

Extending the theory of planned behaviour with application to renewable energy investment: the moderating effect of tax incentives

Moderating
effect of tax
incentives

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Abstract

Purpose – The purpose of this study is to deploy and expand the theory of planned behaviour (TPB) model with application to renewable energy investment by incorporating the component of tax incentives (TIN). This will serve as an additional measure in understanding the conventional energy stakeholders' investment intention into renewable energy in Nigeria.

Design/methodology/approach – Data was collected from 357 individual key conventional energy stakeholders in Nigeria using survey questionnaires. The research model was tested using structural equation modelling.

Findings – The results from the study revealed the applicability of the TPB in predicting the conventional energy stakeholders' investment intention into renewable energy. The result indicates that attitude and subjective norm are significantly associated with investment intentions.

Research limitations/implications – The outcome implies that the integration of tax incentives can improve the predictive power of the model as the introduced variable demonstrates a significant impact on the conventional energy stakeholders' investment intention into renewable energy.

Practical implications – This study extends on the well-established TPB model by integrating tax incentives in understanding investment intentions and the outcome implies a significant association of tax incentives with investment intention and moderated the influence of attitude and subjective norm over the conventional energy stakeholders' investment intention.

Originality/value – TPB has been widely deployed and even extended to predict intention in numerous fields of study. Available literature presents the lack of such empirical research that focuses on investment in Nigeria and specifically regarding energy investment. The outcome highlighted the significant influence of tax incentives, thus the need for policymakers to suggest and implement various tax incentives to attract private investment into renewable energy for electricity generation that will consequently assist in achieving SDG-7 and mitigate climate change.

Keywords Theory of planned behaviour, Renewable energy, Tax incentives, Investment intentions, Electricity generation

Paper type Research paper



1. Introduction

Renewable energy (RE) has been known as the opposite of exhaustible fossil fuel sources (Bell, 1906). RE is becoming a potential alternative to nuclear and coal as centralized sources of

energy to curb carbon emissions (Harjanne and Korhonen, 2019). Nigeria has abundant RE resources but is not adequately harnessed to generate the required electricity in the country (Shaaban and Petinrin, 2014; Mohammed *et al.*, 2013; Adaramola and Oyewola, 2011; Akuru and Okoro, 2010). Available literature linked a low level of RE inclusion into the energy mix to inadequate investment into the sector (Donastorg *et al.*, 2017). Hence, this study intends to understand the investment intention of conventional energy stakeholders RE in Nigeria.

The pivotal theory in the study of human intention generally and investment intention specifically is the theory of planned behaviour (TPB). The theory was adopted and extended to study intention in many areas, including takaful (Sapovadia, 2017; Md Husin and Ab Rahman, 2016; Muhammad, 2016; Joint, 2015; Aziz *et al.*, 2015), online purchase behaviour (Chen, 2009; Hansen, 2008), Islamic micro-finance (Albashir *et al.*, 2018; Maulana *et al.*, 2018; Ibrahim *et al.*, 2017; Jaffar and Musa, 2016; Ashraf, 2014), e-payments (Husnil, 2016; Ting *et al.*, 2016; Gopi and Ramayah, 2007), e-filing (Tallaha *et al.*, 2014; Ramayah *et al.*, 2009; Hsu and Chiu, 2004) and general taxation (Sudiartana and Mendra, 2018; Shaharuddin *et al.*, 2012; Benk *et al.*, 2011; Bobek and Hatfield, 2003; Krishna and Slemrod, 2003). Such is a lacking of on investment in Nigeria. Although some scholars made efforts using the TPB model in the Nigerian context (Aderemi, 2020; Akims and Jagongo, 2017; Obamuyi, 2013; Oriavwote and Oyovwi, 2013; Oloke *et al.*, 2013; Aregbeyen and Mbadiugha, 2011) but not specifically in RE investment intentions. Therefore, the imperative need of deploying and expanding the model to predict the investment intention of conventional energy stakeholders towards RE in Nigeria. The study focuses on Nigeria as the most populous African country with about 200 million people, largest oil producer and second largest gas producer in the continent, but despite these, there is an electricity gap of 175,000 MW, making 120 million people living without access to electricity (Shell Petroleum Development Company, 2019). A recent report shows that 80million Nigerians are living without electricity (World Bank Group, 2019). Approximately, 28 million families and 11 million small and medium enterprises are either off-grid or receive very few hours of electricity a day (Shell Petroleum Development Company, 2019). The country's electricity market is regulated with three major components; the generation, transmission and distribution companies.

Focussing on addressing this gap, the study aspires to offer insights into the applicability of the TPB in this context. The study also leverages the openness of the model to incorporate variable(s) that will further explain intention (Ajzen, 1991). In line with this suggestion and considering the influence of tax incentives (TIN) on investment (Babatunde and Adepeju, 2012), the study considers extending the TPB model by integrating the component of TIN to analyze its impact on the conventional energy stakeholders' investment intention into RE. According to Bonucchi *et al.* (2015), TIN encourages new investments, attracts and supports investors in certain important sectors of the economy. Using TIN, existing investors are maintained, while prospective investors are brought into the fold. Existing literature documented TIN to be a significant factor attracting investment (Babatunde and Adepeju, 2012; Lim, 2011; Clark, 1999).

The rest of this paper is arranged as follows. Section 2 reviews the relevant literature and develops the hypotheses and research model. Section 3 describes the research methodology. Section 4 reports the empirical results. Section 5 provides the discussion of findings, and Section 6 concludes the paper.

2. Literature review and hypotheses development

2.1 Investment intention into renewable energy

In Nigeria, data related to RE investment is mostly not available due to long-term dependence on conventional energy sources for electricity generation (Akuru and Okoro,

2014). Investment is defined as setting an amount of money to work with the expectation of generating additional money otherwise known as profit (Ruby and Narsis, 2019). According to Ruby and Narsis (2019), investment results in economic development and maturing contemporary private enterprise. However, investment intention is defined as the intentional choices made by investors regarding “when”, “where” and “how” capital will be devoted to financial products/instruments of different nature to make more profits or value appreciation (Sindhu and Kumar, 2014). Here, investment intention means the willingness of conventional energy stakeholders to invest in RE for electricity generation in Nigeria.

The TPB extended from the theory of reasoned action (TRA) developed by Fishbein and Ajzen(1980) has been one of the major theories used within the area of behavioural research to study intention (Shaw *et al.*, 2000). TPB claims that attitude (ATT) towards a behaviour, subjective norms (SN) and perceived behavioural control (PBC) will jointly determine the formation of an intention to a certain behaviour (Ajzen, 1985). ATT for a behaviour states the level at which an individual has a favourable or unfavourable assessment of the behaviour of his/her concern. SN refers to the perceived societal influence over the performance or not performance of the behaviour, whereas PBC refers to the perception of the easiness or difficulty in performing the behaviour that is based on the resources and opportunities available to the individual. On the other hand, the intention was described as the direct antecedent of behaviour, and its formation is built on attitudes for the intended behaviour (Yadav and Pathak, 2017; Venkatesh *et al.*, 2003).

For a long time, the TPB model has been tested and found to be suitable in understanding and predicting human intention and subsequent behaviours in several studies (Albashir *et al.*, 2018; Sudiartana and Mendra, 2018; Sapovadia, 2017; Husnil, 2016). For instance, Harland *et al.* (1999) extend TPB to explain pro-environmental intention and behaviour by incorporating personal norms. In energy related area, Tan *et al.* (2017) predict consumers’ purchase intention for energy-efficient household appliances in Malaysia using the TPB model. Within the investment settings, East (1993) deploys TPB to investigate the intention of students in the UK to invest in the shares of electricity companies. In his discussion, investment in shares was rightly determined by measured intention, and the intention was consequently explained by attitude. His findings proved the predictability of the TPB model in the context of his study. In a more recent study in Malaysia, Yee *et al.* (2022) found that intention to invest in RE investments is influenced by the TPB elements. In addition, many studies were conducted on the motivations to invest in RE (Skordoulis *et al.*, 2020; Ntanos *et al.*, 2018; Becker and Kunze, 2014; Li *et al.*, 2013).

Focussing on Nigeria, Aregbeyen and Mbadiugha (2011) examined the factors influencing investment decisions in shares of quoted companies using the TPB; he illustrated that economic, social, cultural and psychological factors jointly influenced investment decisions in shares. Additionally, Aderemi (2020), Akims and Jagongo (2017), Obamuyi (2013), Oriavwote and Oyovwi (2013), Oloke *et al.* (2013) conducted various studies in the field of investment in Nigeria. However, the studies failed to provide a significant proof to link the association of ATT, SN, PBC and investment intention because they extend the model by incorporating other predicting variables and drop the initial TPB elements. In general, past studies looking at investment intention have adapted the TPB model to predict investment intentions and subsequent behaviours, but little regard was given to the context of Nigeria. While adequate literature has revealed the predictive powers of the TPB model in various contexts, it remains unclear how this model can be adopted in the RE investment settings in Nigeria. This study aimed at bridging this gap as prospective investors in Nigeria might respond differently because of variation in economic settings and information asymmetries. Individual investors are basically distinct and extremely varied; accordingly,

individual investors of distinct countries may exhibit different psychological and emotional biases that could influence their investment intentions. This study anticipates a better understanding of the conventional energy stakeholders' investment intention in the context of RE in Nigeria. This is accomplished by extending the model to incorporate TIN as a significant construct attracting investment.

2.1.1 Attitude and investment intention into renewable energy. Attitude refers to the mental reasoning of an individual when assessing the level of favourable or unfavourable performance of a certain behaviour (Eagly and Chaiken, 1993). Attitude towards a behaviour assists in individual conclusion on whether certain action should be performed or not based on its negative or positive consequence. Thus, intention formation is built upon the positive or negative perception of that particular behaviour by an individual. This implies that, the more positive the individual attitude towards a behaviour, the stronger his/her intention to perform that behaviour and vice versa.

Existing studies revealed that attitude is linked with investment intention (Dayaratne and Wijethunga, 2015; Kavitha, 2015; Muhammad, 2016). However, the studies revealed mixed findings. For instance, Dayaratne and Wijethunga (2015), Kavitha (2015) and Muhammad (2016) found significant, significant and insignificant relationships between attitude and investment intention, respectively. This indicates that individual attitude towards investment is unique. Accordingly, individuals' attitudes towards particular investments will not be the same. Studies conducted by Kaiser *et al.* (2007) and Dickson (2000) understand that investors' intention is easily predicted when their attitude regarding a specific investment is known. These scholars suggested that attitude is a factor that could influence investment intentions. The study of East (1993) has also illustrated a significant positive association of attitude and the individuals' intention in the context of electricity investment.

Generally, there is adequate literature relating attitude and investment intention, but little is known concerning attitude and investment intention into RE, specifically in Nigeria. More so, the TPB made it understandable that individuals with a high attitude regarding behaviour will demonstrate a stronger intention to perform that particular behaviour. Therefore, the attitude of conventional energy stakeholders regarding RE investment needs to be examined to enhance the literature. Based on the above findings and arguments, this study anticipates that attitude could influence investment intention into RE. Therefore, this study hypothesizes that:

H1. Attitude will positively influence conventional energy stakeholders' investment intention into RE.

2.1.2 Subjective norm and investment intention into renewable energy. SN is defined as the persons' perception of whether his/her reference group accepts or rejects his/her behavioural action (Cialdini and Trost, 1998). Fu *et al.* (2006) and Venkatesh and Davis (2000) further describe SN as the one's perception regarding whether peer group and other influential people to the person deemed him/her to execute that behaviour. The effect of SN on intention is the outcome of the subjective expectations of immediate family, relatives and personal life and work-life friends (Cavazos, 2013). Various scholars studied the effect of the SN in the context of investment (Raut *et al.*, 2018; Abdul Wahab *et al.*, 2016; Pascual-Ezama, 2014). They concluded that SN is a significant factor influencing investment intentions, and prospective investors and existing ones with less experience and knowledge habitually depend on the ideas of close friends, family members and relatives when it comes to investment decisions.

Based on Hong *et al.* (2004), components like associations with neighbours and worship places can serve as a proxy for sociability. These components promote ones' investment participation. The above study further explained that social investors demonstrate a stronger intention towards an investment when more of their peers are involved in the

investment. Hence, the subjective norm can be labelled as a change in thinking that reflects on ones' behaviour because of his/her association with others. This indicates that although one may not demonstrate a constructive attitude for an investment, the incongruence with ones' attitude and expectations of family and or friends may influence ones' investment intention. These particular people may pursue RE investment to certify acceptability because they may be focussing on a balance between their actions and the perception of others.

In general, the relationship between SN and investment intention is well established in the available literature, but little is known regarding the association of SN and investment intention into RE, specifically in Nigeria. Based on the TPB, individuals mostly come up with their perceptions from the views of family and associates. Hence, the more positive the societal approval of behaviour, the stronger the intention of an individual to perform that particular behaviour. Thus, the need to examine the subjective norm of conventional energy stakeholders towards RE investment. Based on the above findings and arguments, this study anticipates that SN could influence investment intention into RE as investors will be more willing to invest in RE when it is compatible with their SN. Therefore, this study hypothesizes that:

H2. SN will positively influence conventional energy stakeholders' investment intention into RE.

2.1.3 Perceived behavioural control and investment intention into renewable energy. PBC is defined as ones' perception of ease or difficulty in carrying out the behaviour of interest (Ajzen, 1991). Existing empirical literature reveals that PBC has a significant effect on intention (Sudiartana and Mendra, 2018; Ibrahim *et al.*, 2017; Md Husin and Ab Rahman, 2016). In the context of investment intention, Mahastanti and Hariady (2014) advocated that the main important determinant of investors' intention towards stock market investment is the investors' PBC. They further explained that when one has the chance and is capable of investing in the stock market, he or she will subsequently be moved to the performance of that action. In a different study, Phan and Zhou (2014) established that the component of behavioural control could adequately explain the Vietnamese investors' intention and subsequent behaviours towards Vietnam stock market investment. The authors also highlighted those other elements, particularly past experience, information obtained from family, relatives and friends as well as the resources available, can jointly assist in controlling the perceived ease or difficulty in participating in an investment.

Generally, the relationship between PBC and investment intention was well established, but not much is known concerning this relationship in the context of RE, specifically in Nigeria. More so, the TPB elaborates that PBC influences behavioural intention. A person with high PBC and who made his/her intention to execute a behaviour will have more confidence to perform that particular behaviour than an individual with weak PBC. This study posits that the higher the PBC, the stronger the investment intention into RE. Based on the above findings and arguments, this study anticipates that PBC could influence investment intention into RE. Therefore, this study needs to investigate the PBC of conventional energy stakeholders towards RE investment. Thus, this study hypothesizes that:

H3. PBC will positively influence conventional energy stakeholders' investment intention into RE.

2.1.4 Tax incentives and investment intention into renewable energy. TIN referred to a basis for encouraging new capital investment (Bonucchi *et al.*, 2015). It is a planned vital fiscal provision by the government to attract and support investors in certain significant sectors of the economy. TIN comprises all types of government subsidies given to investors, direct or indirect, which from the start are not within the tax structure (Hellerstein and Coenen, 1995). According to Manaf *et al.* (2015), there are different types of incentives available, and therefore, investors' preferences to incentives differ. TIN generally comprises of capital allowance, reinvestment allowance, tax holiday, taxpayers' right of election, investment tax credits, interest subsidy, accelerated depreciation and export processing zone (EPZ) incentives (Hellerstein and Coenen, 1995); these incentives are anticipated to yield higher investments that will lead to economic growth (Ohaka and Agundu, 2012). Existing literature illustrated that TIN has a strong influence in attracting investment (Babatunde and Adepeju, 2012; Lim, 2011; Clark, 1999). In Zimbabwe, for instance, Munyanyi and Chiromba, (2015) established the significant influence of TIN on investment in the tourism sector of the country.

The incorporation of TIN is due to the openness of the TPB model, which suggests the inclusion of additional variable(s) that could improve the predictive powers of the model by explaining intention better depending on the nature and context of the study. Some scholars proved that intention is predicted by other variables like moral norms (Botetzagias *et al.*, 2015; De Leeuw *et al.*, 2015). Additionally, intentions are predicted with socio-cultural influence and self-identity (Ekpe *et al.*, 2016; Shaw and Shiu, 2013). Despite expanding the TPB model to enhance the understanding and prediction of intentions and subsequent behaviours by past studies referenced above, such evidence of incorporating TIN as a critical investment factor that could support individual investment intention formation is currently lacking. For instance, in the context of investment intention into RE for electricity generation, the availability of TIN could influence the conventional energy stakeholders to have stronger intentions towards RE investment. Based on this argument, TIN is integrated into the TPB model as an additional construct to be measured, and the study hypothesizes that:

- H4.* TIN will positively influence conventional energy stakeholders' investment intention into RE.

2.2 Moderator – tax incentives

Past studies using the TPB model revealed inconsistent findings (Dayaratne and Wijethunga, 2015; Kavitha, 2015; Sudarsono, 2015; Pascual-Ezama, 2014); thus, following Supadmi and Astiti (2018) who used TIN to moderate the influence of corporate social responsibility's disclosure on tax aggressiveness, the current study proposed the use of TIN as a moderating variable to examine how the relationship between the independent and dependent variable will change with the introduction of TIN. This study anticipates that TIN will stimulate the relationship between ATT, SN and PBC with investment intention into RE in Nigeria, as suggested by Baron and Kenny (1986). For instance, the influence will be strengthened in the presence of TIN for investors with low attitudes, weak SN and weak PBC regarding RE investment. Based on the above arguments, this study hypothesizes that:

- H5.* TIN moderates the influence of attitude on investment intention into RE.
H6. TIN moderates the influence of SN on investment intention into RE.
H7. TIN moderates the influence of PBC on investment intention into RE.

Based on the reviews of the literature and the formulated hypotheses, a research framework was developed as depicted in [Figure 1](#).

3. Methodology

3.1 Measurement

The measurement items were adapted from previous studies. Each construct of the study is measured using multiple items in line with [Podsakoff et al. \(2003\)](#) to reduce measurement bias. This study deployed a questionnaire survey for testing the conceptual model and the formulated hypotheses. The questionnaire was designed with a seven-point Likert scale ranging from strongly disagree to strongly agree. To ensure content validity, the questionnaire was pretested with six academics and three experienced personnel from the industry. The experts have detected all errors regarding the design of the questionnaire and the assessment of the items' capacity to measure the corresponding constructs of interest. The experts also commented on the wordings and the structure of the questionnaire. Response from the appraising process was incorporated to come up with the revised questionnaire. Following this was the pilot testing of the instrument, which involve 30 respondents from the sector but not part of the intended sample of the study. Reliability analysis was conducted, and Cronbach's α of the five constructs of the study is above the threshold of 0.7, and this indicates a fulfilled internal reliability. [Table 1](#) shows the measurement source.

3.2 Sample and data collection

The targeted respondents were the key conventional energy stakeholders from the energy-related ministries and agencies located in the capital state and the 11 electricity distribution

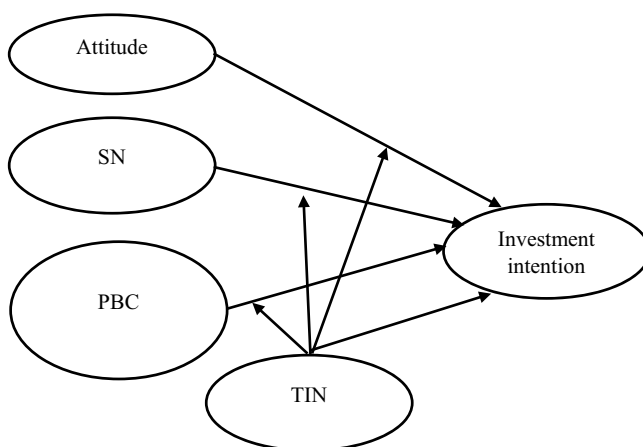


Figure 1.
Research model

Construct	Number of questions	Source	Cronbach α
Intention	4	Yang et al. (2019)	0.881
ATT	4	Reyhanloo (2018)	0.718
SN	3	Reyhanloo (2018)	0.824
PBC	4	East (1993)	0.828
TIN	11	Manaf et al. (2015)	0.859

Table 1.
Measurement items
and their sources

companies across the country. The reason for focusing on the capital state is that it has the head offices of all federal ministries and agencies, thus has the representation of all people from all the states of the federation. However, due to the fact that RE is a new area of investment, the study decided to focus on people with knowledge and experience in the energy sector. The study used a sample from a sample frame of 973. A sample size of 278 was indicated using the Krejcie and Morgan (1970) table, though the number is multiplied by 2 (556) to take care of the low response rate in the country. The questionnaires were self-administered using a simple random sampling approach to give an equal chance of selection. Out of the 556 questionnaires administered, 378 were retrieved, amounting to a response rate of 68%. Of these numbers, 357 questionnaires were valid and useable for further analysis. The results indicated the demographic characteristics of the respondents are mostly male ranging from 36–40 years old, and they have BSc/HND academic qualification, work in the energy-related ministries and are from the northwest zone of the country.

3.3 Statistical tools

The study used the Statistical Package for the Social Sciences (SPSS) for the preliminary descriptive statistics. Descriptive statistics are appropriate in summarizing data and broadly used in describing a phenomenon of concern (Sekaran and Bougie, 2010). Specifically, the result and presentation of data analyses were done using the partial least squares structural equation modelling (PLS-SEM) path modelling package (SmartPLS 3.0). Despite the similarity between PLS-SEM, with the traditional conventional technique, the advantage of using PLS-SEM is its capability to compute both structural and measurement models at once (Duarte and Raposo, 2010; Chin *et al.*, 2003; Gerlach *et al.*, 1979). Additionally, PLS-SEM is used because of issues in data normality within most social science studies (Osborne, 2010), as PLS-SEM can analyze data that is not normally distributed reasonably well (Chin, 1998). Accordingly, PLS-SEM efficiently analyzes reflective measures easily because of its precision (Hair *et al.*, 2010). Finally, SPSS and PLS-SEM are used in this study for their completeness and simplicity (Sekaran, 2003).

4. Analysis and findings

Before preliminary data analysis process, the data were subjected to screening and examination to confirm that the assumptions regarding the data (e.g. missing values, normality, outliers and multicollinearity) are not violated. The descriptive analysis specified the percentage of randomly missing values at 0.04. The missing values were replaced using SPSS mean nearby point method (Hair *et al.*, 2013). Nineteen responses were discarded due to outliers (Hair *et al.*, 2010). The values of skewness and kurtosis were within the threshold value, indicating that the data distribution was normal.

It can be analyzed from Table 2 that the minimum and maximum scores for all the variables are consistent with the seven-point Likert scale used in the questionnaire. This ranges from one, which is the least option for strongly disagree, to seven, which is the highest option representing strongly agree. Moreover, the mean responses ranges from 3.4 to 5.2. This implies that the respondents have moderate to higher perception with regard to the study's variables. In particular, the respondents' intention and ATT towards RE investment are higher, their perception regarding SN and TIN with respect to RE investment is above average. However, they have weaker PBC regarding RE investment.

4.1 Measurement model

A measurement model encompassing all the study constructs was evaluated. Convergent and discriminant validity assessments were conducted to ensure the agreement of the measurements and are not reflective of other variables (Hair *et al.*, 2014). For convergent validity, factor loadings, composite reliability and the average variance extracted (AVE) were examined. As presented in Table 2, all constructs exhibit composite reliability within the range of 0.889 and 0.936, which surpassed the recommended threshold of 0.7 (Hair *et al.*, 2014). The AVE values for intention (0.787), ATT (0.783), SN (0.771), PBC (0.668) and TIN (0.600) were all above the threshold of 0.5 (Hair *et al.*, 2014). All factor loadings were significantly loaded above the recommended value of 0.6 (Bagozzi and Yi, 1988). The above results reveal the convergent validity of the measures deployed (Table 3).

For this study, Hair *et al.* (2014) approach was used to test discriminant validity. Specifically, the heterotrait-monotrait (HTMT) ratio approach was used in measuring the discriminant validity in line with Hair *et al.* (2017). Interestingly, all scales depict higher

Table 2.
Descriptive analysis

Construct	N	Minimum	Maximum	Mean	Std. deviation
Intention	357	1.00	7.00	5.0637	1.73680
ATT	357	1.00	7.00	5.2430	1.53858
SN	357	1.00	7.00	4.7703	1.63457
PBC	357	1.00	7.00	3.3922	1.43318
TIN	357	1.18	7.00	4.9592	1.28490

Table 3.
Results of the
measurement model:
convergent validity

Items	Loadings	Cronbach α	Composite reliability	AVE
ATT1	0.882	0.908	0.935	0.783
ATT2	0.903			
ATT3	0.876			
ATT4	0.879			
INT1	0.860	0.909	0.936	0.787
INT2	0.915			
INT3	0.911			
INT4	0.861			
PBC1	0.697	0.832	0.889	0.668
PBC2	0.827			
PBC3	0.881			
PBC4	0.851			
SN1	0.863	0.852	0.910	0.771
SN2	0.908			
SN3	0.862			
TIN2	0.773			
TIN3	0.790	0.918	0.931	0.600
TIN4	0.731			
TIN6	0.760			
TIN7	0.770			
TIN8	0.789			
TIN9	0.805			
TIN10	0.761			
TIN11	0.791			

AVE values when compared to their correlations with all other constructs thus, delivering proof for discriminant validity, as depicted in [Table 4](#).
The results from the measurement model indicate that the validity and reliability of the data are satisfactory. Hence, the developed constructs in this measurement model could be used for the structural model and hypotheses testing.

4.2 Structural model

The hypotheses in this study were tested by the standard bootstrapping process using a bootstrapping procedure with 5,000 bootstrapped samples and the sum of the study cases. The results of the hypotheses were shown in [Table 5](#).

[Table 5](#) illustrated that three direct and two indirect hypotheses were supported. Specifically, ATT, SN and TIN influence investment intention into RE. For the moderation effect, TIN moderates the relationship between ATT, SN and investment intention into RE. [Table 6](#) presents the variance explained in the endogenous latent variable.

[Table 6](#) shows the research model explains 64% of the total variance of investment intention into RE. This value indicates that the four independent variables and the moderating variable of the study jointly explained 64% of the variance of investment intention into RE. Therefore, based on [Cohen's \(1988\)](#) criterion, the dependent variable exhibited an acceptable level of R^2 value. [Table 7](#) presents the effect size (f^2).

[Table 7](#) shows the effect sizes for the constructs under investigation, i.e. ATT, SN, PBC and TIN were 0.060, 0.095, 0.005 and 0.102, respectively. Accordingly, the effect sizes of

Table 4.
HTMT ratio

Constructs	1	2	3	4	5
ATT					
Intention	0.796				
PBC	0.784	0.698			
SN	0.788	0.778	0.733		
TIN	0.798	0.732	0.709	0.681	

Table 5.
Results of the
structural model and
hypothesis testing

Hypotheses	β	SE	<i>t</i> -value	<i>p</i> -values	Decision
ATT → Intention	0.263	0.073	3.607	0.000	Supported
PBC → Intention	−0.078	0.057	1.375	0.085	Not Supported
SN → Intention	0.260	0.064	4.067	0.000	Supported
TIN → Intention	0.303	0.049	6.229	0.000	Supported
ATT * TIN → Intention	−0.091	0.055	1.653	0.049	Supported
PBC * TIN → Intention	0.022	0.038	0.563	0.287	Not Supported
SN * TIN → Intention	0.133	0.051	2.592	0.005	Supported

Table 6.
Variance explained
in the endogenous
latent variables

Endogenous construct	R^2	R^2 adjusted
II	0.639	0.635

these four exogenous variables on investment intention into RE can be categorized based on Cohen's (1988) criteria as small, small, none and small, respectively. Though, it is worth noting that a small f^2 does not mean an insignificant effect (Limayem *et al.*, 2001). Table 8 presents the construct cross-validated redundancy.

Table 8 presents in the column labelled 1-SSE/SSO the result of the Q^2 test for the endogenous latent variable (investment intention into RE) was above zero ($Q^2 = 0.495$), suggesting large predictive relevance of the model (Henseler *et al.*, 2009; Chin, 1998).

5. Discussion

Building upon the TPB, the study aimed at providing insights into the investment intention of conventional energy stakeholders towards RE in Nigeria. The outcome depicts the applicability of the model in predicting the investment intention in the context of RE in Nigeria. The results demonstrate that ATT, SN and TIN influenced conventional energy stakeholders' investment intention towards RE. In addition, TIN moderates the influence of ATT and SN on investment intention into RE. The demography of the respondents reflects the country's reality, unlike countries like Malaysia, the working class in Nigeria are male. Another justification for this result could be the entry requirement into senior public service is a university degree and its equivalent (BSc/HND). The age bracket is the middle management, which are higher in number and more assessable to answer research questionnaires than the top management. Additionally, energy-related ministries have more number of staff, thus, more represented. Similarly, northwest zone has more population, which may lead to having more participants.

5.1 Direct relationships

For the four direct relationships, three were supported, while one was not supported.

ATT: This study found that *ATT* influences conventional energy stakeholders' investment intention into RE ($b = 0.26$, $t = 3.61$, $p = 0.00$); hence, *H1* was supported. Furthermore, the outcome supports the theory (TPB) that *ATT* is a determinant of intention. The finding is consistent with the view of Kavitha (2015) who concluded that the attitude of Indian entrepreneurs' and officials of brokerage firms has a significant influence on their intention to invest in the stock market. The result suggested that conventional energy stakeholders have a positive attitude towards RE investment, which will significantly influence their intention formation towards investing in RE for electricity generation. This finding is also in congruent with Yee *et al.* (2022), Tan *et al.* (2017) and Harland *et al.* (1999).

Table 7.
Effect size (f^2)

Exogenous constructs	f^2	Effect size
ATT	0.060	Small
PBC	0.005	None
SN	0.095	Small
TIN	0.102	Small

Table 8.
Construct cross-
validated
redundancy

Endogenous construct	SSO	SSE	$Q^2 (=1 - SSE/SSO)$
II	1,428.000	720.958	0.495

SN: This study found that SN influences conventional energy stakeholders' investment intention into RE ($b = 0.26, t = 4.07, p = 0.00$); thus, $H2$ was supported. The outcome is in line with the postulation of the theory (TPB) that SN predicts intention. This result is consistent with the findings of Das (2019) who concluded that SN has a significant positive influence on financial market investment intention among individual Indian investors. The finding indicates that societal influence on conventional energy stakeholders towards RE investment is positive, and this will assist in the easy assimilation of RE policies. This finding is also supported by the works of Yee *et al.* (2022) and Harland *et al.* (1999).

PBC: This study found that PBC has no influence on conventional energy stakeholders' investment intention into RE ($b = -0.08, t = 1.38, p = 0.09$); thus, $H3$ was not supported. The finding is congruent with Dayaratne and Wijethunga (2015) who established an insignificant relationship between PBC and the individuals' investment intention to invest in the Colombo stock exchange. This finding could be attributed to the nature of respondents who are prospective investors; thus, they may rely on other factors before participating in this new area of investment. The findings is also in line with Yee *et al.* (2022), Tan *et al.* (2017) and Harland *et al.* (1999).

TIN: This study found that TIN influences conventional energy stakeholders' investment intention into RE ($b = 0.30, t = 6.23, p = 0.00$); hence, $H4$ was supported. Further, this implied that TIN incorporated into the original TPB model can be used to predict investment intention. The variable has shown a prominent effect as it makes a highly significant contribution to the predictive power of the tested theoretical model. This signifies the relevance of tax incentives in determining conventional energy stakeholders' investment intention into RE. The finding is consistent with Munyanyi and Chiromba, (2015) who concluded that TIN has a significant influence on tourism investment in Zimbabwe. The reason for this finding could be ascribed to the role of TIN towards investment. Many scholars have the opinion that TIN promotes and encourages new investments (Babatunde and Adepeju, 2012; Lim, 2011; Clark, 1999). Considering this, the result indicates that with the availability of TIN, conventional energy stakeholders will be more willing to invest in RE. This finding is also in line with previous studies that extend TPB (Yee *et al.*, 2022; Tan *et al.*, 2017; Harland *et al.*, 1999).

5.2 Moderating effect of tax incentives

TIN was able to moderate the relationship of only two variables, *ATT* and SN.

ATT: This study found that TIN moderates the influence of *ATT* on investment intention into RE ($b = 0.09, t = 1.65, p = 0.05$); hence, $H5$ was supported. The result is significant, implying that the presence of tax incentives strengthens the association of attitude and investment intention into RE. This means that even though the attitude of conventional energy stakeholders towards RE investment is positive, such a relationship could be stronger with the availability of TIN. For it is known that a moderating variable can weaken or strengthen the association of a dependent and independent variable (Baron and Kenny, 1986).

SN: This study found that TIN moderates the influence of SN on investment intention into RE ($b = 0.13, t = 2.59, p = 0.01$); thus, $H6$ was supported. This implied that even though other people's perception regarding RE influences conventional energy stakeholders towards RE investment, yet such a relationship could be stronger with the presence of TIN. Hence, the result is significant, showing the existence of TIN strengthens the association of SN and investment intention into RE.

PBC: This study found that TIN failed to moderate the influence of PBC on investment intention into RE ($b = 0.02, t = 0.56, p = 0.29$); therefore, $H7$ was not supported. The result is

insignificant, implying that conventional energy stakeholders perceived RE investment as a difficult one to the extent that even with available TIN, they do not have much confidence in this energy subsector.

6. Conclusions, implications and limitations of the study

This research deploys and extends the TPB model in the context of energy investment towards the development of a robust model that will predict investment intention into RE that will consequently lead to the availability of affordable and clean energy to address electricity shortage and mitigate climate change. The research set out to contribute to the theory and general body of knowledge in various ways. Firstly, while adequate studies are explaining various investment intentions using TPB (Yee *et al.*, 2022; Tan *et al.*, 2017; Harland *et al.*, 1999), the available literature is either not in the RE sector or not in the Nigerian context. For those that are even in the RE context are either looking at other aspects such as community energy or willingness to pay for RE or adoption of specific RE source. Thus, the study deploys the TPB model in the context of RE investment in Nigeria to bridge this literature gap.

Secondly, unlike the previous studies that extend the model using other behavioural factors, the current study extended the TPB model by incorporating a predictor investment variable, TIN. In the context of investment intention, the conventional energy stakeholders' investment intention into RE may be influenced by the presence of TIN. The results from this study found the effect of TIN to be significant on the investment intention of conventional energy stakeholders. Conclusively, the findings support most of the hypotheses of the proposed model. The hypotheses tested confirmed that investment intention could be predicted using *ATT*, SN and TIN, and the influence of *ATT* and SN on investment intention was moderated by TIN.

The outcome further highlighted the need for policymakers to come with various TIN to attract private investment into RE. The finding provides significant insight for the formulation of enabling policies that could easily encourage conventional energy stakeholders to transform their intention into the actual behaviour of investment into RE for electricity generation. With adequate private investment into RE, the Sustainable Development Goal (SDG) Number 7 – access to affordable and clean energy for all will be achieved. Deploying RE for electricity generation will limit the usage of conventional energy sources for electricity generation. Furthermore, RE has the capacity of providing electricity in both urban and rural areas in the country. Mini off-grid systems can easily provide remote areas with their needed electricity. In addition, generating electricity from renewables will mitigate climate change and will consequently boost economic growth by aiding the establishment of small and medium businesses. With a buoyant economy, crimes will be minimized, security will be strengthened and the general well-being of the people will be improved.

6.1 Limitations and future research directions

This study has some limitations that highlight future research directions. Firstly, the study sample used was limited to only 357 respondents, although the sample served as a representative of the three key stakeholders in the industry. Consequently, this suggests the essential need to validate the model in other contexts considering a larger sample, particularly from other developing countries with RE resources, such as India, South Africa, Ethiopia and Morocco. Secondly, with the four variables used in explaining RE investment intention in this study, it is indisputable that there could be other determinants that could influence investment intention into RE for electricity generation. Hence, the study opens a

new pace for future RE investment intention discussions that could lead to more insights. Thirdly, to build on this research, which is built on a single theory, future research should consider the incorporation of the self-determination theory in this context to examine behavioural intentions as it is found to help give an in-depth result on cognitive processes. However, even with these limitations, this study is believed to offer some vital implications for investment intention studies from the perspective of an emerging African economy, specifically Nigeria.

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