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Research paper

Factors Affecting Intention to Adopt Electric Vehicles in China

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Abstract

This study utilizes the Extended Theory of Planned Behavior (ETPB) and Perceived Risk Theory frameworks to investigate the factors affecting intention to adopt electric vehicles (EVs) of Chinese consumers. By incorporating environmental concern and financial incentive policy as cognitive and policy predictors beyond traditional TPB variables, this research provides a comprehensive examination of EV (electric cars) adoption behavior while exploring the moderating function of perceived risk. This study seeks to examine the relationships between environmental concern, financial incentive policy, and intention to adopt EVs, as well as how perceived risk moderates these relationships. It makes a theoretical contribution by extending TPB with cognitive-environmental and external-policy dimensions and exploring complex interaction mechanisms in China's policy-oriented market. From the practical perspective, the study offers guidance for government policy design and corporate marketing strategies in promoting sustainable transportation and renewable energy adoption. Many studies on EV adoption rely on purely psychological models, while those incorporating cognitive environmental awareness and external-policy factors in the Chinese context remain limited. The goal of this study is to address this knowledge void by providing a thorough understanding of the multi-dimensional factors driving EV adoption decisions in China.

Keywords: *Intention to Adopt; Environmental Concer; Financial Incentive Policy; Perceived Risk.*

1. Introduction

Global climate change has become one of humanity's major concerns in the twenty-first century, evidence suggestedd that approximately 25% of global CO_2 emissions come from the transportation industry (Sheldon et al., 2022). China is one of the world's largest carbon emitters and has committed to peaking carbon emissions by 2030 and achieving carbon neutrality by 2060, making electric vehicle (EV) adoption a strategic national priority (Zhu et al., 2023). Despite China maintaining the world's largest EV market for eight successive years since 2015, demonstrating strong performance with 6.88 million units delivered in 2022, which constituted beyond 60% of the worldwide market segment, EV penetration rates remain relatively low at only 5.5% of total motor vehicles (IEA, 2022). In 2024, sales of new energy vehicles (NEVs, including battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) in China exceeded 11 million units, accounting for approximately 48% of total vehicle sales (CAAM, 2025; IEA, 2025). Entering 2025, the penetration rate of new energy vehicles has surpassed 50% in multiple months, with projected sales expected to exceed 15 million units by year-end, potentially reaching a penetration rate of 57% (IEA, 2025). In September 2025, the production and sales of new energy vehicles reached 1.617 million and 1.604 million units respectively, representing year-on-year increases of 23.7% and 24.6% respectively (CAAM, 2025). From January to October 2025, cumulative NEV sales reached approximately 12.94 million units, and the penetration rate reached a historic 51.6% in October, marking the first time that a single month exceeded the 50% threshold(CAAM, 2025). This growth has been primarily driven by plug-in hybrid electric vehicles (PHEVs), whose market share increased from approximately 15% in 2020 to nearly 30% in 2024, substantially exceeding the growth rate of battery electric vehicles (BEVs) (IEA, 2025). Consumer preferences for extended driving range and lower initial costs have contributed to PHEV growth outpacing that of BEVs (IEA, 2025). A notable trend is the accelerating growth of PHEV sales, with PHEVs accounting for approximately 35% of total NEV sales in 2024 compared to lower proportions in previous years (CAAM, 2025). This shift reflects consumers' pragmatic preferences for dual-mode capability that mitigates range anxiety while benefiting from identical policy incentives as BEVs, including purchase tax exemptions through 2027. At the same time, China has shifted from direct purchase subsidies to a policy mix in which vehicle purchase tax exemptions play the central role. These exemptions are fully applied up to RMB 30,000 per NEV for purchases made in 2024–2025, and they are reduced by half with a cap of RMB 15,000 in 2026–2027. In addition, national trade-in subsidies offer approximately RMB 15,000 to 20,000 for consumers who scrap an old car and purchase a new NEV.Furthermore, the government's new energy vehicle replacement subsidy policy, extended through 2025, provides consumers with subsidies of up to 20,000 RMB for the purchase of new energy vehicles (China Ministry of Commerce, 2025).

Ajzen (1991) explained the Theory of Planned Behavior (TPB) represents a comprehensive analytical framework which systematically explains the underlying mechanisms of consumer behavioral intentions, empirical research has found limitations in its explanatory power

for complex environmental behaviors requiring long-term commitment and moral considerations. The Extended Theory of Planned Behavior (ETPB) addresses these limitations by incorporating extra variables include external policy and environmental concern elements, consistently enhancing the explanatory power and cultural adaptability of the original model (Shalender & Sharma, 2021). ETPB demonstrates excellent applicability in EV adoption research, as traditional TPB variables struggle to explore the influence of complex factors including high costs and lack of recharging facilities (Liao, 2022).

In China's unique context characterized by severe environmental challenges and strong government policy intervention, environmental concern serves as a crucial motivational factor driving green consumption behaviors (Cong et al., 2023). In the Chinese market, Zhang et al.(2022) showed environmental concern has been empirically validated as an influential factor that positively contributes to the formation of consumer adoption intentions for EVs. Similarly, financial incentive policy, including purchase subsidies and tax exemptions, represent key governmental tools for guiding market development in China's policy-oriented economy (Chen et al., 2025).

Furthermore, Perceived Risk Theory (PRT) provides essential insights into consumer hesitation when facing technological uncertainty (Bauer, 1967). As emerging technological products, Pang et al.(2023) emphasized EVs are accompanied by perceived risks including uncertainties about battery performance, charging infrastructure limitations, and technological reliability, which may moderate the association among psychological characteristics and intention to adopt EVs. The present research expands the TPB framework by integrating environmental concern and financial incentive policy to be supplemental predictors while examining perceived risk serves as a moderating variable affecting the effect of the examined variables on intention to adopt EVs among Chinese consumers.

2. Intention to Adopt

Considered to be a direct antecedent of actual conduct, intention may be seen as a measurement of someone's preparedness to participate in a specific activity (Ajzen, 1991). The formation of intention involves cognitive evaluation and social influence, creating a dynamic process that helps explain why certain individuals are more inclined to try new behaviours (Bagozzi & Dholakia, 2002; Kelman, 1958). Intention has a significant forecasting impact on actual behaviour, particularly in environments with strong perceived behavioral control (Ajzen, 1991; Hagger et al., 2002). Intention to adopt denotes the degree to which buyers are inclined to acquire a certain product (Cheung et al., 2019). In the field of sustainable consumption of new technologies, adoption intention was previously established to be a significant antecedent variable in predicting actual buying patterns and acceptance behaviour, having a significant positive impact on consumers' final behavioural decisions. Zahan et al. (2020) found in their study of Bangladeshi consumers' green housing purchase behaviour that green purchase behaviour among consumers was predominantly influenced by green purchase intention, which emerged as the key determining element, confirming the strong predictive role of intention on actual behavior in the sustainable building consumption field. The probability of customers opting for EV use characterizes intention to adopt EVs, encompassing their propensity to select EVs for travel, prioritize EV purchases, and recommend them to others (Xu et al., 2020).

Intention to adopt EVs is crucial for addressing environmental pollution and sustainable transportation development, thus numerous academics across various disciplines have dedicated substantial efforts to exploring on its influencing factors. Existing research categorizes these factors into three major types. First are technological attribute factors, where purchase price constitutes the main barrier, as consumers are unwilling to pay high upfront costs (Carley et al., 2013) meanwhile, insufficient charging infrastructure and long charging times form another technological bottleneck (Xu et al., 2021), while driving range continues to be a critical factor in technological feasibility (Zhang et al., 2022). Second are policy attribute factors, where government support is particularly crucial during the initial promotion period. Research shows that financial incentives (tax exemptions) are more effective in promoting adoption than non-financial incentives (driving privileges) (Li et al., 2017). The third category is consumer characteristics, including both demographic and psychological dimensions. Demographically, middle-aged, well-educated male technology professionals are more inclined to adopt EVs, though income impact is not significant (Hidrue et al., 2011). Regarding psychological factors, research based on theories such as TAM and TPB focuses on variables like perceived risk and subjective norms (Jansson et al., 2017), while the pro-environmental NAM model highlights the positive effect of individual standards (He & Zhan, 2018). Recent panel evidence from 275 Chinese cities also indicates that integrated policy mixes are more effective than single incentives in sustaining EV adoption. Zhao et al. (2024) found that coordinated measures such as charging discounts and road privileges significantly improve adoption, while excessive policy overlap can reduce overall effectiveness.

China represents the largest global market for EVs that reached 9.5 million units in sales in 2023, accounting for over 60% globally (Wu & Chen, 2022). However, relative to its massive overall automobile market, EV penetration still has enormous room for growth, making understanding consumer adoption mechanisms crucial for further market expansion. In the early development stage, policy-driven initiatives served as the core driving force for market adoption. Wang et al. (2016) directed subsidies for EV purchasers were made available by the Chinese government via establishing such "Energy Saving and New Energy Vehicle" plan and the establishment of pilot programs. Wang et al.(2017) found exemptions from the value-added tax and the purchase tax, representing various tax exemptions, as well as exemptions from tolls are some of the other financial incentive measures that have been implemented. According to Ma et al. (2017) a multivariate cointegration model was created with the intention of evaluate the efficacy of incentive policies.

Entering the market segmentation development stage, consumer behaviour and decision-making mechanisms in different markets began to show differentiated characteristics. During this stage, social norms positively correlated with EV adoption intention, with social responsibility and identity significantly enhancing adoption intention, especially among environmentally conscious groups (Rezvani et al., 2018). Furthermore, Tu & Yang (2019) found that Chinese consumers' EV purchase intentions were susceptible to key factors such as resource control, attitudes, perceived usefulness, and lifestyle compatibility. Han & Sun (2024) conducted a discrete choice experiment and found that BEV consumers prioritize driving range and vehicle-to-grid (V2G) technology, while PHEV consumers place more importance on fast charging times. Additionally, regional differences were observed, with northern consumers preferring PHEVs due to climate considerations, while central region consumers exhibit a higher acceptance of BEV innovations. Southern consumers, on the other hand, show greater price sensitivity, and consumers in high-penetration markets are more willing to pay for BEV attributes compared to those in low-penetration markets, where PHEVs are preferred as transitional vehicles.

With the maturation of EV technology and the accumulation of market experience, consumer evaluation of EVs has become more comprehensive and rational. Wang et al. (2018) revealed the perceived usefulness and adoption intention was significantly negatively affected by perceived risk. Wu et al.(2019) extended the traditional concept of perceived usefulness to green perceived usefulness, and the study demonstrated that green perceived usefulness exerted an important and favourable consequence for both usage intention and purchase intention toward autonomous EVs. In China’s post-subsidy era, as direct purchase subsidies were phased out by the end of 2022, the EV market has gradually transitioned from a policy-driven to a market-oriented stage. Recent studies indicate that financial incentives are no longer the primary determinant of adoption intention; instead, non-financial incentives, social norms, and trust in policy institutions have

emerged as dominant factors (Liao, 2022). For instance, evolutionary simulations suggest that even after subsidy abolition, social network influences and environmental identity can sustain market diffusion (Wang et al., 2023). Likewise, AI-based sentiment analysis reveals that consumers have become increasingly rational and value-driven, focusing on charging convenience and technological reliability rather than short-term economic benefits (Liang et al., 2024). Moreover, macro-level evidence shows that institutional trust and policy stability now outweigh financial aid as the key adoption predictors (Irfan & Tang, 2025). Recent studies highlight that the adoption of EVs is also influenced by broader financial and environmental mechanisms. Fintech-enabled green financing tools, such as green loans and digital credit scoring, have been shown to significantly impact consumers' purchasing decisions (Liu & You, 2023). Furthermore, environmental, social, and governance (ESG) performance increasingly contributes to the brand equity of EV companies and shapes consumer attitudes (Huang et al., 2025). Environmental economics research has also emphasized rebound effects, suggesting that lower operating costs may increase driving frequency, thereby partially offsetting environmental gains (Wang et al., 2024). Liu & Selamat (2025) applied TPB, consumer behavior theory, and government intervention theory to analysed 351 EV consumers in Shandong Province. Their results show that subjective norm positively influence purchase behavior by validating the role of social pressure and significant others' expectations, though with weaker effects than incentive policies. The study emphasizes that subjective norms promote purchase behavior through environmental responsibility and social identification. Importantly, Chinese "face" culture significantly moderates consumer decisions, leading the authors to recommend experiential marketing and premium brand building to enhance subjective norms' positive effects.

Comprehensive understanding of the influence mechanisms of three key factors, namely environmental concern, financial incentive policy, and perceived risk, on consumers' EV adoption decisions is particularly important. Environmental concern serves as the core motivation driving green consumption, financial incentive policy function as crucial governmental tools for guiding market development, and perceived risk acts as a key barrier affecting consumers' acceptance of new technologies. The mechanisms through which these three factors operate urgently require thorough investigation, as such research holds significant strategic importance for achieving sustainable industrial development and carbon neutrality goals in China.

3. Environmental Concern

Environmental concern generally indicates an individual's cognizance their readiness to provide support or engage in actions to address those problems of ecological issues (Hasan et al., 2024). Environmental concern encompasses three dimensions: egoistic, altruistic, and biospheric orientations (Schultz, 2001). In the field of environmentally sustainable consumption. Environmental concern as individuals' knowledge of environmental issues, including their support for efforts to address these issues, as well as their propensity for personal engagement in solution development (Hu et al.,2010).

Many researchers (Paul et al., 2016; Yuriev et al., 2020) have emphasized a significance of environmental concern for ecological prediction decisions for examples of waste recycling energy, conservation and green purchasing behavior, indicating that environmental concern drives consumers' pro-environmental intentions and behaviors. EV adoption represents an environmentally responsible practice, while elevated environmental concern correlates with more favorable attitudes toward environmentally friendly products or services (Bardus & Massoud, 2022; Muposhi et al., 2021). Individuals with environmental concern has a greater propensity to choose fuel-efficient vehicles (Afroz et al., 2015). EV adoption demonstrates a higher probability among individuals who exhibit environmental sensitivity and maintain self-perceptions of being actively engaged in addressing environmental challenges (Lai et al., 2015). According to Degirmenci & Breitner (2017) environmental concern plays an important but non-exclusive role in EV adoption. These findings substantiate the proposition that environmental concern substantially affects individuals' sustainable consumption inclinations.

Regarding the positive effects on environmental concern and EV adoption, international research provides important insights. Solekah et al. (2023) researched 239 EV users in East Java, Indonesia, found no significant immediate connection among environmental concern and consumers' green purchase intentions. Rafiq et al. (2024) through snowball sampling of 274 respondents, demonstrated the powerful influence of environmental concern through multiple pathways: significantly affecting attitudes toward EVs, subjective norm, and directly influencing purchase intentions. However, different results have also emerged, for instance, Cong et al. (2023) surveyed of 370 Korean and 500 Chinese consumers, found that environmental concern had a significantly positive impact on both attitudes and purchase intentions in both countries. Zaman et al. (2024) integrated the UTAUT and TPB frameworks in their study of over 400 Chinese respondents, revealed that EV adoption intentions were primarily determined by environmental awareness. However, He et al. (2023) used the goal-directed behavior model, found that environmental awareness did not directly and significantly influence intention to purchase EVs, but played a significant positive moderating role among consumer desires with purchase intentions. Lampo et al. (2025) based on the UTAUT2 framework and a survey of 236 Macao residents, found that environmental concern did not significantly influence behavioral intention toward electric vehicles. Instead, the study revealed that “technology show-off,” integrating the concepts of observability and trialability, was a significant predictor of adoption, emphasizing the contextual complexity of environmental concern in economically developed regions. Although individual studies find indirect effects of environmental concern, most empirical research has confirmed the positive influence of environmental concern for intention to adopt EVs. Particularly in China's drive to achieve carbon neutrality goals, with increasing public environmental awareness, the role of environmental concern in promoting EV adoption deserves thorough examination. Therefore, the research proposes the hypothesis articulated below:

H1: Environmental concern has a significant influence on intention to adopt electric vehicles in China.

4. Financial Incentive Policy

Government-initiated economic actions intended to lower expenses burden associated with EV adoption, thereby increasing consumers' readiness to purchase could be termed that financial incentive policy (Wang et al., 2021). These policies typically assume a type of subsidies, rebates or tax reductions that directly lower purchase or operational costs of EVs (Liao, 2022). Governments around the world widely implement financial incentives include tax credits, thereby enhancing their perceived environmental benefits and increasing consumer acceptance for reducing the expenses of EVs (Roberson & Helveston, 2022). The primary financial incentive engaged in governments provide tax relief for EV purchases.

Financial incentive policy has become a key determinant for consumers' adoption of sustainable technologies. Through consumer segmentation that distinguished between externally driven consumers and internally driven consumers, the research revealed that financial incentive policies demonstrate enhanced persuasive effectiveness among individuals classified as extrinsically motivated consumers (Coad et al.,2009). The majority of consumers worry about the cost of purchase prices as well as regard prices to be a compelling factor in adoption

decisions (Wang et al., 2017). In accordance with (Larson et al., 2014; Degirmenci & Breitner, 2017) compared to conventional gasoline vehicles, elevated pricing of EVs represents a significant obstacle that deters consumer acquisition of these vehicles.

Governments worldwide emphasize fiscal incentive measures to establish consumer confidence in the environmental sustainability and economic viability of EVs, thereby increasing EV adoption. Tax benefits represent the predominant financial incentive employed by governmental authorities for purchasing EVs. Financial incentives were demonstrates positive and statistically meaningful effects on EV adoption rates in 30 countries in 2012 (Xue et al.,2021). While economic incentives offered by governmental entities or manufacturing companies do indeed influence consumers' behavioral intentions, this affects intention to adopt EVs (Wang et al., 2019). In contrast, some investigations have discovered various outcomes. Krishnamurthy et al. (2022) through snowball sampling of 156 respondents, found that the analysis the outcomes revealed no significant statistical relationship of fiscal incentives and intention to purchase EVs.

In research on the Chinese market, financial stimulus policies show a clear influential relationship with EV adoption intention. Huang & Ge (2019) found in their study of respondents in Beijing that monetary incentive policies directly and significantly influence purchase intention. Yang et al.(2019) found that when subsidies exceed 20% of the EV price, Chinese consumers' purchase intention increases significantly. Cong et al. (2023) analysed survey data from Korean and Chinese consumers collected in 2021 and found that financial incentive policy presents a significantly positive effect on both attitudes and purchase intention, but there are significant differences between countries. In the Chinese market, most important factor influencing attitudes and a key factor in purchase intention is financial incentive policy, while their impact in the Korean market is relatively smaller. Chen et al. (2025) conducted stratified random sampling in four cities with high EV penetration rates and through empirical analysis found that policy incentives demonstrate an immediate favourable effect on purchase intention, reflecting the direct incentive effects of measures such as financial subsidies and tax incentives. However, some studies have demonstrated relatively weak effects. He et al. (2024) adopted the TPB framework and conducted a quantitative survey of potential users in Urumqi, finding that although government financial incentive policies (including tax exemptions, charging infrastructure development and subsidies) exhibit a positive influence on purchase intention, their influence is relatively weak. Recent stakeholder-based analysis further reveals that in China's post-subsidy stage, policy stability and institutional trust have surpassed direct financial subsidies as the dominant factors influencing EV adoption (Irfan & Tang, 2025). Xie et al. (2025) investigated online EV purchasing behavior using the TPB framework and a PLS-SEM analysis of 1,000 consumers from Beijing, Shanghai, and Shenzhen. The study found that government policies significantly strengthen the relationship between purchase intention and actual behavior, highlighting the crucial role of subsidies, tax benefits, and charging infrastructure in facilitating behavioral conversion.

To provide a clearer overview of China's rapidly evolving NEV policy context, this study summarizes the major national incentive measures introduced between 2018 and 2025. These policy developments form the institutional foundation within which consumer adoption behavior has unfolded.

Table 1: Evolution of China's NEV Policy Incentives (2018–2025)

Period	Key Policy Measures	Main Features	Implications for EV Adoption
2018–2020	Central NEV purchase subsidies	High subsidy levels linked to battery range and energy density	Rapid BEV market expansion and early-stage cultivation
2021–2022	Subsidy phase-out and final termination	Subsidies reduced by 30–50% before withdrawal	Transition to post-subsidy market; higher role of non-financial incentives
2023	Full exemption of NEV purchase tax	Continued tax support after subsidy termination	Maintains consumer cost advantages and stabilizes demand
2024–2025	NEV purchase tax exemption extended to 2027	Up to RMB 30,000 exemption (2024–2025); up to RMB 15,000 (2026–2027)	Provides medium-term certainty for EV buyers and automakers
2024–2025	National trade-in program	NEV subsidy up to RMB 20,000; fuel-vehicle subsidy up to RMB 15,000	Boosts BEV and PHEV sales; reduces upfront cost
2024–2025	Expansion of green financing tools	Green loans, low-interest NEV credit, leasing schemes	Market-driven incentives complement government policies

Source: Compiled from official policy documents released by China Ministry of Commerce, MOF, MIIT, STA between 2018 and 2025.

The table 1 summarizes the transition of China's NEV policy framework from direct financial subsidies to a broader combination of regulatory and market-oriented incentives. Early subsidy support facilitated rapid initial adoption, whereas the period after 2022 increasingly relied on purchase tax exemptions and national trade-in programs to sustain consumer demand. The recent development of green financing instruments reflects an additional shift toward financial innovation within the policy environment. These policy adjustments provide an important contextual foundation for understanding EV adoption intentions in a maturing and more structurally diverse market. Specifically, the 2024 national trade-in program represents a strategic pivot in policy design, offering the highest subsidy levels (up to RMB 20,000) among post-subsidy instruments and effectively addressing both demand stimulation and fleet renewal objectives (Ministry of Commerce, 2024).

Based on previous literature, mainstream research supports a positive relationship. From a theoretical perspective, financial incentive policy effectively stimulates consumers' intention to adopt EVs by reducing costs. Given that EV prices remain higher than traditional vehicles in the Chinese market, more financial incentives should increase consumer adoption intention. Therefore, the research proposes the hypothesis articulated below:

H2: Financial incentive policy has a significant influence on intention to adopt electric vehicles in China.

5. Perceived Risk

Perceived risk symbolizes the unclear individuals experience while performing specific behaviors (Bauer, 1967). A widely accepted definition distributed by Dunn et al. (1986), and it represents the anticipated adverse consequences individuals link to acquiring particular products or services. Consumers' perceived risk categorized risks encompassing performance, financial, temporal, physical, and psychological dimensions toward EVs (Wang et al., 2018). Pang et al. (2023) further defined it as potential losses consumers may encounter after purchasing EVs, manifesting in various forms such as financial concerns, technological limitations, and performance uncertainties.

Chen & He (2003) noted that perceived risk can affect individuals' purchasing deliberations. Qian & Yin (2017) indicated that consumer attitudes and intentions regarding innovative product or service adoption are adversely influenced by perceived risk, with perceived risk representing a significant impediment to consumers' adoption of novel technologies. In the context of EVs, these influence mechanisms apply equally since EVs are viewed as transformative and groundbreaking technology (White & Sintov, 2017). Consumers' unwillingness for acceptance EVs stems from risk concerns (Li et al.,2017b). One of the most important factors inhibiting EV acceptance is maybe

Perceived risk. The mediating role of perceived risk has also been discovered. Xu et al. (2020) validated perceived risk along with perceived relative advantage and perceived ease of use, mediates the association among EV driving experience with adoption intention, demonstrating that EV driving experience facilitates purchase intention formation through reducing consumer perceived risk while enhancing perceived relative advantage and ease of use. Wang & Tian (2023) found that quality trust and green trust simultaneously mediate the association among perceived risk with willingness to buy water-saving appliances, indicating that risk perception reduces adoption intention by decreasing consumers' trust in product quality and environmental performance.

In international market research, Barbarossa et al. (2015) found through cross-cultural studies that consumers in different countries have significant differences in risk perception toward EVs, reflecting the influence of cultural values on risk perception. Gunawan et al. (2022) found in their study of Indonesian consumers that functional risk, financial risk, and social risk significantly influence the willingness to use EVs. Some studies provided important evidence through a China-Korea comparative study, finding that perceived risk negatively affects EV purchase attitudes and intentions for consumers in both countries (Cong et al.,2023).

Research in the Chinese market provides rich empirical evidence. Wang et al. (2018) further confirmed perceived risk negatively impacts Chinese consumers' attitudes regarding EVs as well as their intention adoption, with Chinese consumers showing relatively high levels of risk perception toward EVs. Liao (2021) demonstrated perceived risk exerts dual negative effects on intention to adopt EVs, direct effects and indirect effects through attitudes. Recent research has further deepened understanding of this mechanism. Zhang et al. (2022) showed through analysis that perceived risk significantly negatively affects behavioral intention, revealing that consumers primarily focus on EV performance reliability, charging time costs, and technological disadvantages compared to conventional vehicles. Wang et al. (2024) found that perceived risk significantly reduces Chinese consumers' intention to adopt EVs, mainly because of concerns about performance reliability, maintenance uncertainty, and technological limitations. The study also showed that adequate infrastructure can help mitigate these risks and enhance adoption intention. Zheng et al. (2025) found that perceived price moderates the relationship between attitude and purchase intention, with higher perceived costs increasing risk perception and lowering consumers' willingness to adopt electric vehicles. This finding highlights the economic dimension of perceived risk in China's post-subsidy market.

Based on the literature review, perceived risk not only directly reduces EV purchase intention but may also weaken the positive effects of other factors. When consumers perceive high risk, even strong environmental concern or favorable financial incentives may have limited impact on purchase intention. Therefore, this study explores whether perceived risk moderates the correlation of environmental concern, financial incentive policy with Chinese consumers' EV purchase intention. Therefore, the research proposes the hypothesis articulated below:

H3: Perceived risk moderates the relationship between environmental concern and intention to adopt electric vehicles in China.

H4: Perceived risk moderates the relationship between financial incentive policy and intention to adopt electric vehicles in China.

6. Theoretical Foundation

ETPB is a theoretical framework constructed drawing from the original TPB. Empirical research has found that the three core constructs of TPB sometimes have unexplained variance, particularly for green behaviors requiring long-term commitment, moral beliefs, or risk assessment (Liao, 2022). To address this, scholars began supplementing the model with additional factors from the early 2010s (Qi & Ploeger,2021). ETPB consistently enhances the explanatory power and cultural adaptability of Ajzen's (1991) original model by incorporating variables particularly moral norms, environmental concern and perceived risk (Shalender & Sharma, 2021). ETPB has been widely used to analysed influential variables of various pro-environmental behaviors. Environmental concern emerges as a key theoretical extension, representing the cognitive and emotional dimensions of environmental awareness. Environmental awareness and ecological understanding significantly enhanced the original TPB's explanatory power when examining green housing purchase behavior (Zahan et al., 2020). ETPB demonstrates excellent applicability in EV adoption research, as traditional TPB variables struggle to analyses the effect of complex factors such as high costs and lack of charging infrastructure. Based on the extended TPB framework in this study (Hartono et al., 2024), environmental concern serves as an additional psychological driver that significantly and positively influences Indonesian consumers' EV purchase intentions, indicating that consumers demonstrating enhanced ecological responsibility exhibit higher tendency to choose eco-friendly transportation options to address atmospheric pollution and global warming issues. Financial incentive policy constitute an important element as extended variables in intention to adopt EVs. Dutta & Hwang (2021) incorporated government incentive policies into the extended TPB model and found government measures strongly influence attitudes, subjective norms, and perceived behavioral control stimulating intention to adopt EVs. Recent research on the Chinese EV market, ETPB continues to demonstrate strong explanatory power. Under the extended TPB theoretical framework, environmental concern and financial incentive policy as additional variables have significant direct positive impacts on intention to adopt EVs of the Chinese consumers. Cong et al. (2023) confirmed in their study of Chinese consumers that purchase intention was significantly and positively impact on environmental concern. Regarding financial policies, Liao (2021) found through extended TPB model research that financial incentive policy as extended variables significantly influence EV adoption intention, and consumer innovation orientation and ecological self-concept play important moderating roles between governmental measures and adoption intention. Ji et al. (2024) successfully integrated ETPB to examine Chinese consumers' EV purchase intentions among 867 participants. Their findings revealed that personal norms exerted the strongest influence on purchase intention, surpassing traditional TPB variables. Hu et al. (2025) extended TPB by incorporating perceived value and perceived risk theories to analyze NEV purchase intentions among 583 Chinese consumers in first-tier cities. Their PLS-SEM analysis achieved substantial explanatory power, revealing that perceived value significantly mediated the relationships between environmental knowledge, environmental concern, and purchase intention. Perceived risk negatively influenced perceived value, highlighting the importance of addressing consumer uncertainties about NEV technology, charging infrastructure, and maintenance costs. Chen et al. (2025) showed purchase intention was direct positive influence by policy incentives. Recent studies underline the growing role of green finance in mobility, including fintech-based green loans, EV leasing schemes, and ESG-driven branding strategies. These developments help lower adoption barriers and complement traditional policy incentives. Although such factors are relevant to China's evolving market, they fall outside the theoretical scope of the present ETPB framework. The current study therefore focuses on psychological, environmental, and policy-related determinants while acknowledging the emerging influence of financial innovation.

PRT is a fundamental theoretical framework in consumer behavior research, used to explain consumers' hesitation or avoidance behavior when facing uncertainty and potential negative consequences. The theory was formally introduced by Bauer (1967), who argued that consumer behavior could be conceptualized as risk-taking behavior because purchase decisions inherently contain uncertainty and potential negative consequences. The core of the theory lies in distinguishing between objective risk and subjective perceived risk. Mitchell(1999) emphasized that consumers perceive subjective uncertainty rather than objective risk, with consumers tending to perceive potential losses

in purchase decisions. Stone & Grønhaug (1993) further developed a multidimensional framework of perceived risk, defining it as subjective expected loss and emphasizing that perceived risk encompasses both uncertainty and potential negative consequences of purchase decisions. This multidimensional approach has had significant impact on subsequent cross-disciplinary consumer behavior research. The multidimensionality of perceived risk constitutes the core characteristic of the theory. Theoretical applications have expanded from traditional consumer goods to multiple fields including e-commerce, finance, food safety, green consumption, and technology adoption. In e-commerce, perceived risk strongly inhibits online purchasing due to concerns about product mismatch, payment fraud, or return difficulties (Pelaez et al., 2019). In sustainable product adoption, perceived risk has become a key theoretical foundation for understanding adoption barriers (Singhal et al., 2019). In the EV consumption field, Pang et al. (2023) treated perceived risk as an important dimension of product perception, finding that perceived risk (including spontaneous combustion, privacy breaches, autonomous driving errors, etc.) significantly reduces users' new energy vehicle adoption intention, consistent with the predictions of perceived risk theory. Phua & Kamaruddin (2024) constructed a multidimensional perceived risk measurement system including financial risk, safety risk, and performance risk, finding that Indonesian consumers' EV acquisition intent was not substantially influenced by perceived risk. In the EV consumption field, Pang et al. (2023) treated perceived risk as an important dimension of product perception, finding that perceived risk (including spontaneous combustion, privacy breaches, autonomous driving errors, etc.) significantly reduces users' new energy vehicle adoption intention, consistent with the predictions of PRT. Hu et al. (2025) incorporated perceived risk as a core construct within ETPB framework in their study of new energy vehicles in China, finding that perceived risk influences consumer purchase intention through internal mechanisms, particularly when consumers face uncertainty regarding the perceived benefits of new energy vehicles as emerging products, making risk avoidance behavior especially pronounced.

7. Conceptual Framework

The proposed conceptual framework exploring the connections between environmental concern, financial incentive policy, intention to adopt EVs, in addition the moderating role of perceived risk is exhibited in Figure 1.

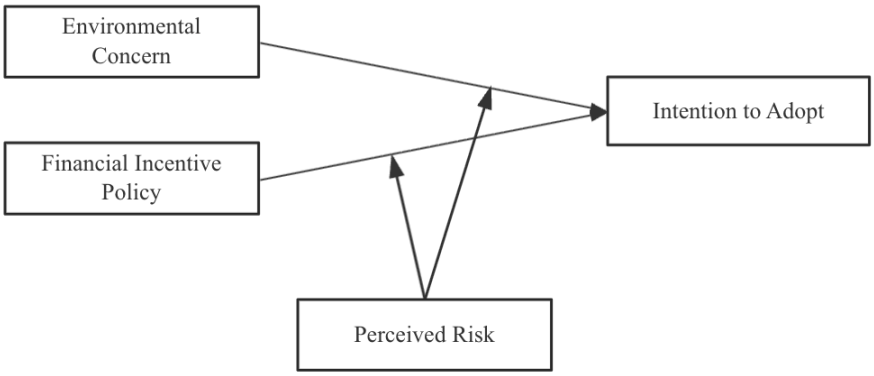

Fig. 1: Conceptual Framework.

It is predicted that environmental concern and financial incentive policy influence intention to adopt EVs, while perceived risk moderates these relationships. Chinese consumers' perception of ecological issues and readiness to promote environmental conservation, their perception of government financial support measures, and their subjective uncertainty about EV technology help to explain the changes in intention to adopt EVs. The moderating relationships in this conceptual framework have not been widely examined in previous EV adoption studies (Hair et al., 2019). This research proposes the hypothesis articulated below:

H1: Environmental concern has a significant influence on intention to adopt electric vehicles in China.
H2: Financial incentive policy has a significant influence on intention to adopt electric vehicles in China.
H3: Perceived risk moderates the relationship between environmental concern and intention to adopt electric vehicles in China.
H4: Perceived risk moderates the relationship between financial incentive policy and intention to adopt electric vehicles in China.

8. Research Methodology

This study selected 11 prefecture-level cities in Shanxi Province, China as the research scope. As a major coal-producing province in China, Shanxi Province is highly dependent on fossil fuel-based power generation while simultaneously promoting EVs. This structural contradiction makes it a representative case and provides a unique research context for examining how consumers balance environmental goals with energy realities (Horton et al., 2021). The target population consisted of potential consumers aged 20-40 with electric vehicle adoption intentions, representing approximately 7.64 to 8.73 million people across the province. Following Krejcie & Morgan(1970) sample size table, the minimum sample size was determined to be 384 at a 95% confidence level. Data were collected through online questionnaires using a snowball sampling method, with measurement instruments employing a 5-point Likert scale. Data analysis was conducted in two stages. The first stage utilized SPSS for descriptive statistics, reliability analysis, and data cleaning. The second stage employed SmartPLS for PLS-SEM analysis, a method suitable for prediction-oriented research with flexible assumptions regarding sample distribution (Hair et al., 2019).

9. Conclusion

The objective of this study is to investigate the multifaceted interaction mechanisms explaining the variance in intention to adopt EVs, thereby proposing comprehensive policy and promotional approaches for advancing eco-friendly mobility in China. Future studies may incorporate green finance mechanisms, ESG-oriented branding, and price-value considerations into behavioral models to reflect the evolving characteristics of China’s EV market. Additionally, integrating NAM and UTAUT could provide a more holistic understanding of how moral obligations interact with technology acceptance factors in shaping EV adoption decisions. Such extensions could enhance

understanding of how financial innovation and sustainability strategies interact with psychological drivers in shaping EV adoption. It may also be valuable to distinguish between BEV and PHEV users, as these groups differ in their risk perceptions and in how they evaluate price, value, and driving needs.

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