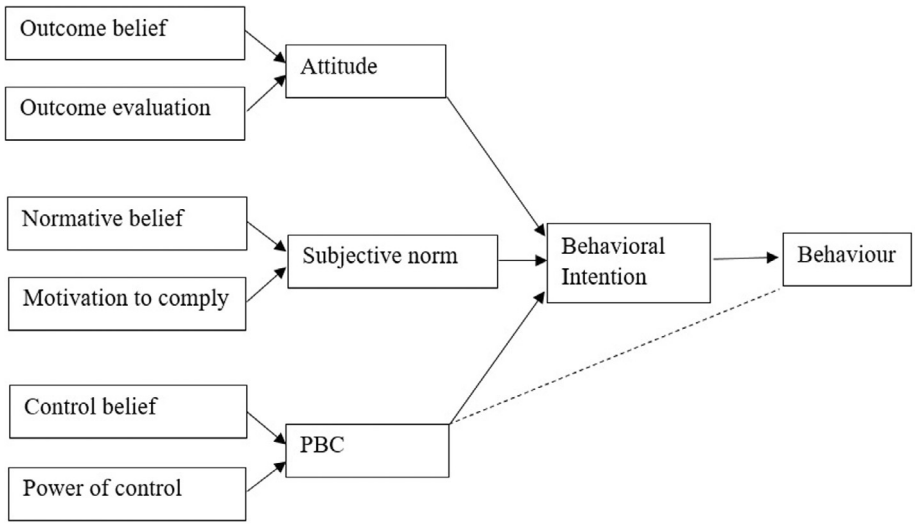

FIGURE 1 Diagram illustrating the Theory of Planned Behavior, adapted from Ajzen (1991). Behavioral intention, a direct antecedent of behavior, is determined by attitude, subjective norm, and perceived behavioral control (PBC). Attitude is composed of outcome beliefs and outcome evaluations. Subjective norms include normative beliefs and the motivation to comply with these. PBC consists of control beliefs and the power of control.

between the individual's beliefs (incl. outcome expectations, perception of others' behavior, and self-efficacy) and the social and physical environment (incl. information disseminated in the media) in which the behavior occurs (Bandura, 2003; Zimmerman et al., 2012). Outcome expectations and self-efficacy are the two most essential constructs in the SCT. Outcome expectations are beliefs about the likely consequences of performing a behavior, and self-efficacy indicates the level of self-confidence that one has in performing that behavior (Bandura, 1982). There have been controversies about the difference between self-efficacy and PBC. Ajzen and Timko (1986) argued that "self-efficacy focuses on factors internal to the individual, whereas PBC is assumed to reflect external factors (e.g., availability of time or money, cooperation of other people) as well as internal factors (ability, skill, information)" (Ajzen & Timko, 1986, p. 262). Besides outcome expectations and self-efficacy, previous studies have highlighted the influence of information disseminated in the media, including social media, on human behaviors (Chen et al., 2017; Gillian et al., 1996; Roberts, 1996; Stefanone et al., 2019). The SCT has evolved over time and been adapted to fit various domains (e.g., Doughty et al., 2021; Lin & Hsu, 2015; Bandura, 1982, 2001, 2003, 2009). Bandura (Bandura, 2001, 2009) stated that information in the media influences human thinking, preferences, and behavior. For instance, people may alter their political beliefs after prolonged exposure to biased news (Bandura, 2001). Lin and Hsu (2015) investigated the role of media influence (MI) on green consumer behavior and included it as a SCT construct. Since our study aimed to inform a social marketing campaign in the media and digital platforms, we followed Lin and Hsu (2015), adding a media construct to the SCT (see Figure 2).

Despite some overlaps with the TPB, the SCT excels by capturing the complexity of factors determining consumption behaviors (Phipps et al., 2013) and using grounded theoretical principles, which can be targeted in behavior change interventions (Bandura, 1997). Another merit of the SCT is that it emphasizes social influences while highlighting an individual's interaction with personal factors (e.g., cognition) and their perception of environmental factors, both physical and social (Doughty et al., 2021). As a result, Doughty et al. (2021) used the SCT to design behavior change interventions to reduce the consumption of saiga antelope horn as a traditional medicine in Singapore. However, how the SCT performs on predicting the consumption of other illegal wildlife products is an empirical question and the focus here. The results of this comparison will inform the selection of models for assessing and determining which factors influence the intention to buy tiger bone glue, while also assessing the parsimony of each model.

3 | METHODS

3.1 | Study areas

The study was conducted in Hanoi, Vietnam's capital and second-largest city. Hanoi is considered a hub of the IWT

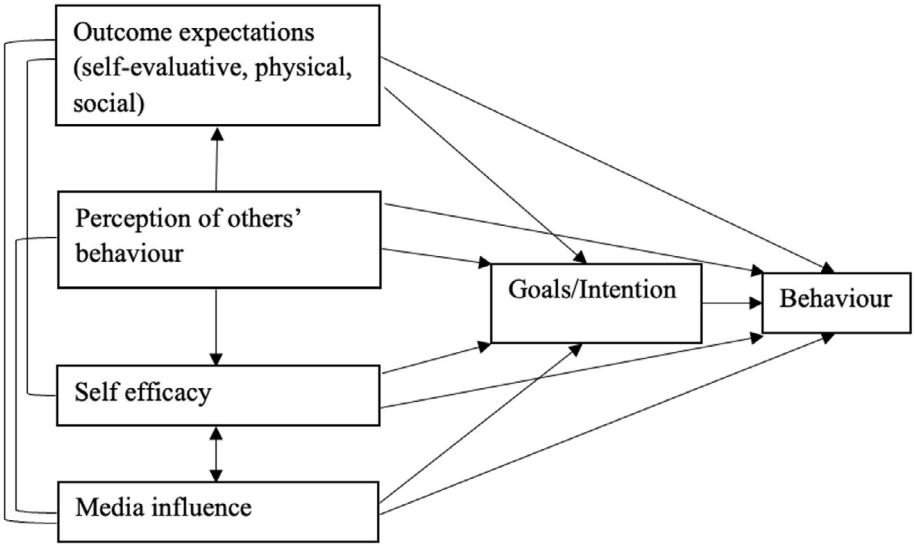

FIGURE 2 Diagram illustrating the Social Cognitive Theory, adapted from Bandura (1978). Behavioral intention and behavior are influenced by outcome expectations (i.e., belief about the likely consequences of performing a behavior), perception of others' behavior, self-efficacy (i.e., the level of self-confidence that one has in performing that behavior), and media influence (i.e., information disseminated in the media).

and a major consumer market of various luxury wildlife products, including rhino horn, tiger bone glue, bear bile, shark fin, and caterpillar fungus (*Cordyceps sinensis*) (Davis et al., 2020; Drury, 2011). Luxury wildlife consumption is driven by traditional medicinal uses and peer pressure to keep up with others of the same wealth group (Dang & Nielsen, 2018; Olmedo et al., 2021; Truong et al., 2016).

3.2 | Questionnaire development

We developed a preliminary questionnaire based on previous studies of tiger bone glue consumption (Coals et al., 2020; Dang et al., 2022) and studies using the TPB or SCT (Dang & Nielsen, 2022; Lin & Hsu, 2015; Pee et al., 2008; Russell et al., 2017; Thøgersen & Grønhøj, 2010). Measures of MI were informed by Lin and Hsu (2015). Neither theory has been applied to the consumption of tiger bone glue; we therefore followed Ajzen (2002) and conducted an elicitation study to identify potential additional factors influencing the intention to buy tiger bone glue that have not yet been empirically tested. In the elicitation study, we conducted seven in-depth interviews and five focus group discussions with tiger bone glue consumers and former traders (3–4 participants in each focus group) from the first author's informal network. We asked open-ended questions about what factors affect, facilitate, and influence intentions to buy tiger bone glue (Data S1A). The most prevalent factors were recorded and compared with those identified in previous studies. The results of the elicitation study inform adding one additional item for the SN construct, one additional item for the SE construct, two additional items for the OE construct, two additional items for the MI construct, and one additional item for the POB construct. Hence, the questionnaire was updated and pilot-tested on 12 senior, high-income consumers living in Hanoi using convenience sampling. Minor changes to the formulation of some questions were made based on feedback from the interviewed consumers.

The final questionnaire was composed of nine survey streams covering all constructs of the TPB and the SCT. It also included questions about respondents' behaviors, beliefs, knowledge, online activities, key interests (i.e., topics searched when using the internet from a predefined list (Vermeulen, 2023)), and socio-demographics (Data S1B). Each statement in the TPB's and SCT's constructs was assessed on a five-point Likert scale, ranging from "strongly disagree" (1) to "strongly agree" (5) (Data S1C). We measured habit (HAB) by asking the respondents if they had used tiger bone glue in the past (PRE) and their frequency of use (FRE). We grouped frequency of use into five categories: 1 (never), 2 (once), 3 (a few times), 4 (from time to time, i.e., using tiger bone glue when in need of a treatment), and 5 (often, i.e., using tiger bone glue as a preventative).

3.3 | Data collection

We conducted the survey with high-income middle-aged and older individuals—a demographic where demand for tiger bone glue is particularly prevalent (Coals et al., 2020; Davis et al., 2020). We started with the sample having participated in our previous study (Dang et al., 2022), providing consent for participating in further studies and being available and willing to participate in this study. We expanded this sample using convenience and snowball sampling. The results of the elicitation

study and the pilot test indicate that individuals without basic knowledge of tiger bone glue is unlikely to buy this product. The design only works for people who have at least heard about tiger bone glue, although they may or may not believe in its benefits. Therefore, we asked potential respondents the screening question—'Do you know about the potential benefits of tiger bone glue?' If they answered 'yes', we invited them to participate in the survey. Data were collected over 3 months, from March to May 2022. Interviews were conducted face-to-face at a place of the respondents' choice, and lasted about 20 min.

3.4 | Data analysis

Before analysis, we cleaned the dataset by checking for outliers and missing values. We assessed the assumptions of multivariate normality and used the bestNormalize package (Peterson & Cavanaugh, 2019) to select the optimal transformation of the data. We log-transformed the dependent variable (i.e., intention) as it had a negatively skewed distribution with a fat tail (Data S1D). We used maximum likelihood to estimate the model parameters.

We used confirmatory factor analysis (CFA), which relates the variables to the constructs to assess measurement models using the following indices: the ratio of chi-square to degrees of freedom (χ^2/d.f.), the Root Mean Square Error of Approximation (RMSEA), the Standardized Root Mean Square Residual (SRMR), the Goodness of Fit Index (GFI), the Tucker Lewis Index (TLI), the Comparative Fit Index (CFI), and the Normal Fit Index (NFI). Recommended values for these indices are presented in Table 1. We assessed the reliability among a construct's items using Cronbach's alpha (CA), with a recommended value of 0.7 (Nunnally, 1978). We then evaluated construct validity through convergent and discriminant validity. We assessed the former by looking at the values of factor loadings (FL), composite reliability (CR), and average variance extracted (AVE). We assessed the latter by comparing the square root values of the AVE across the constructs.

We used Structural Equation Modeling (SEM) to estimate models evaluating the path relationship among the constructs (Anderson & Gerbing, 1988). SEM works with latent and observed variables and allows the examination of moderating effects. To measure the explained variance of the endogenous variables, we used R^2. Socio-demographic variables (incl. age, income, gender, education, occupation) and other covariates (e.g., legal knowledge) were entered into the model to further explore the data. Effect sizes were calculated using Cohen's f^2 values to assess the unique contribution of each construct to the explained variance in intention. The analysis was conducted in the lavaan package (Rosseel, 2012) in Rstudio version 2022.07.2-576.

3.5 | Ethical considerations

This study obtained ethical clearance from the Ethical Review Board of the Hanoi University of Public Health. We followed strict ethical guidelines, policies, and procedures prescribed by the Review Board. We obtained informed consent and informed potential respondents of the study goal and objectives, risks and benefits of participating in interviews, and that they could stop the interview any time they wanted. We collected data using password-protected tablets, instantly uploading data to an encrypted cloud server.

4 | RESULTS

We interviewed a total of 251 respondents, including 174 (69.3%) having used tiger bone glue at least once in their lives (i.e., users) and 77 (30.7%) with no previous use (i.e., non-users). Users mainly used tiger bone glue to treat bone-related diseases (40%) and to improve general health conditions (35%) (see Data S1E). Notably, the

TABLE 1 Goodness-of-fit indices of the measurement models for the TPB and the SCT.

	Recommended value	TPB model	SCT model
χ^2/d.f. (Ratio of chi-square to degrees-of-freedom)	≤5.0	1.90	1.50
RMSEA (Root-Mean-Square-Error of Approximation)	≤0.10	0.06	0.04
SRMR (Standardized Root-Mean-Square-Residual)	≤0.10	0.04	0.05
GFI (Goodness-of-Fit Index)	≥0.90	0.96	0.97
TLI (Tucker-Lewis Index)	≥0.90	0.95	0.97
CFI (Comparative Fit Index)	≥0.90	0.97	0.98
NFI (Normal Fit Index)	≥0.90	0.93	0.95

TABLE 2 Reliability and convergent validity of the measurement models for the TPB and the SCT.

Construct variables	Statements	TPB				SCT			
		FL	CA	CR	AVE	FL	CA	CR	AVE
Attitude (ATT) (TPB)			0.70	0.69	0.43		NR[a]	NR	NR
ATT1	Tiger bone glue can prevent and treat bone-related diseases such as arthritis and rheumatism.	0.65							
ATT2	Tiger bone glue can improve health conditions in general.	0.59							
ATT5	Tiger bone glue is a highly valuable gift, and recipients will appreciate it.	0.75							
Outcome Expectancy (OE) (SCT)			NR	NR	NR		0.64	0.65	0.48
OE1	It makes me feel like a better person to gift tiger bone glue to my family members, friends, and colleagues (Expected self-evaluative outcomes).					0.80			
OE2	By using tiger bone glue, I can recover from my bone-related diseases (Expected positive outcomes).					0.58			
Subjective Norm (SN) (TPB)			0.70	0.71	0.38		NR	NR	NR
SN1	Most traditional medicine practitioners, experts, and peer users support that I should use tiger bone glue for medicinal purposes.	0.81							
SN2	How much do you let traditional medicine practitioners', experts', and peer users' opinions determine your intention to buy tiger bone glue?	0.59							
SN3	Most of my family members, friends, and colleagues support that I should use tiger bone glue for medicinal purposes.	0.53							
SN5	Most of "the influencers" or "key opinion leaders" I know support that I should use tiger bone glue for medicinal purposes.	0.59							
Perception of Others' Behavior (POB) (SCT)			NR	NR	NR		0.58	0.58	0.41
POB1	Most of my family members, friends, and colleagues (i.e., peers) use or support the use of tiger bone glue for medicinal purposes.					0.65			
POB2	Most influential people in Vietnamese society use or support the use of tiger bone glue for medicinal purposes.					0.64			
Perceived Behavioral Control (PBC) (TPB)			0.83	0.83	0.71		NR	NR	NR
PBC1	I believe that the government does not strictly control the tiger bone glue trade, making it easy for me to buy this product.	0.85							
PBC2	Tiger bone glue producers/traders are accessible, making it easy for me to buy tiger bone glue.	0.84							
Self-Efficacy (SE) (SCT)							0.83	0.84	0.72
SE1	I am confident that I could buy tiger bone glue in the near future if I want to.					0.81			
SE2	I have enough disposable income and know how to buy and use tiger bone glue.					0.88			
Media Influence (MI) (SCT)[b]			NR	NR	NR		0.75	0.76	0.52
MI1	I think that obtaining information about captive-bred tiger conditions will decrease my intention to buy tiger bone glue.					0.56			
MI2	I think that obtaining information about the prevalence of fakes or low-quality tiger bone glue or tricks used by traders/sellers to cheat buyers will decrease my intention to buy tiger bone glue.					0.87			
MI4	I think that obtaining information about health risks (negative effects when using tiger bone glue, food safety issues) and risks of legal sanctions will decrease my intention to buy tiger bone glue.					0.70			

Note: FL, CA, CR, and AVE refer to factor loading, Cronbach's alpha, composite reliability, and average variance extracted, respectively.

[a]NR means 'not relevant' because the construct was not in the given model.

[b]The following text is read to respondents before asking to rate the statement: "We conduct this study to design a media campaign about tiger bone glue. Assuming that you have read a news article containing different information about the tiger trade, please rate the following statement."

	χ^2/d.f.	RMSEA	SRMR	GFI	TLI	CFI	NFI
TPB	1.90	0.06	0.04	0.96	0.95	0.97	0.93
SCT	1.64	0.05	0.05	0.95	0.95	0.97	0.93
Recommended value	≤5.0	≤0.10	≤0.10	≥0.90	≥0.90	≥0.90	≥0.90

TABLE 3 Goodness-of-fit indices of the structural models for the TPB and the SCT compared to the recommended values (see full index labels in Table 1).

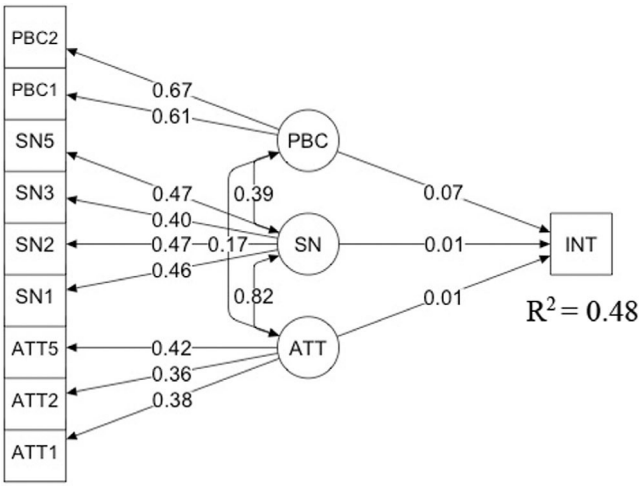

FIGURE 3 Path diagram of the structural equation model for the results of the Theory of Planned Behavior. INT, ATT, SN, PBC refer to behavioral intention, attitude, subjective norm, and perceived behavioral control, respectively. Numbers are estimated path coefficients.

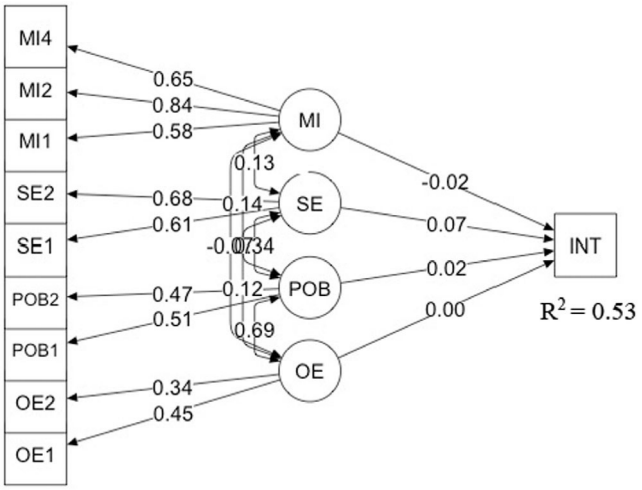

FIGURE 4 Path diagram of the structural equation model for the results of the Social Cognitive Theory. INT, OE, POB, SE, and MI refer to behavioral intention, outcome expectancy, perception of others' behavior, self-efficacy, and media influence, respectively. Numbers are estimated path coefficients.

majority (53.4%) believed buying tiger bone glue is legal, which indicates low awareness among respondents about the legality of buying and using tiger bone glue. The mean age of respondents was 47, while the mean individual monthly income ranged from VND40-49 million (approx. US$1670-2010), which is more than 10 times higher than the national average of VND4.2 million (approx. US$175) in 2021 (GSOV, 2022). More information about respondents' socio-demographic characteristics can be found in Data S1F.

4.1 | Measurement models

We estimated measurement models for the TPB and the SCT. As ATT3, ATT4, OE3, SN4, SN6, POB3, PBC3, SE3, and MI3 had low factor loadings, we removed these items before reestimating the models. We identified the best-fit model based on the goodness-of-fit indices (Table 1). The SCT had a slightly better fit on all indices. We present the values for FL, CA, CR, and AVE in Table 2.

After removing the variables with low factor loadings, all TPB and the SCT constructs met the CA, CR, and AVE recommended values. Hence, they are all reliable constructs. Assessing discriminant validity, we compared the square root values of the AVE across constructs. The value for each construct was greater than its correlations with other constructs, which suggested that discriminant validity is satisfied (Fornell & Larcker, 1981).

4.2 | Structural models

After estimating the measurement models, we estimated the structural models of the TPB and the SCT using SEM. Both models met the recommended values of the fit indices (Table 3).

All scales significantly determined the corresponding constructs. However, in the TPB, only PBC ($\beta = 0.63$) significantly affected the intention to buy tiger bone glue. The model explained 48% of the variance in intentions ($R^2 = 0.48$) (Figures 3 and 4).

In the SCT model, SE and MI had significant effects on intentions, while OE and POB were not significant. The effect size for SE was large ($f^2 = 0.72$), suggesting a strong contribution to intentions. The two covariates, HAB and PRE, had no significant effects and were hence omitted. This model explained 53% of the variance in intention ($R^2 = 0.53$). The coefficient of PBC was positive and significant, suggesting that the stronger the perceived

TABLE 4 Coefficients of the path relationships of the Theory of Planned Behavior and the Social Cognitive Theory model (standard errors in parentheses).

Pathway	TPB	SCT
ATT → INT	0.011 (0.017)	NA
SN → INT	0.008 (0.018)	NA
PBC → INT	0.069*** (0.008)	NA
OE → INT	NA	0.003 (0.013)
POB → INT	NA	0.021 (0.014)
SE → INT	NA	0.069*** (0.007)
MI → INT	NA	−0.023*** (0.007)
R^2	0.48	0.53
AIC	3533.55	4212.91
BIC	3621.69	4315.15

Note: *** indicates $p < 0.01$.

control of buying tiger bone glue (i.e., having enough disposable income and knowing reliable sellers), the more likely one is to intend to buy this product. PBC showed a large effect ($f^2 = 0.58$), suggesting that it played a key role in predicting intention. The coefficient of MI was negative, suggesting that the more susceptible respondents are to media information (i.e., if they receive information in the media about legal sanctions on buying or using tiger bone glue), the less likely they are to intend to buy tiger bone glue. MI had a small effect size ($f^2 = 0.09$), suggesting its limited contribution to predicting intentions. Coefficients of the path relationships of the TPB and the SCT are presented in Table 4. The two models are statistically different (p-value<0.01, Vuong test). The SCT had a slightly higher predictive power, but the TPB was more parsimonious (i.e., using fewer constructs and measures), based on Akaike's and Bayesian Information Criteria (i.e., AIC and BIC). Regarding relative effects, PBC and SE are equally strong predictors of intention in their respective models. We explored the effect of the socio-demographic variables and other covariates, but none had any significant effects.

5 | DISCUSSION

Developing strategies to manage demand for endangered wildlife products requires a deep understanding of consumer motivations and the determinants of demand (Veríssimo et al., 2020; 't Sas-Rolfes et al., 2019). Behavioral theories and models have been employed to investigate factors affecting wildlife consumption, especially the TPB (Doughty et al., 2021). However, few studies have empirically tested multiple theories and models simultaneously or developed a broader framework combining different theoretical constructs to better explain wildlife consumption behaviors (Dang & Nielsen, 2022). This study has three main contributions to the literature and tiger conservation efforts. First, we generated insights into the most important determinants of the intention to buy tiger bone glue among consumers with basic knowledge about this product in the segment primarily demanding this product—the upper-income bracket in Hanoi. Second, we compared the relative power of the TPB and the SCT in predicting intentions. Last, we assessed the relative influence of different types of information on tiger bone glue consumers.

Testing the TPB and the SCT, we found that the intention to buy tiger bone glue is mainly influenced by the PBC and the SE constructs in their respective models. The two models had almost similar predictive power (R^2 values), partly because of overlapping constructs and variables. Adding the MI construct slightly increased the predictive power of the SCT relative to the TPB whilst making it less parsimonious. The merit of adding MI variables was to investigate the relative effects of media information on behavioral intentions. The results indicate that consumers are less likely to intend to buy tiger bone glue given information through the media about the conditions of captive-bred tigers in illegal farms, the prevalence of low-quality and fake products, and the potential health and legal sanction risks when buying and using this product. This resonates with Lin and Hsu's (2015) investigation of the influence of the media on green consumption using the SCT. Green consumption in their study was defined as the consumption that facilitates the sustainable use of natural resources and promote social responsibility (Lin & Hsu's, 2015). This includes promoting alternative medicines derived from sustainable sources rather than endangered wildlife products such as tiger bone glue. However, exposure to information about alternatives to tiger bone glue had low influence on consumer intentions, suggesting that beliefs in the medicinal benefits of tiger bone glue are deeply rooted or that there is a certain skepticism toward information in the media, which will make it challenging to persuade consumers to change to other products or treatments. This finding also aligns with previous studies on endangered wildlife products used as traditional medicine in Vietnam (e.g., Dang & Nielsen, 2022; Davis et al., 2020).

PBC and SE had the strongest influence on intentions in the respective models. Hence, PBC and behavioral intentions could predict behaviors (Ajzen, 1991). There were no differences between PBC and SE in this case, although these constructs have conceptual challenges (Miller, 2017). However, our results indicated that

respondents' intention to buy tiger bone glue would increase if they believed that they had enough disposable income and knew where to buy and how to use this product.

ATT and SN did not significantly influence the intention to buy tiger bone glue, which resonates with Dang and Nielsen (2022). This may reflect that Vietnamese consumers generally have positive attitudes toward the use of tiger bone glue, and that beliefs in the efficacy of this product are entrenched in society, leading to low variation in the ATT and SN variables across the respondents. Vietnamese consumers are under pressure to comply with the norms and expectations of others in the same or higher social strata to which they aspire, while the use of wildlife products as traditional medicine has no stigma (Nguyen et al., 2021; Dang & Nielsen, 2018).

Our results suggest that both the TPB and the SCT can be used to predict the intention to buy endangered wildlife products. The SCT has overlapping constructs with the TPB but captures other factors driving consumption behaviors (Phipps et al., 2013). The SCT is more suitable for designing demand management campaigns since it captures the relative effect of media information on behavioral intentions. However, the SCT is more complex, making it more challenging to operationalize in practice. If future studies only aim to identify the key determinants of behavioral intentions, the TPB offers a more straightforward application due to its simplicity.

Our results provide practical implications for designing demand management interventions, particularly social marketing campaigns disseminating messages through the media and digital platforms. Social marketing is the 'use of marketing principles and techniques to influence a target audience to voluntarily accept, reject, modify, or abandon a behavior for the benefit of individuals, groups, and society as a whole' (Kotler et al., 2002). So far, social marketing has been adopted in several fields, most notably public health, family planning, road safety, smoking prevention, waste recycling, and environmental protection (Truong & Dang, 2016; Truong et al., 2016). There has been a growing call to adopt social marketing to manage demand for endangered wildlife products, recognizing the need for evidence-based, targeted interventions that address consumer behavior (Dang et al., 2020; Greenfield & Veríssimo, 2019; Olmedo et al., 2018). We recommend that tiger bone glue demand management campaigns be guided by the six social marketing benchmark criteria proposed by Andreasen (2002), including target behavior, formative research, segmentation, marketing mix, exchange, and competition. The first criteria refers to targeting specific behaviors (i.e., not buying tiger bone glue) and not just raising general awareness. Formative research plays an important role in the design of social marketing campaigns by generating insights into the target audience, but it is often poorly conducted (Truong & Dang, 2016). The challenges of interviewing high-income consumers make it difficult to gather reliable insights about their behavior, particularly regarding sensitive topics like the use of endangered wildlife products. Our study addresses this gap by employing innovative approaches to interview tiger bone glue consumers (Dang, 2021). Segmentation refers to dividing the broader audience into distinct subgroups (segments) based on relevant characteristics, and tailoring strategies for each. Our findings can be used directly to inform social marketing campaigns to reduce demand for tiger bone glue. Since no significant effects of socio-demographic characteristics or other covariates (incl. previous use, habit, or legal knowledge) were found on respondents' intention to buy tiger bone glue, campaigns should target a broad audience within this group of senior and wealthy individuals including users and non-users, younger individuals and those with relatively lower incomes within this group. Specifically, campaigns should target individuals aged 35 and above, with an average individual monthly income at least five times higher than the national average. A marketing mix or dissemination strategy should move beyond relying on a single message, as seen in previous campaigns (e.g., Offord-Woolley, 2017). Instead, it should deliver factual information through multiple core messages about illegal tiger farms, the risk of buying fake products, as well as potential health and legal sanction risks. It should also apply the 6Ps social marketing mix framework (Dunleavy et al., 2018), which includes the traditional 4Ps in commercial marketing (Product, Price, Place, and Promotion) adding partnerships and policy development, to achieve the social goals. Core messages can be embedded in short films and new articles published in trusted media outlets, and further disseminated by key opinion leaders and influencers through the media and digital platforms such as Facebook, Google, Tiktok, and Youtube—platforms that are widely used in Vietnam.[1] The target audience should be repeatedly exposed to these core messages and encouraged to share them so that the messages are socially reinforced. Social media and digital platforms provide opportunities for target messaging, for instance Facebook Ads and Google Ads. Exchange refers to the idea that people "trade" something when they change their behavior, that is, they give up something and get something in return. The perceived benefits of the new behavior must outweigh the perceived costs. Finally, the competition criterion refers to recognizing that other factors, such as competing behaviors, social norms, or commercial advertising, can

undermine the message. While the target behavior is clearly defined, our study serves as formative research, with findings primarily aimed at informing audience segmentation and shaping the marketing mix.

Our results should be interpreted cautiously due to limitations in the study design and sampling approach. First, our sample was not random. We started with participants in our previous study (Dang et al., 2022) who were willing to participate in further research and expanded this sample using convenience and snowball sampling. Our sample consisted of high-income individuals living in Hanoi, and we did not interview anyone without knowledge about tiger bone glue. Therefore, our results do not represent the Vietnamese population or even high-income people per se. But it does represent the segment consuming tiger bone glue. Second, several scales had low factor loadings and were not included in the models. This is expected given that no previous studies have been conducted on factors driving the intention of high-income Vietnamese consumers to buy tiger bone glue using the TPB or the SCT. Third, we found no significant effects of previous uses of tiger bone glue or habits on intention, and we did not investigate the link between behavioral intentions and actual behaviors. Measuring actual uses of tiger bone glue is challenging because of the sensitive nature of this behavior (Dang, 2021). Finally, there are a range of human behavior theories that can be used to understand factors influencing behavioral intentions (Eyster et al., 2022). The TPB and the SCT may not be able to capture all these factors. In this study, we use and compare these two models because one is the most popularly used model for explaining environmental-related behaviors (TPB) and the other is considered suitable for designing media campaigns to reduce endangered wildlife demand (Doughty et al., 2021). We suggest that future research should dive deeper into the application of the SCT measuring intentions and behaviors at different points in time and using this theory to design demand management interventions using media influence. Future research should also investigate the actual effect of media influence using field or lab experiments in which participants are exposed to information in the media.

6 | CONCLUSION

This study has illustrated the usefulness of the TPB and the SCT in explaining the intention to use tiger bone glue, revealing the importance of PBC and SE and that it is influenced by information from the media. The results can be used to design behavior change interventions, particularly social marketing campaigns that disseminate messages through media channels. Our results suggest that exposing wealthy consumers with a high level of PBC or SE, that is, the target audience, to messages about the poor animal welfare conditions in tiger farms, the risk of buying fake products with high health risks through media campaigns or on digital platforms, could effectively reduce demand for tiger bone glue. In addition, Dang et al. (2022) found a preference for legally produced tiger bone glue in a choice experiment evaluating preferences toward a legalized trade, suggesting that reminding potential consumers about the illegal nature of the trade may also reduce demand. However, to evaluate such campaigns' effects, it is essential to employ rigorous approaches such as a mixed-methods combination of randomized control trials (RCT) and qualitative insights (Pynegar et al., 2021; Wiik et al., 2020). Our results furthermore have methodological implications. Through simultaneously testing and comparing two behavioral theories, our study highlights the need for systematically evaluating which theoretical framework or combination of frameworks most effectively predicts intentions to buy or consume tiger bone glue in particular and other illegal wildlife products in general. Although several theories have been employed to describe and predict wildlife consumption behaviors, many applications are isolated in disjunct disciplines, and each theory has its own assumptions and limitations (Eyster et al., 2022). Furthermore, to address the link between intentions and actual behaviors, future research can use a temporally lagged design measuring intentions and behaviors at different points in time (Russell et al., 2017).

ACKNOWLEDGMENTS

The authors thank the Global Initiative against Transnational Organized Crime (GI-TOC) for funding this research. The first author was further supported by the Icelandic Research Fund (Grant No. 2511374-051). Open Access funding enabled and organized by Projekt DEAL.

CONFLICT OF INTEREST STATEMENT

The authors declare no potential conflict of interest.

DATA AVAILABILITY STATEMENT

All data is available in the supplementary materials.

ETHICS STATEMENT

This research was ethically approved by the Ethical Review Board at the Hanoi University of Public Health (Ref. 461/2019/YTCC-HD3).

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ENDNOTE

[1] An online social marketing campaign to reduce tiger bone glue demand was implemented in Vietnam in 2022, based on initial results of this study. Links to the campaign can still be accessible in online newspapers and digital platforms (e.g., its Youtube channel: https://www.youtube.com/@suthatvecaocot1783).

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Dang Vu, H. N., Taylor, L., Haysom, S., & Nielsen, M. R. (2025). Predicting consumer intention to buy tiger bone glue in Vietnam: A comparison between the theory of planned behavior and the social cognitive theory. *Conservation Science and Practice*, e70130. https://doi.org/10.1111/csp2.70130