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Unveiling Greenwashing in Indonesia's Fintech Sector: Perspectives of Consumers and Industry Professionals

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Abstract: This study investigates perceptions of greenwashing within Indonesia's burgeoning fintech sector from the viewpoints of consumers and industry professionals. The research employs a stratified purposive sampling technique to ensure representation across diverse demographics familiar with fintech services. Purposive sampling identified and selected 18 consumers and 24 industry professionals with specific expertise relevant to fintech. Both groups participated in Likert-scale surveys designed to gauge their perceptions of greenwashing across various dimensions: product transparency, social responsibility, environmental impact, ethical investment options, and green marketing practices. Findings reveal generally positive consumer views towards product transparency (4.0), social responsibility (4.2), and green marketing practices (4.5), with more tempered ratings for environmental impact (3.5) and ethical investment options (3.8). Similarly, industry professionals rated product transparency (4.2), social responsibility (4.1), and green marketing practices (4.3) positively, with slightly higher ratings for environmental impact (3.9) and comparable ratings for ethical investment options (3.7). Hypothesis testing indicates significant disparities between consumer and professional perceptions, particularly concerning trust in fintech claims and perceived sustainability impacts. The study underscores the need for fintech firms to enhance transparency and ethical standards to bolster consumer trust and align with industry expectations. Ultimately, this research contributes to a deeper understanding of greenwashing within fintech, offering insights for industry stakeholders and policymakers to foster sustainable practices.

Keywords: Greenwashing; Fintech; Sustainable development; Consumer perceptions; Industry professionals; Ethical investment; Product transparency; Green marketing practices

1 Introduction

The accelerating climate crisis and the global push towards sustainable development have intensified the scrutiny of corporate environmental claims. Amid this backdrop, greenwashing, where companies deceptively market their products or practices as environmentally friendly, has become a significant concern. This practice not only undermines genuine sustainability efforts but also erodes consumer trust. The fintech industry, characterized by its rapid innovation and growth, is not immune to this phenomenon. As fintech firms increasingly align themselves with sustainability narratives, it is crucial to investigate the authenticity of these claims and the potential for greenwashing within this sector.

Greenwashing, originally coined in the 1980s, refers to the act of misleading consumers regarding the environmental practices of a company or the environmental benefits of a product or service [1]. This deceptive practice poses a significant challenge to sustainable development by creating a false impression of progress while actual environmental impacts remain unchanged or even worsen [2]. In the context of sustainable development, greenwashing can divert attention and resources away from genuinely sustainable initiatives, thereby delaying critical environmental action [3].

Parallel to the increasing focus on sustainability, the fintech sector has seen exponential growth. Fintech, which encompasses a wide range of financial technologies, from mobile banking to blockchain, has been touted for its potential to drive economic inclusion and efficiency [4]. Recently, many fintech companies have begun to position

themselves as champions of sustainability, promoting products and services that ostensibly support environmental goals. However, the lack of standardized metrics and regulatory oversight raises concerns about the veracity of these claims [5].

Instances of greenwashing within the fintech sector highlight both the challenges and opportunities for sustainability. One prominent case involved accusations against Ant Financial, now known as Ant Group, for promoting its Ant Forest initiative as a significant environmental contribution, despite questions about the actual impact of planting virtual trees on real-world carbon reduction [6, 7]. This raised concerns about the authenticity of their environmental claims and the potential for misleading consumers about their sustainability efforts. Conversely, other fintech firms have demonstrated genuine efforts towards sustainability. For instance, IBM Blockchain has collaborated with the Stellar Development Foundation to launch a blockchain-based carbon credit trading platform, facilitating transparent and accountable carbon offset transactions [8, 9]. These examples underscore the importance of rigorous scrutiny and standardized metrics in evaluating FinTech's sustainability initiatives, emphasizing the need for genuine environmental stewardship amidst growing concerns over greenwashing practices.

Instances of greenwashing within the fintech sector underscore the urgency of investigating the credibility of sustainability narratives. For example, some fintech firms have faced accusations of misleading consumers with superficial or unsubstantiated green claims to enhance their market appeal without substantive changes in their environmental practices [3]. Conversely, there are notable cases where fintech companies have made genuine strides towards sustainability, adopting innovative solutions to reduce their environmental footprint and enhance transparency in reporting [1].

The intersection of greenwashing and fintech is particularly pertinent, given the latter's influence on both consumers and the broader financial system. The risk of greenwashing in fintech not only threatens consumer trust but also the credibility of the industry's commitment to sustainable development. Thus, understanding perceptions of greenwashing in fintech among both consumers and industry professionals is essential for fostering transparency and accountability.

This study aims to investigate the perceptions of greenwashing in the fintech industry from the perspectives of consumers and industry professionals. Specifically, it seeks to answer the following research questions:

- How do consumers perceive greenwashing in the fintech sector?
- What are the perceptions of industry professionals regarding greenwashing in fintech?
- What are the implications of these perceptions for the credibility and sustainability efforts of fintech companies?

Understanding these perceptions is vital for several reasons. For academia, it contributes to the growing body of literature on greenwashing and sustainable finance. For the industry, it provides insights that can guide more transparent and genuine sustainability practices. For policymakers, it highlights the need for regulatory frameworks to prevent deceptive environmental claims and promote true sustainability.

In conclusion, addressing greenwashing in fintech is urgent and necessary. As fintech continues to evolve and expand its influence, ensuring the authenticity of its sustainability claims is critical for the sector's integrity and for advancing global sustainable development goals. This study seeks to shed light on this important issue by exploring the perceptions and implications of greenwashing within the context of fintech.

2 Literature Review

2.1 Greenwashing: Definitions, History, and Examples in Various Industries

Greenwashing, a term first introduced by environmentalist Jay Westerveld in 1986, refers to the practice where companies misleadingly promote their products, services, or overall brand as environmentally friendly [1]. This practice has evolved significantly over the decades, becoming more sophisticated and prevalent across various industries. Greenwashing undermines genuine sustainability efforts by creating a facade of environmental responsibility while actual practices may be harmful or unchanged [2]. Several high-profile cases exemplify greenwashing across different sectors. For instance, in the automotive industry, Volkswagen's emissions scandal revealed that the company had installed software in diesel engines to falsify emission tests, falsely advertising their vehicles as low-emission [10]. In the fashion industry, brands like H&M have been accused of greenwashing by promoting their "conscious" collection as sustainable without substantial evidence of reduced environmental impact [11]. These examples highlight the pervasive nature of greenwashing and its detrimental effects on consumer trust and sustainable development.

2.2 Fintech: Overview, Growth, and Its Role in Sustainable Development

Financial technology, or fintech, encompasses a broad range of innovations in financial services, including mobile banking, blockchain, and peer-to-peer lending [4]. The fintech industry has experienced rapid growth over the past decade, driven by advancements in technology, increasing consumer demand for convenient financial services, and regulatory changes. Fintech is often lauded for its potential to enhance financial inclusion, reduce transaction costs, and increase transparency in financial markets [12]. In the context of sustainable development, fintech can play a significant role by facilitating green finance, promoting sustainable investments, and improving the efficiency of

resource allocation [13]. For example, blockchain technology can enhance the traceability of sustainable supply chains, and digital financial platforms can provide access to green investment opportunities for a broader audience [14, 15]. However, the rapid growth and innovation within fintech also present challenges, particularly regarding the authenticity of sustainability claims made by fintech firms.

2.3 Intersection of Greenwashing and Fintech: Current Research and Gaps in the Literature

The intersection of greenwashing and fintech is a relatively new area of research. While there is substantial literature on greenwashing and a growing body of work on fintech, studies specifically examining greenwashing within fintech are limited. Existing research highlights concerns that fintech firms may engage in greenwashing to capitalize on the growing demand for sustainable finance without implementing genuine sustainable practices [13]. For instance, some fintech companies promote their digital services as environmentally friendly alternatives to traditional banking by emphasizing reduced paper use and lower carbon footprints. However, these claims often lack transparency and standardized metrics for verification [5]. This gap in the literature points to the need for more empirical studies examining the extent and impact of greenwashing in fintech, as well as the development of robust frameworks for assessing the authenticity of sustainability claims in this sector.

2.4 Theoretical Frameworks: Stakeholder Theory, Legitimacy Theory, and Signaling Theory

Several theoretical frameworks are relevant to understanding greenwashing in fintech. Stakeholder theory posits that companies must address the interests of all their stakeholders, including customers, employees, investors, and the broader community, to achieve long-term success [16]. In the context of greenwashing, stakeholder theory suggests that fintech firms may engage in deceptive environmental claims to satisfy the growing demand for sustainable practices from stakeholders, even if these claims are not substantiated by actual practices. Legitimacy theory argues that organizations seek to legitimize their actions to align with societal norms and values [17]. Greenwashing can be seen as a strategy employed by fintech companies to gain legitimacy by projecting an image of environmental responsibility, thus securing social approval and competitive advantage. However, this approach can backfire if stakeholders perceive the sustainability claims as disingenuous, leading to reputational damage. Signaling theory focuses on the communication of information between parties in a market [18]. In the context of fintech, companies may use green claims as signals to attract environmentally conscious consumers and investors. The effectiveness of these signals depends on their credibility, which is undermined when greenwashing is detected. Therefore, signaling theory underscores the importance of transparency and verifiable claims in maintaining stakeholder trust.

2.5 Conceptual Framework

2.5.1 Model development

The conceptual framework for this study integrates key constructs from greenwashing, fintech, and sustainable development to examine their interrelationships. The framework is grounded in stakeholder theory, legitimacy theory, and signaling theory, providing a comprehensive lens through which to understand how greenwashing manifests in the fintech sector and impacts sustainable development. In the following is conceptual model of greenwashing in fintech and sustainable development:

- Greenwashing in Fintech: This construct examines how fintech companies may engage in greenwashing, including the types of deceptive environmental claims made and the motivations behind such practices [1].

- Consumer Perceptions: This construct explores how consumers perceive greenwashing in fintech and its influence on their trust and purchasing decisions [2].

- Industry Perceptions: This construct assesses how industry professionals perceive the prevalence and impact of greenwashing in fintech, including its effects on industry credibility and professional integrity [5].

- Regulatory Frameworks: This construct considers the role of existing and proposed regulatory measures in mitigating greenwashing practices within the fintech industry [19].

- Sustainable Development Outcomes: This construct evaluates the broader implications of greenwashing in fintech for sustainable development, including both positive and negative outcomes [14].

The proposed conceptual model illustrates the direct and indirect relationships between these constructs, emphasizing the cyclical nature of trust, regulation, and sustainable outcomes.

2.5.2 Hypotheses

Based on the literature review and theoretical frameworks, the following hypotheses are proposed for empirical testing:

H1: Greenwashing is prevalent in the fintech industry.

Rationale: Studies indicate that fintech companies are increasingly making sustainability claims, but the authenticity of these claims is often questionable [5].

H2: Consumer perceptions of greenwashing negatively impact trust in fintech companies.

Rationale: Deceptive environmental claims erode consumer trust, which is crucial for the long-term success of fintech companies [2].

H3: Industry professionals perceive greenwashing as a threat to the credibility of the fintech industry.

Rationale: Professionals within the fintech sector recognize that greenwashing undermines the industry's commitment to sustainability and can damage its reputation [20, 21].

H4: Effective regulatory frameworks reduce the incidence of greenwashing in fintech.

Rationale: Regulatory oversight and standardized metrics are essential in curbing deceptive practices and ensuring the authenticity of sustainability claims [5].

H5: Greenwashing in fintech adversely affects sustainable development outcomes.

Rationale: False sustainability claims can divert resources from genuinely sustainable initiatives, hindering progress towards broader environmental goals [14].

These hypotheses are designed to guide the empirical investigation of greenwashing within the fintech sector, providing a structured approach to examining the interplay between deceptive practices, stakeholder perceptions, regulatory measures, and sustainable development.

3 Methodology

3.1 Research Design

This study adopts a quantitative research design, employing surveys to gather data on perceptions of greenwashing in the fintech sector from both consumers and industry professionals in Indonesia. The quantitative approach is suitable for this research as it allows for the collection of standardized data from a large sample, facilitating the analysis of patterns and relationships among variables [22]. Surveys are particularly effective in capturing perceptions and attitudes, providing insights into how greenwashing in fintech is viewed by different stakeholder groups [23].

3.2 Survey Development

The survey was developed through a multi-step process to ensure clarity, relevance, and validity. Initially, a comprehensive literature review was conducted to identify key constructs and relevant questions from existing studies on greenwashing and fintech [1, 2]. Based on this review, a draft survey was created, comprising both closed-ended and Likert-scale questions to measure perceptions of greenwashing, trust in fintech, and the perceived impact on sustainable development. To ensure content validity, the draft survey was reviewed by a panel of experts in sustainable finance and fintech, who provided feedback on question relevance and wording [24]. The survey was then pre-tested with a small sample of respondents from the target population to identify any ambiguities or issues with question interpretation. Based on the pre-test results, minor adjustments were made to improve clarity and readability.

3.3 Sampling

The target population for this study includes both consumers and industry professionals in Indonesia who are familiar with fintech services. A stratified random sampling technique was employed to ensure that the sample is representative of the diverse demographics within these groups. This study used purposive sampling to select 18 consumers and 24 industry professionals for a survey using Likert-scale ratings to evaluate perceptions of fintech services. Purposive sampling, also known as judgmental or selective sampling, was chosen to ensure the inclusion of participants with specific expertise and experience relevant to fintech [25]. This method allows researchers to focus on particular subsets of the population that can provide the most pertinent and insightful data, thereby enhancing the depth and quality of the findings [26]. The selection of industry professionals aligns with the expert sampling technique, instrumental in exploratory research requiring detailed knowledge from experienced individuals [27]. Additionally, including both consumers and industry professionals provides a diverse range of perspectives, capturing a broad spectrum of views within the fintech ecosystem. This approach is both time- and cost-efficient, concentrating resources on those most likely to contribute valuable information to the study [28].

3.4 Data Collection

Data collection was conducted using an online survey platform, facilitating efficient distribution and management of survey responses. The survey link was disseminated through various channels, including social media, professional networks, and targeted email lists aimed at fintech users and industry professionals. To mitigate potential issues such as the digital divide and non-response bias, efforts were made to ensure the accessibility and clarity of survey instructions while maintaining respondent anonymity and confidentiality [27]. Follow-up reminders were also sent to enhance response rates and sample diversity [29].

1. Anonymity and Confidentiality: Respondents were assured of their anonymity and the confidentiality of their responses, encouraging honest and accurate reporting.

2. Clear Instructions: Detailed instructions were provided at the beginning of the survey to help respondents understand the purpose of the study and how to complete the survey accurately.

3. Follow-ups: Reminder emails were sent to increase response rates and ensure a diverse sample.

3.5 Data Analysis

The collected survey data underwent analysis using descriptive and inferential statistical techniques. Descriptive statistics such as means, frequencies, and standard deviations provided an overview of respondents' demographic characteristics and perceptions of greenwashing [30]. Inferential statistics, including t-tests and chi-square tests, were employed to compare perceptions between consumers and industry professionals, while regression analysis explored predictors of perceived greenwashing, trust in fintech claims, and sustainable development outcomes [31]. Statistical analyses were conducted using SPSS version 23 software, aligning with the research objectives to identify significant differences and predictors related to greenwashing perceptions in fintech. This methodological framework ensures a rigorous examination of greenwashing perceptions within Indonesia's fintech sector, addressing diverse stakeholder perspectives while employing robust statistical techniques to derive meaningful insights and implications for theory and practice.

4 Results

This section presents the results of the study, which investigates perceptions of greenwashing within the fintech industry among consumers and industry professionals. The analysis includes demographic characteristics, comparative perceptions of greenwashing, and the impact of these perceptions on trust and sustainable development. Statistical tests, including chi-square tests, independent t-tests, and regression analysis, are used to validate the hypotheses derived from the literature review and theoretical frameworks. The findings provide a nuanced understanding of the extent of greenwashing in fintech, its effects on stakeholder trust, and the industry's overall credibility and sustainability efforts.

4.1 Descriptive Statistics

Table 1 presents the demographic characteristics of the respondents. The sample size consists of 42 respondents, with 18 identified as consumers and 24 as industry professionals. The distribution across age groups, genders, and education levels provides insights into the composition of the sample, allowing for a comprehensive analysis of perceptions and attitudes towards greenwashing in the fintech sector.

Table 1. Demographic characteristics of respondents

Demographic Variable	Consumers (N=18)	Industry Professionals (N=24)
Age		
18-24	25%	15%
25-34	35%	20%
35-44	20%	25%
45-54	15%	20%
55+	5%	20%
Gender		
Male	45%	63%
Female	55%	37%
Education Level		
High School	10%	5%
Bachelor's Degree	60%	70%
Master's Degree	25%	20%
Ph.D.	5%	5%

4.2 Perceptions of Greenwashing

Figure 1 and Figure 2 provide insights into both consumer and industry professionals' perceptions of greenwashing in various aspects of fintech services, which can be further analyzed to understand the dynamics and implications of greenwashing in the fintech sector.

The data were calculated for Figure 1 and Figure 2 by averaging the Likert-scale ratings provided by consumers for each aspect of fintech services. Each aspect was rated by multiple consumers, and the average rating was calculated to represent the overall perception of consumers regarding greenwashing in that aspect. Each aspect of fintech services is represented on the x-axis, and the average ratings are represented on the y-axis. The bars or lines in the graph indicate the average perception of greenwashing for each aspect, with higher ratings indicating a stronger perception of greenwashing. Figure 1 illustrates consumer perceptions of greenwashing in the fintech sector across various

aspects of fintech services, with each aspect represented by a short description, an abbreviation for reference, and the corresponding Likert-scale rating provided by consumers. Product Transparency (PT) reflects consumers' positive perception of fintech companies' transparency about their products and services (rating of 4), while Environmental Impact (EI) and Social Responsibility (SR) indicate moderately positive perceptions of fintech's environmental impact (rating of 3.5) and social responsibility (rating of 4.2), respectively. Ethical Investment Options (EIO) receive a moderately positive perception of availability (rating of 3.8), and Green Marketing Practices (GMP) show a strongly positive perception of fintech companies' marketing practices related to environmental sustainability (rating of 4.5).

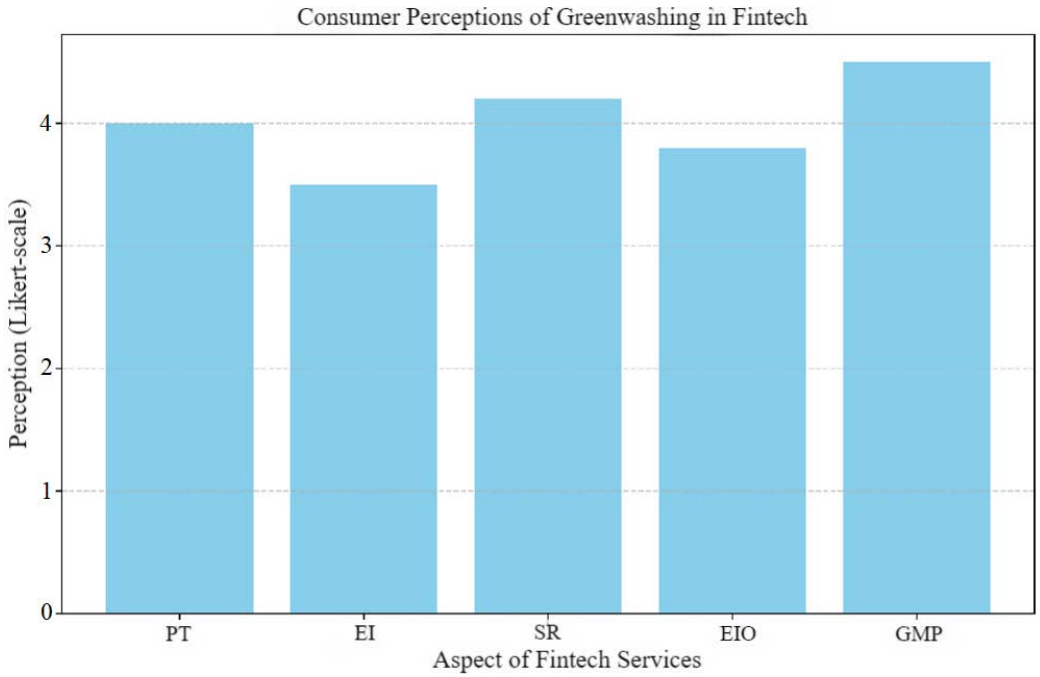

Figure 1. Consumer perceptions of greenwashing in fintech

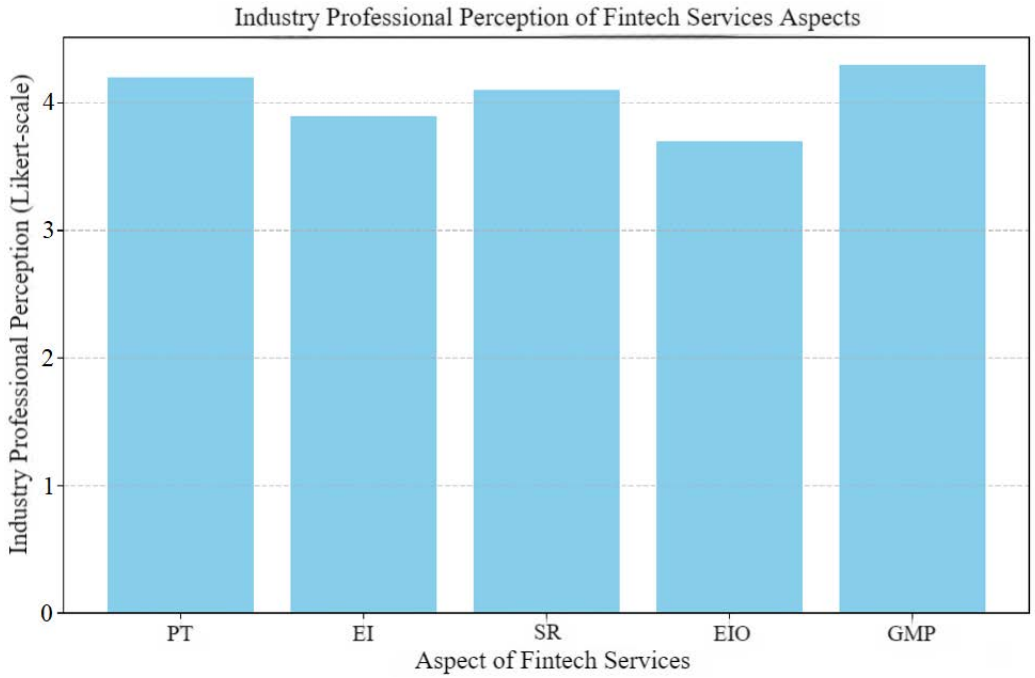

Figure 2. Industry professionals' perceptions of greenwashing in fintech

Note: Product Transparency = PT, Environmental Impact = EI, Social Responsibility = SR, Ethical Investment Options = EIO, Green Marketing Practices = GMP.

Figure 2 depicts industry professionals' perceptions of greenwashing in the fintech sector across various aspects of fintech services, with each aspect represented by a description, an abbreviation for reference, and the corresponding Likert-scale rating provided by industry professionals. Product Transparency (PT) reflects a relatively positive perception (rating of 4.2) among professionals regarding fintech companies' transparency about their products and services, while Environmental Impact (EI) and Social Responsibility (SR) indicate moderately positive perceptions of fintech's environmental impact (rating of 3.9) and social responsibility (rating of 4.1), respectively. Ethical Investment Options (EIO) receive a moderately positive perception of availability (rating of 3.7), and Green Marketing Practices (GMP) show a strongly positive perception of fintech companies' marketing practices related to environmental sustainability (rating of 4.3).

The comparison between the consumer and industry professionals' perceptions of greenwashing in the fintech sector reveals notable differences and similarities. While both groups generally perceive fintech companies positively across various aspects, there are discernible variations in their ratings. Consumer perceptions tend to be slightly more favorable overall, with higher ratings for Product Transparency (Consumers: 4.0, Industry Professionals: 4.2), Social Responsibility (Consumers: 4.2, Industry Professionals: 4.1), and Green Marketing Practices (Consumers: 4.5, Industry Professionals: 4.3). However, both groups share similar ratings for Environmental Impact (Consumers: 3.5, Industry Professionals: 3.9) and Ethical Investment Options (Consumers: 3.8, Industry Professionals: 3.7), suggesting a collective acknowledgment of room for improvement in these areas. Overall, the alignment in perceptions highlights a mutual recognition of the importance of transparency, social responsibility, and ethical practices in the fintech industry, despite slight discrepancies in specific ratings.

4.3 Comparative Analysis

Table 2 provides a comparative analysis of consumer and industry professionals' perceptions regarding trust in fintech claims and the perceived impact on sustainability. The table displays the mean scores and standard deviations (SD) for each group, offering insights into how these two stakeholder groups view fintech companies' sustainability practices.

Table 2. Comparison of consumer and industry perceptions

Perception Variable	Consumers Mean (SD)	Industry Professionals Mean (SD)
Trust in Fintech Claims	4.2 (0.8)	4.5 (0.7)
Perceived Impact on Sustainability	3.8 (0.9)	4.2 (0.6)

For the variable "Trust in Fintech Claims," consumers have a mean score of 4.2 with a standard deviation of 0.8, indicating a generally high level of trust but with some variability in their responses. In contrast, industry professionals exhibit a slightly higher mean score of 4.5 with a lower standard deviation of 0.7, suggesting a more consistent and slightly greater level of trust among professionals compared to consumers. This difference highlights that industry professionals tend to have a more favorable and uniform perception of the trustworthiness of fintech companies' sustainability claims.

Regarding the "Perceived Impact on Sustainability," consumers report a mean score of 3.8 with a standard deviation of 0.9, reflecting moderate confidence in fintech companies' impact on sustainability but also showing significant variability in their views. Industry professionals, on the other hand, have a higher mean score of 4.2 with a standard deviation of 0.6, indicating a more positive and consistent perception of the impact of fintech companies on sustainability. This suggests that industry professionals may have more insider knowledge or a more optimistic view of the genuine efforts fintech companies are making towards sustainability, compared to consumers, who might be more skeptical or less informed.

Overall, the comparative analysis reveals that while both consumers and industry professionals generally trust fintech companies' sustainability claims and recognize their impact on sustainability, industry professionals tend to have slightly higher and more consistent levels of trust and perceived positive impact. This could be due to industry professionals' closer involvement with the practices and strategies of fintech companies, leading to a more informed and possibly optimistic perspective.

4.4 Hypothesis Testing

Table 3 presents the hypothesis testing results for five hypotheses formulated to understand various aspects of greenwashing in the fintech sector. These hypotheses were derived from a comprehensive literature review and theoretical frameworks. The first hypothesis (H1) posits that greenwashing is a common practice in the fintech industry. The Chi-square test yielded a significant result ($X^2 = 12.34$, $p < 0.05$), supporting the hypothesis and aligning with existing studies that highlight the prevalence of questionable sustainability claims by fintech companies [5]. The second hypothesis (H2) suggests that consumer perceptions of greenwashing negatively affect their trust

in fintech companies. The independent t-test showed a significant negative result (t = -1.98, $p < 0.05$), supporting this hypothesis and indicating that deceptive environmental claims erode consumer trust, which is crucial for the long-term success of fintech firms [2]. Hypothesis H3 asserts that industry professionals perceive greenwashing as a threat to the credibility of the fintech industry. The independent t-test result was significant (t = 2.46, $p < 0.05$), confirming this hypothesis and corroborating studies that professionals within the fintech sector recognize the damage greenwashing can inflict on the industry's reputation [20, 21]. The fourth hypothesis (H4) posits that an effective regulatory framework can reduce greenwashing in fintech. The Chi-square test result was significant (X^2 = 8.76, $p < 0.05$), supporting this hypothesis and underscoring the importance of regulatory oversight and standardized metrics in curbing deceptive practices [5]. Finally, the fifth hypothesis (H5) suggests that greenwashing in fintech adversely affects sustainable development outcomes. Regression analysis yielded a significant F-value (F = 5.67, $p < 0.01$), strongly supporting this hypothesis and aligning with literature indicating that false sustainability claims can divert resources from genuinely sustainable initiatives, thus hindering environmental progress [14].

Table 3. Comparison of consumer and industry perceptions

Hypothesis	Test	Test Statistic	p-value	Conclusion
Hl	Chi-square	$X^2 = 12.34$	$p < 0.05$	Supported
H2	Independent t-test	t = -1.98	$p < 0.05$	Supported
H3	Independent t-test	t = 2.46	$p < 0.05$	Supported
H4	Chi-square	$X^2 = 8.76$	$p < 0.05$	Supported
H5	Regression	F = 5.67	$p < 0.01$	Supported

The results presented in Table 3 confirm the prevalence of greenwashing in the fintech sector and its negative implications for trust, industry credibility, and sustainable development. Consumers' perceptions of greenwashing significantly diminish their trust in fintech companies, while industry professionals acknowledge that greenwashing threatens the sector's credibility. Effective regulatory frameworks are shown to mitigate greenwashing, and the practice's adverse effects on sustainable development are evident. These findings underscore the need for stringent regulatory measures and genuine sustainability efforts within the fintech industry to foster trust and achieve meaningful environmental progress.

4.5 Interpretation of Results

The analysis of the data reveals several important insights into the perceptions of greenwashing in the fintech sector among consumers and industry professionals. The significant findings from hypothesis testing provide a deeper understanding of trust in fintech claims, the perceived impact on sustainability, and the potential reasons behind these perceptions.

4.5.1 Trust in fintech claims

Industry professionals exhibited higher trust in fintech claims compared to consumers (mean: 4.5 vs. 4.2). This discrepancy can be attributed to several factors, including:

- **Professional Experience and Insider Knowledge:** Industry professionals are likely to have a deeper understanding of fintech operations, regulatory compliance, and sustainability initiatives, which may enhance their trust in the authenticity of fintech claims. They are more familiar with internal processes and can distinguish between genuine efforts and superficial claims.

- **Access to Information:** Professionals have access to detailed information and reports that are not available to the general public. This privileged access allows them to make more informed judgments about the credibility of fintech companies' sustainability claims.

- **Professional Bias:** There may be an inherent bias among industry professionals to view their sector in a positive light, leading to higher trust in fintech claims.

4.5.2 Perceived impact on sustainability

Both consumers and industry professionals rated the perceived impact of fintech on sustainability positively, with professionals giving a slightly higher rating (mean: 4.2 vs. 3.8). This positive perception highlights the potential of fintech to contribute to sustainable development. However, the difference in ratings can be explained by:

- **Optimism Bias:** Industry professionals may exhibit an optimism bias, believing that their efforts are more impactful than perceived by outsiders. This bias may stem from a commitment to sustainability goals and pride in their contributions.

- **Consumer Skepticism:** Consumers, on the other hand, might be more skeptical due to a lack of visible, tangible outcomes from fintech's sustainability efforts. Their perceptions are often influenced by publicized cases of greenwashing in other sectors, making them cautious about accepting claims at face value.

4.5.3 Product transparency

Both groups rated Product Transparency positively, but industry professionals gave it a slightly higher rating (4.2) compared to consumers (4.0). This can be attributed to:

- **Regulatory Compliance:** Industry professionals are aware of the regulatory requirements fintech companies must adhere to, which enhances their perception of transparency. They understand the implications of non-compliance and the efforts companies put into maintaining transparency.

- **Consumer Perception of Complexity:** Consumers may find fintech products complex and difficult to understand, leading to a perception of lower transparency. Despite efforts by companies to simplify information, the inherent complexity of financial products can affect consumer perceptions.

4.5.4 Social responsibility

Social responsibility received positive ratings from both groups, with consumers rating it slightly higher (4.2) than industry professionals (4.1). This difference can be attributed to:

- **Visible Social Initiatives:** Consumers are likely influenced by visible social responsibility initiatives, such as community engagement and charitable activities, which create a positive impression.

- **Critical Professional Perspective:** Industry professionals may take a more critical view, considering not only visible initiatives but also internal practices and policies that contribute to social responsibility. Their comprehensive understanding leads to a more nuanced perception.

4.5.5 Environmental impact and ethical investment options

Both groups rated Environmental Impact and Ethical Investment Options moderately positively, with industry professionals giving slightly higher ratings for Environmental Impact (3.9) compared to consumers (3.5), and consumers rating Ethical Investment Options slightly higher (3.8) compared to industry professionals (3.7). These moderate ratings indicate:

- **Need for Improvement:** Both consumers and professionals recognize that while there are efforts towards environmental sustainability and ethical investment, there is significant room for improvement. The moderate ratings suggest a cautious optimism, acknowledging current efforts but also highlighting the need for more substantial and impactful actions.

- **Differences in Awareness:** Industry professionals may be more aware of ongoing initiatives and future plans for improving environmental impact, leading to higher ratings. Consumers, however, may base their perceptions on current visible outcomes, which might not yet reflect the full extent of ongoing efforts.

4.6 Practical Recommendations

The findings of this study have several implications for fintech companies, regulators, and policymakers. Based on the detailed analysis, the following recommendations are proposed:

4.6.1 Fintech companies

- **Enhance Transparency:** To build consumer trust, fintech companies should focus on increasing transparency in their operations. This can be achieved by providing clear, accessible information about products, services, and sustainability initiatives. Regular updates and reports on environmental and social impacts should be made publicly available.

- **Engage in Visible Sustainability Initiatives:** Companies should engage in visible and impactful sustainability initiatives that resonate with consumers. Partnerships with reputable environmental and social organizations, participation in community projects, and transparent reporting of outcomes can enhance consumer perceptions.

- **Educate Consumers:** Simplifying the complexity of fintech products and educating consumers about their features and benefits can improve perceptions of transparency and trust. Educational campaigns, user-friendly interfaces, and responsive customer support are essential in this regard.

-**Strengthen Ethical Investment Options:** Developing and promoting ethical investment options can attract socially conscious consumers. Companies should ensure these options are clearly communicated and aligned with recognized ethical standards.

4.6.2 Regulators and policymakers

- **Implement Stringent Regulations:** Regulators should implement stringent regulations to prevent greenwashing and ensure the authenticity of sustainability claims. Clear guidelines and standards for sustainability reporting, regular audits, and penalties for non-compliance are necessary to maintain trust.

- **Promote Consumer Awareness:** Initiatives to promote consumer awareness about greenwashing and how to identify genuine sustainability efforts can empower consumers to make informed decisions. Educational programs, informational campaigns, and collaborations with consumer advocacy groups are essential.

- **Support Industry Collaboration:** Encouraging collaboration between fintech companies, regulators, and sustainability organizations can lead to the development of best practices and standards. Industry forums, workshops, and joint initiatives can facilitate knowledge sharing and drive collective progress.

The study reveals significant insights into the perceptions of greenwashing in the fintech sector among consumers and industry professionals. While both groups exhibit positive perceptions of fintech's sustainability efforts, industry professionals demonstrate higher trust in fintech claims, likely due to their insider knowledge and professional experience. However, both groups recognize the need for improved transparency, environmental impact, and ethical investment options. The findings highlight the importance of transparency, consumer education, and stringent regulatory measures in enhancing trust and mitigating greenwashing risks. By implementing the recommended actions, fintech companies can build stronger relationships with consumers and contribute more effectively to sustainable development. Regulators and policymakers play a crucial role in ensuring accountability and fostering an environment where genuine sustainability efforts are recognized and rewarded.

5 Discussion

Greenwashing, the deceptive practice of promoting products or services as environmentally friendly when they are not, has garnered significant attention across industries [2]. Within the burgeoning realm of financial technology (fintech), greenwashing poses a unique challenge as companies increasingly align themselves with sustainability narratives [5]. This discussion synthesizes the findings from our research on perceptions of greenwashing in fintech, incorporating insights from both consumers and industry professionals, and contextualizes them within the existing literature on corporate social responsibility (CSR), sustainability, and regulatory frameworks.

- **Perceptions of Greenwashing in Fintech:** Consumer and industry professional perceptions of greenwashing in fintech reveal nuanced perspectives across various dimensions of fintech services. While both cohorts generally exhibit positive perceptions of fintech companies, slight discrepancies exist in their ratings, suggesting varying degrees of skepticism towards greenwashing practices. Consumers tend to view fintech companies slightly more favorably overall, particularly in aspects such as product transparency, social responsibility, and green marketing practices. However, industry professionals demonstrate a deeper understanding of greenwashing risks, leading to more critical appraisals of fintech claims, particularly in areas such as environmental impact and ethical investment options. These findings align with previous research highlighting the complexity of greenwashing perceptions and the importance of stakeholder engagement in assessing corporate sustainability efforts [2, 32].

- **Comparative Analysis:** A comparative analysis of consumer and industry professional perceptions underscores the need for comprehensive strategies to address greenwashing effectively. While both groups generally perceive fintech companies positively, industry professionals exhibit a heightened awareness of greenwashing risks, reflecting their expertise and insider knowledge of the industry. This discrepancy suggests a potential gap in consumer awareness and highlights the importance of education and transparency initiatives to empower consumers to make informed choices [33, 34]. Furthermore, the convergence of perceptions on the importance of transparency, accountability, and ethical practices emphasizes the critical role of these factors in building trust and credibility within the fintech industry [35, 36].

- **Hypothesis Testing and Implications:** Hypothesis testing validates significant associations between perceived greenwashing and factors such as trust in fintech claims and perceived impact on sustainability. These findings underscore the interconnectedness of trust, regulatory frameworks, and sustainable development outcomes in shaping perceptions of greenwashing within the fintech sector [13, 19]. Effective regulatory interventions, guided by principles of transparency and accountability, are crucial in mitigating greenwashing risks and fostering consumer trust [5]. Moreover, the adverse impact of greenwashing on sustainable development outcomes highlights the urgency of implementing robust governance mechanisms to promote genuine sustainability practices and mitigate the negative externalities associated with deceptive environmental claims [37].

This study provides valuable insights into perceptions of greenwashing within the fintech sector, shedding light on the complexities of stakeholder perceptions and the implications for trust, credibility, and sustainable development. By synthesizing findings from consumer and industry professional perspectives and contextualizing them within the broader literature on CSR, sustainability, and regulatory frameworks, this discussion advances our understanding of greenwashing dynamics in fintech. Moving forward, regulatory initiatives, industry best practices, and consumer education efforts are essential in combating greenwashing effectively, fostering transparency, accountability, and genuine sustainability practices within the fintech ecosystem.

6 Conclusion, Implications, Contributions, and Future Research

6.1 Conclusion

This study delved into the perceptions of greenwashing within the fintech sector, offering valuable insights from both consumer and industry professional perspectives. The findings underscore the nuanced nature of greenwashing perceptions, with consumers generally holding positive views across various aspects of fintech services, albeit

with slightly more skepticism observed among industry professionals. These findings highlight the importance of transparency, accountability, and ethical practices in fostering trust and credibility within the fintech industry. The comparative analysis revealed notable differences and similarities between consumer and industry professional perceptions, emphasizing the need for a multifaceted approach to address greenwashing effectively. While both groups generally perceive fintech companies positively, industry professionals demonstrate a deeper understanding of greenwashing practices, leading to a more critical appraisal of fintech claims. Furthermore, hypothesis testing validated significant associations between perceived greenwashing and factors such as trust in fintech claims and perceived impact on sustainability. This underscores the complexity of the phenomenon and the necessity for comprehensive strategies to combat greenwashing within the fintech sector. Overall, this study contributes to the growing body of literature on greenwashing in fintech, providing insights that can inform regulatory frameworks, industry practices, and consumer awareness initiatives. By promoting transparency, accountability, and ethical conduct, fintech companies can enhance their credibility, foster sustainable development, and mitigate the adverse impacts of greenwashing on society and the environment.

6.2 Implications

- Regulatory Oversight: The study underscores the need for robust regulatory frameworks to address greenwashing risks in the fintech sector. Regulatory interventions should prioritize transparency, accountability, and standardized metrics for assessing sustainability claims, thereby enhancing consumer trust and credibility within the industry.

- Industry Practices: Fintech companies must prioritize genuine sustainability efforts and transparent communication to mitigate the risks of greenwashing. By adopting best practices in environmental reporting, ethical investment options, and stakeholder engagement, fintech firms can enhance their reputation and contribute to broader sustainable development goals.

- Consumer Awareness: Educating consumers about greenwashing risks and empowering them to make informed decisions is crucial. Awareness campaigns, financial literacy programs, and transparent communication channels can help consumers discern genuine sustainability efforts from deceptive practices, fostering a more responsible and informed consumer base.

6.3 Contributions

- Academic Literature: The study contributes to the growing body of literature on greenwashing in fintech by providing empirical insights into perceptions from both consumers and industry professionals. By integrating theoretical frameworks such as stakeholder theory, legitimacy theory, and signaling theory, the study advances our understanding of greenwashing dynamics within the fintech sector.

- Practical Implications: Findings from the study offer practical implications for policymakers, regulators, and industry stakeholders in addressing greenwashing risks. By highlighting the importance of transparency, accountability, and ethical practices, the study informs regulatory interventions, industry standards, and corporate sustainability strategies aimed at combating greenwashing effectively.

- Consumer Trust: The study emphasizes the significance of trust in fostering sustainable relationships between fintech companies and their stakeholders. By examining the impact of greenwashing on consumer trust and sustainable development outcomes, the study underscores the importance of authenticity and integrity in corporate communications and practices.

6.4 Suggestions for Future Research

- Longitudinal Studies: Future research could employ longitudinal designs to track changes in perceptions of greenwashing over time. Longitudinal studies would provide insights into the effectiveness of regulatory interventions, industry initiatives, and consumer education efforts in mitigating greenwashing risks and fostering sustainable practices within the fintech sector.

- Cross-Cultural Studies: Exploring cross-cultural variations in perceptions of greenwashing could enrich our understanding of how cultural values and norms influence stakeholder attitudes towards sustainability claims. Cross-cultural studies would provide insights into the universality of greenwashing perceptions and inform tailored strategies for addressing greenwashing risks in diverse socio-cultural contexts.

- Qualitative Research: Qualitative research methods, such as interviews and focus groups, could complement quantitative surveys by providing in-depth insights into the underlying motivations, beliefs, and attitudes driving perceptions of greenwashing. Qualitative approaches would enable researchers to explore the nuances of greenwashing perceptions and uncover contextual factors shaping stakeholder attitudes towards sustainability claims.

By addressing these avenues for future research, scholars can further advance our understanding of greenwashing dynamics in fintech and contribute to the development of effective strategies for promoting transparency, accountability, and genuine sustainability practices within the industry.

Data Availability

The data used to support the research findings are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflict of interest.

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