Analysis

Understanding determinants of the intention to buy rhino horn in Vietnam through the Theory of Planned Behaviour and the Theory of Interpersonal Behaviour

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A B S T R A C T

Demand for rhino horn in Asian markets is driving a rhino poaching crisis in Africa. Despite the urgency of understanding consumers' motivations and demand, social-psychological factors underpinning the intention to buy rhino horn remain under-investigated. This study examined rhino horn demand using a novel approach combining the theory of planned behaviour and the theory of interpersonal behaviour. We conducted a survey on a unique sample of 427 high-income individuals in Hanoi, Vietnam, including 281 rhino horn users and 146 non-users. We empirically tested all constructs of the two theories predicting the intention to buy rhino horn using structural equation modelling. Perceived behavioural control and habit were the sole determinants of the intention to buy rhino horn. Respondents with higher disposable income and better knowledge about how to buy and use rhino horn and those with previous experience using rhino horn were more likely to intend to buy this good. However, frequent users had a lower intention to buy rhino horn in the near future than those having used rhino horn only once or a few times. We discuss the implications of our results for policy-making and the informed design of behaviour change campaigns to reduce rhino horn demand.

1. Introduction

The consumption of wildlife products is a global phenomenon driven by various motivations (Thomas-Walters et al., 2021). While trade in many species is legally controlled and sustainable, illegal wildlife trade poses a significant threat to biodiversity conservation (Tittensor et al., 2020). The effect and scale of the illicit wildlife trade highlight the importance of understanding consumers' motivations and demand, especially for products from endangered species, including bear bile, rhino horn, saiga horn, tiger bone, and pangolin meat and scales (Doughty et al., 2021, 2019; Olmedo et al., 2021; Davis et al., 2020, 2019a, 2019b; Hanley et al., 2017; Veríssimo et al., 2020a).

Growing demand for rhino horn, especially in Vietnamese and Chinese markets, is driving poaching in Africa, pushing the remaining rhino populations to the brink of extinction (Cheung et al., 2021; USAID Vietnam, 2018; USAID Wildlife Asia, 2018; Milliken and Shaw, 2012). In Vietnam, the demand for rhino horn is driven by utilitarian and hedonic values (Dang and Nielsen, 2018). And rhino horn has been used in traditional medicine for centuries with perceived benefits in treating various diseases and health conditions (Cheung et al., 2018; Nowell, 2012; But et al., 1990). Truong et al. (2015) revealed that body detoxification and hangover treatment were the most prevalent uses of rhino horn among 608 respondents in urban Hanoi and Ho Chi Minh City in the primary consumer group – high-income males. Consumers often buy a small piece of rhino horn (one or a few hundred grams), which can be used for a long time - even years, grind into a powder and mixed with water to produce a drinkable liquid (Truong et al., 2015). Consumers also use rhino horn to display wealth and as a status gift to cultivate business and political relationships (Dang and Nielsen, 2018; Truong et al., 2015). Reducing demand for rhino horn in Vietnam is challenging as consumers have little concern for rhino conservation (Dang and Nielsen, 2018; Olmedo et al., 2018). Despite the amendment of the Vietnamese Penal Code in 2015 providing recourse for increased legal sanctions, the consumption of rhino horn generally attracts no stigma and is often seen as a normative and socially acceptable behaviour (Dang et al., 2020; Nguyen et al., 2020; Truong et al., 2015).

Reducing rhino horn demand is further complicated by the emotions associated with a strong peer-induced desire to increase social status in Vietnamese society by showing wealth through conspicuous consumption and appearance (Drury, 2011). In Confucian societies like the Vietnamese, individuals are under intense pressure to comply with norms and expectations of peers in the same wealth group (Ahuvia and Wong, 1998). As a result, consumers are influenced by normative beliefs to meet a certain standard of decency through the volume and quality of goods consumed (Dang and Nielsen, 2018). Nevertheless, few studies have explicitly examined which social-psychological factors are the most important drivers of demand for rhino horn using a sample of self-reported rhino horn consumers (Dang and Nielsen, 2021; Nguyen et al., 2020).

Here we aim to evaluate the determinants of rhino horn demand in Hanoi, testing the Theory of Planned Behaviour (TPB) and the Theory of Interpersonal Behaviour (TIB). The TPB has been used to study various wildlife-related behaviours over the past two decades (Miller, 2017). Notwithstanding its dominance in the literature (Yuriev et al., 2020), the TPB has been criticized for a paucity of research on the link between behavioural intentions and actual behaviours (Miller, 2017). Another criticism is a failure to include non-cognitive behavioural determinants such as habits and emotions (Russell et al., 2017; Klöckner, 2013). The TIB assesses a broader range of behavioural determinants but has received limited attention from researchers (Issock et al., 2020). To the best of our knowledge, the TIB has never been applied to behaviours related to illegal wildlife consumption. Here we test the effect of constructs of the TPB and the TIB separately. Furthermore, recognizing that many behaviours are guided by both cognitive and more automatic and affective processes, including habits as well as emotions, we also test a model integrating constructs of both the TPB and the TIB. This aims to provide insights for informed policy-making and the design of behaviour change campaigns to reduce rhino horn demand in Vietnam.

2. Theoretical framework and literature review

2.1. Theory of Planned Behaviour

Proposed by Icek Ajzen in 1985 as an extension of the Theory of Reasoned Action (Ajzen and Fishbein, 1980), the TPB posits that the three constructs: attitude toward the behaviour, subjective norm, and Perceived Behavioural Control (PBC) of an action determine behavioural intention, and that intention is a direct antecedent of behaviour (Ajzen, 1991). In general, the more positive attitude and subjective norms favouring a behaviour, and the greater PBC, the more likely an individual will perform that behaviour (Ajzen, 1991). In the TPB model (see Fig. 1), attitude is operationalized as an individual's evaluation of whether conducting a behaviour is favourable or not. Subjective norm is the perceived social pressure to perform (or not perform) that behaviour, while PBC reflects the ease (or difficulty) of performing the behaviour (Fishbein and Ajzen, 2010; Ajzen, 1991).

Each of the constructs can be further disaggregated into a number of indicators (Fishbein and Ajzen, 2010; Ajzen, 1991). Hence, attitude is composed of Outcome Beliefs (OB), which are individuals' beliefs about the consequences of the behaviour, and Outcome Evaluations (OE), which are evaluations of the desirability of those consequences. Subjective norm consists of Normative Beliefs (NB), which are beliefs about the normative expectations of significant 'referents' (e.g., family members, friends, or colleagues), and Motivation to Comply (MC), which is the degree of motivation to meet these referents' normative expectations or approval of the behaviour. PBC is composed of Control Beliefs (CB), which are beliefs about the presence of factors that may facilitate and impede the performance of the behaviour, and the individual's Power of Control (PC), which is the perceived ability to influence these factors (Fishbein and Ajzen, 2010; Ajzen, 1991).

The TPB has been used to predict human behaviours in various fields (Miller, 2017; McDermott et al., 2015; Hardeman et al., 2002; Armitage and Conner, 2001), with examples including road safety (e.g., Rowe et al., 2016), contraceptive use (e.g., Kiene et al., 2014), alcohol and substance use (e.g., Duncan et al., 2012), dietary choice (e.g., McDermott et al., 2015), fruit and vegetable consumption (e.g., Menozzi et al., 2015). For wildlife-related behaviours, the TPB has been used to predict the intent to buy legal timber in Cameroon (Belinga et al., 2021), the intent to kill large predators in Latin America (Amit and Jacobson, 2017; Marchini and Macdonald, 2012), wild boars, sambars, pangolins, and tigers in Indonesia (St. John et al., 2018), deers in the United States (Shrestha et al., 2012; Hrubes et al., 2001), the intent to hunt pangolins and peacock-pheasants on Hainan Island, China (Wang et al., 2021), the consumption of sea turtle meat and eggs in São Tomé, Gulf of Guinea (Veríssimo et al., 2020b), and the intent to kill and willingness to consider wildlife management in routine cattle management activities (Willcox et al., 2012). Despite a great potential to provide insights for the development of behaviour change initiatives (Hardeman et al., 2002; Armitage and Conner, 2001; Rutter, 2000), the application of the TPB to predicting the intention to consume illegal products from endangered wild animals is only slowly taking shape.
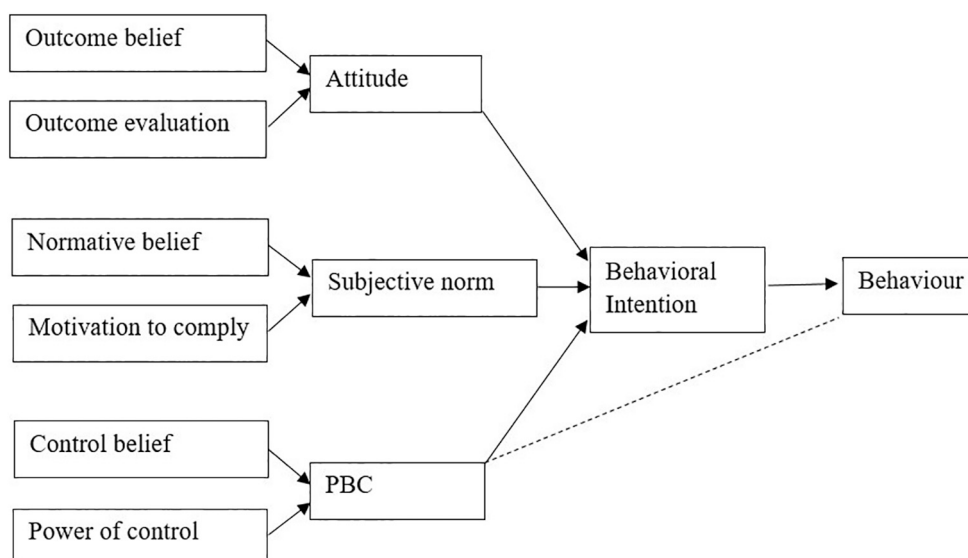

Fig. 1. The Theory of Planned Behaviour, adapted from Ajzen (1991).

2.2. Theory of Interpersonal Behaviour

The TIB (Triandis, 1977) adds several factors to the TPB constructs, namely social factor, affect, habit, and facilitating condition (see Fig. 2). Apart from attitude, Triandis recognized the importance of social and emotional factors in forming intentions (Issock et al., 2020). Going beyond intentions as direct antecedents of behaviour, Triandis (1977) argued that behaviour is also mediated by the frequency of past behaviour – i.e., habit. And, both intention and habit are moderated by facilitating conditions (Triandis, 1977). The TIB, therefore, posits that any human behaviour can be predicted partly by the intention to perform that behaviour, partly by habit, and partly by the contextual constraints and conditions (Triandis, 1980, 1977). In the TIB, social factor refers to norms, roles, and self-concept. Norms, which are conceptually similar to the subjective norm construct of the TPB (Pee et al., 2008), encompass the social rules or expectations of others about what one should and should not do (Triandis, 1977). Roles are defined as 'sets of behaviours that are considered appropriate for persons holding particular positions in a group' (Triandis, 1977). Self-concept is a personal belief about one's responsibility toward something (Shavelson et al., 1976). Roles and self-concept are not considered in the TPB (Pee et al., 2008). Affect includes emotional factors, both positive and negative, that are distinct from rational thinking and may influence intentions (Triandis, 1980). Affect is differentiated from attitude in that it refers to the emotional response or feeling generated in response to a person, object or event. In contrast, an attitude refers to a prior formed position, orientation or tendency toward similar aspects that may be more or less rationally derived. The TPB only considers the cognitive aspect of attitude, which is assessed through outcome evaluation (Pee et al., 2008). Triandis (1977) emphasized the importance of habit, or past behaviours, in predicting future actions. Lastly, facilitating conditions refer to situational constraints or opportunities to perform a specific behaviour.

The application of the TIB has been limited compared to the TPB, although it appears to have better explanatory power (Egmond and Bruel, 2007). Turaga et al. (2010) asserted that the TIB can provide a broader theoretical framework for understanding environment-related behaviours. And according to Issock et al. (2020), there is still

potential for expanding the theory. Notably, the TPB and the TIB have been simultaneously tested in several studies (e.g., Russell et al., 2017; Pee et al., 2008; Boyd and Wandersman, 1991), and combined or modified models with better predictive power have been proposed before this study (see Russell et al., 2017; Pee et al., 2008).

2.3. The integrative model

To determine which model and identify the constructs that best predict the intention to buy rhino horn, we first test the TPB and the TIB separately and then propose a broader theoretical framework integrating constructs from both the TPB and the TIB (see Fig. 3). Taking the TPB as a starting point, a limitation is that non-cognitive determinants and particularly emotions and habits are not considered. Emotions play an important role in the consumption of rhino horn. Dang and Nielsen (2018) found that consumers use rhino horn as a ritualised way of honouring terminally ill family members, while Nguyen et al. (2020) found that consumers not only buy rhino horn for personal use but also gift this product to their loved ones to fulfill their spousal, filial, or familial duty. Furthermore, rhino horn is often shared in social networks and clubs where its use is not merely driven by health-related purposes (i.e., reducing hangover) but also considered a search for pleasures among wealthy males (Truong et al., 2015). This is an emotional state that is often referred to as "sociopleasure" or the pleasure of being together (Tiger, 2000). Besides emotions, there is evidence to suggest that habits may affect rhino horn consumers' intentions and behaviours (Milliken and Shaw, 2012). The most prevelent use of rhino horn is to reduce hangover after drinking binges (Truong et al., 2015). Milliken and Shaw (2012) described habitual users frequently engaging in parties involving excessive alcohol consumption. These users "routinely mix rhino horn powder with water or alcohol as a general health and hangover-curing tonic" (Milliken and Shaw, 2012, p. 15). We, therefore, combined the emotion and habit constructs of the TIB with the constructs of the TPB in the integrative model.

Motivations for consuming rhino horn also include the urgency of treating diseases (Dang et al., 2022; Nguyen et al., 2020). Conducting a choice experiment with 345 rhino horn consumers, Dang et al. (2022) found that respondents with higher income and higher urgency of using
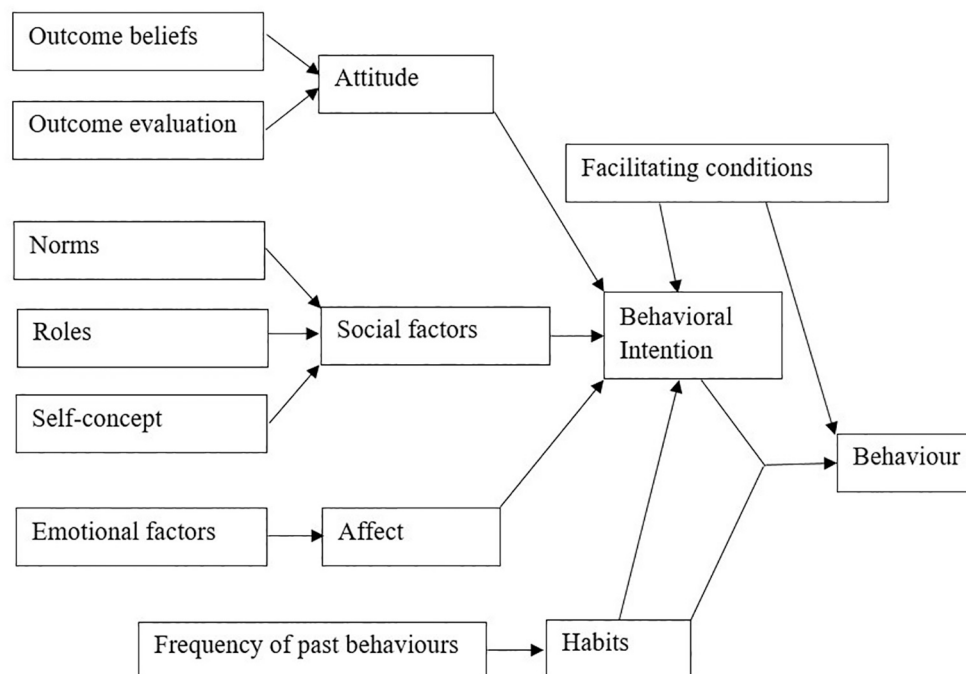

Fig. 2. The Theory of Interpersonal Behaviour, adapted from Triandis (1980).
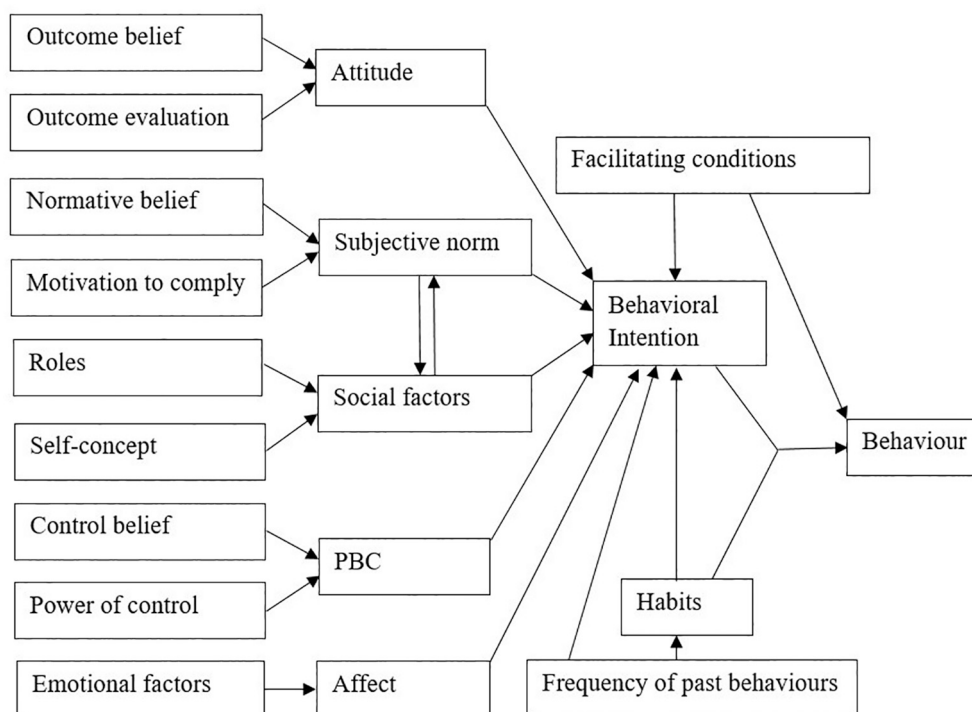
Fig. 3. The integrative model combining constructs of the TPB and the TIB.

rhino horn have a stronger preference for illegal rhino horns and are less sensitive to price than those with lower income and lower urgency of using this product. We, therefore, add the TIB construct facilitating conditions to the integrative model.

Pee et al. (2008) indicated that the social factor construct of the TIB is conceptually similar to the subjective norm construct of the TPB, particularly normative beliefs. However, previous studies have shown that the use of endangered wildlife products such as rhino horn is socially accepted in Vietnam, and that consumers generally are not concerned about protecting rhinos (Nguyen et al., 2020; Dang and Nielsen, 2018). The former relates to consumers' self-concept, while the latter reflects consumers' beliefs about their role in conservation. Therefore, we add self-concept and role beliefs (i.e., other components of the social factor construct) to the integrative models, while we keep normative beliefs in the subjective norm construct of the TPB to avoid overlapping.

Hence, the integration of the constructs of the TIB and the TPB is supported by past research on rhino horn consumers, which recognises the influence of non-cognitive determinants, social factors, and facilitating conditions on rhino horn consumers' motivations and behaviours.

3. Methods

3.1. Study areas

We conducted a survey on individuals living in the larger area of Hanoi, Vietnam's capital and second-largest city by population (GSOV, 2019). Hanoi has a total area of 3358.6 km², with more than eight million inhabitants (GSOV, 2019). The consumption of wild meat and other luxury wildlife products, including caterpillar fungus (*cordyceps sinensis*), bear bile, and tiger bone glue, is popular among high-income individuals in Hanoi (Davis et al., 2020, 2019a; Drury, 2011). Hanoi has also been identified as a hotspot for the rhino horn trade, selling poached horns from Africa to local consumers and Chinese tourists (Stoner et al., 2017).

3.2. Questionnaire development

A preliminary questionnaire was developed through a literature review and an elicitation study. Adoption of the TPB and TIB was informed by the insights of previous studies including Dang et al. (2020), Issock et al. (2020), Nguyen et al. (2020), Dang and Nielsen (2018), Russell et al. (2017), Fielding et al. (2012), Truong et al. (2015), and Pee et al. (2008) (see Appendix B, Supplementary materials). We further followed Ajzen (2002) suggestion to use the elicitation method to identify potential additional factors that could contribute to predicting behavioural intention, but which have not been empirically validated before, given that this is the first attempt to predict the intention to buy rhino horn using these theories. In the elicitation study, we conducted 10 in-depth personal interviews with self-reported rhino horn consumers and three focus group discussions. Each focus group consisted of four participants, including two self-reported rhino horn consumers, one intended consumer, and one individual with a history of trading rhino horn. We solicited focus group participants among individuals who participated in our previous studies (Dang et al., 2020; Dang and Nielsen, 2018). We asked participants open-ended questions about what factors affect, facilitate, and influence their intention to buy rhino horn (see Appendix A, Supplementary materials). We recorded the most frequently reported factors affecting the choice to buy rhino horn and compared them with those identified through the literature review. The elicitation study provided two additional items for the PBC construct and one item for facilitating conditions.

We then conducted 30 pilot interviews using convenient sampling with middle-aged and high-income consumers in Hanoi, to test the questionnaire. Based on the results of the pilot, we made minor adjustments to the formulation of several questions. The final questionnaire contained several survey streams covering all constructs of the TPB and the TIB (see Appendix B, Supplementary materials), as well as questions about respondents' behaviours, beliefs, and knowledge about rhino horn (see Supplementary materials). A five-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (5) was used to assess each statement (see Table 1). Of these eight constructs, affect, habit, and intention were considered reflective because they were uni-dimensional

Table 1

Summary of the survey constructs/variables, measures, expected direction toward intention, and sources.

Constructs/ Variables	Measures	Expected direction	Sources
Attitude (ATT)			
ATT1	Rhino horn can help detoxify the body and reduce hangovers.	+	Nguyen et al. (2020); Dang and Nielsen (2018); Truong et al. (2015); Ajzen (2002).
ATT2	Rhino horn has general health benefits.	+	
ATT3	Rhino horn can help treat terminal illnesses (e.g., cancer, stroke).	+	
ATT4	Rhino horn is a highly valuable gift. Recipients will highly appreciate it.	+	
Subjective Norm (SN)			
SN1	Most of the individuals I know having good knowledge about rhino horn supports that I should use rhino horn for medicinal purposes.	+	Dang et al. (2020); Nguyen et al. (2020); Ajzen (2002)
SN2	How much do you let the opinion of these knowledgeable individuals determine whether you will buy rhino horn or not?[a]	+	
SN3	Most of my family members, friends, and colleagues support that I should use rhino horn for medicinal purposes.	+	
SN4	How much do you let the opinion of your family members, friends or colleagues determine whether you will buy rhino horn or not?	+	
SN5	Most of "the rich and famous" that I know of does not support that I should use rhino horn for medicinal purposes (e.g., hangover, detoxification, treatment of minor ailments, terminal illnesses).	−	
SN6	How much do you let the opinion of "the rich and famous that you know of" determine whether you will buy rhino horn or not?	+	
Social Factor (SF)			
SF1	As a Vietnamese citizen, it is appropriate for me to buy and/or use rhino horn for health-related purposes.	+	Dang et al., 2020; Nguyen et al., 2020; Issock et al. (2020); Pee et al. (2008).
SF2	I consider that using rhino horn is suitable for my age.	+	
SF3	It is my responsibility to contribute to saving rhinos, tackling the illegal trade and consumption of rhino horn.	−	
Perceived Behavioural Control (PBC)			

Table 1 (*continued*)

Constructs/ Variables	Measures	Expected direction	Sources
PBC1	If I want to, I am confident that I could buy rhino horn in the near future.	+	Dang and Nielsen (2018); Ajzen (2002); Elicitation study.
PBC2	I believe that I have enough resources (e.g., money, knowledge) to buy rhino horn.	+	
PBC3	I believe that it will be easy for me to find a rhino horn trader if I want to.	+	
Facilitating Condition (FC)			
FC1	My family members, including me, currently need rhino horn to treat diseases or for general health benefits.	+	Nguyen et al. (2020); Dang and Nielsen (2018); Elicitation study.
FC2	I know how to check whether a rhino horn is authentic.	+	
FC3	I have friends with whom I can share the cost of the buy of rhino horn.	+	
Affect (AFF)			
AFF1	It is pleasant to share rhino horn with friends in a party to reduce hangovers.	+	Nguyen et al. (2020); Dang and Nielsen (2018); Truong et al. (2015); Elicitation study.
AFF2	I would feel fulfilled when gifting rhino horn to my family members to treat diseases.	+	
Habit (HAB)[b]			
PRE	Have you ever used rhino horn for any purposes?	+	Russell et al. (2017); Fielding et al. (2012).
FRE	How often do you use rhino horn?	+	
Intention (INT)[c]			
INT1	I intend to buy rhino horn for medicinal purposes or gifting to others in the near future.		Dang and Nielsen (2018); Ajzen (2002)
INT2	If I have an opportunity (i.e., offer by a trader, invitation from peer users), I will accept it and buy rhino horn.		

Notes:

[a] The following text is read to respondents before asking this question: "Now, please think about the people or groups who influence your decision to buy or use rhino horn. This includes in particular people you consider having good knowledge about rhino horn and who you may want to consult when you intend to buy rhino horn. We call them 'reference groups'."

[b] We measured habit (HAB) by asking the respondents if they had used rhino horn in the past (PRE), as well as their frequency of use (FRE). The habit scores were grouped into five categories: 1 (never), 2 (once), 3 (a few times), 4 (from time to time), and 5 (often).

[c] In the analysis, the intention scales were averaged to create the mean intention score, with a higher score suggesting greater intention (Francis et al., 2004).

and removing a scale did not change the construct meaning. Attitude, subjective norm, social factor, perceived behavioural control, and facilitating condition, on the other hand, were formative because the meaning of a construct was jointly determined by each scale and removing a scale could change the construct meaning (Pee et al., 2008).

3.3. Data collection

The survey was conducted on individuals with basic knowledge about rhino horn, including a large proportion (66%) having used rhino horn at least once. Respondents were selected from previous studies (Dang et al., 2020; Dang and Nielsen, 2018; Truong et al., 2015). We used convenient and snowball sampling to expand this initial sample, and more respondents were identified through the personal networks of the first author and four research assistants (Dang, 2021). Our pilot study revealed that not everyone possessed knowledge about the potential use of rhino horn. As a result, they could not meaningfully contribute to the survey. We, therefore, started interviews with a screening question asking potential respondents, 'Do you know about the potential benefits of using rhino horn?' If they answered 'yes', we invited them to participate in the survey. Data were collected over 5 months, from May to September 2020. Interviews lasted 25–30 min and were conducted face to face at a place convenient to the respondents.

3.4. Data analysis

We used Structural Equation Modelling (SEM) to evaluate the influence of the constructs of the two theories on the intention to buy rhino horn. SEM is considered an extension of multiple regression combined with factor analysis (Hox and Bechger, 2011). SEM facilitates models with both latent and observed variables and enables examining the moderating influence of some variables on others. We estimate the TPB model and the TIB model separately, and then the integrative model.

To prepare the collected data for the analysis, we checked for outliers and missing values and assessed the assumptions of multivariate normality. Because the dependent variable – behavioural intention – had a negatively skewed distribution with a fat tail (see Fig. 3, Appendix C, Supplementary materials), we log-transformed this variable and used the maximum likelihood method to estimate the model parameters.

The analysis is composed of two main stages: (a) confirmatory factor analysis (CFA) to assess the measurement model, which relates the variables to the constructs, and (b) structural equation analysis to evaluate the path relationship among the constructs (Anderson and Gerbing, 1988). In the first stage, we used several indices to assess the extent to which the model fits the observed data, including the ratio of chi-square to degrees-of-freedom (χ^2/d.f.) (recommended maximum value 0.5, see Hair et al., 1998), the Root-Mean-Square-Error of Approximation (RMSEA) and the Standardized Root-Mean-Square-Residual (SRMR) (both recommended maximum value 0.1, see Kline, 1998), the Goodness of Fit Index (GFI), the Tucker-Lewis Index (TLI), the Comparative Fit Index (CFI), and the Normal Fit Index (NFI) (all recommended minimum value 0.9, see Kline, 1998). To assess the reliability among items of each construct, we used the Cronbach's alpha (CA), which has a recommended value of 0.7 (Nunnally, 1978). We evaluated construct validity through convergent and discriminant validity. Convergent validity includes factor loadings (FL) (recommended minimum value 0.6, see Chin et al., 1997), composite reliability (CR) (recommended minimum value 0.6, see Bagozzi and Yi, 1988), and average variance extracted (AVE) (recommended minimum value 0.5, see Fornell and Larcker, 1981). Discriminant validity was assessed by comparing the square root values of the AVE across constructs. We used the R-squared to measure the explained variance of the endogenous variables. Finally, we tested the effect of socio-demographic variables and previous use of rhino horn (i.e., the dummy PRE) to further explore the results. We used the bestNormalize package (Peterson and Cavanaugh, 2019) to assess the optimal data transformation and the lavaan package (Rosseel, 2012) for data analysis in Rstudio version 1.2.5042.

3.5. Ethical considerations

This study received ethical approval from the Research Ethics Committee for SCIENCE and SUND at the University of Copenhagen (Ref. 504–0069/19–5000) and the Ethical Review Board at the Hanoi University of Public Health (Ref. 461/2019/YTCC-HD3). Our study team complied with all policies and procedures of the authorizing institutions' review boards. Given the sensitive nature of rhino horn use, the study team followed strict ethical guidelines and an informed consent policy. Potential respondents were informed about the study purposes, potential benefits and risks when participating in interviews and that they at any time could withdraw from the interview. Data from interviews were recorded using password-protected tablets, and collected data were uploaded immediately to an encrypted cloud server, the security of which was handled by the University of Copenhagen's IT department.

4. Result

A total of 427 respondents participated in our survey. Of these, 281 had used rhino horn at least once (henceforth users), while 146 had not (henceforth non-users). The most prevalent uses of rhino horn were for body detoxification (70.5%) and hangover reduction (65.5%). A considerable proportion of respondents used rhino horn as a health tonic (18.5%) and for treatment of high fever (14.6%). Among users, 13.5% used rhino horn daily or whenever they had a reason such as a hangover. In contrast, more than two thirds (76.6%) had used rhino horn just once or a few times in their lives (see Appendix D, Supplementary materials). The mean respondent age was 48, and the median was 46. The mean and median individual monthly income was in the range of VND50–59 million (approx. US$2100–2800), which is about 15 times higher than the national average of VND3.76 million (approx. US$176) in 2018 (GSOV, 2018). Additional information about respondent socio-demographics and their beliefs and knowledge about rhino horn are presented in Appendix E and Appendix F, respectively (Supplementary materials).

4.1. Measurement models

We estimated measurement models for each theory and the integrative model combining constructs of the two theories (i.e., TPB and TIB) with all the scale items. Because the test of factor loadings revealed low loadings on items ATT3, ATT4, SN1, SN5, SN6, SF3, and PBC3, we omitted these items and reestimated the measurement models. The goodness-of-fit indices indicate an acceptable fit between the reestimated models and the observed data. The TIB model had the best fit of the three measurement models (see the goodness-of-fit indices, Table 2). Reliability (CA) and convergent validity (FL, CR, AVE) measures are summarised in Table 3.

The facilitating condition construct did not meet the recommended values of CA and AVE and was therefore not included in the structural

Table 2
Goodness-of-fit indices of the measurement models.

	Recommended value	TPB model	TIB model	Combined model
Ratio of chi-square to degrees-of-freedom (χ^2/d.f.)	≤5.0	6.36	1.57	3.43
Root-Mean-Square-Error of Approximation (RMSEA)	≤0.10	0.11	0.04	0.07
Standardized Root-Mean-Square-Residual (SRMR)	≤0.10	0.07	0.04	0.06
Goodness of Fit Index (GFI)	≥0.90	0.96	0.98	0.93
Tucker-Lewis Index (TLI)	≥0.90	0.83	0.97	0.85
Comparative Fit Index (CFI)	≥0.90	0.91	0.98	0.90
Normal Fit Index (NFI)	≥0.90	0.90	0.96	0.87

Table 3

Measurement model: reliability and convergent validity.

Constructs and variables	Statements	Combined model				TPB				TIB			
		FL	CA	CR	AVE	FL	CA	CR	AVE	FL	CA	CR	AVE
Attitude (ATT)			0.63	0.63	0.46		0.63	0.63	0.46		0.63	0.63	0.46
ATT1	Rhino horn can help detoxify the body and reduce hangovers.	0.66				0.65				0.66			
ATT2	Rhino horn has general health benefits.	0.70				0.71				0.70			
Subjective Norm (SN)			0.71	0.78	0.57		0.71	0.81	0.63		NA	NA	NA
SN2	How much do you let the opinion of these knowledgeable individuals determine whether you will buy rhino horn or not?[a]	0.64				0.59							
SN3	Most of my family members, friends, and colleagues support that I should use rhino horn for medicinal purposes.	0.57				0.52							
SN4	How much do you let the opinion of your family members, friends or colleagues determine whether you will buy rhino horn or not?	0.89				0.99							
Social Factor (SF)			0.70	0.70	0.53		NA	NA	NA		0.69	0.69	0.53
SF1	As a Vietnamese citizen, it is appropriate for me to buy and/or use rhino horn for health-related purposes.	0.73								0.73			
SF2	I consider that using rhino horn is suitable for my age.	0.73								0.73			
Perceived Behavioural Control (PBC)			0.70	0.70	0.53		0.68	0.68	0.52		NA	NA	NA
PBC1	If I want to, I am confident that I could buy rhino horn in the near future.	0.63				0.67							
PBC2	I believe that I have enough resources (e.g., money, knowledge) to buy rhino horn.	0.83				0.78							
Facilitating Condition (FC)			0.59	0.60	0.33		NA	NA	NA		0.59	0.60	0.33
FC1	My family members, including me, currently need rhino horn to treat diseases or for general health benefits.	0.61								0.61			
FC2	I know how to check whether a rhino horn is authentic.	0.54								0.54			
FC3	I have friends with whom I can share the cost of the buy of rhino horn.	0.57								0.57			
Affect (AFF)			0.73	0.73	0.58		NA	NA	NA		0.73	0.75	0.60
AFF1	It is pleasant to share rhino horn with friends at a party to reduce hangovers.	0.67								0.60			
AFF2	I would feel fulfilled when gifting rhino horn to my family members to treat diseases.	0.88								0.97			

[a] The following text were read to respondents before asking this question: "Now, please think about the people or groups who influence your decision to buy or use rhino horn. This includes in particular people you consider having good knowledge about rhino horn and who you may want to consult when you intend to buy rhino horn. We call them "reference groups.""

model for the TIB. The attitude construct had good factor loadings and marginally met the criteria for convergent validity. Other constructs, incl. Subjective norm, social factor, affect, and PBC, exceeded the recommended values for CA, CR, and AVE, suggesting that they are all reliable constructs.

To evaluate 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 suggesting that discriminant validity is satisfied (Fornell and Larcker, 1981).

4.2. Structural models

We estimated SEMs, which all meet the recommended threshold values and compared the results using the fit indices (Table 4). In the TPB model (see Fig. 6 in Appendix G, Supplementary materials), all the scales were significant in determining their constructs. Still, among the

paths of the constructs, only PBC had a significant effect on the intention to buy rhino horn. The model explained 86% of the variance in the respondents' intention to buy rhino horn ($R^2 = 0.86$).

In the TIB-based model, habit (HAB) and previous use (PRE) had no significant effect. Thus, we removed these variables and reestimated this model (see Fig. 7 in Appendix G, Supplementary materials). All scales were significant in determining the corresponding constructs. The ATT construct was not significant, while the SF construct and the AFF construct were significant at the 0.05 level and at the 0.01 level, respectively. The relationships between the two constructs SF, AFF and intention were positive, indicating that the more favourable SF and the more pleasure and fulfilment it brings (i.e., AFF), the more likely one is to intend to buy rhino horn. However, this model explained only 22% of the variance in intentions ($R^2 = 0.22$).

In the integrative model, the four constructs ATT, SN, SF, and AFF were not significant. Hence we removed these constructs. We kept PBC,

Table 4

Goodness-of-fit indices of the structural models.

	χ^2/d.f.	RMSEA	SRMR	GFI	TLI	CFI	NFI
Combined model	2.08	0.05	0.02	0.99	0.99	0.99	0.99
TPB	4.80	0.09	0.06	0.96	0.90	0.94	0.93
TIB	1.59	0.04	0.02	0.99	0.98	0.99	0.98
Recommended value	≤5.0	≤0.10	≤0.10	≥0.90	≥0.90	≥0.90	≥0.90

habit, and previous use and reestimated the model (see Fig. 8 in Appendix G, Supplementary materials). All the scales and constructs were significant at the 0.01 level. PBC had a positive effect on intention, indicating that the stronger the perceived control of using rhino horn (i. e., respondents believed that they have the ability to buy and know how to use rhino horn), the more likely one is to intend to buy rhino horn. Respondents who had used rhino horn at least once in their lives also had a stronger intention to buy rhino horn. However, the frequency of use negatively influenced the intention to buy rhino horn in the near future. This model explained 87% of the variance in intentions (R^2 = 0.87).

The three models are compared in Table 5. The models are statistically different (*p*-value<0.01, Vuong test). The TIB model had the lowest predictive power, while the integrative model had the highest predictive power and best relative fit while being the most parsimonious model (judged by the values of AIC and BIC).

PBC emerged as the strongest predictor of intention (β = 0.089) across models, while previous use was the second strongest (β = 0.046). We also tested the effect of socio-demographic variables. Only age had a significantly negative effect ($p < 0.05$), indicating that older respondents were less likely to intend to buy rhino horn (Appendix H, Supplementary materials).

5. Discussion

Understanding the socio-psychological factors determining the decision to buy rhino horn is critical for designing behaviour change campaigns to reduce rhino horn demand (Dang and Nielsen, 2021; Veríssimo et al., 2020a). To the best of our knowledge, this study is the first attempt to combine different behavioural theories to understand the determinants of the intention to buy rhino horn. Testing the TPB, the TIB, and an integrative model combining constructs of these theories, we found that the intention to buy rhino horn in our sample of respondents matching the profile of rhino horn consumers in Hanoi was driven mainly by the two constructs - PBC and habit.

Of the three models, only the TPB and the integrative model had high R^2 values and hence the potential to predict intention among our respondents. In the TPB model, PBC had a significantly positive effect on intention, while attitude and subjective norm had no significant effects. In the TIB model, the two constructs - social factor and affect - were significant. But this model had low predictive power. The facilitating condition construct had low factor loadings, possibly because traditional medicine, including rhino horn, is often used preemptively rather than as a treatment. Hence, the urgency of using rhino horn was not a significant predictor of the intention to buy rhino horn.

PBC emerged as the strongest determinant of intention in the TPB and integrative models. Therefore, PBC and behavioural intentions could be used to directly predict behaviour (Ajzen, 1991). In our study, the intention to buy rhino horn largely relied on respondents' beliefs about their control over this behaviour and particularly whether they

had sufficient disposable income to buy rhino horn, whether they knew a trader and how to use it. This implies that campaigns should be directed toward individuals with high disposable income and access to rhino horn traders or retailers through their social networks.

The fact that attitude and subjective norm did not significantly predict intention among our respondents may be explained by the generally positive attitudes of Vietnamese consumers toward the use of traditional medicine, including wildlife ingredients such as rhino horn, tiger bone glue, and bear bile (Dang et al., 2020; Nguyen et al., 2020; Davis et al., 2020, 2019a). Beliefs in the medicinal efficacy of these products are deeply rooted in Vietnamese society (Dang and Nielsen, 2021; Nguyen et al., 2020). Hence, the reason why the effect of the attitude construct was insignificant across the models may simply be due to low variation between respondents (see Fig. 4 in Appendix C, Supplementary materials). Similarly, the general acceptance of wildlife use, attracting no stigma in Vietnamese society, and the predisposition to comply with the norms and expectations of others may explain the lack of any effect of respondents' normative beliefs about the opinions of significant others and motivations to comply with these groups may have caused similarly low variation and lack of any effect of these measures (see Fig. 5, Appendix C, Supplementary materials).

The two TIB constructs – social factor and affect – did not have any significant effects in the integrative model. These results resonate with Nguyen et al., 2020, Dang and Nielsen (2018), and Truong et al. (2015), finding that using rhino horn is socially acceptable among high-income respondents in urban areas of Hanoi and Ho Chi Minh City, who generally are not concerned about the conservation of rhinos. Participants in those studies generally found it pleasurable to share rhino horn with others in a party context (Truong et al., 2015) and felt emotionally fulfilled when gifting this product to their sick family members (Nguyen et al., 2020; Dang and Nielsen, 2018). Hence, the social factor (incl. self-concept, role belief) and affect scores did not vary much across the sample (see Appendix F, Supplementary materials). In the integrative model, habit had a significant effect on intention. This finding adds empirical support to the importance of past experience and its frequency in determining the intention to buy illegal wildlife products. Respondents having previously used rhino horn were more likely to intend to buy this product in the future. This suggests that behaviour change campaigns should target habitual users. However, the effect of frequency was negative, suggesting that the more often respondents use rhino horn, the less likely they intend to buy this product again in the near future. There are at least three possible explanations for this result. First, frequent users may have possessed some rhino horn at the time of the interview, which can be used over a long time period according to focus group discussions. Second, they could have used rhino horn sufficiently many times without experiencing the desired medicinal effect and realized that it was not worth the considerable investment. Respondents who had never previously used rhino horn or only tried it once had a stronger intention to buy this product. A single direct experience using rhino horn could positively affect our respondents by providing more reliable information about the good and reducing perceived risks (De Groot et al., 2009). Even limited experience and trial would enable them to verify the lack of risk (e.g., unpleasant taste or side effects) without revealing the limited efficacy in treating various conditions. Finally, the third possible explanation is that this remains a sensitive question, and social desirability bias may have caused some respondents to not provide a truthful answer. The fact that habit is the second strongest determinant of intention is consistent with findings on a range of subjects (Issock et al., 2020; Kupfer et al., 2019; Alhassan et al., 2018; Russell et al., 2017; Klöckner, 2013; Fielding et al., 2012).

Our results suggested that the TPB and the TIB both have the potential to predict intentions to buy and use illegal luxury wildlife products. Each theory provided a significant predictor of intention, and the constructs can be combined to provide a broader framework for understanding the determinants of demand for wildlife products. Our study corroborates Klöckner (2013), who conducted a meta-analysis of

Table 5
Coefficients of the path relationships of the TPB, TIB, and integrative model (standard errors in parentheses).

Pathway	TPB	TIB	Integrative model
ATT → INT	−0.008 (0.005)	0.016 (0.008)	NA
SN → INT	0.003 (0.004)	NA	NA
SF → INT	NA	0.016** (0.009)	NA
PBC → INT	0.090*** (0.005)	NA	0.089*** (0.004)
AFF → INT	NA	0.024*** (0.007)	NA
HAB → INT	NA	NA	−0.014*** (0.005)
PRE → INT	NA	NA	0.046*** (0.014)
R-square	0.86	0.22	0.87
AIC	3875.71	3475.49	1988.75
BIC	3960.90	3552.57	2041.49

***, ** indicate $p < 0.01$ and 0.05.

environmental behaviour research and showed the potentials for combining different behavioural theories and models into a broader framework that can help identify critical determinants of behaviour across cultures.

Nevertheless, our results must be interpreted with caution due to inherent limitations. First, our sampling approach was not random. Our sample was recruited from specific networks and expanded using convenient and snowball sampling. Our respondents were mostly high-income individuals living in urban areas in Hanoi, who constitute the largest group of potential rhino horn consumers in Vietnam (Truong et al., 2015). Individuals of other profiles (e.g., those of lower-income brackets) were less likely to participate in our survey. Respondents having no knowledge about the use of rhino horn in traditional medicine were excluded by default. Hence our findings cannot be generalized to the Vietnamese population or even to the high-income group. Second, some scales had low factor loadings and were removed from the model, including the facilitating condition construct. These scales were either developed from the elicitation study or adapted from prior studies on different behaviours but not validated on similar behaviours. This is unavoidable given that this is the first study to predict the intention to buy rhino horn using these theories. Third, the relationship between intention and respondents' past purchase of rhino horn was not significant. And, our study did not provide empirical evidence about the link between intention to buy and actually buying in the near future. This would require a randomized controlled trial or a temporally lagged design measuring intentions and behaviours at different points in time (e.g., Russell et al., 2017; Boyd and Wandersman, 1991).

6. Conclusions and recommendations

This study illustrates the potential of combining the TPB and the TIB to predict the intention to buy rhino horn. Our findings indicate that PBC is the most important determinant of the intention to buy rhino horn, followed by habit. More frequent and older users are less likely to intend to buy rhino horn in the near future. Attitude, subjective norm, social factor, and affect had no significant effects. These findings provide important implications for developing policies and behaviour change campaigns. Campaigns should focus on consumers with high disposable income who have access to rhino horn traders and are knowledgeable about the use of rhino horn. The effect of habit suggests that consumers having used rhino horn only once or a few times should be targeted as priority campaign audiences because they are more likely to intend to buy rhino horn in the near future. Campaigns should also be directed at relatively younger individuals in this group who may have a less traditional mindset and may be more responsive to campaign messages. Besides, efforts to enforce existing options for legal recourse through the Vietnamese penal code should be strengthened to reduce consumers' perceived ability to buy rhino horn at no risk. Graduated sanctions increasing in magnitude with offender income should be considered to affect the utility of high-income consumers.

Data availability

The dataset analyzed in this study is available at the University of Copenhagen's Electronic Research Data Archive (ERDA) at https://doi. org/10.17894/ucph.ad013106-697f-4632-b548-309b9a46e503.

Code availability

The R and NGENE script used in this analysis is available from the authors upon request.

Authors' contributions

Both authors contributed to the conceptualization of the project and the development of the survey and sampling procedures. D.V.H.N. and M.R.N. jointly designed the study. D.V.H.N. led the fieldwork, analyzed the collected data, and wrote the first draft of the manuscript. Both authors reviewed and edited the manuscript and gave final approval for publication.

Declaration of Competing Interest

The authors declare no competing interests.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi. org/10.1016/j.ecolecon.2022.107361.

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