

Article

# The Theory of Reasoned Action Applied to Green Smartphones: Moderating Effect of Government Subsidies

Hsiang Te Liu <sup>1</sup> and Ruey-Chyn Tsaur <sup>2,\*</sup> 

<sup>1</sup> Department of Public Affairs, Ming Chuan University, Taoyuan 333, Taiwan; lback@mail.mcu.edu.tw

<sup>2</sup> Department of Management Sciences, Tamkang University, New Taipei 251, Taiwan

\* Correspondence: rctsaor@mail.tku.edu.tw

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**Abstract:** Smartphones have become indispensable for human beings today. However, with mobile phone manufacturers updating existing models or launching new models every year, consumers tend to keep replacing their phones with the latest versions, resulting in an excessive waste of resources. These days, most governments worldwide emphasize energy conservation and carbon reduction. If pre-owned smartphones are refurbished or repaired, the excessive waste of resources can be reduced. Such recycling can positively enhance corporate image, while ensuring that consumer needs are met. Thus, to explore consumers' willingness to purchase such "green" smartphones, this study uses the theory of reasoned action (TRA) to explore consumers' purchase intentions and understand how brand equity, green marketing, as well as consumer's green awareness and attitude influence this intention. This research also investigates the role of government subsidies as a moderator affecting consumers' willingness to purchase green smartphones. The results indicate that, in general, consumers are willing to purchase green smartphones, the direct effect of brand equity on purchase intention is significant, and government subsidies have significant moderating effects. Therefore, it is recommended that the government cooperate with enterprises. The cooperation can be aimed at promoting green products as well as subsidizing consumers, to increase their willingness to purchase green smartphones.

**Keywords:** green marketing; green awareness; TRA; government subsidies

## 1. Introduction

Green products refer to products that are harmless to humans or animals, and cause less harm to the environment compared with conventional products which can be designed to be reused, disassembled, and remanufactured, or its materials can be recycled, reducing with minimum environmental impact than other products [1,2]. The refurbished smartphone strives to protect or enhance the natural environment by conserving energy and/or resources and reducing or eliminating use of toxic agents, pollution, and waste, therefore, we can define refurbished smartphones to be green products. Since the launch of the America's Apple iPhone in 2007, the frequency at which new generations of smartphones are introduced has increased. The number of discarded or idle smartphones is increasing steadily each year. To solve the problem of discarded smartphones, this research adopts a previous definition of green products to include refurbished recycled products [1,2], which perform just as well as new products. In terms of the entire supply chain, the process of recycling, component purchasing, refurbishing, and remanufacturing for used smartphones involves numerous evaluations and precise and eco-friendly production processes. An eco-friendly company can build consumer trust that the brand and its products are reliable and trustworthy, and then increase the consumer's intent to buy

green products. By focusing on green marketing and implementing green value chains, companies with good brand equity can increase their environmental performance and competitive advantages with less environmental harm during the process from design to production. Furthermore, environmentally unfriendly products will gradually disappear from the market. Therefore, consumers' intent to consume will facilitate or prompt companies to launch green products that both satisfy customer needs and increase environmental awareness, thereby promoting the environment, economy, and society [3–5]. Empirical studies show that of the 40% of consumers who are willing to buy green products, only 4% purchase green products which remain extremely low [6,7]. To understand the factors influencing consumers' purchase of green products, this research aims at exploring the following six topics: (1) the impact of green marketing on consumers' green awareness; (2) the impact of green awareness on consumers' intent to buy green products; (3) the impact of government subsidies on relationship of consumers' attitude and intent to buy green products; and (4) the direct impact of green attitude on consumers' intent to buy green products; (5) the impact of brand equity on purchase intention; (6) the impact of brand equity on attitude.

This research applied the theory of reasoned action (TRA) in the context of green consumption [8,9]. Although the TRA model is old, many consumer survey studies today continue to base their research dimensions and questionnaires on this model, making it a definitive theory [10–15]. Adopting the definition of brand equity in the classic literature by Aaker and Keller, this study proposed a consumer green product purchase model which integrated the green marketing, brand value, and green consciousness perspectives, to ensure consistency in the discourse [16–19] with respect to meeting the economic, social, and environmental triple bottom line [20]. In terms of consumer product buying or brand behavior, the theory of reasoned action model is shown in Figure 1.

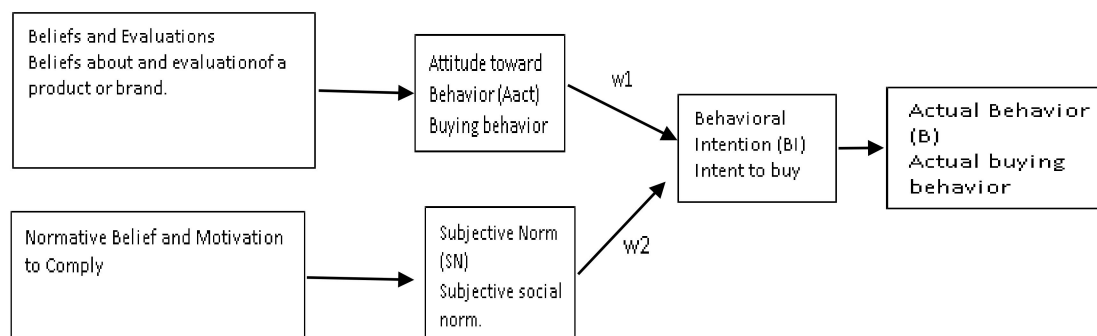


Figure 1. Theory of reasoned action (TRA) consumer buying model [9].

The TRA model in Figure 1 can be expressed by the following equation:

$$B - BI = Aact (w1) + SN (w2), \quad (1)$$

where B represents consumer buying behavior; BI represents consumer intent to implement the buying behavior; Aact (attitude toward action) represents consumer attitude toward implementing a buying behavior or action; SN (subjective or social norm) represents the expectation of others, where the consumer complies with subjective or social norms; and w1 and w2 represent the relative weights of the impact of Aact and SN on BI. Finally, this study uses structural equation modeling (SEM) in AMOS software to verify the established hypothesis. In the past, many studies have also used TRA to study green product issues, but most of them have completely applied TRA to green product attitudes, subjective norms, and purchase intentions. Few studies have incorporated the government subsidy dimension into the theory of reasoned action. In fact, green products are often purchased at a higher price or sold after being recycled. Consumers' willingness to purchase refurbished mobile phones cannot be increased quickly, and government subsidy policies have become an important thrust. This study can be said to be an expansion of TRA. In addition to the original consumer attitudes, cognition,

and behavioral intentions, the inclusion of government subsidies is one of the main research values of this study. In addition, this study introduces brand equity as consumers' evaluation of products, which in turn affects attitude perception. In this study, green awareness is regarded as a subjective norm in the TRA, and environmental protection awareness forms a kind of social norm to some extent. Finally, this article also regards green marketing as the incentive of consumers. These are the extensions of the TRA and which are considered as the second research value of this study.

This paper is organized as follows. In Section 2, we show a brief literature review to formulate the framework of hypotheses between TRA and green marketing, brand equity, green awareness, attitude, government subsidy, and purchase intention. Then, in Section 3, methodologies for the questionnaire design, measure scale, data collection, and statistical analysis are proposed. The analytical result using an SEM model is shown in Section 4. A discussion of the results compared with previous research is shown in Section 5, and finally, an overall summary and direction for future research is discussed in Section 6.

## 2. Literature Review and Hypothesis Development

According to the TRA model, when consumers implement a purchase action, they benefit from that behavior and earn approval from others. The TRA attempts to predict consumer buying behavior and intent. While the model states that buying intent precedes actual consumer buying behavior, in reality, actual behavior and behavioral intent are only prerequisite but not necessary conditions. In other words, whereas buying intent must be present for an actual buying behavior to occur, the presence of buying intent does not necessarily lead to actual buying behavior. In the TRA equation, buying behavior and buying intent are expressed as B–BI without using an equal sign because it is generally inaccurate to predict future buying behavior by measuring behavioral intent in advance [21,22]. Prediction studies on consumer buying behavior generally stop at buying intent, and this research is no exception. This means that the prediction regarding consumers' purchase of green products stops at their intent to buy green products. In the context of green consumption, the main dimensions in Ajzen and Fishbein's TRA model of general consumer buying can be transformed into corresponding dimensions in "the model of consumer intent to buy green products" [9].

In the context of green consumption, consumers will compare the overall value they can obtain from green brands with the price they have to pay. If evaluation shows that the value exceeds the price, they will feel a sense of satisfaction (satisfaction is a form of "attitude"), which will generate purchase intent. Thus, in the context of green consumption, the transformation of this dimension into overall value brought about by the green brand is "green brand equity".

Normative beliefs and motivation for compliance: Global attention to environmental protection, energy conservation, carbon reduction, and green products has become a social norm and a symbol of progress. In the context of green consumption, this dimension is essentially concerned with green product marketing. With the use of green products already a social trend, motivating consumers to buy a particular green brand and generating buying intent toward that brand amidst competition from multiple green brands is an issue to be addressed.

Attitude toward buying behavior: Attitude toward buying behavior refers to consumers' feelings of regret, happiness, or pride if they actually buy a used smartphone of a particular brand. Those with high green consciousness believe that paying a little more to save energy, reduce carbon, and save the planet is worthwhile. They feel happy and proud of their purchase. By contrast, those with low green consciousness regret their purchases. In the context of green consumption, this dimension is transformed into "green consciousness".

Buying intent: In the context of green consumption, this dimension is transformed into "intent to buy green products".

Marketing authority Kotler defines "brand" as a name, noun, symbol, or design, or a combination of the above. Its purpose is to differentiate an entity's products or services from those of its competitors [23]. Brand expert Aaker defines "brand" as a unique name and symbol for identifying the products or

services of a seller or a group of sellers that distinguish them from those of competitors. Therefore, brands allow consumers to identify the product source. They are also signals that protect customers and manufacturers when similar products are manufactured by competitors [16,24,25]. Based on the above two definitions, we can conclude that brands provide a certain value to consumers, and this value is brand equity.

Green consumer products involve reverse logistics. Considering the national-level objectives regarding environmental protection, energy conservation, and carbon reduction, governments often formulate subsidy policies for green products (products with green certification labels). Subsidies mean lower prices, which increase consumer intent to buy green products. During green marketing activities, if consumers adore the spokesperson, they will also have green product purchase intent even if they have no environmental protection awareness [26]. Green products are highly cost-effective and will generate green product purchase intent even in consumers without environmental protection awareness.

Since the 1980s, brand equity has attracted industrial attention and has become the focus of marketing research in both Europe and the United States. Scholars have continued to explore the definition, source, and measurement of brand equity, and suggest that industries should invest in brands from a long-term perspective to obtain long-term benefits. Aaker stated that brand equity is a set of assets and liabilities associated with a brand, brand name, and symbol that may increase or decrease the value of products or services for businesses and consumers [24]. Brand equity can help consumers reduce transaction costs and uncertainty when making purchase decisions. It is also an important source of competitive advantage and surplus control for businesses. Tauber proposed that business managers should gradually increase their focus on brand value and regard brand extension as a manifestation of capitalization to achieve benefits [27]. For refurbished smartphones, the higher the green brand equity, the higher the willingness to purchase green products. The brand equity of refurbished smartphones can reduce consumers' transaction costs and uncertainty, thereby improving their purchase intention.

**Hypothesis 1 (H1).** *Brand equity has a significant positive impact on purchase intention.*

Keller believes that brand equity is a key factor for business success [28]. The value expected by customers is communicated through brand equity, so that customers will eventually reciprocate, achieving a win-win effect. Moreover, green brand customers consider green brands a basic equity, and form their green brand attitude by analyzing their knowledge of green brands. Peattie defines green brand equity as green brand recognition and association by consumers [29]. The brand concept comprises brand awareness and brand image, and a green brand conveys its brand and company value with the ability to reduce environmental impact, constantly remind the public on the importance of strengthening the green concept, and gain a market advantage as the result of attracting increased consumer trust. Assael suggested that brand attitude refers to acquired consumer tendencies [30]. It is a consistent assessment of a brand, whether favorable or unfavorable, and ranges from bad to perfect in the overall assessment of consumers' attitudes toward a brand. When consumers evaluate the brand equity of refurbished smartphones as high, their attitude towards green products will increase.

**Hypothesis 2 (H2).** *Brand equity has a significant positive impact on green attitude.*

Environmental issues are attracting increasing attention and have become a factor in purchasing decisions. Therefore, more companies must implement green marketing strategies to drive green consciousness [31]. Green marketing refers to guiding business concepts that encompass environmental protection, and marketing concepts, methods, and strategies that are based on green cultural value and are centered on green consumption. Kotler defines green marketing as businesses that create ecologically safe products with recyclable and easily decomposable packaging, and develop better pollution prevention methods and efficient use of energy [32].

The concept of green marketing combines green eco factors with marketing strategies to strengthen market competitiveness and increase company profit [33]. Nagar found that consumer attitude toward green marketing influences their loyalty to a company through product trust, and subsequently affects their purchase intention [34]. For enterprises, green marketing should not merely be a result of regulatory mandates. Rather, outstanding enterprises regard green marketing as a policy for strengthening the company by not only increasing company capability and reducing risks, but also by shaping the differentiation and product distinction of the company's brand. The deeper the green marketing of mobile phone manufacturers makes consumers feel, the more consumers' green awareness can be improved.

**Hypothesis 3 (H3).** *Green marketing has a significant positive impact on green awareness.*

Green awareness, also known as environmental awareness, refers to the strong sense of environmental concern among individuals or groups based on their cognitive values, and their attitude and actions in actively engaging in environmental protection and improvement. In recent years, increasing environmental damage, emerging environmental protection activities, and increasing numbers of eco-conscious consumers have led to an increase in green awareness among consumers [35]. The notion of consumers' gradually increasing their concern for the natural environment is reflected in their values and behaviors. A study pointed out that motivation and contextual factors that induce corporate ecological responsiveness. One of the contextual factors is individual concern, which is the green awareness of consumers. [36]. Laroche et al. believe that most consumers are willing to buy green products, and eco awareness will affect their intention to buy green products [37]. When consumers' green awareness increases, they can naturally increase their willingness to purchase green products.

**Hypothesis 4 (H4).** *Green awareness has a significant positive impact on purchase intention.*

Young et al. found that when buying technology products, green consumers in the UK changed their product purchase attitude because of their concern for the environment [38]. Green products not only conserve resources and reduce environmental pollution, but also build brand loyalty and corporate status. Wu et al. indicated that environmental awareness directly affects consumers' perceived values of green products and their attitude toward buying green products, thereby affecting their purchase intention [39]. Balderjahn found that consumers with high green awareness will buy green products and are inclined to support environmental groups [40]. When the green awareness of consumers increases, the green attitude of consumers will also change.

**Hypothesis 5 (H5).** *Green awareness has a significant positive impact on green attitude.*

Attitude refers to the manner in which individuals perform certain behaviors, including positive or negative evaluations. Fishbein and Ajzen argued that attitude is shaped by goals, ethics, behaviors, or events, and based on the behavioral intention model of attitude [8], proposed that consumers' attitudes will affect their purchase intention for a certain product. The psychological structure of attitude mainly includes three factors: cognitive, affective, and behavioral. Shim and Drake showed a high correlation between consumer attitude and purchase intention [41]. The significant impact of purchase attitude on purchase intention indicates that the more positive the consumer attitude toward buying, the greater their purchase intention. Buying behavior is under the control of will, and is a combination of belief, attitude, and willingness [42].

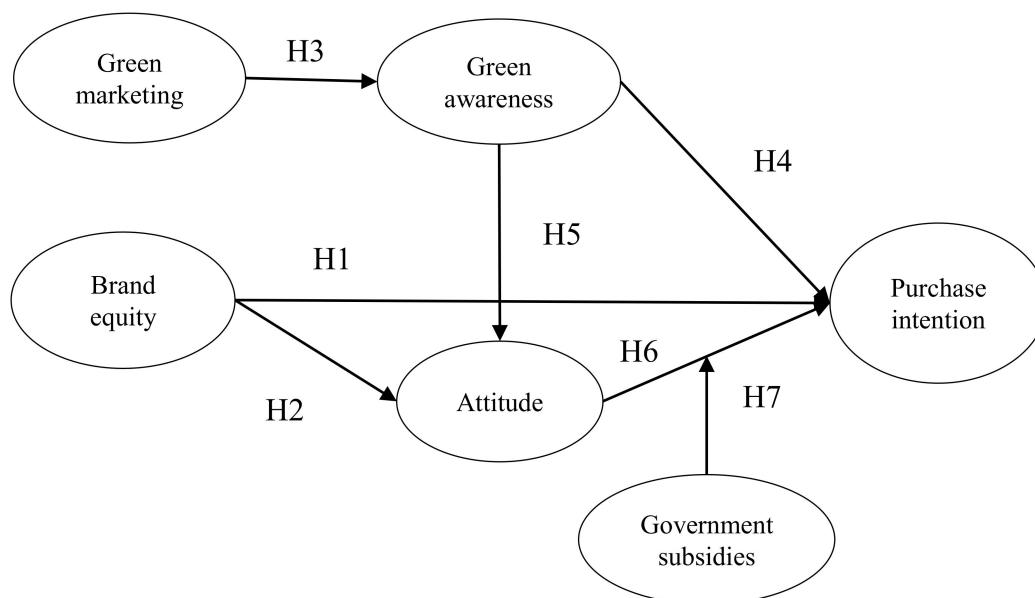
**Hypothesis 6 (H6).** *Attitude has a significant positive impact on purchase intention.*

Young et al. believe that government subsidies have a positive impact on consumer purchase of green products [38], and suggested that governments should put more effort into green product

education and consumer policies so that consumers can understand green products quicker. Pavan suggested that governments can raise public awareness of eco-labels through public events, and ultimately influence consumer buying behavior [43]. Most consumers believe that although eco problems are serious, the government should assume greater responsibility for environmental sustainability and protection [44]. Government subsidies can increase public purchase intention; hence, this study hypothesized that government subsidies affect the relationship between consumer attitude and their purchase intention of green products. For the general mobile phone buyer, refurbished smartphones may be less attractive than brand new phones. Therefore, government subsidies can increase consumers' attitudes toward refurbished smartphones, thereby increasing their willingness to buy. That is, government subsidies can strengthen the relationship between attitudes and willingness to consume.

**Hypothesis 7 (H7).** *Government subsidies moderate the relationship between consumer attitude and purchase intention.*

Based on the seven hypotheses established above, this research draws the following research framework in Figure 2.



**Figure 2.** Conceptual framework.

### 3. Methodology

#### 3.1. Sample and Data Collection

The sample for this study was adults close to the age of 20. The investigation focused only on America's iPhone users in Taiwan. According to the Taiwan mobile phone research report, the brand of America's Apple accounted for 33.6 percent of Taiwan's total smartphone sales volume in November 2018 (<https://focustaiwan.tw/business/201812220008>), ahead of South Korea's Samsung Electronics Co. (16.7 percent) and other mobile phone brands. In addition, according to a survey report on smartphones in Asia, the main age of America's Apple mobile phone users is 18–34 years old (<https://kknews.cc/zh-tw/tech/2l5r8me.html>). Therefore, this article selects America's Apple users who are close to 20 years old as the research object.

Since respondents with higher education can easily understand and respond to the questionnaires compared with those with lesser education, most of the respondents selected were college graduates

and above. The responses were collected from personal interviews and an internet survey. The two-way collection method was used to select a sample from every region and explore consumers' thoughts in more detail. The collection period was from April 2017 to May 2017. Samples were collected from residents of northern Taiwan using a convenience sampling model. In convenience samples, responses that are more readily accessible to the researcher are more likely to be included. The 332 samples were collected from community websites, including Facebook, Line, and Instagram.

### 3.2. Measure Scale

This study adopted multiple questions to analyze each dimension of the model with a 7-point Likert scale to denote the preference of items. A scale score of 1 denotes "Strongly Disagree" and 7 denotes "Strongly Agree". As shown in Table 1, we combined and adapted the scales to fit the context of this study. Brand equity is designed for a total of three items; green marketing and attitude are designed for two items; green awareness and purchase intention are also designed for three items.

**Table 1.** Variable operational definition.

Variable	Operational Definition
Brand equity	The green smartphone associated with the brand where the link, mark, or value are attached by the product or service.
Green marketing	The marketing activities of green commodities, such as market segmentation, promotion, and distribution.
Green awareness	Consumers' ideas and basic knowledge about green products.
Attitude	Consumers' attitude toward green smartphones.
Purchase intention	Consumers' willingness to buy green smartphones
Government subsidies	Government agencies provide subsidies to consumers who purchase green smartphones to facilitate energy saving and carbon reduction.

### 3.3. Statistical Data Analysis

The sample size required for this study was computed based on the desired level of 15–20 observations per studied variable, as recommended by Hair et al. [45]. The study has 7 constructs (3 items for brand equity, 2 items for green marketing, 3 items for green awareness, 2 items for attitude, 3 items for purchase intention, 1 item for government subsidies, a total of 15 items), resulting in an ideal sample size of 300 ( $=15 \times 20$ ) respondents. In this study, the surveyed area consists of cities in the northern area of Taiwan; we collected 376 sets of sample questionnaires. After eliminating 44 incomplete questionnaires, 332 valid sample sets remained, with an effective response rate of approximately 88.3%. Table 2 shows the socio-demographic profiles of the samples. Structural equation modeling was used to test the hypotheses, which consisted of a measurement model and a structural model. The purpose of the measurement model was to determine the relationship between the observed variables and potential variables. The structural model used path analysis to explore the relationship between the potential variables and examine the significance of the coefficients [46].

**Table 2.** Socio-demographic profile.

Variables	Frequency	Percent (%)	Variables	Frequency	Percent (%)
<b>Gender (n = 332)</b>			<b>Monthly personal income <sup>1</sup></b>		
Male	167	50.30%	Less than USD 678.817	211	63.55%
Female	165	49.70%	USD 678.81–1357.635	84	25.30%
<b>Age</b>			USD 1357.635–2036.452	24	7.23%
~20	74	22.29%	USD 2036.452–2715.270	7	2.11%
20–29	205	61.75%	Over USD 2715.270	6	1.81%
30–39	44	13.25%	<b>Career</b>		
40–49	5	1.51%	Freelancer	12	3.61%
50–59	4	1.20%	Manufacturing industry	22	6.63%
<b>Marital status</b>			Information technology	13	3.92%
Single or not married	274	82.53%	Service industry	40	12.05%
Married	58	17.47%	Military personnel, Civil servants and teachers	18	5.42%
<b>Education</b>			Student	217	65.36%
Junior high school	3	0.90%	Housekeeper	1	0.30%
High school graduate	19	5.72%	Retired	9	2.71%
College graduate	219	65.96%			
Master graduate	90	27.11%			
Ph. D graduate	3	0.90%			

Note: USD means United States Dollar. <sup>1</sup> In 2017, the minimum wage in Taiwan was approximately USD 713.064, so the minimum salary for this study was set at around USD 713.064. As many of the research samples are drawn from around the age of 20, the minimum salary range is set at NTD 20,000, which is equivalent to USD 678.817.

### 3.4. Validity and Reliability Analysis

Confirmatory factor analysis (CFA) was used to ensure the convergent validity of latent factors. This procedure allows the coherent items to be highly convergent in the same latent factor [46]. This study measured those latent factors, including brand equity, green marketing, green awareness, attitude, government subsidies, and purchase intention.

Notably, the absolute loading values  $\lambda$  of the items constructed by the study were significantly above the level recommended by Hair et al. and Fornell and Larcker, ( $>0.50$ ), which indicated satisfactory convergent validity [47,48]. By contrast, all those constructs, including brand equity, green marketing, green awareness, attitude, government subsidies, and purchase intention, were revised from famous scales used extensively by previous experts and researchers. These experts evaluated the constructs' items carefully to measure their defined content [49], which also justified the constructs' content validity in this study.

The average variance extracted (AVE) and composite reliability (CR) were calculated. Constructs' AVE ranged from 0.84. to 0.98 ( $>0.5$ ), above the level recommended by Fornell and Larcker [47]. CR ranged from 0.91–0.99 ( $>0.7$ ), above the level recommended by Hair et al. [48] (see Table 3). The AVE and CR values reconfirmed the constructs' convergent validity and reliability.



**Table 3.** Construct loading and model fits.

Constructs	Items	Lambda Loading	AVE	CR
Brand equity	BE1	0.97	0.93	0.97
	BE2	0.97		
	BE3	0.95		
Green marketing	GM1	0.97	0.84	0.91
	GM2	0.86		
Attitude	AT1	0.99	0.98	0.99
	AT2	0.99		
Green awareness	GC1	0.98	0.96	0.99
	GC2	0.98		
	GC3	0.98		
Purchase intention	BI1	0.99	0.97	0.99
	BI2	0.99		
	BI3	0.98		

### 3.5. Model Fit Analysis

The previous load  $\lambda$  value is only part of the verification from the factor analysis process. It is necessary to observe the model fit index to confirm the model fit and overall construct validity. Confirmatory factor analysis is one of the more accurate and credible methods. In terms of the absolute fitness index, the GFI of the conceptual model of this study is 0.93, which is greater than 0.90, indicating that the hypothetical model can be accepted. The chi-square degree freedom ratio value is 2.282 and less than 3. The RMSEA is 0.059, which is below the criterion of 0.08, and is still within an acceptable range [46]. According to the value-added fitness index, AGFI is 0.90, NFI is 0.98, CFI is 0.99, and IFI is 0.99. All are higher than the criterion of 0.90, indicating that the hypothesis model can be accepted [46]. The PNFI is 0.78; the PGFI is 0.65, which is higher than the criterion of 0.50. All of the model fit indices indicate the appropriateness of the conceptual model [46].

## 4. Results

This study justifies the hypothesis established by the path coefficient analysis of structural equation modeling (SEM) [46]. As Table 2 shows, brand equity positively affects purchase intention, and the path coefficient is 0.369, which is statistically significant ( $p < 0.01$ ), and Hypothesis 1 is verified. This result is similar to the study conducted by Tauber [27]. Brand equity can help consumers reduce transaction costs and uncertainty when making purchase decisions. Brand equity positively affects attitude, with a path coefficient of 0.807, reaching a statistically significant level ( $p < 0.01$ ), verifying Hypothesis 2. Keller believes that brand equity is a key factor for business success [28]. Brand equity is the value expected by customers, which would allow customers to eventually reciprocate the company, and change their attitude.

Green marketing positively affects green awareness, with a path coefficient of 0.959, reaching a statistically significant level ( $p < 0.01$ ) and accepting Hypothesis 3. This also verifies the claims provided by Nagar [34], who found that consumers' attitudes toward green marketing influence their loyalty to a company through product trust, and subsequently affects their purchase intention. Green marketing in the smartphone industry can indeed enhance consumers' awareness of green environmental protection.

Green awareness positively affects purchase intention, with a path coefficient of 0.116, but it does not reach a statistically significant level ( $p = 0.141$ ), therefore rejecting Hypothesis 4. This does not

verify the claims provided by Laroche et al. [37], who found that most consumers are willing to buy green products, and eco awareness will affect their intention to buy green products. However, we did not confirm this point.

Green awareness positively affects attitude, with a path coefficient of 0.260, reaching a statistically significant level ( $p < 0.05$ ), accepting Hypothesis 5. This also verifies the claims provided by Young et al. [38] and Wu et al. [39]. Green consumers will change their product purchase attitude because of their concern for the environment. Environmental awareness directly affects consumers' perceived values of green products and their attitude toward buying green products.

Attitude positively affects purchase intention, with a path coefficient of 0.649, reaching a statistically significant level ( $p < 0.05$ ), accepting Hypothesis 6. This also verifies the claims provided by Shim and Drake [41] and Muk [42]. The significant impact of purchase attitude on purchase intention indicates that, when consumers' attitudes toward green products are more positive, their willingness to buy will be higher.

The interaction of government subsidies and attitude positively affects purchase intention, with a path coefficient of 0.05, reaching a statistically significant level ( $p < 0.05$ ) and thus accepting Hypothesis 7. This also verifies the claims provided by Young et al. [38] and Pavan [43]. Government subsidies are considered to have a positive impact on consumer purchase of green products, if governments put more effort into green product education and consumer policies so that consumers can understand green products quicker. When governments can raise public awareness of eco-labels through public events, they ultimately influence consumer buying behavior.

Table 4 presents all hypotheses' verification, and six hypotheses are accepted.

**Table 4.** Path coefficients (coefficients,  $p$ -values).

Causal Path	Coefficients	$p$ -Value	Accept or Reject
H1:Brand equity => Purchase intention	0.369	0.007 ***	Accept
H2:Brand equity => Attitude	0.807	0.005 ***	Accept
H3:Green marketing => Green awareness	0.959	0.007 ***	Accept
H4:Green awareness => Purchase intention	0.116	0.141	Reject
H5:Green awareness => Attitude	0.260	0.043 *	Accept
H6:Attitude => Purchase intention	0.649	0.019 **	Accept
H7:Government subsidies Attitude => Purchase intention	0.050	0.018 **	Accept

Note: \*, \*\*, and \*\*\* indicate statistically significant levels of  $p < 0.10$ ,  $p < 0.05$ ,  $p < 0.01$ , respectively.

## 5. Discussion

This study examines all established hypotheses by using a path coefficient analysis of structural equation modeling (SEM). First, this study confirms that brand equity positively affects purchase intention. Brand equity is a set of assets and liabilities associated with a brand, brand name, and symbol that may increase or decrease the value of products or services for businesses and consumers. When smartphone enterprises are willing to increase their brand equity, it increases consumers' willingness to purchase green products.

Second, this study confirms that brand equity positively affects attitude. Brand equity is really the value expected by customers, which would allow customers to eventually reciprocate. It also

confirms that the brand equity of green smartphones can change the attitude and purchase intention of consumers. When green product brand equity is raised, consumers are willing to change their past attitudes and accept them.

This study confirms that green marketing positively affects green awareness. Green marketing in the smartphone industry can indeed enhance consumers' awareness of green environmental protection. Regardless of government agencies or enterprises, it is still necessary to increase the marketing of green products in order to change the attitude of consumers and for them to accept environmental protection products.

Green awareness positively affects attitude, and attitude further influences consumers' purchase intention. Environmental awareness directly affects consumers' perceived value of green products and their attitude toward buying green products. If government agencies and enterprises can work to improve consumers' awareness of green environmental protection and change their purchasing attitude, they can increase their willingness to purchase green products.

The interaction between government subsidies and attitude positively affects purchase intention. Government subsidies seem to have a positive impact on consumer purchases of green products. For companies, green products are more expensive and less popular, requiring government subsidies. For government agencies, encouraging the consumption of green products in the early period requires government subsidies to change consumers' attitudes toward green products.

In the past, researchers discussed green market segmentation [5]; some discussed the antecedents of green purchasing behavior [14,26]. Other research explored the topic of sustainable business strategies [18] and marketing of green products [33]. Some studies explored why manufacturers respond to green demand [36]. When green products first appeared, the focus of these studies was on market segmentation, antecedents of purchase, and corporate strategy.

As more green products become available, research has gradually begun to explore how green advertising affects brand loyalty [34]; how consumers' green knowledge affects buying behavior [35]; and find out why consumers are willing to pay environmentally friendly products [37]. There are also researchers discussing how personal attributes and environmental attitudes predict the purchase intention of green products [40].

In the past, many studies also used the theory of reasoned action to study green product issues. Few studies included the government subsidy dimension into the theory of reasoned action. This is the difference between this study and past studies. In fact, green products are usually bought at a higher price or sold after recycling. Consumers' willingness to purchase refurbished mobile phones cannot be quickly increased. The government's subsidy policy has become an important driving force for green consumption.

In addition, this study uses brand equity as consumers' evaluation of green products, which in turn affects attitude perception. In this study, green awareness is regarded as the subjective norm in the theory of reasoned action. Finally, this article also regards green marketing as an incentive for consumers, which is an extension of theory of reasoned action and another research value of this study.

## 6. Conclusions

For the theoretical implications, many studies have used the theory of reasoned action to study green product issues, but most studies have fully applied the factors of the theory of reasoned action to the research of green products, including attitudes, subjective norms, and purchase intentions [15]. Few studies have incorporated the factors of government subsidies into the theory of reasoned action. Perhaps some scholars explored the moderating effects of the role of government and media exposure on the relationship between value and attitude [44]. This study mainly explores how government subsidies can moderate the relationship between attitude and purchase intention. In fact, green products are usually bought at higher prices or sold after recycling. Consumers' willingness to purchase refurbished mobile phones cannot be increased rapidly, and government subsidy policies have become an important driving force. This study includes government subsidies, which can be said

to be an extension of the theory of reasoned action. In addition, this study uses brand equity as the consumer's assessment of the product, which in turn affects attitude perception. In this study, green awareness is regarded as the subjective norm in the theory of reasoned action, and environmental protection awareness constitutes a social norm to some extent. Finally, this article also regards green marketing as the motivation of consumers. These are extensions of the theory of reasoned action, and are not the same as past studies that fully adopted theory of reasoned action. In this study, the original theory of reasoned action factor was converted, and the relevant factors in line with green purchasing behavior were added.

For managerial implications, implementing a green marketing strategy is inseparable from the company's long-term development planning. Refurbishing smartphones requires enterprises to conduct in-depth market research based on the target market, rationally position their products and brands, analyze potential market capacity and potential customers' purchasing power, and effectively integrate green marketing resources. The strategic significance of refurbishment smartphone green marketing requires that companies have a clear green development plan as the basis for the implementation of green marketing, which should describe the product green development cycle, green marketing promotion plan, and green marketing management plan. In addition, before implementing green marketing, companies must implement green marketing process management, and systematically plan human resource management, capital flow, and value flow to ensure the timely and effective integration of various resources in the marketing process and promote the entire green implementation of the marketing process.

When refurbishment smartphone companies carry out a brand equity strategy, they must pay close attention to the green products, give green brands more connotation, establish green management culture, instill green management concepts, and realize the optimization and maximization of brand value. Only through the principles of green management can enterprises establish green development strategies, implement green business management strategies, and formulate green marketing plans, to finally produce products that meet the public's green needs, and realize the social and the sustainable development of the enterprise. In addition to the green marketing of the refurbishment smartphone company itself, it is also very important to establish green awareness of consumers. In addition, starting from improving the brand equity of the company, increasing the value of the company's sustainable development, and changing the consumer's perception of the organization, they can also increase the consumer's purchase intention. In addition to the company's own green marketing, and the establishment of brand equity, promoting the government to increase subsidies is also one of the corporate strategies. Green and renewable products still cannot be popularized in the consumer market, and the government provides subsidies, which is considered to be one of the main reasons for improving the green product market.

Regarding the limitations of this study, convenience sampling is used in this study instead of probabilistic sampling. It is possible that the sampled respondents cannot represent the population under study. At this time, this study will generate statistical "sample bias" or "selection bias" problems. Due to the limited resources of this study, it is impossible to reach all the appropriate questionnaire respondents, or the geographical area involved is not wide enough. In these cases, the sample selected by this research cannot be considered a random sample. In order to obtain specific research results, a sufficient number of samples is very important. The larger the number of samples, the more accurate the research results. This study tried its best to obtain 332 valid samples, but when the number of samples in the study was not large enough, it was more difficult to use limited data to prove the significant relevance of the research content. Usually when engaging in statistical analysis, a larger number of samples is more representative of a population, so the results obtained through the analysis are also more applicable in the population. This study adopts a cross-sectional method, which investigates the single or multiple behaviors or phenomena of the research object at a specific time point. The advantage of a cross-sectional study is that it can quickly and comprehensively understand the characteristics, phenomena, and conditions of specific events or groups. However, because it only

studies the same period and lacks long-term data, its shortcoming is that it is difficult to discuss the causes and trends of problems or phenomena in depth. Finally, this study mainly uses Taiwan as a research area, which may be biased due to the cultural background and personal perception of certain phenomena, and this bias may affect the inference of the research.

Future research can use probability sampling to obtain random samples as a basis for extrapolating research results. Secondly, researchers can try to expand the research sample to obtain more accurate inferences. Thirdly, future research can use longitudinal studies to gain a deeper understanding of observations at different times. It is finally recommended that future researchers can expand the sample to all parts of the world and reduce the errors caused by cultural factors by collecting more national samples.

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