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Public Acceptance of Carbon Tax Implementation: A Nationwide Empirical Study in Malaysia

(Penerimaan Masyarakat Terhadap Pelaksanaan Cukai Karbon: Kajian Emperikal Seluruh Malaysia)

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ABSTRACT

This study investigates public personal traits and demographic factors influencing their acceptance of the implementation of carbon tax policy in Malaysia. Understanding the public's acceptance behaviour becomes crucial as carbon tax gains attention in developing countries. Through an online survey of 566 respondents, the research employs multiple regression analysis, t-test and one-way analysis of variance to examine the relationships. The results indicate that the carbon tax policy receives positive support from the public, who perceive carbon tax as an effective policy to reduce carbon emissions, those willing to pay more to protect the environment, those who recognise climate change as a serious issue and the Chinese community. These findings fill a gap in the environmental taxation literature for developing countries, offering insights for the Malaysian government to formulate effective strategies for public support. It is imperative for the government to consistently disseminate information to the public and create awareness through mass media regarding the serious issue of climate change and the effectiveness of a carbon tax to mitigate it. Regardless of the political party in power, adopting a carbon tax should be prioritised as a national agenda to maintain the country's economic, social, and environmental sustainability to demonstrate the government's unwavering commitment.

Keywords: Public acceptance; carbon tax; Malaysia; environmental tax; developing countries

ABSTRAK

Kajian ini menyiasat faktor sikap masyarakat dan demografi yang mempengaruhi pelaksanaan dasar cukai karbon di Malaysia. Memahami tingkah laku penerimaan masyarakat adalah penting memandangkan cukai karbon semakin mendapat perhatian negara-negara membangun. Melalui kaji selidik atas talian ke atas 566 responden, kajian ini menggunakan analisis regresi berganda, ujian-t dan analisis varians untuk mengkaji hubungan antara faktor pembolehubah. Hasil kajian mendapati pelaksanaan cukai karbon mendapat sokongan masyarakat yang percaya bahawa polisi tersebut berkesan untuk mengurangkan kadar pelepasan gas karbon, daripada masyarakat yang sanggup membayar lebih untuk melindungi alam sekitar, mereka yang mengetahui perubahan iklim adalah isu yang serius dan komuniti kaum Cina. Hasil kajian ini menyumbang kepada literatur yang terhad mengenai percukaian alam sekitar di negara membangun dan memberikan cadangan kepada kerajaan Malaysia untuk merangka strategi berkesan dalam mendapatkan sokongan masyarakat untuk pelaksanaan cukai karbon. Adalah penting bagi kerajaan untuk menyampaikan maklumat melalui media massa dan memupuk kesedaran masyarakat secara konsisten berhubung isu serius perubahan iklim dan keberkesanan cukai karbon untuk mengatasinya. Tanpa mengira parti politik yang berkuasa, pelaksanaan cukai karbon harus diutamakan sebagai agenda nasional untuk mengekalkan kemampanan ekonomi, sosial dan alam sekitar negara bagi menunjukkan komitmen kerajaan yang teguh.

Kata kunci: Penerimaan masyarakat; cukai karbon; Malaysia; cukai alam sekitar; negara membangun

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INTRODUCTION

This study delves into the topic of environmental tax policy acceptance and the challenges it faces during implementation. While the fundamental characteristics of a policy instrument labelled as 'tax' are akin to an unlabelled policy instrument, environmental taxes encounter significantly lower levels of acceptance. Existing

studies have identified various factors contributing to environmental tax aversion among the public. These factors encompass perceptions of tax policy inefficacy (Douenne & Fabre 2020), lack of confidence in political representatives (Savin et al. 2020), and concerns over unfair income distribution (Kallbekken & Aasen 2010). People tend to harbour skepticism regarding the effectiveness of environmental taxes in curbing carbon emissions and exhibit apprehension about potential personal financial burdens (Lo et al. 2013).

Furthermore, a lack of understanding between a Pigouvian tax (a tax assessed against private individuals or businesses for engaging in activities that create adverse side effects for society) and a Ramsey tax (an optimal tax is subject to the basis of consumption) leads to the public perceiving taxes solely as revenue-generating tools (Zvěřinová et al. 2014). To achieve the desired outcomes on the economy, environment, and fiscal front, the success and sustainability of environmental tax policy hinge on garnering public support. Implementation of such policies is fraught with significant challenges, and without the backing of businesses and households, the policy may not endure long enough to realize its intended effects (Heine & Black 2019).

Tax policy, despite potentially facing public resistance, has garnered attention from policymakers due to the significant advantages associated with implementing a carbon tax policy. One of the primary benefits lies in its potential to effectively reduce greenhouse gas (GHG) emissions and foster economic, social, and environmental stability. Additionally, the carbon tax serves as a revenue-generating mechanism to support crucial government services and provide assistance to vulnerable groups, thereby contributing to the development of cleaner, healthier, more resilient, and inclusive economies. The growing global prominence of carbon tax policies has spurred extensive research examining factors influencing public acceptance of such initiatives. However, it is noteworthy that a majority of these studies have been predominantly conducted in developed countries, where the implementation of carbon taxes has been more commonplace (Baranzini & Carattini 2017; Nastis & Mattas 2018; Savin et al. 2020).

In recent years, the adoption of carbon tax policies has extended to several developing countries, including Indonesia and South Africa. Malaysia is poised to join the ranks of 33 nations that have already embraced carbon tax policies as part of their commitment to reducing GHG emission intensity of gross domestic product (GDP) by up to 45% compared to 2005 levels by the year 2030 (UNFCCC 2015). The inclusion of a carbon tax in the 12th Malaysian Plan (2021-2025) indicates an impending increase in the financial burden on the public. Consequently, comprehensive studies focusing on the public acceptability of a carbon tax become imperative for the Malaysian government to construct a policy that is not only feasible but also acceptable to the citizens.

Notably, the research done by Muhammad et al. (2022) demonstrated a significant and positive association between public support for the proposed implementation of a carbon tax and the government's accountability. The study implies that the public's concern over government spending is a significant element influencing their opinion of a carbon tax, with government spending transparency appearing as a critical aspect in securing public support. In order to understand the broader public's view and expectations, additional study is necessary given the significance of public acceptability on the effectiveness of policy implementation. These investigations are necessary to make sure that the time, money, and other resources used to execute the carbon tax policy are not wasted. Therefore, in light of the impending policy enactment, a deeper understanding of public perceptions and preferences becomes vital for fostering successful and sustainable implementation of the carbon tax in Malaysia.

LITERATURE REVIEW

PUBLIC ACCEPTANCE OF CARBON TAX

Muhammad et al. (2021), Ejelöv and Nilsson (2020), Carattini et al. (2018), and Drews and van den Bergh (2015) have conducted comprehensive reviews of studies exploring public acceptability of various environmental policies. These researchers have commonly identified four principal themes influencing public behaviour, namely policy-related factors, governance-related factors, personal traits, and demographic factors. These overarching themes encompass several sub-themes, as depicted in Table 1. The researchers also highlight that most research on public acceptance has been conducted in the United States and various European countries, where the implementation of a carbon tax has been realised. Understanding the determinants of people's behaviour before the implementation of a carbon tax policy is of paramount importance, as it enables the development of relevant strategies to foster higher levels of acceptance and mitigate the risk of policy rejection (Muhammad et al. 2021; PMR 2017). Such insights contribute significantly to crafting effective and well-received policies that align with the values and preferences of the public.

TABLE 1. Categories of the factors that influence public behaviour for environmental policies

Main theme	Policy	Governance	Personal traits	Demographic
Sub-theme	Use of revenue Cost distribution Effectiveness Type of policy Tax rate	Political value orientation Trust Efforts in protecting the	Perceived severity of climate change Environmental protection attitude	Location Income Gender Education Age

	Information Dissemination Competitiveness Experience Exemption	environment Quality of government	Psychological Social sharing Good health Actual polluter Visited abroad	Energy dependency Household size Parenthood Race Employment Religion Religiosity

Source: Muhammad et al. (2021)

In the Malaysian context, Muhammad et al. (2022) conducted an examination of the impact of trust in the government on the public acceptability of a carbon tax. Their study revealed that public support for a carbon tax is positively influenced by the level of trust individuals have in the government's accountability. Particularly, the public's concern over government spending necessitates transparency in fiscal management to garner support for the proposed policy. To comprehensively understand public behaviour in this pre-implementation stage, this study will focus on factors falling under personal traits and demographic themes, considering two main reasons. Firstly, adopting a holistic approach allows for a comprehensive exploration of the various factors that may shape public attitudes and preferences towards the carbon tax policy. Secondly, previous research has presented divergent findings in relation to both personal traits and demographic factors, warranting further investigation in this context.

Within the personal traits theme, this study will examine four variables – individuals' perceptions of the effectiveness of the carbon tax in reducing carbon emissions, their attitudes towards climate change issues, their stance on environmental protection, and their willingness to contribute financially to environmental conservation efforts. On the other hand, the demographic theme will encompass seven variables, namely income, gender, education level, age, geographic location, race, and employment status. By investigating these factors, the study seeks to gain deeper insights into the intricate interplay between personal traits, demographic characteristics, and public acceptability of the carbon tax policy in Malaysia. Understanding these dynamics is critical in formulating targeted and effective strategies that resonate with the concerns and preferences of the Malaysian public, ultimately enhancing the prospects of successful policy implementation and acceptance.

In order to investigate the public acceptance of carbon tax implementation, this study employs Heider's (1958) Attribution Theory. The theory suggests that internal or external factors determine all human behaviour. The internal factors explain the person, such as their abilities, physical characteristics, and traits. The internal factors are under the taxpayers' control; for example, their willingness to pay carbon tax is because the taxpayer understands that they are helping the government to reduce carbon emissions. External factors, such as the phenomenon of global climate change, imply that taxpayers may have limited or no control over their behaviour. In this theory, taxpayers' acceptance of the taxation system is contingent upon their assessment of the taxation itself. Recent studies by Islam et al. (2023), Fan et al. (2023) and Abrokwah et al. (2023) demonstrate that Heider's (1958) Attribution Theory is still a relevant and important theory in social psychology that can be used to explain a wide range of social phenomena.

PERSONAL TRAITS

Perceptions of the Effectiveness of Carbon Tax in Reducing Carbon Emissions The selection of an appropriate environmental policy is of utmost importance for the government to achieve its social, economic, and environmental objectives. Many studies consistently emphasise a positive relationship between public support for environmental tax policies and their beliefs in the policy's effectiveness in inducing behavioural change and reducing emissions (Clayton 2018; Dreyer & Walker 2013; Kim et al. 2013; Rhodes et al. 2017; Uyduranoglu & Ozturk 2020). For instance, Baranzini and Carattini (2017) reported a significant increase of nearly 30% in public support when the carbon tax was perceived as an effective tool for reducing carbon emissions. Additionally, Dreyer and Walker (2013) demonstrated that strong public support is evident when the carbon tax is deemed highly effective.

Conversely, public support for environmental tax policies tends to decline when skepticism arises concerning the policy's actual impact on the environment (Beuermann & Santarius 2006; Carattini et al. 2017; Kotchen et al. 2017) or when the policy is perceived as inequitable (Baranzini & Carattini 2017; Douenne & Fabre 2020; McLaughlin et al. 2019; Savin et al. 2020; Uyduranoglu & Ozturk 2020). Like other forms of taxation, carbon tax is often viewed as inequitable as it disproportionately affects lower-income groups. The increased costs of fossil-based goods, such as electricity and fuel, impose a heavier financial burden on these vulnerable segments of the population.

To garner public support, governments are encouraged to consider various approaches to returning the revenue collected from carbon taxes to the public. These approaches include cash-back initiatives, free health insurance programs, and reductions in goods and services taxes (Bergquist et al. 2020; Douenne & Fabre 2020; Hsu et al. 2008). Such measures aim to alleviate the perceived burden of the carbon tax and foster acceptance and cooperation among the public. Based on the above discussions, the perceptions of the effectiveness of carbon tax

in reducing carbon emissions are based on external factors guided by the Attribution Theory. Therefore, in this study, it is hypothesised that:

H_1 Perceptions of the effectiveness of carbon tax in reducing carbon emissions positively affect public acceptance of carbon tax in Malaysia.

Perceptions of Climate Change Issue Muhammad et al. (2021) and Ejelöv and Nilsson's (2020) analysis show that public perception of climate change severity, as gauged by concern, awareness, and knowledge, constitutes a prominent variable widely examined in numerous studies. Findings from past studies consistently indicate that public support for environmental taxes is positively correlated with the level of comprehension, awareness, and acknowledgement of climate change issues, including its adverse impacts on the environment and its underlying causes (McLaughlin et al. 2019; Rosentrater et al. 2012; Rotaris & Danielis 2019). For instance, Kotchen et al. (2017) observed that individuals who believe in the occurrence of global warming are 35 percent more likely to endorse a carbon tax. Having an informed and clear understanding of climate-related concerns tends to evoke empathy towards addressing environmental problems and fosters a genuine concern for the future of our planet's environment (Savin et al. 2020; Thalmann 2004).

In essence, public perception of climate change plays a pivotal role in shaping attitudes towards environmental taxes. As individuals become more aware of the gravity of climate change and its potential ramifications, they are inclined to support policy measures that aim to mitigate its impact. This knowledge-driven empathy underscores the significance of effective communication and education initiatives in influencing public opinion and enhancing public support for environmental tax policies. Thus, understanding the interplay between public awareness of climate change and their support for a carbon tax is essential for the government to develop targeted strategies to combat climate change effectively and garner widespread public endorsement for environmentally conscious policies.

As discussed, perceptions of climate change issues are positively influenced by taxpayers' awareness. According to the Attribution Theory, awareness constitutes individuals' internally developed thoughts and perspectives based on their knowledge. The second hypothesis is formulated as follows:

H_2 Perceptions of climate change have a positive effect on public acceptance of carbon tax in Malaysia.

Attitude Towards Environmental Protection The relationship between public support and their attitude toward environmental protection, as indicated by public environmental behaviour and green membership, is another common factor that researchers investigate. With the exception of the study conducted by Duan et al. (2014), the majority of research reveals a positive and significant association between these variables. Specifically, higher levels of public support for environmental taxes tend to be linked with more positive attitudes toward environmental protection (Baranzini & Carattini 2017; Kim & Shin 2015; Uyduranoglu & Ozturk 2020). This alignment between support for environmental taxes and positive attitudes toward environmental protection is further supported by the findings of Beuermann and Santarius (2006), who observed a willingness among business leaders and focus group participants to contribute financially towards sustainability goals, climate change mitigation, and natural resource preservation.

In contrast, the study conducted by Convery et al. (2014) reported noticeable variation in respondents' replies concerning their level of environmental awareness. This discrepancy highlights the complex nature of public attitudes and perceptions concerning environmental issues and policies. Therefore, further investigation is warranted to better understand the intricate relationship between public environmental behaviour, green membership, and their support for environmental taxes. As most of the literature in previous studies supports a positive relationship between attitude and the public acceptance of environmental taxes, it is hypothesised that the attitude toward environmental protection positively impacts the public acceptance of carbon tax in Malaysia.

H_3 Attitude towards environmental protection positively affects public acceptance of carbon tax in Malaysia.

Willingness to Pay for Environmental Protection The literature concerning willingness to pay estimates for climate change policy at the international level has been steadily expanding. The majority of research in this domain has been conducted in the United States, followed by Europe (Alló & Loureiro 2014). Kotchen et al. (2017) and Nastis and Mattas (2018) observed a positive relationship between individuals' willingness to pay and their acceptance of climate change policies geared towards environmental protection. Notably, their willingness to pay behaviour was influenced by factors such as revenue recycling policies (Beiser-McGrath & Bernauer 2019), higher income levels (Nastis & Mattas 2018), and higher educational attainment (Alberini et al. 2018). These findings suggest that a considerable proportion of the population is more amenable to supporting climate change policies when they perceive tangible benefits, such as revenue recycling mechanisms and enhanced personal income and education.

However, earlier research by Rosentrater et al. (2012) yielded contrasting results. Their survey study in Norway revealed respondents who acknowledged anthropogenic climate change and recognised the significance of implementing a carbon tax. While favouring policy options generally deemed beneficial for the environment, these respondents exhibited reluctance to incur higher costs to protect it. These divergent findings emphasise the nuanced nature of public attitudes towards climate change policies and willingness to pay. Consequently, further investigation is warranted to elucidate the intricate factors influencing individuals' decisions regarding their support for a carbon tax and their willingness to contribute financially.

H_4 Willingness to pay for environmental protection positively affects Malaysia's public acceptance of carbon tax.

DEMOGRAPHIC

Research has placed significant emphasis on examining demographic factors in relation to the support of environmental taxes (Muhammad et al. 2021). Income, gender, education, age, and geography rank among the demographic variables that are most commonly tested. Regarding how these factors affect public support for environmental levies, however, the results of previous studies have been mixed and ambiguous. Contextual factors, different sample characteristics, or different policy contexts between research may be the cause for the conflicting conclusions.

In addition to the five demographic factors that are frequently investigated, this study also analyses race and employment status. The study attempts to get a more thorough knowledge of these additional demographic characteristics' possible impact on public acceptance of carbon tax policies.

Income The majority of research consistently found a positive and statistically significant relationship between income levels and support for environmental tax policies, indicating that those with greater incomes are more likely to support such measures (Birol & Das 2010; Kenny 2019; Rotaris & Danielis 2019). For instance, Kotchen et al. (2017) discovered that the probability of support for a carbon tax increased by 1percent per US$10,000 increase in household income. The impact of income on public attitudes of environmental taxes is highlighted by this observation.

However, several studies have shown inconsistent findings, with no apparent relationship between income and public support for environmental tax policies (Brown & Johnstone 2014; Duan et al. 2014; Fairbrother 2017). For example, Convery et al. (2014) qualitative study found that participants' socioeconomic status did not appear to have a substantial impact on their answers supporting environmental tax. Although previous studies have produced mixed results, this study posits that demographic characteristics serve as internal factors influencing individuals' behaviour. Consequently, the hypothesis is as follows:

H_5 Income positively affects public acceptance of carbon tax in Malaysia.

Gender Numerous studies have examined the link between gender and support for environmental policies, with the results being varied and occasionally contradicting. Some studies have repeatedly found little evidence of a gender effect on public support for environmental initiatives (Hammar & Jagers 2006; Hsu 2010; Kotchen et al. 2017). Other research, however, have found a notable correlation between gender and public support, with mixed results for men and women and some showing a strong yet weak relationship.

For instance, studies by Agrawal et al. (2010), Fairbrother (2017), and Rotaris and Danielis (2019) have found that women are more likely than men to favour environmental policies. However, the results of other research have not been conclusive, and there have been no claims of significant gender-based variations in the public acceptance (Duan et al. 2014; Eliasson & Jonsson 2011; Grimsrud et al. 2019). It is hypothesised that:

H_6 Gender positively affects public acceptance of carbon tax in Malaysia.

Education The relationship between education level and public opinions about environmental taxes has been the subject of numerous research, with a variety of results. There is a lot of evidence indicating those with less education are more likely to be strongly opposed to environmental taxes (Davidovic & Harring 2019; Gevrek & Uyduranoglu 2015; Hsu et al. 2008). On the other hand, research by Baranzini and Carattini (2017) and Bachus et al. (2019) has shown a favourable correlation between education and willingness to pay environmental taxes. More specifically, there is a nearly 3% rise in likelihood of approving the carbon price for every extra year of education. It is important to note that according to the literature, highly educated people are those who have graduated high school, obtained graduate degrees, or possessed higher professional qualifications (Hammar & Jagers 2006; Thalmann 2004).

In contrast, some research findings suggest that education may not significantly influence public support for environmental taxes (Denstadli & Veisten 2020; Duan et al. 2014; Feldman & Hart 2018). These divergent outcomes may be attributed to various factors, including the specific contexts in which the studies were conducted, variations in sample characteristics, and the specific design and methodology employed. The discussions indicate that individuals with higher levels of education are more inclined to embrace new tax policies compared to those with lower educational attainment. Given that the level of education is regarded as an internal factor influencing individuals' behaviour, the study posits the following hypothesis.

H_7 Education positively affects public acceptance of carbon tax in Malaysia.

Age Divergent results have been found in several research that have examined into the relationship between public support for environmental taxes and age. According to a large body of research (Hammar & Jagers 2006; Rotaris & Danielis 2019; Wicki et al 2019), younger people tend to support environmental taxes at higher rates than older groups. On the other hand, research by Agrawal et al. (2010), Amdur et al. (2015), and Thalmann (2004) has revealed that elderly people support environmental taxes more than youngsters do. In particular, Hammar and Jagers (2006) discovered that persons between the ages of 31 and 60 showed greater negative acceptance of environmental taxes compared to people of other ages. Although the findings of previous studies have yielded contradictory results, this study formulates the following hypothesis regarding the relationship between age and the public acceptance of carbon tax in Malaysia.

H_8 Age positively affects public acceptance of carbon tax in Malaysia.

Location Studies have revealed conflicting findings on public support and locations (city, state, or country). Brown and Johnstone (2014), Fairbrother (2017), and Hammar and Jagers (2006) found no differences between urban residents and suburban areas, while other studies reveal a significant relationship between the variables (Eliasson & Jonsson 2011; Grimsrud et al. 2019; Hammar & Jagers 2007; Migheli 2018; Rotaris & Danielis 2019; Thalmann 2004; Umit & Schaffer 2020). Except for Umit and Schaffer (2020), other studies revealed that residents of rural or suburban locations tend to be less supportive, which may be related to their significant reliance on cars. People in cities are more inclined to support it because they are more likely to be exposed to air pollution caused by road transport and favour fiscal policies to reduce gasoline and diesel consumption (Rotaris & Danielis 2019). As a nationwide pre-implementation study of carbon tax implementation, this research aims to investigate the influence of state location on public acceptance. Therefore, the hypothesis is as follows:

H_9 Location positively affects public acceptance of carbon tax in Malaysia.

Race Research investigating the influence of race on public support for environmental taxes has primarily been conducted in the United States. Among these studies, Feldman and Hart (2018) reported a non-significant relationship between race and public support for environmental taxes. However, other investigations have revealed a notable and significant association between race and support for such policies. For instance, Agrawal et al. (2010) concluded that white voters were less likely to support environmental taxes compared to non-white individuals. On the other hand, Amdur et al. (2015) found that non-white individuals were significantly less inclined to support a carbon tax in comparison to Caucasians. Based on the discussions, it is hypothesised that:
H_{10} Race positively affects public acceptance of carbon tax in Malaysia.

Employment The role of employment status as a determinant of public acceptance of environmental taxes has received relatively less attention in the existing literature. Among the limited studies that have examined this relationship, Birol and Das (2010) and Kenny (2019) reported conflicting findings regarding the association between employment status and public acceptability for wastewater charges. Specifically, Birol and Das (2010) found a significant relationship between employability and public acceptance, while Kenny (2019) arrived at contradictory results. The lack of research on the influence of employment status on public attitudes towards environmental taxes highlights the need for further investigation in this area. The above discussions indicate inconclusive findings on the relationship between employment and public acceptance of environmental tax. However, this study suggests that employment positively affects public acceptance of carbon tax.

H_{11} Employment positively affects public acceptance of carbon tax in Malaysia.

The review of the existing literature on the eleven independent variables pertaining to public acceptance has resulted in the development of the research model for this study, as depicted in Figure 1.

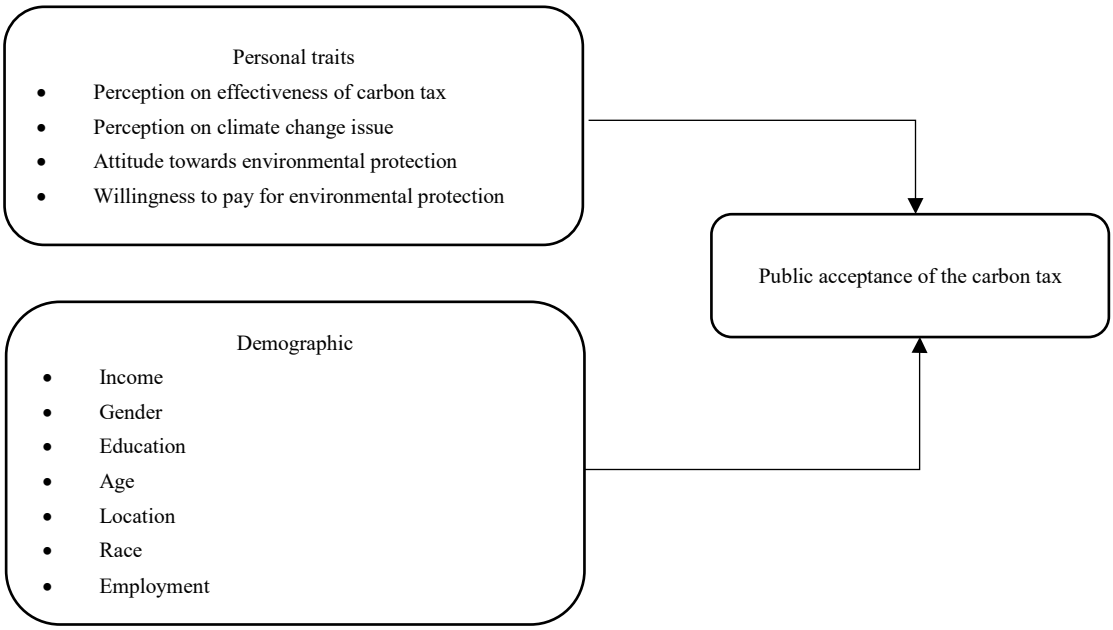

FIGURE 1. Research model of the public acceptance of the carbon tax

METHODOLOGY

A quantitative research approach was employed in this study, utilizing a questionnaire constructed with Google Forms as the primary data collection tool. The questionnaire's introductory section provided a comprehensive explanation of the concept of carbon tax and elucidated the potential implications of higher fuel and electricity prices. Similar to other consumption-based taxes such as sugar, sales, and services tax, carbon tax ensures equitable contributions from all users, irrespective of age and income group. Consequently, individuals who consume higher amounts of fuel and electricity indirectly contribute more to the tax.

The questionnaire was divided into two sections, namely Section A and Section B. The former consisted of statements designed to measure the personal traits variables, as presented in Appendix 1. On the other hand, Section B encompassed demographic questions to gather information about respondents' characteristics. To enhance the questionnaire's validity, it underwent rigorous review and scrutiny by three tax and environmental experts. Subsequent to their feedback, several amendments were made to refine the instrument. Additionally, to accommodate the diverse language preferences of the Malaysian population, the questionnaire was translated into Malay, the national language of Malaysia.

The target population for this study comprised Malaysian citizens residing in the 14 states of Malaysia including Wilayah Persekutuan Labuan, Sabah, and Sarawak, aged 18 years and above. The choice of respondents above 18 years was based on their presumed maturity and better comprehension of the subject matter being investigated (Cozby 2013). The total population of interest amounted to 21.1 billion individuals, and the sample size employed was determined through area sampling. The study adhered to the sampling guidelines outlined by Krejcie and Morgan (1970) for population-based sample size determination. Given the population of interest, which is 21.1 million, an appropriate sample size would be 384.

In order to achieve a wide and diverse participation, the Google form was disseminated through commonly used communication applications, including WhatsApp, Facebook Messenger, and Telegram. Moreover, on social media platforms, it was shared through Facebook and Instagram. Approximately more than 3,000 instances of the Google form were distributed to a combined audience of 2,500 followers on Facebook and Instagram and 500 participants in WhatsApp groups. Furthermore, enumerators were strategically placed in each state to maintain a relatively balanced distribution of responses across diverse geographical areas. The selection of enumerators was made from among accounting graduates. Over the course of two months in 2021, a total of 566 respondents completed the survey.

For data analysis, this study employed the statistical method of multiple regression analysis to assess the associations between the dependent variable and the four variables of the personality traits – public perceptions of the effectiveness of carbon tax, climate change is a serious issue, public attitude towards protecting the environment and their willingness to pay for environmental protection. The proposed regression model is represented as Equation 1 below, serving as a foundational framework for exploring the relationships between public acceptance of the carbon tax and the personal trait variables.

Equation 1. Regression Analysis Model to Determine the Public Acceptance of the Carbon Tax with Personal Trait Factors on Carbon Tax Implementation

$$Y = \beta_0 + \beta_1(X_1) + \beta_2(X_2) + \beta_3(X_3) + \beta_4(X_4)$$

Where:
Y = public acceptance of the carbon tax,
X1 = effectiveness of carbon tax,
X2 = climate change is a serious issue,
X3 = attitude towards protecting the environment,
X4 = willingness to pay for environmental protection,

For the demographic factors, the independent t-test and a one-way between-groups analysis of variance (ANOVA) were conducted on gender and the other variables (monthly income, education, age, location, race and employment), respectively. These analytical approaches allow for evaluating the significance of each independent variable in the specified relationship (Petchko 2018).

RESULTS

RESPONDENT DEMOGRAPHIC

Table 2 presents the demographic information of the respondents, providing insights into the distribution of participants across various categories. In terms of monthly income, a significant proportion of respondents (39.6% or 224 participants) reported earning less than RM1,200. In contrast, only a small fraction of respondents, comprising 2.8% (16), reported a monthly gross income of more than RM12,001. The distribution of respondents by gender indicates that the majority are female, constituting 71.2% (403) of the total sample, while male respondents accounted for 28.8% (163).

Regarding educational attainment, the majority of respondents, accounting for 47.9% (271), possess a bachelor's degree. Respondents with secondary education and those with no formal schooling were among the least represented, comprising only 0.5% (3) and 0.2% (1) of the entire sample, respectively. The findings reveal that the majority of the respondents are in the age category between 21-39 years, constituting 66.6% (377) of the total sample. In contrast, the category of 60-69 years represents only 0.7% (4) of the respondents.

Regionally, Negeri Sembilan had the highest number of respondents, with 103 individuals (18.2%). In contrast, Perlis, Wilayah Persekutuan Putrajaya, and Labuan had minimal representation, with 0.9%, 0.7%, and 0.2% of the total respondents, respectively. In terms of ethnicity, Malay respondents were the most prominent, representing 87.6% (496) of those who participated in the survey. Conversely, the Indian ethnic group had the lowest representation, with only 1.1%. Regarding employment status, 49.6% (281) of respondents identified as full-time employed, while retired individuals had the lowest representation, accounting for only 0.5% or three respondents.

The composition of respondents in this study closely resembles the demographic distribution observed in the wider population, facilitating the study's ability to make meaningful inferences and extend its findings to the broader population.

TABLE 2. Respondents' demography

Description	Frequency	Percentage	Valid (%)	Cumulative (%)
Monthly gross income				
Less than RM1,200	224	39.6	39.6	39.6
RM1,201 – RM3,000	167	29.5	29.5	69.1
RM3,001 – RM6,000	96	17.0	17.0	86.0
RM6,001 – RM9,000	42	7.4	7.4	93.5
RM9,001 – RM12,000	21	3.7	3.7	97.2
RM12,001 or more	16	2.8	2.8	100.0
Total	566	100.0	100.0	
Gender				
Male	163	28.8	28.8	28.8
Female	403	71.2	71.2	100.0
Total	566	100.0	100.0	
Education				
No schooling completed	1	.2	.2	.2
Primary school	3	.5	.5	.7
High school	54	9.5	9.5	10.2
Matriculation/Pre-Diploma/Certificated	31	5.5	5.5	15.7
STPM/ Diploma	102	18.0	18.0	33.7
Professional Certificate	9	1.6	1.6	35.3
Bachelor’s degree	271	47.9	47.9	83.2

Master's degree	68	12.0	12.0	95.2
Doctor of Philosophy	27	4.8	4.8	100.0
Total	566	100.0	100.0	
Age (Years)				
18-20	75	13.3	13.3	13.3
21-39	377	66.6	66.6	79.9
40-49	74	13.1	13.1	92.9
50-59	36	6.4	6.4	99.3
60-69	4	0.7	0.7	100.0
Total	566	100.0	100.0	
Location				
Johor	21	3.7	3.7	3.7
Kedah	39	6.9	6.9	10.6
Kelantan	30	5.3	5.3	15.9
Melaka	23	4.1	4.1	20.0
Negeri Sembilan	103	18.2	18.2	38.2
Pahang	20	3.5	3.5	41.7
Perak	56	9.9	9.9	51.6
Perlis	5	.9	.9	52.5
Pulau Pinang	38	6.7	6.7	59.2
Sabah	9	1.6	1.6	60.8
Sarawak	77	13.6	13.6	74.4
Selangor	93	16.4	16.4	90.8
Terengganu	18	3.2	3.2	94.0
Wilayah Persekutuan Kuala Lumpur	29	5.1	5.1	99.1
Wilayah Persekutuan Labuan	1	.2	.2	99.3
Wilayah Persekutuan Putrajaya	4	.7	.7	100.0
Total	566	100.0	100.0	
Race				
Malay	496	87.6	87.6	87.6
Chinese	14	2.5	2.5	90.1
Indian	6	1.1	1.1	91.2
Iban	29	5.1	5.1	96.3
Others	21	3.7	3.7	100.0
Total	566	100.0	100.0	
Employment				
Full-time employed	281	49.6	49.6	49.6
Part-time employed	25	4.4	4.4	54.1
Self-employed	51	9.0	9.0	63.1
Student	165	29.2	29.2	92.2
Retired	3	.5	.5	92.8
Not employed	41	7.2	7.2	100.0
Total	566	100.0	100.0	

VALIDITY AND RELIABILITY ANALYSIS

To ensure the data's validity for the four personal traits variables, two statistical measures were employed: Bartlett's Sphericity test and the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) (see Table 3). The results of Bartlett's test of Sphericity indicated statistical significance for all variables, with $p < 0.05$, indicating the presence of sufficient inter-variable correlations (Tabachnick & Fidell 2007). Additionally, the KMO measure provided further validation, as its value exceeded the recommended minimum threshold of 0.6, confirming the suitability of the data for conducting factor analysis (Tabachnick & Fidell 2007). These validation procedures reinforce the data's reliability and appropriateness for subsequent analytical processes, enabling a robust examination of the relationships among the variables under investigation.

TABLE 3. Validity analysis

Variables		KMO value
1.	Effectiveness of Carbon tax	0.706
2.	Climate change is a serious issue	0.707
3.	Attitude towards protecting the environment	0.744
4.	Willingness to pay for environmental protection	0.616
5.	Public acceptance of the carbon tax	0.767

The measurement's reliability and internal consistency were deemed valid, as evidenced by the alpha coefficient value surpassing the commonly accepted threshold of 0.7 (see Table 4). This indicates that the items used in the measurement demonstrate strong internal coherence and reliability, enhancing confidence in the accuracy and consistency of the data collected for the study.

TABLE 4. Reliability analysis

Variables		No.of Items	Cronbach's Alpha
1.	Effectiveness of Carbon tax	3	0.869
2.	Climate change is a serious issue	3	0.863
3.	Attitude towards protecting the environment	4	0.757
4.	Willingness to pay for environmental protection	3	0.705
5.	Public acceptance of the carbon tax	3	0.940

MULTIPLE REGRESSION ANALYSIS RESULTS

Following the completion of the validity and reliability analyses, a multiple regression analysis was undertaken to explore the association between public acceptance of the carbon tax and the four variables of the personal traits variables: 1) perceptions of the effectiveness of carbon tax, 2) recognition of climate change as a serious issue, 3) attitude towards environmental protection, and 4) willingness to pay. The variables were found to be in compliance with the normality, linearity, multicollinearity, and heteroscedasticity tests. In the context of multicollinearity testing, the VIF exhibited a maximum value of 4.085, while the average VIF was 1.872. The summary of the regression analysis results for the model assessing public acceptance of the carbon tax with attitude factors is detailed in Table 5.

TABLE 5. Summary of results of multiple regressions

	B	SE	Beta	t-Value	P-value
Constant	0.152	0.180		0.847	0.397
Attitude towards protecting the environment	-0.024	0.045	-0.018	-0.542	0.588
Effectiveness of carbon tax	0.535	0.032	0.550	16.859	0.000*
Willingness to pay for environmental protection	0.286	0.039	0.253	7.273	0.000*
Climate change is a serious issue	0.131	0.042	0.106	3.137	0.002*

Model Summary: $R^2 = 0.574$; Adjusted $R^2 = 0.571$; F (566) = 188.74; p (0.000) < 0.05
*Significance level is at α=0.05

The regression model provides a good fit to the data, as indicated by an R^2 of 0.574 and an adjusted R^2 of 0.571. The *F*-statistic (F = 188.74) supports the model's overall significance. The associated p-value is highly significant at 0.000 ($p < 0.05$), suggesting that the model's explanatory power is not due to random chance and indicating that the whole model provides valuable information about the relationship between the independent and dependent variables.

Among the multiple regression analysis results, three variables emerged as significant determinants of public acceptance of the carbon tax: perceptions of the effectiveness of carbon tax (Beta = 0.53, p = 0.000), recognition of climate change as a serious issue (Beta = 0.131, p = 0.002), and willingness to pay (Beta = 0.286, p = 0.000). However, the variable related to attitude towards environmental protection was found to be insignificant determinant in the public acceptance of the carbon tax. The R^2 value of 0.574 indicates that the model explains approximately 57.4 percent of the variance in public acceptance towards the carbon tax in Malaysia.

For the gender factor, the group descriptive and summary of the t-test results are shown in Table 6 and Table 7, respectively. There was no significant difference in scores for males (M = 3.27, SD = 0.97) and females (M = 3.37, SD = 0.8); t (564) = - 1.259, p = 0.21, 2-tailed.

TABLE 6. Group descriptive

Gender	N	Mean	Std. Deviation	Std. Error Mean
Male	163	3.2720	.96527	.07561
Female	403	3.3714	.79987	.03984

TABLE 7. Summary of T-Test results

	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Equal variances assumed	5.902	.015	1.259	564	.209	-.09940	.07896
Equal variances not assumed			1.163	256.507	.246	-.09940	.08546

The ANOVA results for the remaining demographic factors are presented in Table 8. The results show that there was a statistically significant difference at the $p < .05$ level only for the race groups which are between Chinese, Iban and others: F (4, 566) = 5.4, p = 0.000. Despite reaching statistical significance, the actual difference in mean scores between the groups was quite small. The effect size, calculated using eta squared, was .04. Post-hoc comparisons using the Tukey HSD test indicated that the mean score for Chinese (M = 2.57, SD = 0.88) was significantly different from Iban (M = 3.57, SD = 0.70) and Others (M = 3.34, SD = 0.85). Malay and Indian did not differ significantly from either group. Other demographic factors are found not significant.

TABLE 8. Summary of ANOVA results

	Sum of Squares	*df*	Mean Square	F	Sig.
Income	3.050	5	.610	.841	.521
Education	8.499	8	1.062	1.476	.163
Age	2.266	4	.567	.781	.538
Race	15.206	4	3.802	5.412	.000
Location	13.349	15	.890	1.236	.240
Employment	4.475	5	.895	1.238	.290

CONCLUSIONS

This study investigates the determinants of public acceptability towards the implementation of a carbon tax in Malaysia. The analysis reveals that only four variables – public perceptions of the effectiveness of the carbon tax, agreement on the seriousness of climate change, willingness to pay for environmental protection, and the Chinese exert a positive and significant influence on public acceptance of the carbon tax policy. These results indicate that the public places considerable importance on the effectiveness of the carbon tax in controlling or reducing carbon emissions. Notably, the past abolishment of the Goods and Services Tax (GST) in 2018 may have contributed to concerns regarding the stability of government policies in addressing specific issues. As such, similar concerns could arise regarding the effectiveness of the carbon tax policy if it were to be implemented.

The findings of this study contribute valuable insights to the limited literature on carbon tax in Malaysia and offer important implications for government policy. The results align with Heider's (1958) Attribution Theory by highlighting the influence of external factors (perceived effectiveness of the policy and climate change issue) and internal factors (willingness to pay more for environmental protection) on policy acceptance. The alignment of these results with the Attribution Theory provides a compelling framework to interpret the dynamics behind policy acceptance. The theory's distinction between external and internal attributions proves valuable in elucidating how individuals make sense of the carbon tax proposal. In terms of policy, by identifying the key factors influencing public acceptance of the carbon tax, the Malaysian government can devise more targeted and effective strategies to gain support and ensure sustainable and effective carbon tax policies in Malaysia. This aligns with United Nations Sustainable Development Goal (SDG) 13: "Climate Action." SDG 13 specifically addresses taking urgent action to combat climate change and its impacts, and it emphasises the need to raise public awareness and mobilise resources to address environmental challenges and secure a sustainable future for the planet.

This study also offered a perspective on the public behaviour in developing countries and the pre-implementation of environmental tax policies. Existing studies on public behaviour towards environmental tax policies have predominantly focused on developed countries and were often conducted post-policy implementation (Ejelöv & Nilsson 2020; Muhammad et al. 2021). The contrasting findings of this study with previous research on public attitudes and demographic factors suggest that individuals in developing countries may have limited knowledge and awareness concerning environmental protection. Given that many developing countries, including Malaysia, are adopting various environmental and carbon pricing policies to fulfil their nationally determined contributions, understanding public attitudes towards environmental protection becomes crucial in achieving national targets. Therefore, conducting more pre-implementation studies in Malaysia is imperative by exploring policy variables such as subsidy reform, utilisation of revenue, and tax rates, using experimental or causal-comparative approaches.

The pivotal role of the government in enhancing public support and facilitating the effective implementation of a carbon tax cannot be overstated. Based on the findings of this study, several recommendations have been identified and are classified into three categories: governance, policy, and public. These proposals offer advice to the government's strategies to implement an effective carbon tax policy, which greatly influences public support as there are few discussions and information on the implementation of carbon taxes in Malaysia.

The governance aspect holds paramount importance in the successful implementation of a carbon tax policy in Malaysia. To ensure the continuity and effectiveness of the policy, it must be treated as a national initiative rather than a political agenda. The abolishment of GST should serve as a significant instructive experience for the government and the public. In 2018, the opposition pledged to abolish the GST and politicised it during the general election despite the fact that GST is an effective tax system that raises government revenue. As a result, the approximate government revenue reduction amounted to RM21 billion, substantially influencing tax collection (New Straits Times 2018). Politicising an efficient tax policy should be avoided, and efforts to implement it should persist despite changes in government. The government must also invest in talent development to build a pool of carbon tax experts, given the current shortage in this field. Accountability and transparency in tax collection and usage should be prioritised to foster public trust. Moreover, sustainability efforts, such as recycling and renewable energy use, should be championed by government agencies to set an example for the public and businesses. A robust governance framework will bolster positive perceptions and confidence in the government's carbon tax policy.

In terms of policy, coordination with the emission trading scheme is essential to prevent carbon leakage and ensure the effectiveness of both carbon pricing mechanisms. Establishing a national committee to conduct extensive studies on policy coordination is crucial. The government should also adopt a practical approach by allowing a testing period of two to three years for the policy. This timeframe will enable the identification and resolution of issues and facilitate the construction of a user-friendly system. A well-coordinated and tested policy will enhance public compliance and support, as stakeholders will be assured that coherent policies are in place and the correct amount of tax is being collected to protect the environment.

Additionally, to improve public support, continuous environmental education programs should be implemented to raise awareness about the importance of environmental protection. Public awareness of the carbon

tax should also be heightened through various means, such as educational materials, social media campaigns, workshops, and consultations. A high level of environmental awareness and commitment from all stakeholders will prevent a reversal of an efficient tax policy like the GST, which resulted in significant revenue loss. Adopting a revenue-neutrality approach, where tax proceeds are reinvested back into society through cash or facilities for social and economic development, will further enhance public support.

To ensure the efficacy of the carbon pricing policy, continuous studies of public acceptance should be conducted. After implementing the policy, the government should assess public perceptions of its effectiveness and fairness. Key indicators to monitor include whether the policy effectively supports low-income households, controls price hikes on goods and services, and encourages companies to invest in green technologies. Delaying the implementation of the carbon pricing policy should be avoided to address the pressing issues of global warming and climate change effectively. Protecting the planet is not only a responsibility but also the most significant legacy that can be bequeathed to future generations.

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APPENDIX A

Statements in Questionnaire	Choice of answers
Effectiveness of Carbon tax	
1. Do you think carbon tax helps to reduce the effect of global warming eventually?	1 (strongly not confident), 2 (not confident), 3 (neutral), 4 (confident), 5 (strongly confident)
2. How effective do you think the carbon tax will help to lower carbon emissions from industries in Malaysia?	
3. Do you think carbon tax influence human behaviour in protecting the environment?	
Climate change is a serious issue	
1. If things continue on their present course, we will soon experience a major ecological catastrophe.	1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), 5 (strongly agree)
2. The phenomena of global climate change are worsening.	
3. The earth is getting warmer because of human activity, such as burning fossil fuels.	
Attitude towards protecting the environment	
1. It is my responsibility to protect the environment.	1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), 5 (strongly agree)
2. If public transportation is efficient, I will not drive my car to protect the environment.	
3. Whenever possible, I try to save natural resources.	
4. In my daily life, I try to find ways to conserve water or power.	
Willingness to pay for environmental protection	
1. I would give part of my income if I were certain the money would be used to prevent environmental pollution.	1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), 5 (strongly agree)
2. I would be willing to pay much higher taxes to protect the environment.	
3. I would like to see more government spending to address global climate change, regardless of increased taxes.	
Public Acceptance	
1. Do you support this government's decision to implement a carbon tax?	1 (strongly not support), 2 not support), 3 (neutral), 4 (support), 5 (strongly support)
2. To what extent are you supporting the implementation of carbon tax policy?	
3. Are you willing to accept this government's decision to implement a carbon tax?	1 (strongly do not accept), 2 (do not accept), 3 (neutral), 4 (accept), 5 (strongly accept)