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EMPIRICAL PAPERS

# Impact of Education on Green Fintech Adoption: Evidence From the New Sub-Center of Beijing

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Integrating financial technologies with green initiatives is critical to the sustainable development agenda. This is particularly true for newly developed cities like Tongzhou, the sub-center of Beijing. To assess the adoption of green fintech in Tongzhou, this paper extends the Energy-Augmented Technology Acceptance Model (EA-TAM) to incorporate two green factors – environmental awareness and green knowledge. This paper applies structural equation modeling techniques to analyze data from 403 respondents who live, work, and/or study in Tongzhou and finds all hypothesized constructs significant. Since green knowledge is significant to the adoption of green fintech, this paper further divides the sample into a high-education group (162 respondents with university-or-above degrees) and a low-education group (251 respondents with post-secondary-or-lower degrees) to evaluate the impact of education. All the hypothesized factors are significant to the high-education group, but environmental awareness and perceived usefulness are insignificant to the low-education group. Hence, the results provide evidence that people in the newly developed city adopt green fintech due to their environmental sensitivity. The adoption of green fintech is more environmentally sensitive for people with high education levels.

## 1. Introduction

Financial technology, commonly abbreviated as fintech, refers to the use of technological means to innovate financial products and services with the aim of improving efficiency and reducing operating costs of the financial sector. According to the United Nations Environment Program (UNEP, 2016), fintech has accelerated the integration of finance with the real economy, promoting the transition toward sustainable development. The UNEP (2016) introduced the Financial Technology for Sustainable Development (FT4SD) framework to better understand how fintech supports sustainability. The UNEP (2016) found that fintech had increased access and decentralization, enhanced transparency, accountability, and cross-sector collaboration, improved risk management and diversification, reduced costs through automation, and fostered competition in the financial system. These advancements have positively impacted sustainable development by promoting inclusiveness, solidarity, natural resource efficiency, resilience, recycling, and intergenerational decision-making.

With society's increasing environmental concerns, more and more enterprises pay attention to the environment, society, and governance (ESG). These enterprises are further motivated by green finance, which promotes environmental protection and governance by guiding resources from industries with high pollution and high energy consumption toward advanced sustainable technologies. Green finance ensures financial support for environmentally friendly products and services through project financing, risk management, and monitoring. Green finance has experienced rapid development in China. In 2022, newly issued Chinese green bonds reached 874.66 billion yuan in China and 109.24 billion yuan overseas (International Institute of Green Finance [IIGF], 2023). The funds raised in the green bond market not only support various environmental protection initiatives and projects but also facilitate the green trade of financial products and services and the dissemination of financial information, all of which rely on the continuous innovation of technology, namely green fintech. Green fintech has been used in various environmental protection projects, products, and services, such as energy conservation, emission reduction, and renewable energy.

While China is at the forefront of green fintech adoption, residents in newly developed Chinese cities are among the pioneer adopters of the technology. In 2012, the Beijing government proposed to create a fully functional urban area, positioning Tongzhou as the new sub-center of Beijing (Tongzhou District People's Government of Beijing Municipality, 2024). The aim was to expand the space for urban development in Beijing, mitigate the big-city problems, promote coordination of Beijing, Tianjin, and Hebei, and evaluate the optimal development mode of densely populated areas. As the sub-center of Beijing, Tongzhou has made remarkable progress in economic development, urban construction, and cultural tourism. Environmental protection and green technology are among the emerging industries in Tongzhou, making Tongzhou a suitable case for the study of green fintech adoption.

To evaluate the factors that determine people's adoption of green fintech in Tongzhou, this paper extends the theoretical models that are widely applied in marketing studies to explain consumer behavior. This paper employs statistical techniques to analyze data obtained from a survey of people living, working, and/or studying in Tongzhou. As proposed in Lei and An (2024), this paper divides the sample into subgroups of high and low levels of education to further examine how education affects green fintech adoption. This paper contributes an investigation into how people in a newly developed city adopt green fintech due to environmental sensitivities and educational backgrounds in addition to various factors that affect their behavior. The findings of this study concerning the green financial industry provide crucial insights for policymakers and business practitioners.

# 2. Literature Review and Hypotheses

## 2.1. Green Fintech

### *2.1.1. Fintech and Sustainable Development*

The first period of digitalization of the financial sector is widely referred to as Fintech 1.0, which dates back to the use of telecommunication and transportation technologies, such as telegraph and steamships, in cross-border financial communication and transactions (Setiawan & Maulisa, 2019). Fintech 2.0 began with the invention of the automated teller machine (ATM) in 1967 and later the popularization of the Internet, which enabled online banking. Fintech 3.0 started in 2008 with the rapid development of financial start-ups and mobile devices that enabled digital wallets and peer-to-peer (P2P) lending.

Fintech has played a supporting role in green finance, the capital flow into projects and policies promoting environmental sustainability (Höhne et al., 2011; Zadek & Flynn, 2013). Hinson (2019) suggested that combining data analytics, green technologies, and mobile financial services could ease trade-offs in sustainable development. Soundarrajan and Vivek (2016) also emphasized the need for the synergy of the technology development company, the financial sector, and the government in building the infrastructure for sustainable development of India.

Green fintech, as a subdomain of fintech, is a relatively new concept in the literature. Arena et al. (2018) defined green fintech to be innovations with a blended-value mission to balance environmental impact and business objectives, which involves increasing the flow of financial resources toward sustainable development while also ensuring financial returns to maintain long-term impacts. Puschmann et al. (2020) found that green fintech influenced the entire value chain in Switzerland, including customer-to-customer (C2C), business-to-customer (B2C), and business-to-business (B2B) transactions.

### *2.1.2. Green Fintech in China*

Ren et al. (2022) categorized the development of green finance in China into three phases. The first phase (1995-2014) saw the establishment of green finance systems in insurance, credit, and carbon emissions. In 2013, 21 Chinese banks committed to expanding green credit investment, and in 2014, the China Banking Regulatory Commission introduced guidelines to boost green finance. In the second phase (2015-2020), China enhanced its green finance system through both top-down and bottom-up approaches, becoming one of the largest green finance markets globally, with green loans surpassing 12 trillion yuan by the end of 2020. The third phase (from 2021 onwards) marked a rapid growth period driven by policies aimed at achieving “carbon neutrality” and “carbon peak” goals. In 2021, China, along with G20 nations, set international standards for green finance and initiated pilot zones for green finance reform.

Despite the progress, challenges remain in China's green finance development. Liu and Zhang (2020) noted that China's model leaned toward the "German model," dominated by government intervention and lacking market-driven sustainability. Yang et al. (2020) identified a shortage of talent and research in promoting a green fintech ecosystem. Hu (2021) highlighted a conflict between green fintech and privacy concerns, as fintech 3.0 technologies like blockchain remained underdeveloped, and fintech relied heavily on big data, cloud computing, and AI, which carried inherent risks.

Several studies recommended solutions for China's green finance growth. Zhao (2021) argued for developing a financial system centered on equity investment to accommodate the high risks and long project cycles associated with green technology. Wang and Zhang (2022) suggested using regulatory sandboxes to ease the introduction of new low-carbon financial products. Peng (2022) emphasized the need for government departments to improve information disclosure standards and ensure the accuracy of environmental data. Fan and Zhou (2022) pointed out a funding gap for China's carbon peak goals, advocating for more diverse green credit products. Gong (2022) highlighted the importance of supporting low-energy, low-pollution industries and using green finance to drive innovation and reduce environmental damage.

While the future of green finance is promising, green fintech must evolve to support the green transition for consumers and small-to-medium enterprises (SMEs) through technologies like big data and AI (Ye, 2021). Ye (2021) stressed the significance of industry-government collaborations, citing joint fintech labs, such as those formed by the Bank of China and Tencent, as key to green fintech development. A notable example is Ant Group's Ant Forest, which allows users to accumulate "green energy" through low-carbon actions and plant real trees or support biodiversity projects (Ant Group, 2023). Similar initiatives include Weibo's ForestApp, where users can adopt virtual animals and contribute to environmental projects, and Tencent's "go together" project, which converts daily steps into donations for public welfare projects (Tencent, 2023; Weibo, 2023).

## 2.2. Theories on Adoption of Fintech

The Theory of Reasoned Action (TRA), introduced by Fishbein and Ajzen (1975), was initially used in psychology to explore how attitudes influence individual behaviors. Ajzen (1985) later expanded the TRA into the Theory of Planned Behavior (TPB), adding "perceived behavioral control" to account for the fact that not all behaviors were entirely voluntary. The TPB consists of attitude, subjective norm, perceived behavioral control, and behavioral intention. Davis (1989) further extended these theories to develop the Technology Acceptance Model (TAM), initially used to predict people's acceptance of information technology in Management Information Systems (MIS) research. The TAM has been verified and expanded in subsequent studies, becoming a foundational model for analyzing user behavior in adopting new technologies.

Among studies that applied the models to assess fintech adoption, Ngo (2024) found that the potential demand of users was a critical factor in the adoption intention. Das (2022) observed that government and private service employees, people in businesses, self-employed people, daily wage workers, and agricultural workers had increasing usage of fintech services. Das (2022) found that government support, trust, perceived utility, attitude, and social influence positively affected fintech adoption. Stewart (2018) assessed the risks of fintech and concluded that data security, customer trust, and user design interface affected the adoption of fintech. Abdullatif et al. (2020) also stressed the importance of maintaining the confidentiality of fintech users' data to raise consumer confidence. According to Raman and Viswanathan (2011), uncertainty would be automatically interpreted as risks, and trust was needed for the parties involved to be willing to act, especially in the adoption of financial products. According to Jünger and Mietzner (2020), consumers with low trust, good financial education, and a preference for transparency were more likely to adopt fintech. They highlighted three dimensions of consumer trust - competence, willingness to provide mutual satisfaction, and integrity of the enterprise. Nangin et al. (2020) also pointed out that trust issues brought tremendous challenges to fintech innovators. Nurfadilah and Samidi (2021) suggested that government support for fintech could indirectly impact the attitude and behavior of users through perceived ease of use, thus building trust. Ali et al. (2021) concluded that perceived benefits and perceived risks had positive and negative significant impacts on consumer trust in fintech, respectively.

## 2.3. Theories on Adoption of Green Technology

When examining the adoption of green technology, many recent studies applied the Energy Augmented TAM (EA-TAM) (S. Ali et al., 2020; Hsu et al., 2017; Karaoglan, 2016; Ma et al., 2017; L. Yang et al., 2021). The EA-TAM posits that technology necessitates additional energy to operate effectively and support business activities, thereby highlighting the critical role of energy demand in economic activities and its contribution to advancing the green development agenda. The model emphasizes that green factors significantly influence the adoption of green products, with the selection of green suppliers fostering green purchase intentions. Additionally, elements such as industrial green engineering, green procurement, green consumerism, product recycling, and green innovation enhance the user-friendliness of green products. Various factors, including political constraints and elevated carbon prices, can impact the green innovation process and ultimately shape attitudes toward using green products. Moreover, a preference for green products broadens the range of ecological product options, promoting their usage.

According to Anser et al. (2020), the EA-TAM differed from other green TAM in five key ways: (1) Green investments in the energy sector contribute to greener logistics. (2) Advancements in cleaner production are facilitated by integrating renewable energy demands into current energy portfolios. (3)

Export competitiveness and energy support prices shape attitudes toward green product usage. (4) The use of eco-friendly products is influenced by carbon pricing. (5) Political reluctance hinders the implementation of effective green supply chain management practices, which can be improved through the establishment of green protocols.

### 2.4. Theoretical Model and Hypotheses

The study aims to evaluate the factors that influence the adoption of green fintech. Hence, it draws on theoretical models that have been widely used to assess the adoption of fintech and the adoption of green technology. The reconciliation of the two strands of literature can be achieved by extending the EA-TAM. In particular, this study incorporates the construct of environmental awareness, as in Karaoglan (2016), and the construct of green knowledge, as in Hsu et al. (2017). Therefore, our model sets out the following hypotheses. (The graphical representation of the model is shown in Figure 1.)

> H1: Perceived usefulness (PU) positively affects attitude toward use (ATT).
>
> H2: Perceived ease of use (PEOU) positively affects attitude toward use (ATT).
>
> H3: Perceived ease of use (PEOU) positively affects perceived usefulness (PU).
>
> H4: Attitude toward use (ATT) positively affects intention (INT).
>
> H5: Perceived usefulness (PU) positively affects intention (INT).
>
> H6: Environmental awareness (EW) positively affects intention (INT).
>
> H7: Green knowledge (GK) positively affects intention (INT).
>
> H8: Intention (INT) positively affects usage intention (UI).

## 3. Methodology

### 3.1. Sampling

As of 2023, the permanent population of Tongzhou was about 1.843 million. We obtained a non-probability sample of the target population using convenience sampling, snowball sampling, spatial sampling, and self-selection sampling methods. The electronic questionnaire first introduced the purpose of the study and provided a brief definition and examples of green fintech. The screening question ensured only respondents who lived, studied, and/or worked in Tongzhou were included. 403 valid responses were collected for the dataset. Our analysis of the full sample found that green knowledge was a significant determining factor of green fintech adoption. Since education can affect the accumulation of knowledge, including green knowledge, this paper further assesses the impact of education on green fintech adoption by dividing the sample into a high-education group (162 respondents with a college degree or above) and a low-education group (251 respondents without any college degree).

A sample size with sufficient power for this study can be calculated using G*Power. G*Power is a tool that performs computational statistical power analysis capabilities applicable to many different tests, such as t-tests, F tests, $\chi^2$ tests, and z-tests. With seven variables and a target power of 0.8, the sample size required for this study is 103. Hence, the sample size of each of our education groups satisfies this requirement. Besides, Velicer et al. (1995) also pointed out that 100 cases were the minimum satisfactory sample size for structural equation modeling (SEM) analysis.

### 3.2. Survey Administration

After pilot tests with a small sample, the electronic questionnaire was released on June 12, 2023, and 460 questionnaires were received over one month. The number of valid questionnaires was 403 after excluding 57 invalid questionnaires with an apparent logical inconsistency, so the effective recovery rate was 87.61%. The electronic questionnaire was distributed both online and offline. It was distributed offline at densely populated subway stations, universities, and government offices in Tongzhou. The questionnaire was distributed online using invitation links. The respondents could voluntarily choose whether to participate in the survey or not. In addition, before filling out the questionnaire, each respondent was informed that the information they provided would be entirely anonymous, untraceable, and confidential, and by submitting their responses, they indicated full awareness and agreement that the data would be used for the research and subsequent academic publications.

### 3.3. The Questionnaire

To assess the impacts and significance of different factors on the adoption of green fintech, our research model, as explained in Section 2.4, requires the measurement of seven variables. The four dependent variables are perceived usefulness, attitude toward use, intention, and usage, and the three independent variables are perceived ease of use, environmental awareness, and green knowledge. As shown in Table 1, we design statements by referencing those found in the literature. Previous studies pointed out that too many questions in the questionnaire would lead to a loss of patience and authenticity of the responses. Therefore, we omitted some redundant statements so that no more than six were used to measure each construct. The respondents were asked to rate each statement on a 7-point Likert Scale: 1 for "Strongly Disagree," 2 for "Disagree," 3 for "Slightly Disagree," 4 for "Neutral," 5 for "Slightly Agree," 6 for "Agree," and 7 for "Strongly Agree".

Table 1. Measurement of Variables

| Variable | Identifier | Statement | Reference |
|---|---|---|---|
| Perceived usefulness | PU1 | Using green fintech can meet my needs. | Huh et al. (2009) |
| | PU2 | Green fintech can save time. | |
| | PU3 | Green fintech can improve efficiency. | Hu et al. (2019) |
| | PU4 | Green fintech is useful to me. | |
| Perceived ease of use | PEOU1 | It is easy to use green fintech. | Hu et al. (2019) |
| | PEOU2 | I think the operation interface of green fintech is friendly and understandable. | Zandhessami and Geranmayeh (2014) |
| | PEOU3 | It is easy to have the equipment to use green fintech (cellphone, APP, WIFI, etc.). | |
| | PEOU4 | Downloading green fintech application programs from the Internet is easy. | Hansen (2018) |
| | PEOU5 | Completing transactions using green fintech is easy. | |
| | PEOU6 | I think it is very easy to find information using green fintech anytime and anywhere. | Fernando (2018) |
| Attitude toward use | ATT1 | I want to invest using green fintech. | Fernando (2018) |
| | ATT2 | I believe using green fintech is a good idea. | Hu et al. (2019) |
| | ATT3 | I am interested in green fintech. | Grabner and Faullant (2008) |
| | ATT4 | In general, I support green fintech. | Cha et al. (2017) |
| | ATT5 | I think using green fintech is reliable. | Grabner and Faullant (2008) |
| Intention | INT1 | I want to use green fintech. | Fernando (2018) |
| | INT2 | I want to use green fintech to obtain information. | |
| | INT3 | I would like to use green fintech soon. | Hu et al. (2019) |
| | INT4 | I want to invest in using green fintech. | Grabner and Faullant (2008) |
| | INT5 | I will use green fintech more efficiently. | Ali et al. (2020) |
| Usage intention | UI1 | I continue to increase the frequency of use of green fintech. | Fernando (2018) |
| | UI2 | If I have used green fintech, I am willing to continue using them. | Hu et al. (2019) |
| | UI3 | I use green fintech quite frequently. | Ali et al. (2020) |
| Environmental awareness | EW1 | I think climate change in recent years is a big problem. | Karaoglan (2016) |
| | EW2 | Reducing the use of polluting energy will have a positive impact on the environment in Tongzhou. | |
| | EW3 | By reducing our consumption of fossil fuels, we are contributing to the protection of the environment. | |
| | EW4 | I think renewable energy will help create jobs. | |
| | EW5 | Tax incentives should be given to boost renewable energy production. | |
| Green knowledge | GK1 | Compared to an average person, I am more familiar with the environmental policies of fintech providers. | Hsu et al. (2017) |
| | GK2 | Compared to my friends, I am more familiar with the green programs of fintech providers. | |
| | GK3 | Compared to people who purchase many technology products, I am more familiar with the green labels of fintech. | |

Table 2. Sample Characteristics (N = 403)

| Demographic Variable and Category | | Frequency | Percent |
|---|---|---|---|
| gender | male | 169 | 41.9 |
| | female | 234 | 58.1 |
| age | < 18 years | 22 | 5.5 |
| | 18~25 years | 57 | 14.1 |
| | 26~30 years | 109 | 27.0 |
| | 31~40 years | 87 | 21.6 |
| | 41~50 years | 65 | 16.1 |
| | 51~60 years | 45 | 11.2 |
| | >60 years | 18 | 4.5 |
| highest education attainment | Primary school or below | 12 | 3.0 |
| | Junior high school | 31 | 7.7 |
| | Senior high school | 63 | 15.6 |
| | Technical secondary schools and technical schools | 31 | 7.7 |
| | Post-secondary school | 104 | 25.8 |
| | University or above | 162 | 40.2 |

# 4. Analysis and Results

## 4.1. Descriptive Statistics

Table 2 shows the socio-demographics of the respondents. As shown in Table 1, 41.9% of the respondents were male; Women accounted for 58.1%. Respondents with a bachelor's degree or above accounted for 40.2%, meaning that those without any bachelor's degree accounted for a total of 59.8%.

## 4.2. Model Estimation

In this study, we used IBM SPSS and Amos 26.0 to perform statistical analyses. To test for reliability, we obtained Cronbach's α coefficient. Cronbach's α coefficient has a value between 0 and 1. The closer the value is to 1, the higher the internal consistency of the measurement items and the higher the reliability. Most researchers believe that a Cronbach's α coefficient higher than 0.7 indicates acceptable reliability. Table 3 reports the results of the reliability test. Cronbach's α coefficients of all the variables are above 0.8, indicating that the measurement items have acceptable reliability. In addition, the CITC values of all indicators were higher than 0.7, indicating a high correlation between the variables.

After verifying the reliability, we tested for structural validity using the discriminative validity test and convergence validity test. The discriminant validity test, due to Fornell and Larcker (1981), suggested that if the square root of the average variation extraction of each latent variable is higher than the correlation coefficient between the variable and the other latent variables, there is convergence validity in the model and the scale constructed in the study. In Table 4, the bolded statistics on the diagonal are the square root values of the Average Variance Extracted (AVE) of the seven variables:

Table 3. Reliability Analysis

| Variable | Identifier in questionnaire | Corrected Item-Total Correlation（CITC） | Cronbach's α value after deleting the item | Cronbach's α value after deleting the item |
|---|---|---|---|---|
| Perceived usefulness | PU1 | 0.754 | 0.865 | 0.893 |
| | PU2 | 0.77 | 0.859 | |
| | PU3 | 0.758 | 0.863 | |
| | PU4 | 0.768 | 0.860 | |
| Perceived ease of use | PEOU1 | 0.748 | 0.896 | 0.912 |
| | PEOU2 | 0.761 | 0.894 | |
| | PEOU3 | 0.741 | 0.897 | |
| | PEOU4 | 0.769 | 0.893 | |
| | PEOU5 | 0.759 | 0.895 | |
| | PEOU6 | 0.739 | 0.898 | |
| Attitude toward use | ATT1 | 0.753 | 0.895 | 0.911 |
| | ATT2 | 0.752 | 0.896 | |
| | ATT3 | 0.769 | 0.893 | |
| | ATT4 | 0.745 | 0.897 | |
| | ATT5 | 0.739 | 0.898 | |
| | ATT6 | 0.757 | 0.895 | |
| Intention | INT1 | 0.741 | 0.878 | 0.898 |
| | INT2 | 0.733 | 0.880 | |
| | INT3 | 0.746 | 0.877 | |
| | INT4 | 0.760 | 0.874 | |
| | INT5 | 0.763 | 0.873 | |
| Usage intention | UI1 | 0.697 | 0.767 | 0.834 |
| | UI2 | 0.712 | 0.754 | |
| | UI3 | 0.675 | 0.789 | |
| Environmental awareness | EW1 | 0.763 | 0.877 | 0.901 |
| | EW2 | 0.753 | 0.879 | |
| | EW3 | 0.751 | 0.880 | |
| | EW4 | 0.752 | 0.880 | |
| | EW5 | 0.748 | 0.881 | |
| Green knowledge | GK1 | 0.707 | 0.824 | 0.858 |
| | GK2 | 0.758 | 0.777 | |
| | GK3 | 0.733 | 0.801 | |

0.822, 0.795, 0.795, 0.799, 0.792, 0.804, and 0.819. Each is greater than the correlation coefficient between the respective dimension and other dimensions below the diagonal. Hence, discriminative validity is verified.

We performed a convergence validity test to verify the extent how each measurement item of the same dimension effectively reflects the same construct. Researchers usually use AVE and Composite Reliability (CR) to make judgments. AVE indicates the ability of each measurement index to explain the variation of its corresponding underlying construct, and CR reflects the internal consistency of the underlying construct measurement index. When both CR exceeds 0.6, and AVE exceeds 0.5, there is high convergence validity. On the other hand, AVE between 0.36 and 0.5 is only

Table 4. Discriminative Validity Test

| Variable | PU | PEOU | ATT | INT | UI | EW | GK |
|---|---|---|---|---|---|---|---|
| PU | 0.822 | | | | | | |
| PEOU | 0.446*** | 0.795 | | | | | |
| ATT | 0.472*** | 0.548*** | 0.795 | | | | |
| INT | 0.406*** | 0.456*** | 0.498*** | 0.799 | | | |
| UI | 0.443*** | 0.479*** | 0.515*** | 0.450*** | 0.792 | | |
| EW | 0.517*** | 0.436*** | 0.435*** | 0.404*** | 0.449*** | 0.804 | |
| GK | 0.510*** | 0.503*** | 0.502*** | 0.409*** | 0.450*** | 0.541*** | 0.819 |

Note: *** indicates p<0.001.

considered to be acceptable. As shown in Table 5, the AVE for each variable is more than 0.36, and the combined reliability of each variable is more than 0.6, indicating convergence validity.

### 4.3. Structural Equation Modeling

After validity and reliability tests, the adaptation of the data to the hypothesized model could be analyzed using SEM techniques. We estimated the path coefficient and significance coefficient of each latent variable to verify the hypothesized structure. In terms of goodness of fit, Table 6 reports that the Chi-square freedom ratio is 1.681 < 3, and RMSEA is 0.041 < 0.05. NFI, RFI, IFI, TLI, and CFI are all greater than 0.9, which are considered as high. GFI and AGFI are above 0.8 but less than 0.9, which are considered relatively high. Hence, there is a high goodness of fit, indicating a desirable adaptation of the data to the hypothesized model.

We tested the eight hypotheses of the theoretical model listed in Section 2.2 for the full sample and presented the results in Figure 1. All the estimated coefficients are statistically significant. PU had a significant positive effect on ATT ($\beta = 0.262$, $T = 4.780$, $p < 0.001$), PEOU had a significant positive effect on ATT ($\beta = 0.446$, $T = 7.729$, $p < 0.001$), PEOU had a significant positive effect on PU ($\beta = 0.472$, $T = 8.499$, $p < 0.001$), ATT had a significant positive effect on INT ($\beta = 0.342$, $T = 5.710$, $p < 0.05$), PU had a significant favorable effect on PU ($\beta = 0.138$, $T = 2.438$, $p < 0.05$), EW had a significant positive effect on INT ($\beta = 0.152$, $T = 2.526$, $p < 0.05$), GK had a significant positive effect on INT ($\beta = 0.127$, $T = 2.027$, $p < 0.05$), and INT had a significant positive effect on UI ($\beta = 0.474$, $T = 8.042$, $p < 0.001$). The important finding here is that not only were the factors proposed in previous EA-TAM significant in the present study, but the newly introduced green factors – environmental awareness and green knowledge - were also significant to the adoption of green fintech. The more environmentally aware a person is and the more green knowledge he/she has, the more likely he/she intends to, and therefore uses, green fintech, and vice versa.

On this basis that green knowledge was a significant factor that determined green fintech adoption, we believed that education, which affected the level of knowledge, should also have a significant impact on green fintech adoption. With the data set collected for the present study, we could investigate the

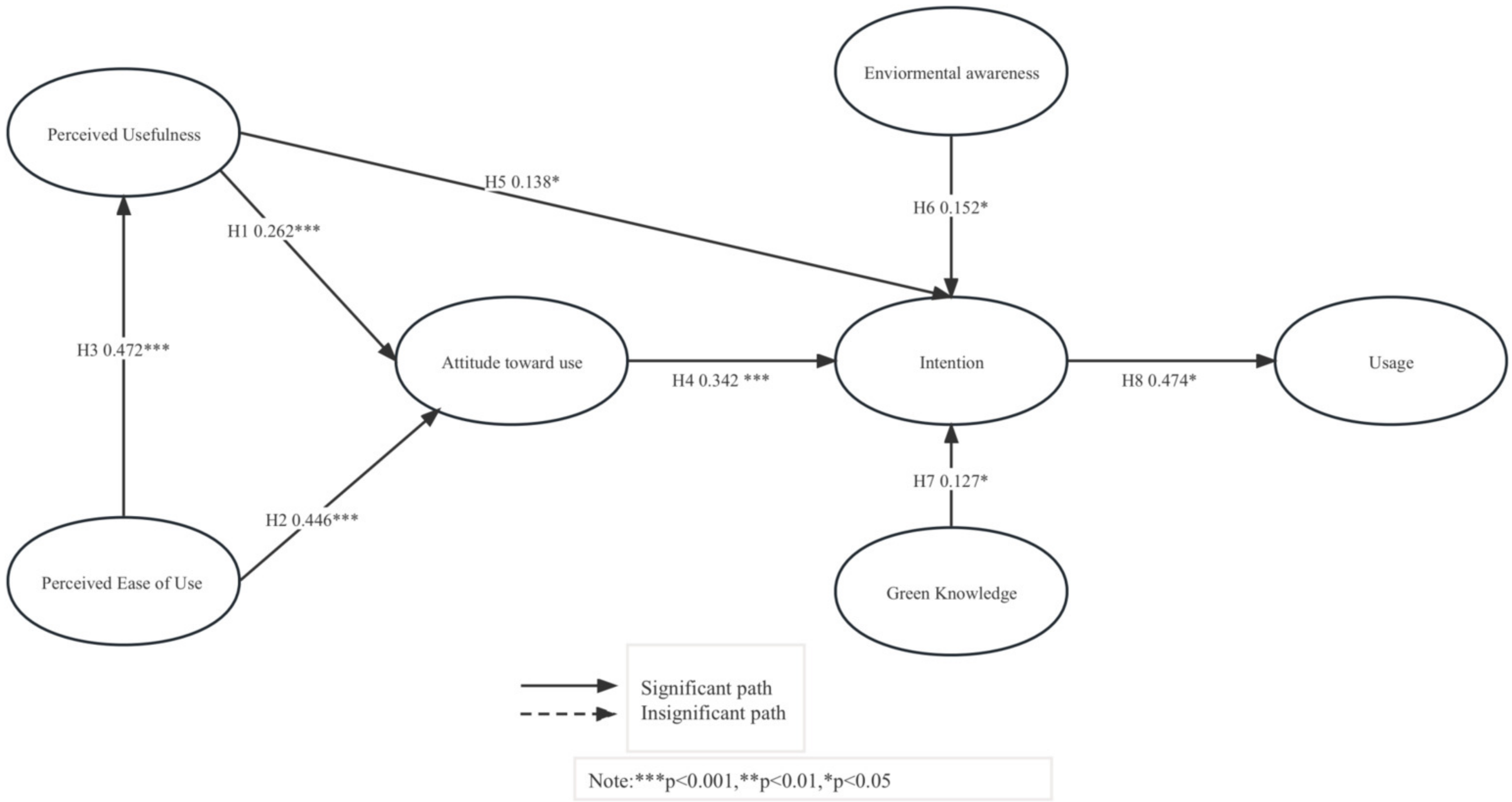


Figure 1. The Resulting Model

Table 5. Convergence Validity Test

| Correspondence | Parameter significance estimation | | | | Factor loading | Topic reliability | Combinatorial reliability | Average extraction |
|---|---|---|---|---|---|---|---|---|
| | Unstd. | S.E. | t-value | P | Std. | SMC | CR | AVE |
| PU→PU1 | 1 | | | | 0.817 | 0.667 | 0.893 | 0.675 |
| PU→PU2 | 1.025 | 0.055 | 18.558 | *** | 0.826 | 0.682 | | |
| PU→PU3 | 1.003 | 0.055 | 18.347 | *** | 0.818 | 0.669 | | |
| PU→PU4 | 1.006 | 0.054 | 18.558 | *** | 0.826 | 0.682 | | |
| PEOU→PEOU1 | 1 | | | | 0.788 | 0.621 | 0.912 | 0.633 |
| PEOU→PEOU2 | 0.999 | 0.057 | 17.418 | *** | 0.800 | 0.640 | | |
| PEOU→PEOU3 | 1.023 | 0.060 | 17.027 | *** | 0.786 | 0.618 | | |
| PEOU→PEOU4 | 0.991 | 0.056 | 17.785 | *** | 0.813 | 0.661 | | |
| PEOU→PEOU5 | 1.038 | 0.059 | 17.509 | *** | 0.803 | 0.645 | | |
| PEOU→PEOU6 | 0.972 | 0.057 | 16.909 | *** | 0.781 | 0.610 | | |
| ATT→ATT1 | 1 | | | | 0.793 | 0.629 | 0.912 | 0.632 |
| ATT→ATT2 | 0.964 | 0.055 | 17.528 | *** | 0.799 | 0.638 | | |
| ATT→ATT3 | 1.017 | 0.058 | 17.548 | *** | 0.800 | 0.640 | | |
| ATT→ATT4 | 1.004 | 0.058 | 17.233 | *** | 0.788 | 0.621 | | |
| ATT→ATT5 | 1.003 | 0.059 | 17.138 | *** | 0.785 | 0.616 | | |
| ATT→ATT6 | 1.023 | 0.058 | 17.701 | *** | 0.805 | 0.648 | | |
| INT→INT1 | 1 | | | | 0.786 | 0.618 | 0.898 | 0.639 |
| INT→INT2 | 0.979 | 0.059 | 16.509 | *** | 0.778 | 0.605 | | |
| INT→INT3 | 1.032 | 0.060 | 17.062 | *** | 0.799 | 0.638 | | |
| INT→INT4 | 1.031 | 0.059 | 17.368 | *** | 0.811 | 0.658 | | |
| INT→INT5 | 1.053 | 0.060 | 17.669 | *** | 0.822 | 0.676 | | |
| UI→UI1 | 1 | | | | 0.804 | 0.646 | 0.835 | 0.628 |
| UI→UI2 | 0.954 | 0.060 | 15.863 | *** | 0.813 | 0.661 | | |
| UI→UI3 | 0.949 | 0.063 | 15.012 | *** | 0.758 | 0.575 | | |
| EW→EW1 | 1 | | | | 0.814 | 0.663 | 0.901 | 0.646 |
| EW→EW2 | 1.011 | 0.056 | 18.119 | *** | 0.806 | 0.650 | | |
| EW→EW3 | 0.991 | 0.055 | 17.875 | *** | 0.798 | 0.637 | | |
| EW→EW4 | 0.98 | 0.054 | 18.074 | *** | 0.805 | 0.648 | | |
| EW→EW5 | 0.959 | 0.054 | 17.761 | *** | 0.794 | 0.630 | | |
| GK→GK1 | 1 | | | | 0.783 | 0.613 | 0.859 | 0.671 |
| GK→GK2 | 1.164 | 0.067 | 17.268 | *** | 0.857 | 0.734 | | |
| GK→GK3 | 1.040 | 0.063 | 16.603 | *** | 0.815 | 0.664 | | |

impact of education by dividing the sample into a high-education group (those with a college education or above) and a low-education group (those without a college education). We performed the steps of the analysis explained above to each education group. If the hypothesis testing results differ across the two groups, there is evidence that education is an external factor that determines green fintech adoption.

Table 6. Path Model Fit

| Fit index | RMSEA | GFI | AGFI | NFI | RFI | IFI | TLI | CFI |
|---|---|---|---|---|---|---|---|---|
| Model Fit | 0.041 | 0.896 | 0.879 | 0.91 | 0.902 | 0.962 | 0.958 | 0.962 |
| Result | high | acceptable | acceptable | high | high | high | high | high |

Table 7. Hypothesis Testing Results of the Low-Education Group

| Correspondence | Estimate | S.E. | C.R. | P | Test result |
|---|---|---|---|---|---|
| PEOU→PU | 0.471 | 0.08 | 5.888 | *** | Pass |
| PU→ATT | 0.305 | 0.067 | 4.529 | *** | Pass |
| PEOU→ATT | 0.517 | 0.079 | 6.53 | *** | Pass |
| ATT→INT | 0.265 | 0.068 | 3.914 | *** | Pass |
| GK→INT | 0.284 | 0.075 | 3.796 | *** | Pass |
| EW→INT | 0.1 | 0.062 | 1.606 | 0.108 | Fail |
| PU→INT | 0.099 | 0.065 | 1.528 | 0.126 | Fail |
| INT→UI | 0.587 | 0.081 | 7.216 | *** | Pass |

Note: ***p<0.001, **p<0.01, *p<0.05, #p<0.1

Table 8. Hypothesis Testing Results of the High-Education Group

| Correspondence | Estimate | S.E. | C.R. | P | Test result |
|---|---|---|---|---|---|
| PEOU→PU | 0.509 | 0.082 | 6.174 | *** | Pass |
| PU→ATT | 0.182 | 0.081 | 2.255 | * | Pass |
| PEOU→ATT | 0.334 | 0.08 | 4.158 | *** | Pass |
| ATT→INT | 0.449 | 0.107 | 4.201 | *** | Pass |
| GK→INT | -0.197 | 0.112 | -1.761 | # | Pass |
| EW→INT | 0.274 | 0.109 | 2.516 | * | Pass |
| PU→INT | 0.172 | 0.085 | 2.021 | * | Pass |
| INT→UI | 0.361 | 0.096 | 3.776 | *** | Pass |

Note: ***p<0.001, **p<0.01, *p<0.05, #p<0.1

According to Table 7 and Table 8, all the model hypotheses could not be rejected for the high-education group, but some were rejected for the low-education group. In particular, EW→INT and PU→INT were the two paths that failed the hypothesis tests for the low-education group. Intuitively, only highly educated people with higher environmental awareness and positive perceptions toward the usefulness of green fintech will be more likely to adopt green fintech; the same does not apply to people with lower education levels. This confirms that education is an external factor that impacts the variables in the hypothesized model. However, surprisingly, the path from green knowledge to behavioral intention is not affected by education. This implies that in people with relatively low education, green knowledge may still significantly encourage their green fintech usage.

On the other hand, the highly educated are typically those with better access to information about government initiatives and official documents on environmental protection, so they are more aware of environmental issues. Compared to the less educated, the highly educated pay more attention to the sustainable development of the area over personal interests, so they have a broader vision regarding the environment. These contribute to the strong positive link between environmental awareness and green fintech adoption of the high-education group.

## 5. Conclusion

Green fintech plays an increasingly prominent role in the sustainable development of industries and the economy as a whole. This paper takes the new sub-center of Beijing, Tongzhou, as a case to study the factors that determine green fintech adoption. We extended the widely applied EA-TAM by incorporating two green factors - environmental awareness and green knowledge. After checking for reliability and validity, we proceeded to estimations using SEM techniques. The goodness-of-fit indexes indicated our model fit the data reasonably well. All four dependent variables, perceived usefulness, attitude toward use, intention, and usage, and all three independent variables, perceived ease of use, environmental awareness, and green knowledge, followed paths in the hypothesized model. When separating the high-education (those with college degree or above) and low-education (those without college degrees) groups, the hypothesis testing results were similar to those of the full sample, with the exceptions that perceived usefulness and environmental awareness did not have significant positive impacts the intention to adopt green fintech among the lowly educated. It was not surprising that both green knowledge and environmental awareness had significant positive impacts on green fintech adoption by the highly educated. However, green knowledge, which might have been accumulated through means other than formal education, was also a significant determinant of green fintech adoption among the less educated.

### 5.1. Implications and Recommendations for Policymakers and Practitioners

China is at the forefront of green fintech adoption, and Tongzhou is Beijing's new sub-center, whose priority is to build a "green city" (Tongzhou District People's Government of Beijing Municipality, 2024). Hence, Tongzhou provides an ideal ground for a quasi-experiment of green fintech adoption. The experiences of Tongzhou provide important insights for policymakers and practitioners.

This research finds that environmental awareness, green knowledge, and education have positive impacts on green fintech adoption. To strengthen environmental awareness, governments can promote the value of green fintech to environmental protection through effective means, such as social media and word-of-mouth of influencers. Governments should encourage the continuous acquirement of knowledge about green policies, products, services, and technology. Examples are lifelong learning programs and short-term courses subsidized by the government. By collaborating with NPOs and NGOs, governments can enhance environmental science education to students starting from a young age. Governments can provide financial incentives, such as lower transaction fees and carbon credits, to motivate businesses and consumers to adopt green technologies. These policies are the most direct and powerful instruments, especially at the developmental stage of green fintech.

Practitioners in the green financial sector and related businesses can focus on raising consumer awareness and enhancing the transfer of information about the benefits of green fintech, such as through campaigns targeting the less environmentally conscious demographics. Practitioners can harness the power of new fintech, such as big data analytics, AI, and machine learning, to offer personalized green financial products, helping consumers make informed eco-friendly decisions while tracking sustainability metrics effectively. Large enterprises with experience in ESG can share their experiences with business partners, especially SMEs with fewer resources, to better transition toward sustainable practices. Financial institutions and green fintech developers should also strengthen data privacy and security measures that concern consumers during green fintech adoption. The combined efforts of the public, private, and civic sectors can drive meaningful environmental changes and promote green economic growth.

### 5.2. Limitations and Recommendations Future Research

The study faced time and financial constraints during data collection, resulting in a non-random sample that might lower the generality of the findings. To provide precise recommendations for policymakers, financial institutions, and fintech companies, future studies can collaborate with the entities to obtain a more representative sample and improve statistical inferences.

Additionally, some responses were deemed invalid due to acquiescence bias (i.e., “yea-saying”) and “nay-saying” tendencies. Besides, the reliance on an honor system often raises concerns about the truthfulness of the answers. Future researchers can enhance data collection by adopting mixed methods, in which qualitative data are collected through personal contact, and researchers can evaluate the quality of the data.

The distribution of the questionnaire primarily in areas frequented by younger individuals resulted in relatively few elderly respondents, which might impact the representativeness of the sample. Even though the younger respondents are the main users of green fintech, future studies can improve statistical inferences by obtaining sufficient data and constructing a quota sample, for example.

Finally, the extended EA-TAM was not the only theoretical model used in similar studies. As in previous studies, future researchers can continue to explore new social, economic, and environmental factors by adapting some, all, or variations of the existing models. Future empirical research may find supportive or counter-evidence, but either will make important contributions to the field of research.

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