




Sustainable behavior among millennials in Malaysia and China: The moderating role of social media usage

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ABSTRACT

As future leaders, millennials are invariably expected to adopt sustainable behavior (SB) and contribute to achieving the 2030 sustainable development goals. The bulk of existing research on SB and young people have applied a west-centric lens that are not adequately comparative in nature. By adopting the dual approaches of quantitative study and planned behavior theory, this study therefore intended to compare two Asian countries' Malaysia and China-millennials' input on SB and to examine the moderating role of social media usage with regards to such behavior. An online questionnaire was administered to 419 respondents from Malaysia and 416 respondents from China. The data were analyzed using the partial least squares structural equation modelling (PLS-SEM). PLS-SEM results indicated that the direct effects between the variables, which included the impact of sustainable knowledge and interpersonal influence on attitude toward sustainability (ATS); the impact of ATS on sustainable intention (SI); and the impact of SI on SB in both models (Malaysia and China) were found to be significant with only a slight difference in the path coefficients between the two models. Interestingly, PLS-SEM results also discovered no moderating effect of social media usage in both Malaysia and China. The result of the study is helpful for policymakers in both countries to use as reference when focusing on vital elements, such as sustainability knowledge to promote SB among their respective millennials.

Keywords: sustainable behavior, social media, millennials, survey, comparative study

INTRODUCTION

The advancement of technology has made social media one of the important tools in digital communication. Young people in particular have highly utilized social media to communicate and interact with each other beyond geographical borders. More importantly, during a critical period of COVID-19 pandemic, social media played a significant role as a platform for the public to obtain relevant and timely information (Naeem, 2021). At the same time, social media is one of the numerous interactive platforms that have enabled people to connect to each other (Ngien & Jiang, 2022). Additionally, it is also a platform that has been used by the education field for online teaching, information building, and student group collaboration during the pandemic (Tkacová et al., 2022). Due to its strong impact on human life, social media has been

labelled as one of the most influential information technologies (Alshare et al., 2022). Its prevalence and increased usage, therefore, has caught the interest of practitioners and scholars around the world (Bodhi et al., 2022).

Despite its many positives, social media is not without its drawbacks. Social media is often negatively associated with user addiction and the sharing of information without verification (Alshare et al., 2022). Another typical negative effect of social media is associated with the problem of flooded information, and its subsequent influencing factor for social fatigue among users (Zhang et al., 2022). In the workplace, social media usage (SMU) has also been linked to guilt and fatigue among users who deem it an obstruction towards productive behavior (Labban & Bizzi, 2022). Therefore, it is unsurprising to find that social media platforms are used for confronting the obstacles of discontinuance and loss of users that utilizes it for their activity (Fu et al., 2021; Zhang et al., 2022).

The sustainability communication research field has found social media to be an important tool for promoting sustainable behavior (SB) among the public. For instance, the promotion of sustainable tourism activities on social media have been found to impact upon SB among tourists in India (Gulati, 2022). Similarly, the frequent exposure of food waste prevention on social media not only increased public awareness of the issue, but also contributed to the public's negative reception towards food waste (Teoh et al., 2022). In addition, social media information on food consumption also promoted the acculturation to sustainable food consumption behavior among social media users (Choudhary, 2019).

Considering the correlation between SMU and sustainability, the Chinese government thus deems social media, especially mobile-based services, as an integral medium of sustainable development for the country (Yang & Zeng, 2018). Social media data are significant indicators in measuring the emotions and behaviors of Chinese residents towards the surrounding environment (Shan et al., 2021). Malaysia, on the other hand, is still currently undergoing a nationwide shift towards sustainable development (Tim et al., 2018). As such, the use of social media by the Malaysian government, especially via higher education institutions, is imperative to increase the social impact such as promoting environmental awareness and knowledge that can then use to strengthen environmental policies for the purpose of achieving sustainable development (Mohammed & Dominic, 2021).

The study by Huang et al. (2020) demonstrates the cultural gaps between Chinese and Malaysian Internet users in their participation in social networking platforms. In sharp contrast to the consumption worship of offline user groups, social media users advocate frugal and SB patterns (Chwialkowska, 2019), which deserves further study. Additionally, there are gaps in academic understanding of how social media affects young people, especially in today's rapidly changing landscape of social media forms (Tang et al., 2021). The depth of user participation in social media is affected by the context of participation, but there is a lack of empirical research on the factors that contribute to this effect (Cao et al., 2021).

Ample literature therefore points to sustainability and social media as two fields with high research interest, which has resulted in an emerging body of work that have been carried out at the intersection of these two research topics (Lee et al., 2021). A sizeable body of research have focused on researching the impact of social media on sustainability and SB, though the repertoire of work conducted on millennials aged between 18 to 41 years-old, is presently limited. The study on certain generations such as the millennials is important as this generation can play a significant role in shaping certain long-term trends in behavior (Grimal, 2020), particularly, SB. More importantly, millennials are the generation whose time is mostly spent using gadgets and surfing the internet (Lee et al., 2020), thus granting them the label of 'digital cohort' who possess extensive knowledge of and skilled users in technologies (Bargoni et al., 2023).

A few studies, notably Gulati (2022), Simeone and Scarpato (2020), and Sujata et al. (2019), focused on all ages groups of respondents in understanding their SB and its relationship to social media. Thus, it is essential for the present study to fill the void by studying millennials' views on social media and SB. In addition, little to no research has delved into a comparative analysis of perspectives between two countries, particularly among Asian nations such as Malaysia and China. Extant studies on millennials have predominantly focused on individual countries, such as Mun et al. (2017) and Tang et al. (2020) in the case of Malaysia, and Guo et al. (2021), Kong and Zhu (2021), and Luo et al. (2020) for China.

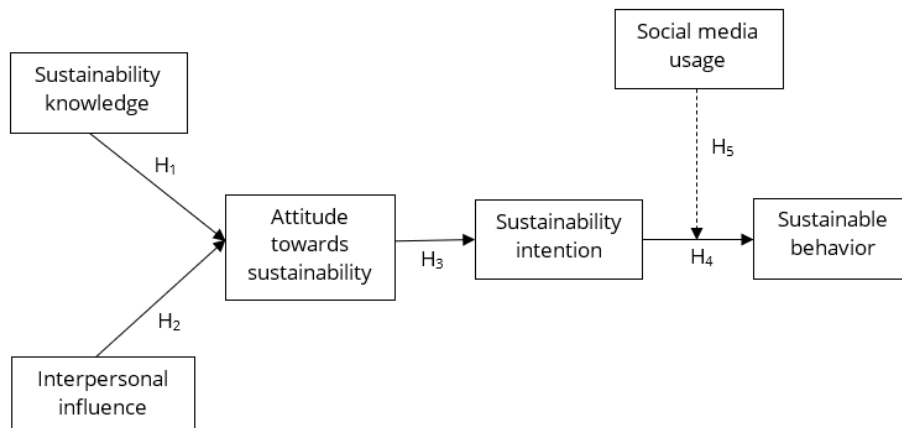


Figure 1. Theoretical framework of the study (Source: Authors)

Adopting a comparative study approach, this research aims to assess the direct impact of sustainability knowledge (SK) and interpersonal influence (II) on attitudes toward sustainability (ATS), as well as ATS toward sustainability intentions (SI). In doing so, the study also evaluates SI concerning SB among users. However, the primary emphasis lies in examining the moderating role of SMU on SIs and SB among millennials in both Malaysia and China.

THEORETICAL FOUNDATION

The theory of planned behavior (TPB) is one of the most widely-used theories in behavioral research (Ajzen, 1991), which includes those focusing on the impact of sustainability on behavior (Yuriev et al., 2020). TPB is applied as a theoretical foundation in research on sustainable usage of shared bicycles (Si et al., 2020), green consumption among youths (Amoako et al., 2020), and patronage of green restaurants (Moon, 2021). TPB assumes that individuals' behaviors are contingent upon rational decisions that they have made based on available knowledge and information. The three factors of attitude, perceived behavior, and subjective norms control constitute the model to explain the intention of a specific behavior of personal practice (Ajzen & Madden, 1986). The theoretical framework of TPB thus sets up a bridge between personality traits and SBs, exploring how personality traits including attitudes, will eventually affect behavior by affecting intentions (Liu et al., 2021).

The reliability of TPB was proven in research investigating the safety knowledge, norms, attitudes, and intentions of young people, as the modified TPB established a framework for safety and health knowledge, attitude towards behavior, as well as behavioral intentions (Guerin & Toland, 2020). Kristiyono and Felim (2021) constructed a framework based on TPB in their research on green consumption to prove that II has a positive impact on environmental attitudes, which positively affects green purchasing behavior. In addition, the moderating effects of social media (abundance and trustworthiness) were applied to the study on consumers' engagement intention and engagement behavior to construct a conceptual model (Cao et al., 2021).

This study integrated models applied in previous TPB research to understand and compare the influencing factors of attitude towards sustainability. The moderating effect of SMU was also incorporated, thus leading to the formation of the following theoretical framework in [Figure 1](#).

HYPOTHESES DEVELOPMENT

Sustainability education plays a key role in disseminating SK, and teachers and students involved in education for sustainable development subjects have been found to possess more positive attitudes towards sustainable development (Nousheen et al., 2020). The accumulation of knowledge helps consumers to clearly understand the advantages of environmentally sustainable commodities, leading to the formation of sustainability attitudes and reducing the attitude-behavior gap (Dhir et al., 2021). Also, an urban tourism scene game on a digital platform provides users with professional knowledge through the virtual environment, and

simulates and presents the simulated world environment, which leads to change on users' attitudes (Chan et al., 2022). Thus, the first proposed hypothesis is, as follows:

H₁. SK has a direct positive effect on ATS.

In a research on the relationship between II, altruism, and environmental knowledge and green purchasing behaviors, II of users of environmentally friendly products showed a positive and significant impact on environmental attitudes (Kristiyono & Felim, 2021). A study by Niwarthana et al. (2020) further supported the findings, as they found that under the influence of collectivism, II of Sri Lankan millennials positively affects their attitude towards green products, evidenced from their willingness to pay premium prices. In addition, IIs have also been shown to positively impact upon environmental attitudes in the research of young Indian consumers (Uddin & Khan, 2018). Thus, the second proposed hypothesis is, as follows:

H₂. II has a direct positive effect on ATS.

In a research on sustainable use of shared bicycles, users' behavioral attitudes have been shown to have a significant positive impact on sustainable use intentions (Si et al., 2020). The research of Akande et al. (2020) provides an integrated approach to sharing economy drivers, with attitudes identified as the best predictor of sustainable sharing intentions. In the extended theory of planned behavior, attitudes, subjective norms, perceived behavioral control, and curiosity have been shown to influence consumers' behavioral intentions to dine at sustainable restaurants (Tommasetti et al., 2018). Thus, the third proposed hypothesis is, as follows:

H₃. ATS has a direct positive effect on SIs.

According to the research of Liu et al. (2021), conservative household energy saving intentions have a significant impact on most energy saving behaviors. Behavioral intention is the best variable to explain effective SBs of consumers, and the greater the intention of people to engage in sustainable practices, the more likely they are to implement those behaviors (Ciasullo et al., 2017; Tommasetti et al., 2018). When employees gain support from their employers, they develop more positive attitudes, perceive stronger norms, and are subject to more behavioral control, resulting in a stronger intention to practice pro-environmental behavior (Leung & Rosenthal, 2019). Thus, the fourth proposed hypothesis is, as follows:

H₄. SI has a direct positive effect on SB.

In consumer behavior research, social media acts as a moderating factor that influences consumers' participation intention on participation behavior (Cao et al., 2021). Thus, communication interventions perceived by the public on social media make moderating effects in the relationship between consumption intention and consumption behavior (Sultan et al., 2020). Thus, the final proposed hypothesis is, as follows:

H₅. SMU moderates the relationship between SI and SB.

METHODOLOGY

Sampling & Data Collection

To achieve the research objective, an online survey was employed to collect research data. It is important to note that online survey was chosen due to the inability to conduct face-to-face surveys during COVID-19 (Bohler-Muller et al., 2021). This study's primary respondents consisted of millennials aged between 18 to 41 years-old from Malaysia and China. Aelbrecht and While (2021) emphasized the worthiness of researching millennials, especially since they have the potential in shaping the policy of any country. In this study, purposive sampling was adopted based on the participants meeting three criteria, as follows:

- (a) aged between 18 to 41 years-old during the data collection stage,
- (b) either Malaysian or Chinese nationality, and
- (c) live in their respective home country.

Non-citizens such as expatriates and foreign workers in Malaysia and China were excluded from this study as the nature of their residence is transitory. The snowball sampling method was also employed to obtain respondents from the contacts of previous respondents.

Data collection was performed using a self-administered online questionnaire, which was completed by 419 respondents from Malaysia, and 416 respondents from China. In total, 835 respondents answered the

Table 1. Summary of constructs items & sources

Constructs	Questionnaire items	Sources
SK	1 Protecting the environment is necessary for sustainability.	Michalos et al. (2012)
	2 Human actions are contributing to changes in our atmosphere and climate systems.	
	3 Sustainability requires shifting to the use of renewable resources as much as possible.	
	4 Good citizenship is necessary for sustainability.	
	5 Sustainability requires people to reflect on what it means to improve the quality of life.	
II	1 It exerts pressures on individuals to respond in a certain way	Jain et al. (2020)
	2 I believe that II affects behavior.	
	3 It influences the behavior of individuals.	
	4 I believe opinion seekers depend on people for advice.	
ATS	1 Sustainability is good	Sujata et al. (2019)
	2 I believe that my SB will help reduce pollution.	
	3 I believe that my SB will help reduce wasteful use of landfills.	
	4 I believe that my SB will help conserve natural resources.	
	5 I feel good about myself when I behave in a sustainable way.	
SI	1 I plan to take part in sustainability activities.	Sujata et al. (2019)
	2 I am willing to take part in sustainability activities advocated in social media in near future.	
	3 I intent to behave in a sustainable way in the future.	
SMU	1 I am always keen to use social media	Jain et al. (2020)
	2 I often read posts shared on social media	
	3 Social media posts influence my opinions.	
	4 My behaviors are guided by social media	
SB	1 I pick up litter when I see it in a park or a natural area.	Michalos et al. (2012)
	2 I volunteer to work with local charities or environmental groups.	
	3 I have thought quite a bit about how to live sustainably.	
	4 I choose to walk or bike to places instead of using a motor vehicle.	
	5 I never waste water.	
	6 At home I recycle as much as I can.	
	7 I have changed my personal lifestyle to reduce waste.	

distributed online survey. The online questionnaire consisted of two sections: the first section collected demographic data, and the second section obtained information related to exogenous constructs, i.e., SK, II, attitude toward sustainability (ATS), SI, and SMU as a moderator, and endogenous construct (i.e., SB). To ensure the respondents can easily understand and answer the survey, all the multiple-choice questions were composed using simple sentences (Lee et al., 2020).

The questionnaire was first prepared in English (Ponis & Lada, 2021) and later translated to Malay and Mandarin by two experts in the field of sustainability and communication. Both experts are fluent in English language. One of them is native in Malay language and the other one is native in Mandarin. The questionnaire was then subsequently back-translated into English to check potential differences in meaning. Eventually some items were revised. The questionnaire was then distributed in Malay and English in Malaysia, whereas the Chinese counterparts received the Mandarin version only. The respondent's participation in this study was voluntary (Abate et al., 2022), and no incentive was provided to respondent in answering the survey (Duh & Dabula, 2021). Consent was acquired from each respondent before answering the questionnaire form. In the first page of questionnaire, respondents were informed about the purpose of study, as and assurance was given that their answers would be kept for academic use only. Following research ethics, the respondents' identities were kept confidential (Suresh et al., 2022). The questionnaire took 15-20 minutes to be completed.

The relevant items used in this study were adapted from the existing literature as presented in **Table 1** to best fit this study's settings and objectives. In order to make sure that the chosen items are suitable and relevant to this study, a content validity was conducted by two experts in the field. Both agreed that the selected set of scale items were appropriate and relevant to the content domain of the construct that it is trying to measure. Nevertheless, later the discriminant validity demonstrated the validity of the chosen items. In other words, each group of chosen items have reflected the target construct, which make it different than other constructs. Moreover, the analysis demonstrated that the chosen items were appropriate and test what they are supposed to test. The items then used to measure SK and SB, which were adapted from a study by Michalos et al. (2012); ATS and SI were adapted from Sujata et al. (2019); while the items of II and SMU were adapted from Jain et al. (2020).

Table 2. Characteristics of respondents (n=835)

Demographics		Malaysia (n=419)		China (n=416)		Total (n)
		Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	
Sex	Male	135	32.2	190	45.7	325
	Female	284	67.8	226	54.3	510
Marital status	Single	325	77.6	229	55.0	554
	Married	90	21.5	181	43.5	271
	Divorce	4	1.0	6	1.4	10
Age	18-23	220	52.5	130	31.3	350
	24-29	101	24.1	75	18.0	176
	30-35	55	13.1	70	16.8	125
	36-41	43	10.3	141	33.9	184
Education	Primary school	1	0.2	1	0.2	2
	High school	34	8.1	0	0.0	34
	Diploma/college	47	11.2	31	7.5	78
	First degree/undergraduate	290	69.2	351	84.4	641
	Master's degree	26	6.2	19	4.6	45
	PhD	6	1.4	3	0.7	9
	Middle school	0	0.0	10	2.4	10
Other	15	3.6	1	0.2	16	
Occupation	Civil servant	99	23.6	1	12.0	100
	Private employee	67	16.0	0	8.0	67
	Student	223	53.2	31	30.4	254
	Entrepreneur	14	3.03	351	43.7	365
	Teacher	3	0.7	19	2.6	22
	Self-employed	0	0.0	3	0.4	3
	Professionals	0	0.0	1	0.1	1
	Other	13	3.1	10	2.8	23
Monthly income	USD 866 & below	341	81.4	209	9.9	550
	USD 867-1,866	72	17.2	166	47	238
	USD 1,867 & up	6	1.4	41	5.6	47
Duration of SMU	≤1 hour	54	12.9	18	4.3	72
	2 hours	123	29.4	112	26.9	235
	3 hours	122	29.1	120	28.8	242
	≥5 hours	120	28.6	166	39.9	286

Data Analysis

To analyze the collected data, statistical package for the social sciences (SPSS) version 25 and SmartPLS 3 software were used. SPSS was used for inferential (descriptive) analysis (i.e., the characteristics of respondents). While partial least squares structural equation modelling (PLS-SEM) method was applied through SmartPLS 3 to test the proposed research hypotheses. SmartPLS as second generation of statistic was selected due to its ability to manage low sample size, data that lack normality, and an intricate structural model with many constructs, indicators, and model correlations (Hair et al., 2019). Two main model assessments are considered in the analysis when using SmartPLS; measurement model assessment (outer model) and structural model (inner model).

The demographic data in **Table 2** presents the characteristics of respondents from Malaysia and China. In total, out of 835 respondents, 419 and 416 respondents from Malaysia and China answered the survey, respectively. Majority of respondents in both countries were female (Malaysia, n=284; China, n=226), and single (Malaysia, n=325; China, n=229). However, in terms of age, majority respondents from Malaysia were aged between 18 to 23 years-old (n=220), while majority respondents from China were aged between 36 to 41 years-old (n=141). In addition, majority respondents are degree holders (Malaysia, n=290; China, n=351). In terms of occupation, majority respondents from Malaysia comprised of students (n=223). In contrast, majority respondents from China comprised of entrepreneurs (n=351). Majority respondents from both countries have average incomes of USD 866 and below (Malaysia, n=341; China, n=209). In terms of the duration of their daily SMU, majority of respondents in Malaysia and China use social media for at least two hours and more. Overall, **Table 2** shows that the proportion of younger (18-23 years-old) participants in Malaysia is higher than that in China (Malaysia=52.5%, China=31.3%), in contrast, the proportion of older participants in China (36-41 years-old) is higher than that of Malaysian participants (Malaysia=10.3%,

China=33.9%). Previous research has shown that age gaps among respondents may lead to differences in their attitudes towards SB (Walsh et al., 2021), which may ultimately play a role in the survey results. Although teenagers have been shown to be more active and engaged on social media than adults (Jang et al., 2016), heavy users of social media (usage of more than five hours a day) among Chinese respondents in this survey are still much higher than Malaysia (39.9%>28.6%).

RESULTS

As mentioned earlier, two assessments needed to be performed for PLS-SEM: the measurement models or outer models' assessment, and the structural model or the inner model. For each assessment, different statistical tests need to be conducted.

Measurement Model Assessment

The assessment of internal consistency reliability and the examinations of convergent and discriminant validity for all reflective constructs is required to evaluate the measurement model's quality. Convergent validity refers to the degree to which individual indicators reflect a construct converging in comparison to indicators measuring other constructs. While discriminant validity refers to the degree to which indicators differentiate across constructs or measure distinct concepts by examining the correlations between the measures that could potentially overlap. In other words, it refers to the extent the constructs under investigation are truly distinct from one another. Therefore, to assess the internal consistency of measures Cronbach's alpha (CA), composite reliability (CR), and rho A are used.

Nevertheless, some of the researcher report only CA and CR. The desirable value for CA and CR is >0.70 (Avkiran & Ringle, 2018). However, in some cases, to establish the convergent validity, items with values between 0.60 and 0.70 could be retained to meet the preferred average variance extracted (AVE) rate of 0.50 or higher (Hair Jr et al., 2017). For discriminant validity, Fornell-Larcker criterion and Heterotrait-Monotrait (HTMT) ratio of correlations are usually used. In Fornell-Larcker criterion, square root of AVE must be greater than correlation of reflective construct with all other constructs (Hair Jr et al., 2017). Though HTMT ratio of correlations becomes the primary criterion for assessing discriminant validity, a threshold value of 0.85-0.90 is proposed for HTMT (Hair et al., 2019). **Table 3** shows construct reliability and validity (Malaysia vs. China).

Table 3. Construct reliability & validity (Malaysia vs. China)

Constructs/associated items	Loading		CA		rho A		CR		AVE	
	Malaysia	China	Malaysia	China	Malaysia	China	Malaysia	China	Malaysia	China
SK			0.813	0.771	0.814	0.772	0.870	0.845	0.572	0.522
SK1	0.750	0.744								
SK2	0.790	0.741								
SK3	0.751	0.685								
SK4	0.781	0.726								
SK5	0.709	0.717								
II			0.847	0.827	0.883	0.835	0.894	0.884	0.678	0.657
II1	0.780	0.780								
II2	0.863	0.863								
II3	0.877	0.877								
II4	0.768	0.768								
ATS			0.905	0.837	0.905	0.843	0.930	0.885	0.727	0.608
ATS1	0.744	0.706								
ATS2	0.883	0.821								
ATS3	0.876	0.739								
ATS4	0.894	0.813								
ATS5	0.858	0.812								
SI			0.839	0.746	0.847	0.750	0.903	0.856	0.756	0.664
SI1	0.903	0.862								
SI2	0.849	0.779								
SI3	0.856	0.802								
SMU			0.752	0.747	0.788	0.747	0.838	0.841	0.564	0.569
SMU1	0.706	0.738								
SMU2	0.794	0.717								

Table 3 (Continued). Construct reliability & validity (Malaysia vs. China)

Constructs/associated items	Loading		CA		rho A		CR		AVE	
	Malaysia	China	Malaysia	China	Malaysia	China	Malaysia	China	Malaysia	China
SMU3	0.752	0.794								
SMU4	0.750	0.767								
SB			0.839	0.856	0.853	0.860	0.878	0.890	0.510	0.536
SB1	0.606	0.724								
SB2	0.708	0.780								
SB3	0.746	0.739								
SB4	0.646	0.678								
SB5	0.698	0.697								
SB6	0.766	0.759								
SB7	0.809	0.744								

Table 4. Discriminant validity (Fornell-Larcker criterion) (Malaysia vs. China)

	Malaysia						China					
	SK	II	ATS	SI	SMU	SB	SK	II	ATS	SI	SMU	SB
SK	0.756						0.723					
II	0.380	0.823					0.477	0.810				
ATS	0.698	0.459	0.853				0.750	0.531	0.780			
SI	0.526	0.470	0.516	0.870			0.577	0.686	0.661	0.815		
SMU	0.255	0.274	0.284	0.423	0.751		0.419	0.508	0.397	0.562	0.755	
SB	0.342	0.577	0.363	0.604	0.291	0.714	0.552	0.721	0.603	0.750	0.509	0.732

Table 5. Discriminant validity (HTMT criterion) (Malaysia vs. China)

	Malaysia						China					
	SK	II	ATS	SI	SMU	SB	SK	II	ATS	SI	SMU	SB
SK												
II	0.421						0.582					
ATS	0.812	0.489					0.931	0.624				
SI	0.627	0.534	0.583				0.757	0.865	0.832			
SMU	0.317	0.331	0.338	0.514			0.549	0.647	0.501	0.754		
SB	0.397	0.673	0.402	0.702	0.325		0.672	0.844	0.708	0.935	0.631	

Table 4 shows discriminant validity (Fornell-Larcker criterion) (Malaysia vs. China).

Table 5 shows discriminant validity (HTMT criterion) (Malaysia vs. China).

Structural Model Assessment

When the measurement model assessment is satisfactory as demonstrated above, the next step in evaluating PLS-SEM results is the assessment of the structural model. First, before conducting the path coefficient estimation, the collinearity among the constructs is examined. The variance inflation factors value for all predictors was lower than five, which indicates that the collinearity is not an issue in both models. Next, to investigate the proposed hypotheses and direct relationships, the significance of path coefficients was tested. The statistics show that the four hypotheses for each model (Malaysia and China) were supported.

Moreover, the overall data also show that the value of path coefficients in the China model is higher than in Malaysia. **H₁**, China model the impact of SK on attitude towards sustainability (SK→attitude towards sustainability [ATS]) is ($\beta=0.643$, $p<0.05$) while the Malaysia model is slightly lower ($\beta=0.612$, $p<0.05$). However, **H₂** recorded almost similar results, where the Malaysia model shows that the path coefficient between II and attitude towards sustainability (II→ATS) is slightly higher ($\beta=0.227$, $p<0.05$), while the China model is ($\beta=0.225$, $p<0.05$).

For **H₃** and **H₄**, the bath coefficients are higher for the China model. **H₃**, the influence of ATS on SI (China model) is ($\beta=0.661$, $p<0.05$), and **H₄**, the impact of SI on SB is ($\beta=0.678$, $p<0.05$). On the other hand, the Malaysia model recorded the value of path coefficients for **H₃** and **H₄**, as follows $\beta=0.5816$, $p<0.05$; $\beta=0.585$, $p<0.05$, respectively.

Table 6. Results of R^2 (Malaysia vs. China)

	R^2 value		Sample mean		Standard deviation		t-value		p-value	
	Malaysia	China	Malaysia	China	Malaysia	China	Malaysia	China	Malaysia	China
ATS	0.531	0.601	0.540	0.605	0.036	0.039	14.685	15.408	0.000	0.000
SI	0.266	0.437	0.269	0.438	0.042	0.048	6.403	9.098	0.000	0.000
SB	0.366	0.574	0.373	0.578	0.037	0.037	9.883	15.603	0.000	0.000

Table 7. Result of Q^2

	Malaysia	China
ATS	0.378	0.357
SI	0.194	0.284
SB	0.178	0.302

Moderating effect of social media usage

In a PLS path modelling context, the moderating effects describe a moderated relationship within the structural model (Fassott et al., 2016). In other words, one construct moderates the direct relationship between two other constructs. The moderation analysis involves several approaches that include Product-Indicator, Two-Stage, and Orthogonalizing (Memon et al., 2019). In this study, the Orthogonalizing method, which is applicable when both independent and moderating factors are reflective, was employed (Memon et al., 2019). Surprisingly, the analysis demonstrates that the moderating effect of SMU on the linkage between sustainability intension and SB is not significant at $p < 0.05$ in both models. So, **H₅** was not supported.

In addition, in both models, the structural models were evaluated by R^2 values of the endogenous variables (Table 6). The R^2 ranges from zero to one, with higher values indicating a greater explanatory power (Hair et al., 2019). The R^2 values in the two models show different degrees of effect. The value of R^2 values in the China model is higher than in the Malaysia model. For instance, the China model indicates an R^2 of 0.574, which indicates that the moderator variable (SMU) and the predictor variable (intention sustainability) explain 57.4% of the variance in SB. In contrast, in the Malaysia model the same variables explain only 36.6% (0.366) of the variance in SB. However, in both models the R^2 falls between 0.50 and 0.25, which is considered as moderate (Hair et al., 2019). In addition, the Q^2 are calculated to assess PLS path models' predictive accuracy (Table 7). Using the blindfolding procedure, the result shows that there is a difference in the value of Q^2 between the two models. However, the Q^2 value is greater than zero in both models, which indicates that both models have predictive accuracy. Nevertheless, when comparing between the two models, the China model shows a higher value of Q^2 except for ATS (Table 7).

DISCUSSION

This study compared between Malaysia and China's millennials' input on the impact of sustainable knowledge and II on ATS, and the impact of ATS-on-SI, as well as the influence of sustainable intention on SB. In other words, it was examining the direct effect between the earlier mentioned variables (**H₁**, **H₂**, **H₃**, and **H₄**). This study also investigated the moderating effect of SMU between the sustainable intention and SB (**H₅**) in both samples. The results reveal that the direct effects between the variables in both models are significant with only a slight difference in the path coefficients between the two models. For example, the path coefficient between SK and attitude towards sustainability are recorded as $\beta_7 = 0.643$ for the China sample, and $\beta_7 = 0.612$ for the Malaysia sample. In similar context, Mohamad Saleh et al. (2022) reported that SK can affect individuals' attitudes. Likewise, Kristiyono and Felim (2021) found that II has a positive and significant effect on environment attitude. The structural model shows a slightly higher path coefficient in China than in Malaysia, which may be related to the higher age of the respondents in China (Table 8).

Table 8. Results of path coefficient & moderating effect (Malaysia vs. China)

R&H	Standardized beta		Standard error		Standard deviation		t-value		p-value	
	Malaysia	China	Malaysia	China	Malaysia	China	Malaysia	China	Malaysia	China
SK→ATS	0.612	0.643	0.614	0.644	0.040	0.037	15.347	17.516	0.000	0.000
II→ATS	0.227	0.225	0.228	0.225	0.038	0.037	5.964	6.019	0.000	0.000

Table 8 (Continued). Results of path coefficient & moderating effect (Malaysia vs. China)

R&H	Standardized beta		Standard error		Standard deviation		t-value		p-value	
	Malaysia	China	Malaysia	China	Malaysia	China	Malaysia	China	Malaysia	China
ATS→SI	0.516	0.661	0.517	0.661	0.040	0.036	12.905	18.229	0.000	0.000
SI→SB	0.585	0.678	0.584	0.677	0.037	0.036	15.667	18.944	0.000	0.000

Note. R&H: Relationships & hypotheses & p<0.05

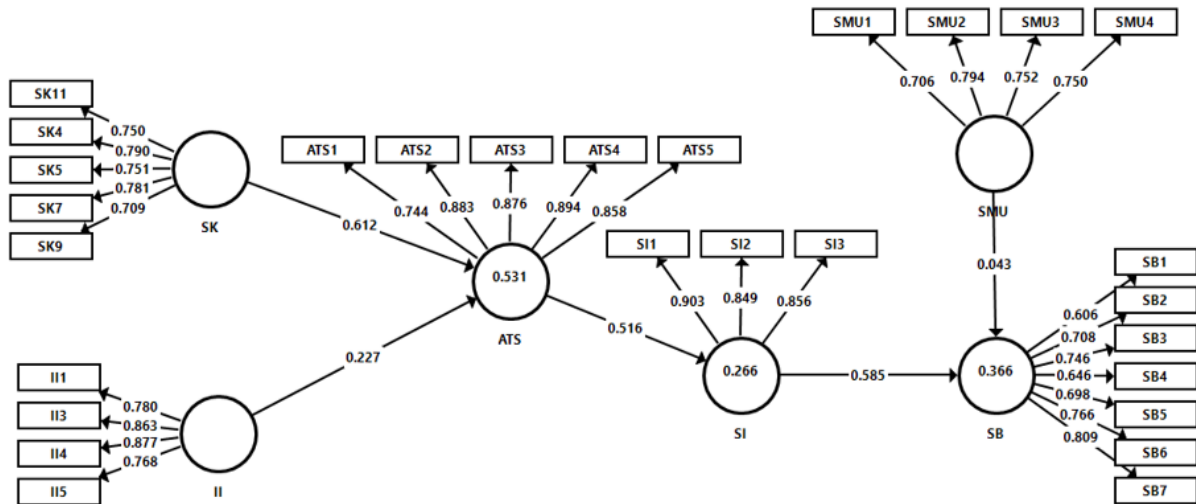


Figure 2. Structural model (Malaysia) (path coefficient analysis) (Source: Authors)

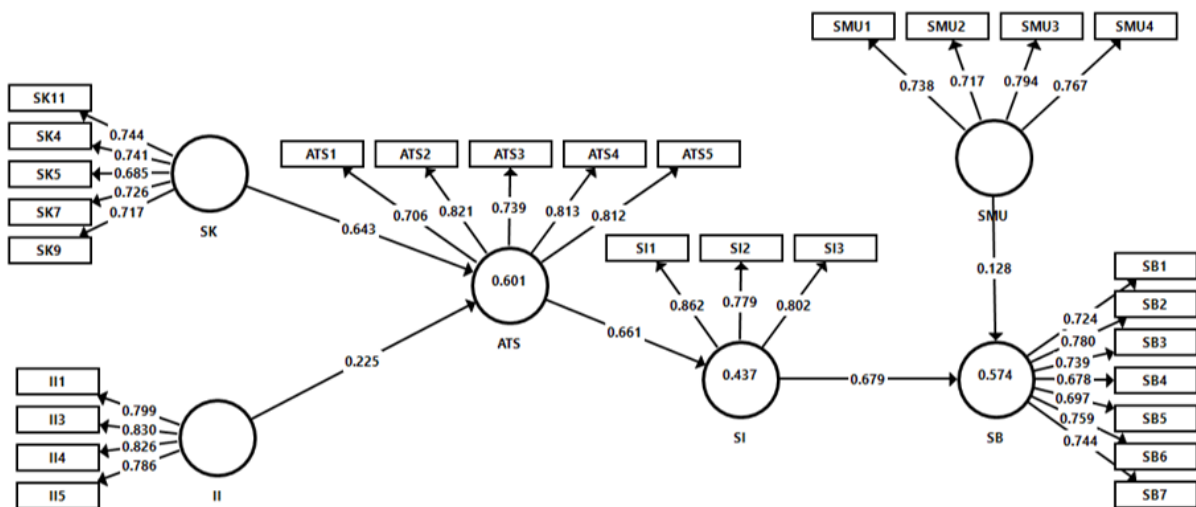


Figure 3. Structural model (China) (path coefficient analysis) (Source: Authors)

Table 9. Moderating effects of SMU

Hypotheses	Standardized beta		Standard error		Standard deviation		t-value		p-value	
	Malaysia	China	Malaysia	China	Malaysia	China	Malaysia	China	Malaysia	China
SI*SMU→SB	0.516	0.661	0.517	0.661	0.040	0.036	12.905	18.229	0.000	0.000

Note. p<0.05

Figure 2 shows structural model (Malaysia) (path coefficient analysis).

Figure 3 shows structural model (China) (path coefficient analysis).

Previous research suggest that this is because the older the respondents, the stronger the relationship between their behavioral control and intentions towards green behaviors becomes (Moon, 2021). Increased SMU may also strengthen this kind of relationship (Farronato et al., 2022) (**Table 9**).

Figure 4 shows structural model (Malaysia) (moderation analysis) while **Figure 5** shows structural model (China) (moderation analysis).

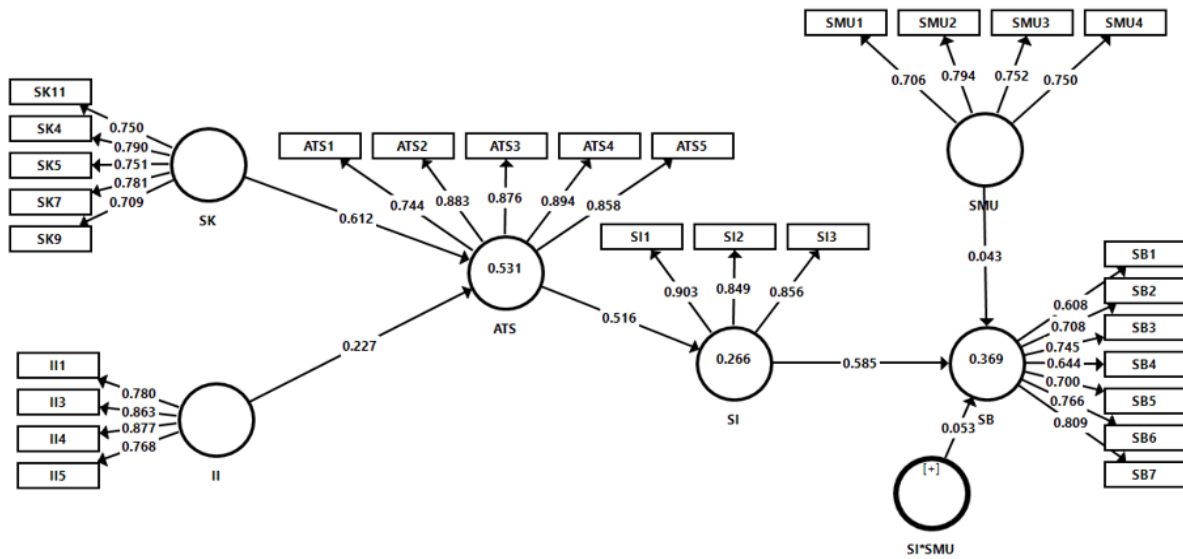


Figure 4. Structural model (Malaysia) (moderation analysis) (Source: Authors)

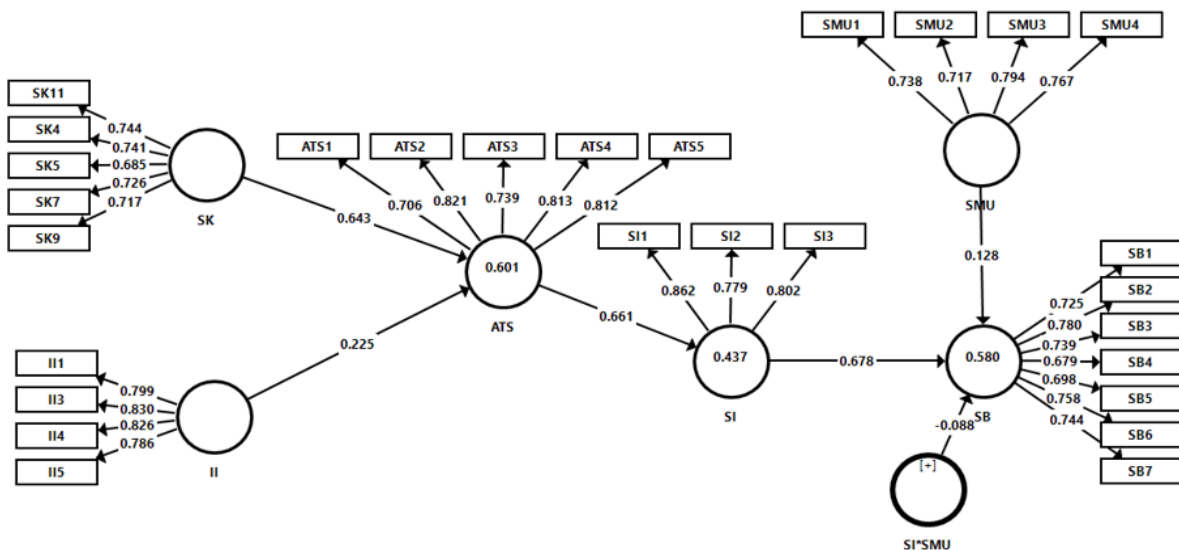


Figure 5. Structural model (China) (moderation analysis) (Source: Authors)

Regarding the relationship between the ATS and SI, the result of this study is consistent with findings from past studies such as those by Mohamad Saleh et al. (2022), Swaim et al. (2014), and Trivedi et al. (2018). Likewise, the relationship between SI and SB is consistent with past studies (see Al Mamun et al., 2018; Mohamad Saleh et al., 2022). This is also in line with TPB, where the actual SB can be predicted through behavioral intention (Teoh et al., 2022).

In addition, although many previous studies such as Ali and Aziz (2021), Bozkurt and Gligor, (2021), and Shang et al. (2021) demonstrated the moderating role of SMU, the result of the current study shows no moderating effect of SMU in both models (China and Malaysia). To put it differently, in this study the moderating role of SMU for the relationship between intention sustainability and SB (H₅) was not supported in both models. Nevertheless, Ramayah et al. (2018) mentioned that the *R*² is an important value in the analysis of the moderating effect and thus should be considered. Therefore, by looking at the *R*², the result show that the *R*² values in the China model were higher than it is in the Malaysia model. In addition, the result show that the value of *Q*² was higher in China model than it is in Malaysia model as well.

From the *R*² value of the dependent variable (SB) in the two (China and Malaysia) models was different in the China model (*R*²=0.574 or 57.4%), which indicates that 57.4% of the variance or change in SB is predicted by their SI.

Whereas the R^2 in the Malaysia model represent 36.6% of the variance in SB, which is predicted by the individuals' SI. It can be concluded that the level of SI is higher among Chinese than it is among Malaysians to adopt SB or lifestyle. In other words, SI of China respondents has more effect on their SB compared to respondents in Malaysia. In this regard, Wang and Mangmeechai (2021) reported that people with strong behavioral intentions are more likely to engage in behaviors such as pro-environmental or SB.

Besides, the findings of the current study demonstrate no significant difference between China and Malaysia samples. This poses interesting insights as Malaysia and China are heterogenous and homogenous societies, respectively, with very different contextual and cultural backgrounds. A significant difference in the result between both countries was expected, because Ngang (2012) discovered a difference between the agreement and implementation level on the practice of Malaysian and Chinese special education teacher leadership. Hence, it is safe to conclude that the findings of the study indicated that the background of the country and demography profile has no significant influence towards the determination of SK, attitude, intention, behavior as well as the social media on sustainability among the millennials. This is quite similar to a finding of past study conducted by Baohui and Nik Hasan (2014) who found a similarity between the perception of Malaysian and Chinese journalists towards their professional roles in delivering the information to the public versus being the spokesperson and earning profit.

Interestingly, the same findings of this study demonstrate that the impact of SK on individuals' attitude (for Malaysia, $SK \rightarrow ATS$, $\beta=0.612$, for China, $SK \rightarrow ATS$, $\beta=0.643$) is more than the impact of II (for Malaysia, $II \rightarrow ATS$, $\beta=0.227$, for China, $II \rightarrow ATS$, $\beta=0.225$). As a result, based on this finding, SK should be taken into consideration by the authorities in both countries in projects related to sustainable development.

CONCLUSIONS

Overall, the findings of this study can be helpful for sustainable development in general for both countries to overcome several problems related to the environment, society, and economy by understanding the potentially damaging behaviors of some individuals to our planet (Hiratsuka et al., 2018; Steg, 2016). For instance, it can benefit various sectors, firms and industries, marketers and marketing related to sustainability to understand millennials' attitudes and consumption, their behavioral inclinations, and the suitability of relevant consumer products. In addition, understanding millennials' behavior will help the industry to produce and design the right product to change their unsustainable behaviors to sustainable ones. As a result, many environmental, social, and economic problems can be solved or mitigated, such as the depletion of natural resources. Moreover, the findings of this study could be helpful for authorities and policymakers to set policies accordingly primarily related to SK enhancement among the millennials. Marketers could benefit from the findings of this study by promoting sustainable products for consumers who are adopting a sustainable lifestyle (Matharu et al., 2020).

Furthermore, from a theoretical standpoint, this study significantly contributes to TPB literature by delving into a relatively novel dependent construct—SB, as opposed to the conventional focus on pro-environmental behavior (Navarro et al., 2020). This expansion of TPB framework involves the introduction of SK and II as determinants influencing individuals' attitudes toward sustainability.

Additionally, different from the view that social media plays an important role in TPB, which is supported by many researchers (Ali et al., 2023; Joo et al., 2020; Rodrigo & Mendis, 2023; Wallace & Buil, 2023), this study raises the possibility that social media does not show a moderating effect on TPB in a special context. The special context arising from millennials and SB deserves to be further explored in TPB study. The exploration of the moderating effect of SMU enriches the literature on TPB model and sustainability, particularly within the unique context of a developing country like Malaysia. Notably, Matharu et al. (2020) have underscored the inadequacy of literature addressing sustainability-related behavior. Hence, this research and its findings are poised to make a substantial contribution to the knowledge base surrounding behavior and sustainability.

This study, like any that employed the survey method, is nevertheless constrained to self-reporting, which may lead to inaccurate measures resulting from social desirability bias. This could be considered as a limitation for this study. Another limitation concerns the cross-sectional nature of the data collected in this study. Thus, future research can avoid the limitations of this study and benefit from it to conduct further studies in different contexts using other methods and theoretical perspective.

For instance, researchers may adopt a longitudinal study, whereby data collection is conducted over a period of time, rather than a cross-sectional one, whereby data are collected at only one point in time. Future researchers may also employ qualitative methods such as the in-depth survey or focus group discussion to obtain more in-depth and insightful commentary from the participants. In addition, future research may employ the theory of interpersonal behavior as a theoretical foundation in order to get more insights related to SB phenomenon. Furthermore, future studies could adopt different items to investigate the effect of SMU as a moderator between the attitude and SI. Moreover, emphasizing the indirect effect (i.e., mediating effect) will enhance the value of similar future studies. In fact, future researchers are invited to conduct a comparative study between Asian countries with similar cultural and socio-historical backgrounds such as between Malaysia and Indonesia.

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Declaration of interest: The authors declare no competing interest.

Data availability: Data generated or analyzed during this study are available from the authors on request.

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