

The Green Premium in Venture Capital Investment: An Evolving Advantage

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Abstract: While green investments in classical financial markets often yield excess returns or price discounts, in the context of venture capital (VC) in a major emerging market, the green premium is more pronounced in its quantitative characteristics. Employing a comprehensive dataset of 79,120 financing events across 36,570 Chinese enterprises from 1991 to 2017, our empirical results reveal that compared to non-green ventures, single-round VC investments in green ventures are approximately 10% lower. However, green ventures receive an average of 0.8 additional financing rounds. Consequently, the total VC funding accumulated by green firms ultimately exceeds that of non-green firms by around 10%. A mediation analysis shows that this unique pattern is driven by a combination of both policy incentives and market preferences, which help to mitigate the single-round investment discount for green projects. This suggests that in emerging markets, while each individual investment round may be smaller, the cumulative effect of multiple rounds results in a higher overall funding advantage for these enterprises.

Keywords: Green Premium, Green Finance, Venture Capital, China

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1.Introduction

Despite the extensive discussions surrounding green premiums in mainstream financial markets such as stocks and bonds (D'hondt et al., 2022; Pástor et al., 2022; Zerbib, 2019), the topic receives relatively little attention in the venture capital market, particularly in emerging markets which are marked by less institutionalized financial systems, divergent regulatory frameworks (Aibai et al., 2019; Tang et al., 2024; Yao and Tang, 2021; Zhou et al., 2023), and underdeveloped venture capital (VC) ecosystems (Qi et al., 2024). In recent years, the role of venture capital in facilitating the green economic transition has garnered significant attention. Against the backdrop of escalating climate change and global commitments to carbon neutrality, debates persist regarding whether VC exhibits a systematic preference for green enterprises, and whether such firms secure over financing. This paper synthesizes the decision-making logic, performance outcomes, and underlying heterogeneity in VC investments in green industries or green technologies, aiming to elucidate the dynamic interplay between sustainable innovation and capital markets.

Recent scholars have noted the presence of a green premium in some niche financial markets, such as crowdfunding (Yao,2025) ². Given this context, it is important to investigate how green premiums manifest in the venture capital market. The imperative for sustainable development has placed green technology innovation at the forefront of global economic and environmental agendas. As nations worldwide strive to mitigate climate change and transition towards more sustainable practices, the development and deployment of green technologies have become increasingly critical (Stern, 2007). This urgency has spurred significant policy support and growing investor interest in green initiatives, leading to the emergence of a potential "green premium" in various economic sectors, including finance. Understanding the financial implications of environmental responsibility for innovative enterprises, particularly in the rapidly

² Empirical results suggests that sustainable projects receive around 55% more funding than non-sustainable projects in the baseline regression on average in the IndieGoGo platform.

evolving landscape of technology, is of paramount importance for fostering a sustainable future.

In this context, China, as a major global economy and a significant contributor to both technological advancement and environmental challenges, presents a compelling setting to examine the financing dynamics of green tech innovation. The Chinese government has made substantial commitments to green development, and its technology sector is experiencing unprecedented growth. However, the financial landscape for pioneering green technologies remains complex, characterized by inherent uncertainties and the risk-averse behavior often associated with early-stage investors. This study delves into the manifestation of a "green premium" within the financing of tech innovation enterprises in China, specifically investigating whether and how green initiatives impact their financing outcomes.

Based on a comprehensive database comprising over 70,000 venture capital events, Figure 1 illustrates the annual amounts of single venture capital investments in both green and non-green firms from 2000 to 2017. It can be stated that: Firstly, in terms of the amount of single venture capital investments, green firms generally receive lower amounts compared to non-green firms. Secondly, both green and non-green firms exhibit similar fluctuation trends over time, and notably, the gap between investment amounts for green and non-green firms appears to be narrowing³. These observations suggest a potential shift in investor preference or an increase in opportunities for green firms relative to their non-green counterparts.

Figure 1 is about here

The research questions that this study seeks to answer are: Do green initiatives

³ The green bars represent the annual investment amounts in green firms, while the black line represents the trend for non-green firms. The data shows that investments in green firms have fluctuated over the years, with notable peaks around 2005 and 2008. In contrast, the trend for non-green firms, indicated by the black line, shows a more gradual increase until around 2008, followed by a decline and then some fluctuations thereafter.

significantly impact the financing outcomes of tech innovation enterprises in China, and if so, how do these impacts manifest across different dimensions of financing, such as single round amount, number of financing rounds, and total financing capital?

While the empirical focus of this study is centered on the Chinese venture capital landscape, the findings offer profound implications for global sustainable finance, particularly within the evolving European regulatory framework. As Europe advances its Green Deal and implements rigorous sustainability disclosure requirements such as the SFDR, understanding the friction between short-term capital allocation (the 'round-size discount') and long-term sustainability premiums becomes imperative. China serves as a unique 'natural laboratory' in this regard; its experience demonstrates how targeted policy incentives can effectively bridge the financing gap that inherent technological uncertainties create. By elucidating these dynamics in a major emerging economy, this research provides a comparative benchmark for European investors and policymakers, suggesting that the successful scaling of green innovation requires a deliberate balance between alleviating immediate funding pressures and incentivizing cumulative capital commitment.

This research contributes to the existing literature in several ways: Firstly, it provides nuanced empirical evidence on the existence and nature of a "green premium" (or green discount) within the specific context of venture capital in China. While prior studies have explored green finance and venture capital investment, this study offers a focused analysis on the interplay between "greenness" and various financing outcomes within a crucial and rapidly growing sector in a major emerging economy.

Secondly, this study comprehensively examines the impact of green initiatives across multiple dimensions of financing outcomes, including the single round amount, the total number of financing rounds, and the cumulative total financing capital raised. This multi-faceted approach provides a more holistic understanding of the financial implications of being a green tech innovation enterprise, moving beyond a singular focus on valuation or initial funding.

Thirdly, by analyzing a large and detailed dataset of financing events, this research

offers insights into how the financial implications of "greenness" may vary across different development stages of tech ventures and across different venture capital funding rounds. This stage-specific analysis contributes to a more granular understanding of the financing lifecycle of green tech innovation and the evolving perceptions of investors over time.

Finally, the findings of this study have practical implications for policymakers and investors seeking to promote sustainable technological development. By elucidating the financial challenges and advantages faced by green tech innovation enterprises, this research informs strategies for creating a more supportive and efficient financing ecosystem for sustainable innovation in China and potentially in other similar contexts.

2.Literature review

The increasing global focus on sustainability and the imperative to transition towards a greener economy have spurred significant interest in the role of finance in supporting environmentally friendly ventures. Venture capital, as a key source of funding for innovative and high-growth potential companies, plays a crucial role in this transition. A central question that has emerged in the academic literature is whether venture capital firms exhibit a preference for green enterprises or projects, and if so, whether this preference translates into tangible benefits for these ventures in terms of funding amount, and funding rounds.

2.1. The logics behind the green premium in VC

Theoretically, there are several reasons why venture capital firms might be inclined to favor green enterprises. **Firstly**, the growing awareness of environmental risks and the increasing demand for sustainable products and services create significant market opportunities for green innovations (Acemoglu et al., 2012). Venture capitalists, in their pursuit of high returns, are likely to be attracted to sectors with substantial growth potential. **Secondly**, government policies and regulations aimed at promoting sustainability, such as subsidies, tax incentives, and carbon pricing, can reduce the risk

and enhance the profitability of green investments (Hémous, 2022; Popp, 2019). These policy tailwinds can make green ventures more attractive to venture capital investors. **Thirdly**, there is increasing evidence that investors, including institutional investors who often allocate capital to venture capital funds, are incorporating environmental, social, and governance (ESG) factors into their investment decisions (Pastor, 2020; Bolton & Kacperczyk, 2021). This growing demand for sustainable investments can create a dedicated pool of capital seeking out green opportunities in the venture capital space (Riedl & Serafeim, 2017). Signaling theory also suggests that by investing in green enterprises, venture capital firms can signal their commitment to sustainability, potentially enhancing their reputation and attracting environmentally conscious limited partners (Spence, 1973).

Empirical studies have increasingly examined whether these theoretical motivations translate into a discernible preference for green enterprises in venture capital investment decisions. While the evidence is still evolving, a growing body of literature suggests that green ventures do indeed attract significant venture capital funding. For instance, research has explored the funding patterns in clean technology sectors, often finding substantial investment flows driven by both technological advancements and policy support (Hall & Lerner, 2010). Studies focusing on the energy sector have also documented venture capital investments in renewable energy and energy efficiency companies (Yoshino & Taghizadeh-Hesary, 2016). Furthermore, some studies directly compare the funding success of green versus non-green enterprises, often using classifications based on industry or specific green certifications. These studies generally indicate that green enterprises are at least as likely, if not more likely, to receive venture capital funding compared to their non-green counterparts, particularly in sectors where green technologies offer a clear competitive advantage or address pressing environmental challenges.

2.2. Empirical quantitative measurement in VC

The question of whether green enterprises obtain a supernormal amount of funding

has also been investigated. While simply receiving funding is one aspect of preference, the magnitude of investment is another critical dimension. Evidence suggests that green enterprises in certain sectors, particularly those requiring significant upfront capital investment for research and development or infrastructure deployment (like clean energy or advanced materials), may indeed secure larger funding rounds compared to non-green ventures in other sectors or even within the same broader industry. This could be attributed to the scale of the opportunities being addressed by green technologies or the potential for significant long-term impact. However, it is important to note that the "supernormal" nature of this funding often depends on the specific industry and the capital intensity of the underlying technology. Some studies might find that while green enterprises attract funding, the average deal size might not always be significantly larger across all sectors.

The number of investments rounds a company receives is a crucial indicator of sustained investor confidence and the ability to navigate the often lengthy and uncertain path from early-stage development to commercialization. Research suggests that green enterprises, especially those in deep-tech areas like sustainable agriculture or advanced recycling, might require and subsequently experience a greater number of financing rounds (Gompers, 1995). This could be due to the longer development timelines associated with bringing novel green technologies to market, the need for iterative testing and validation, and the staged investment strategies employed by venture capitalists to mitigate risk over time. Investors might initially provide smaller seed or angel rounds to assess technological feasibility and market potential, followed by larger Series A, B, and subsequent rounds as the venture demonstrates progress and achieves milestones related to sustainability goals and financial performance.

2.3. Mediation and Heterogeneity in VC

Several mediations could explain the observed patterns of venture capital investment in green enterprises. As mentioned earlier, market opportunities, policy support, and investor demand for ESG are key drivers. Specialized green venture capital

funds have also emerged, focusing specifically on investing in environmentally sustainable businesses. These funds often possess deep industry expertise and networks within the green technology ecosystem, facilitating investment and providing valuable support to their portfolio companies (Hall & Lerner, 2010). Furthermore, the increasing availability of information and standardized metrics for measuring environmental impact might reduce information asymmetry between investors and green enterprises, making it easier for venture capitalists to identify and assess promising green opportunities.

The relationship between venture capital and green enterprises is also likely to exhibit significant heterogeneity. For instance, the preference for green ventures might vary across different sectors within the broader green economy. Clean energy technologies might attract different types of investors and funding amounts compared to sustainable agriculture or green building materials. Regional differences in environmental regulations, policy incentives, and investor preferences could also lead to variations in venture capital investment in green enterprises across different geographies. Moreover, the stage of development of the green enterprise (seed, early-stage, late-stage) might influence the amount and type of venture capital funding it attracts. Early-stage green ventures might face greater uncertainty and require more patient capital, while later-stage companies with proven technologies and business models might be more attractive to mainstream venture capital investors seeking faster returns.

In conclusion, the academic literature suggests a growing trend of venture capital firms showing a preference for green enterprises and projects, driven by market opportunities, policy support, and increasing investor demand for sustainability. These patterns are likely driven by a combination of factors, including the emergence of specialized green venture capital funds and improved information availability. However, the relationship is not uniform and exhibits heterogeneity across industries, regions, and enterprise life cycle stages.

3.Hypothesis, Data and Methodology

3.1. *Hypothesis development*

In contrast to classical financial markets, where green investments often exhibit excess returns or issue discounts, the green premium in venture capital (VC) is more pronounced in terms of "quantitative" characteristics. This distinction highlights the unique dynamics and valuation mediations at play within the venture capital ecosystem, particularly when it comes to green enterprises.

In traditional financial markets, such as stock exchanges and bond markets, green investments—such as green bonds and environmentally responsible equities—have been observed to offer excess returns or issue discounts. These phenomena are typically driven by several factors: (1) Risk-Adjusted Returns: Green investments may provide higher risk-adjusted returns due to their alignment with long-term sustainability goals and reduced environmental risks. (2) Market Perception: Investors increasingly view green assets as less risky or more resilient in the face of climate change and regulatory pressures, leading to higher valuations. (3) Regulatory Support: Government incentives and subsidies can lower the cost of capital for green projects, enhancing their attractiveness to investors. However, these benefits often manifest in the form of price premiums or discounts relative to non-green counterparts. For instance, green bonds might trade at a premium because they are perceived as safer or more aligned with future regulatory trends.

In the realm of venture capital, the manifestation of the green premium is complex and not always straightforward. While the long-term potential of green ventures is increasingly recognized, their funding dynamics in single rounds can be subject to a discount. This means that, on average, green ventures tend to secure **smaller single financing rounds** compared to their non-green peers. This phenomenon can be attributed to several factors:

(1) Lower Single-Round Funding: Green startups may face a round size discount on a single financing round. While their long-term potential is high, the immediate risks and uncertainties associated with their technologies and business models—such as

unproven markets, complex regulatory hurdles, or longer payback periods—can make investors hesitant to commit large amounts of capital in a single go. Studies have found that while green startups can attract significant total funding over time, their individual rounds may be smaller on average, reflecting a more cautious, milestone-based investment approach. This contrasts with the notion that all aspects of green ventures automatically attract a premium, instead suggesting a more nuanced reality in which a single round's size is influenced by risk perception.

(2) Increased Number of Financing Rounds: Green enterprises frequently undergo multiple rounds of financing, indicating sustained investor interest and confidence in their growth potential. The iterative nature of innovation in green technology requires continuous capital infusion to develop and scale solutions. Additionally, green ventures often benefit from policy support and market incentives, which enhance their ability to attract subsequent rounds of funding.

(3) Greater Total Investment Amounts: Over time, green ventures accumulate larger total investment amounts across all financing rounds. This cumulative effect underscores the long-term commitment of investors to green enterprises. A comparative analysis of green and non-green startups over a five-year period revealed that green companies received approximately 30% more total funding (Henisz et al., 2020).

In summary, while classical financial markets observe green investments through the lens of excess returns or issue discounts, venture capital showcases a more quantitatively pronounced green premium. This premium is reflected in the higher single-round funding, increased number of financing rounds, greater total investment amounts, and facilitated exit mediations for green enterprises.

In the context of venture capital financing, it is hypothesized that **green tech innovation enterprises will, on average, face a round size discount** in a single financing round compared to their non-green counterparts. This expectation is rooted in the inherent uncertainties and perceived higher risks often associated with pioneering green technologies. Investors, particularly those in the venture capital space, may exhibit caution when committing substantial capital to ventures whose technological

and market viability is yet to be fully established. The development of novel green technologies frequently involves longer and more complex research and development timelines, as well as uncertainties regarding future consumer adoption and evolving regulatory landscapes (Hall & Lerner, 2010). This heightened uncertainty can lead investors to adopt a more conservative approach, preferring to invest smaller amounts on average to assess the venture's progress and de-risk their investment over time.

Furthermore, the valuation of green tech ventures can be particularly challenging due to the nascent nature of the technologies and markets they operate within. Unlike more established sectors, there is often a lack of comparable companies or historical performance data to guide valuation assessments. This information asymmetry between the venture and potential investors can result in lower valuation expectations for green enterprises, consequently leading to smaller funding rounds on average. Investors might prefer to stage their investments, providing smaller initial amounts to achieve specific milestones before committing larger sums in subsequent rounds, a strategy that allows them to better evaluate the technological and commercial traction of the green innovation (Gompers, 1995).

Drawing parallels with existing literature on venture capital investment, it is plausible that investors perceive an additional layer of risk associated with the "greenness" of the venture. While the long-term potential of sustainable technologies is increasingly recognized, the immediate market demand and profitability might be less certain compared to more conventional tech innovations. Therefore, funding decisions may, on average, reflect this perceived risk differential, resulting in a round size discount for green tech enterprises as investors seek to mitigate their exposure in the face of these uncertainties.

H1: Green tech innovation enterprises will, on average, face a round size discount in a single financing round.

Despite the anticipated smaller sizes per round, it is hypothesized that green tech innovation enterprises will require and ultimately undergo a larger number of financing rounds compared to their non-green peers. This expectation stems from the capital-

intensive nature often associated with the development and commercialization of green technologies. These ventures frequently require significant upfront investments in research and development, prototyping, infrastructure deployment, and navigating complex regulatory approvals (Yoshino & Taghizadeh-Hesary, 2016). The extended timelines for development and market validation inherent in many green technologies also contribute to the need for more sustained financial support over a longer period.

Moreover, the iterative nature of risk mitigation sought by investors in the green tech domain is likely to drive a higher frequency of funding rounds. As these ventures progress through various stages of development, from initial concept to commercial scale-up, investors will likely provide capital in tranches, contingent upon the achievement of specific technological and market milestones. This staged investment approach allows investors to continuously assess the venture's progress, adjust their investment strategies, and mitigate their risk exposure over time. Each funding round can be seen as a reassessment point, where investors evaluate the venture's performance against predefined targets related to sustainability goals and financial performance.

Furthermore, the potentially longer path to profitability for some green tech ventures, particularly those in deep-tech areas like sustainable energy or advanced materials, might necessitate more funding rounds to bridge the gap until they achieve self-sustaining revenue streams. Unlike some software-based tech innovations that can scale relatively quickly with less capital intensity, green tech often involves tangible infrastructure, complex manufacturing processes, and navigating established industry structures, all of which can require more sustained and phased financial support from venture capital investors.

H2: Green tech innovation enterprises will necessitate and subsequently experience a greater number of financing rounds throughout their operational lifespan.

Integrating the seemingly counteracting effects of smaller initial round sizes and a greater number of financing rounds, this study posits that green tech innovation

enterprises will ultimately amass a significantly larger aggregate capital infusion compared to non-green ventures operating within comparable sectors. While individual funding rounds in the early stages might be smaller, the increased frequency of these rounds over the long term is expected to lead to a substantial cumulative funding advantage for green enterprises. This reflects the sustained investor interest and the recognition of the long-term growth potential and societal value associated with green technologies.

The capital-intensive nature of green innovation, as discussed in Hypothesis 2, implies that while initial investments might be cautious, the overall capital requirements for these ventures to achieve their full potential are substantial. The greater number of funding rounds allows green enterprises to access this necessary capital in a phased manner, aligning with their development milestones and reducing the initial risk burden for investors. As these ventures demonstrate progress, achieve technological breakthroughs, and gain market traction, they are likely to attract continued and potentially larger investments in later funding rounds, contributing to a higher total funding amount.

This hypothesis suggests that while green tech ventures might face an initial hurdle in securing large early-stage investments, their ability to attract sustained investor confidence and navigate multiple funding rounds will ultimately lead to a greater overall capital accumulation. This long-term funding advantage is crucial for enabling green enterprises to scale their operations, commercialize their innovations, and ultimately contribute significantly to the transition towards a sustainable economy. The market opportunities driven by increasing environmental awareness and supportive government policies are likely to further incentivize investors to provide this sustained financial backing to promising green tech ventures.

H3: The cumulative effect of the increased frequency of financing rounds will result in a net positive effect on the total funding.

3.2. Data

The Qingke Database, developed and maintained by the Zero2IPO Group, stands as a premier source of private equity and venture capital data in China. It offers comprehensive records on various financial activities, including equity investments across different stages, mergers and acquisitions, IPOs, and detailed information on investment funds and companies. This database is particularly valuable for its extensive coverage of early-stage investments, making it an indispensable resource for researchers, investors, and policymakers seeking to analyze market trends, evaluate investment opportunities, and formulate strategic decisions. The data within the Qingke Database are meticulously collected from public disclosures, company filings, and professional analysts, ensuring a high level of accuracy and reliability.

In preparing data from the Qingke Database data cleaning is processed with Stata, where preliminary checks are conducted to identify missing values, outliers, and inconsistencies. Missing data are flagged for exclusion. Outliers are carefully examined in baseline regression and robust check. Furthermore, categorical variables are standardized to ensure uniformity. Employing a comprehensive dataset of 79,120 financing events across 36,769 Chinese enterprises from the Qingke database, I analyze single financing amount, total financing amount, and number of financing rounds as key dependent variables. Greenness rigorously adheres to the International Capital Market Association (ICMA) Green Bond Principles and China's Green Bond Support Project Directory (2021 Edition). Green projects are assigned a value of 1, and non-green projects are coded as 0.

3.3. Methods

To investigate the impact of green initiatives on the financing outcomes of tech innovation enterprises in China, this study employs a quantitative research design using regression analysis. We will estimate separate econometric models to test each of our three hypotheses, focusing on single financing amount, total financing amount, and the number of financing rounds as key dependent variables.

The general form of the regression equation for each outcome variable can be represented as follows:

$$Y_i = \alpha_0 + \beta_1 \text{Green} + \beta_k \text{Controls}_i + \varepsilon \quad (1)$$

Where Y_i represents the dependent variable for the i -th observation (either single round amount, total financing amount, or number of financing rounds)⁴. α is the intercept. β_1 is the coefficient of interest, capturing the effect of the green initiative indicator on the financing outcome. Green_i is the primary explanatory variable, indicating whether the i -th project or company is classified as green. We will use both Green and Green2 as alternative measures of greenness for robustness checks. Controls_i is a vector of control variables included in the respective models. β_k is a vector of coefficients for the control variables. ε_i is the error term.

The specific econometric equations for each hypothesis are detailed below, along with the definition of all variables used in the analysis.

Single Round Amount (Hypothesis 1)

To test Hypothesis 1, which posits that green enterprises initially face a round size discount, we will estimate the following ordinary least squares (OLS) regression model using the full sample of financing events (Panel A of Table 1):

$$\ln \text{AmtSingle}_i = \alpha_1 + \beta_{11} \text{Green} + \beta_{12} \text{Stage}_i + \beta_{13} \text{Round}_i + \beta_{14} \text{InvPerson}_i + \beta_{15} \text{InvStrategy}_i + \beta_{16} \text{CurType}_i + \beta_{17} \text{State}_i + \beta_{18} \text{Year}_i + \varepsilon_i \quad (2)$$

Where $\ln \text{AmtSingle}_i$ is the natural logarithm of the financing amount in a single round for the i -th financing event (in USD). Green_i is a binary variable coded as 1 if the industry to which the company belongs matches the 'China Green Industry Guidance Catalogue (2019 Edition)', and 0 otherwise. Stage_i is a categorical variable indicating

⁴ Detailed explanations of the variables are provided in Table A1.

the stage of the company when receive venture capital. Round_i is the Sequential number of the financing round for a given company.

Inv_Person_i is a binary variable indicating the involvement of individual investors in the i-th round (1) or not (0). Inv_Strategy_i is a categorical variable representing the investment strategy of the investors in the i-th round. Cur_Type_i is a categorical variable representing the currency type used in the i-th financing round. State_i is a categorical variable representing the geographical location (country or region) of the company associated with the i-th event. Year_i is the year of the i-th financing event. ϵ_i is the error term for the single round amount model.

Based on Hypothesis 1, we expect the coefficient β_{11} to be negative and statistically significant, indicating that, ceteris paribus, green projects receive a smaller amount of funding in a single round, particularly in earlier stages (which will be further explored through interaction terms in subsequent analyses).

Number of Financing Rounds (Hypothesis 2)

To test Hypothesis 2, which posits that green enterprises will experience a greater number of financing rounds, we will estimate the following OLS regression model using the company-level data (Panel B of Table 1):

$$\text{Rounds}_i = \alpha_2 + \beta_{21}\text{Green} + \beta_{22}\text{Stage}_i + \beta_{23}\text{Round}_i + \beta_{24}\text{State}_i + \beta_{25}\text{Year}_i + \epsilon_i \quad (3)$$

Where Rounds_j is the total number of financing rounds received by the j-th company. Green_i is a binary variable coded as 1 if the industry to which the company belongs matches the 'China Green Industry Guidance Catalogue (2019 Edition)', and 0 otherwise. Stage_i is a categorical variable indicating the stage of the company when receive venture capital. Round_i is the Sequential number of the financing round for a given company. State is a categorical variable representing the geographical location of the j-th company. Year_j is the year of the first financing event for the j-th company. ϵ_{3j} is the error term for the number of financing rounds model.

Consistent with Hypothesis 2, we expect the coefficient β_{21} to be positive and statistically significant, indicating that green tech innovation enterprises tend to undergo a larger number of financing rounds throughout their lifespan.

Total Financing Amount (Hypothesis 3)

To test Hypothesis 3, which posits that green enterprises will raise a larger total amount of funding, we will estimate the following OLS regression model using the company-level data (Panel B of Table 1):

$$\ln \text{AmtTotal}_i = \alpha_3 + \beta_{31} \text{Green}_i + \beta_{32} \text{Stage}_i + \beta_{33} \text{Round}_i + \beta_{34} \text{State}_i + \beta_{35} \text{Year}_i + \varepsilon_i \quad (4)$$

Where: $\ln \text{AmtTotal}_j$ is the natural logarithm of the total financing amount raised by the j -th company (in USD). Green_i is a binary variable coded as 1 if the industry to which the company belongs matches the 'China Green Industry Guidance Catalogue (2019 Edition)', and 0 otherwise. Stage_i is a categorical variable indicating the stage of the company when receive venture capital. Round_i is the Sequential number of the financing round for a given company. State_i is a categorical variable representing the geographical location of the j -th company. Year_i is the year of the first financing event for the j -th company. ε_i is the error term for the total financing amount model.

In line with Hypothesis 3, we anticipate the coefficient β_{31} to be positive and statistically significant, suggesting that, on average, green tech innovation enterprises accumulate a larger total financing amount.

4. Empirical results

4.1. Descriptive Statistics

Table 1 provides descriptive statistics for the financing events and the companies included in this study. It is divided into three panels, each offering a different perspective on the data.

Panel A presents descriptive statistics for the full sample of 79,120 individual financing rounds. The dependent variable of interest here is $\ln \text{AmtSingle}$, which represents the natural logarithm of the single round amount. The mean of $\ln \text{AmtSingle}$

is 1.2577, with a standard deviation of 1.179, indicating a considerable variation in the amount raised in individual rounds. The minimum value is quite small (0.0099), while the maximum reaches 6.8897, suggesting a wide range of funding amounts. The median value of 0.9439 is lower than the mean, indicating a potential right skew in the distribution of single round amounts⁵. The key explanatory variable, Green, is a binary indicator where 1 denotes a green project and 0 denotes a non-green project. The mean of Green is 0.0416, suggesting that approximately 4.16% of the individual financing events in the full sample are classified as green. Green2⁶ is another green indicator with a mean of 0.0454, representing a slightly different classification or a robustness check for greenness. The table also includes several control variables. Stage represents the financing stage, with a mean of 2.8047. Inv_Person is a binary variable with a mean of 0.1242, potentially indicating the involvement of individual investors. Inv_Strategy represents the investment strategy, with a mean of 1.1863 and a range from 1 to 10. Cur_Type denotes the currency type, with a mean of 1.3432 and a range from 1 to 16. State represents the geographical location (province/region) with a mean of 4.9486 and a wide range from 1 to 51. Finally, Year indicates the year of the financing event and a range from 1991 to 2017.

Panel B shifts the focus to the company level, providing descriptive statistics for the total financing amount received by 36,570 unique companies. The dependent variable here is lnAmtTotal, the natural logarithm of the total financing amount for each company. The mean of lnAmtTotal is 1.3016, with a standard deviation of 1.454, again indicating substantial variation in the total funding raised by different companies. The mean of the green indicator is 0.0339, and Green2 is 0.0373, indicating that approximately 3.39% to 3.73% of the companies in this sample are classified as green.

Panel C directly compares the means of key variables between the non-green and green subsamples within the full dataset. For the single round amount (lnAmtSingle),

⁵ In the robustness test, I investigated the impact of data truncation, and the results were found to be consistent and robust under these conditions.

⁶ Green2 is an alternative binary variable coded as 1 if the industry to which the company belongs matches the International Capital Market Association (ICMA) Green Bond Principles.

green projects have a slightly lower mean compared to non-green projects, and this difference is statistically significant at the 5% level. However, when considering the total financing amount at the company level, green companies have a substantially higher mean compared to non-green companies, and this difference is highly statistically significant. Similarly, for the number of financing rounds, green companies have a significantly higher mean compared to non-green companies, also significant at the 1% level. These preliminary statistics suggest that while green tech innovation enterprises might receive slightly smaller amounts in individual funding rounds, they tend to have more funding rounds overall, leading to a significantly larger total amount of funding raised.

[Table 1 is about here](#)

The figure 2(a) presents a box plot comparing the number of funding rounds for green firms (labeled as "1") and non-green firms (labeled as "0"). The y-axis represents the number of funding rounds. The box plot reveals that green firms have a higher median number of funding rounds compared to non-green firms, with a larger interquartile range indicating greater variability in the number of rounds. Both categories exhibit outliers, with green firms showing a notably higher number of funding rounds.

The figure 2(b) presents a box plot comparing total capital investment amounts between green firms (labeled as "1") and non-green firms (labeled as "0"), with the y-axis showing the natural logarithm of the total investment amount. It illustrates that green firms receive higher median investments compared to non-green firms, alongside greater variability in investment amounts as indicated by a larger interquartile range. Additionally, both categories exhibit outliers, with green firms displaying notably high investment values. These observations suggest that venture capital investments tend to be both larger and more varied for green firms than for their non-green counterparts.

Figure 2 is about here

4.2. Baseline regression

Table 2 presents the baseline regression results examining the relationship between a project's green classification and the single round financing amount ($\ln \text{AmtSingle}$). Each column represents a different model specification, progressively including a wider range of control variables to isolate the effect of "Greenness."

In Column (1), the coefficient for Green is -0.0390, which is statistically significant at the 5% level. This negative coefficient suggests that, on average, green projects receive a lower amount of funding in a single round compared to non-green projects, even without controlling for other factors. This initial finding provides preliminary support for Hypothesis 1, indicating a potential round size discount for green initiatives in their early financing stages.

Column (2) introduces the Stage variable, which has a highly significant and positive coefficient. This indicates that later-stage financing rounds tend to have significantly larger amounts, which is consistent with the typical venture capital investment pattern where funding increases as ventures mature and de-risk. Notably, the coefficient for Green remains negative and becomes even more significant, suggesting that even after controlling for the financing stage, green projects still experience a discount in the single round amount. This finding strengthens the initial support for Hypothesis 1 and implies that the round size discount for green projects is not merely driven by their stage of development.

Column (3) further adds variable Round, representing the sequential number of the financing round. The coefficient for Round is negative and highly significant, indicating that as a company goes through more funding rounds, the amount received in a single round tends to decrease, potentially reflecting dilution effects or changes in investment strategy over time. The coefficient for Green remains significantly negative,

and its magnitude has increased, suggesting that after controlling for both the stage and the number of rounds, the round size discount for green projects is even more pronounced.

Column (4) incorporates investor characteristics and currency type by including `Inv_Person`, `Inv_Strategy`, and `Cur_Type`. The coefficient for `Inv_Person` is not statistically significant, suggesting that the involvement of individual investors does not significantly impact the single round amount in this model. However, both `Inv_Strategy` and `Cur_Type` have significant and positive coefficients, indicating that different investment strategies and currency types are associated with larger single round amounts. The coefficient for `Green` remains significantly negative, although its magnitude has slightly decreased compared to Column (3), suggesting that some of the initial discount might be explained by these additional factors.

Finally, Column (5) presents the most comprehensive model, including `State` (geographical location) and `Year` controls. The coefficient for `State` is significantly positive, indicating regional variations in funding amounts. The coefficient for `Year` is significantly negative, suggesting a slight downward trend in single round amounts over the years in the sample, potentially reflecting market dynamics. In this full model, the coefficient for `Green` remains significantly negative, providing robust evidence for a round size discount for green projects even after controlling for a wide array of factors.

[Table 2 is about here](#)

These findings are consistent with the initial hypothesis that green tech innovation enterprises might face a round size discount in their earlier financing stages. The persistent negative and significant coefficient for the green across all specifications suggests that investors may initially be more cautious in their investment amounts for green projects, possibly due to the perceived higher risks and uncertainties associated with these ventures, as discussed in the literature review. This could also reflect the risk-averse behavior of early-stage investors or challenges in valuing novel green

technologies compared to more established non-green counterparts. While later stages and other factors like investment strategy and currency type play a significant role in determining funding amounts, the "greenness" of a project appears to be associated with a lower single round funding amount, at least in the context of this baseline analysis. This warrants further investigation into the underlying moderating factors that might influence this relationship.

Table 3 presents the baseline regression results for the number of financing rounds and the total venture capital investment amount, focusing on the impact of the "Green" variable. In this revised table, columns (1) and (2) report the results for the number of financing rounds (Rounds), while columns (3) and (4) focus on the natural logarithm of the total venture capital investment amount. The inclusion of control variables in columns (2) and (4) allows us to assess the robustness of the estimated effects.

In columns (1) and (2), which examine the number of financing rounds, the "Green" variable is significantly associated with an increase in the number of rounds. Specifically, being classified as green increases the number of financing rounds by approximately 0.736 without controls and by about 0.807 when control variables are included. Columns (3) and (4), which focus on the natural logarithm of the total investment amount, show that the "Green" variable has a substantial positive effect. Without controlling for other factors, the coefficient is 0.426, and it decreases to 0.101 when control variables are added. These results indicate that green enterprises attract both more frequent and larger investments compared to their non-green counterparts. The adjusted R-squared values suggest that the models explain a modest proportion of the variance in the dependent variables, highlighting the need for additional explanatory factors. Overall, these findings provide robust evidence of the positive relationship between green classification and venture capital investment activity.

Table 3 is about here

4.3. Heterogeneity test

Table 4 presents the results of the analysis examining the impact of a project's green classification on the single round financing amount across different development stages of the invested companies: Seed Stage (Column 1), Early-Stage (Column 2), Expansion Stage (Column 3), and Mature Stage (Column 4). This allows us to investigate whether the "green premium" or discount varies depending on the maturity of the venture.

In Column (1), focusing on Seed Stage companies, the coefficient for Green is positive and statistically significant at the 10% level, with a value of 0.2769. This suggests that, in the seed stage, green projects tend to receive a higher amount of funding in a single round compared to their non-green counterparts. This finding contrasts with the overall round size discount observed in the baseline results (Table 2) and indicates a potential "green premium" at the very early stages of development.

Moving to Column (2), which examines Early-Stage companies, the coefficient for Green is negative but not statistically significant. This suggests that in the early stages, there is no statistically significant difference in the single round funding amount between green and non-green projects. The initial premium observed in the seed stage seems to disappear as ventures move into the early stages.

Column (3) focuses on the Expansion Stage. Here, the coefficient for Green is negative and highly statistically significant. This finding aligns with the baseline results, indicating that green projects in the expansion stage receive a significantly lower amount of funding in a single round compared to non-green projects at the same stage of development. The magnitude of the discount appears to increase as companies move from the early to the expansion stage.

Finally, Column (4) examines Mature Stage companies. The coefficient for Green is also negative and highly statistically significant, suggesting that even in the mature stage, green projects continue to experience a round size discount compared to non-

green projects. The magnitude of the discount is slightly larger than that observed in the expansion stage.

[Table 4 is about here](#)

These results provide a more nuanced understanding of the relationship between green classification and single round funding amount. The initial "green premium" observed in the seed stage might reflect early enthusiasm or specific incentives for nascent green technologies. However, as ventures progress through the early, expansion, and mature stages, a consistent and significant round size discount emerges for green projects. This could be attributed to various factors, such as the capital-intensive nature of scaling green technologies requiring more rounds with potentially smaller amounts per round, or differing risk perceptions of investors at later stages. The findings suggest that the impact of "greenness" on single round funding is not uniform across the venture lifecycle and warrants further investigation into the specific drivers behind these stage-dependent effects.

The results in Table 4 reveal a critical stage-dependent dynamic: green startups receive significantly higher single-round investment amounts during the seed stages, but this premium reverses into a significant discount at the expansion and mature stages. This inversion can be interpreted through the lens of institutional logics and evolutionary path dependency.

In the early stages, green ventures benefit from strong policy incentives and market signaling effects. Governments and development banks often provide matching funds or risk-sharing for early-stage green investments, reducing the perceived risk for venture capitalists (He & De Boer, 2018). Moreover, green labels serve as a powerful *legitimacy signal* in nascent markets, helping startups overcome the "liability of newness" by aligning with societal and regulatory expectations (Marquis & Toffel, 2010). This creates a positive selection effect where green firms are more likely to attract patient capital and mission-driven investors during the seed phase.

However, as firms mature, the institutional logic shifts from *legitimacy-seeking* to *performance accountability*. Mature green firms are expected to demonstrate scalable business models and profitability, yet they often face path dependency traps due to their reliance on niche technologies or regulated markets (He, Chen, & Zhu, 2021). Their growth trajectories may be constrained by technological lock-ins or policy volatility, making them less attractive to late-stage investors who prioritize rapid scalability and high exit multiples (Gompers & Lerner, 2001). Furthermore, mature green firms may have already absorbed the initial policy subsidies, reducing their marginal appeal. Thus, the very attributes that conferred an advantage in the early stage—such as regulatory compliance and environmental focus—can become liabilities in the maturity stage when financial performance becomes the dominant evaluation criterion. This stage-dependent inversion underscores the temporal dimension of green premium and highlights the need for differentiated policy support across the venture lifecycle.

Table 5 presents the results of the analysis examining the impact of a company's green classification on the single round financing amount across different venture capital funding rounds: Pre-A Round (Column 1), Series A (Column 2), Series B-G (Column 3), and Pre-IPO & Others (Column 4). This allows for an investigation into how the valuation and funding amounts for green projects might differ across the typical VC financing lifecycle.

In Column (1), focusing on Pre-A Rounds, the coefficient for Green is positive but not statistically significant. This suggests that in the very early stages of venture capital funding, there is no statistically significant difference in the single round amount received by green projects compared to non-green projects.

Moving to Column (2), which examines Series A rounds, the coefficient for Green becomes negative and statistically significant at the 1% level. This indicates that green projects in their Series A funding round tend to receive a significantly lower amount of funding compared to non-green projects at the same stage. This finding provides evidence for a round size discount for green ventures as they progress beyond the initial

pre-A stage.

Column (3) focuses on later-stage funding, encompassing Series B through G rounds. Here, the coefficient for Green is negative and highly statistically significant. The magnitude of the negative coefficient has increased compared to Series A, suggesting that the round size discount for green projects is even more pronounced in these later stages of venture capital financing.

Finally, Column (4) examines Pre-IPO and other late-stage financing rounds. The coefficient for Green is negative but not statistically significant. This suggests that as companies approach their IPO or engage in other very late-stage financing, the difference in single round funding amount between green and non-green projects becomes statistically insignificant again, although the coefficient remains negative. The small number of observations in this category (N=390) might contribute to the lack of statistical significance.

[Table 5 is about here](#)

These results offer a more granular view of the round size discount for green ventures across different stages of venture capital financing. While there is no significant difference in the Pre-A stage, a clear and significant discount emerges in Series A and becomes more pronounced in the subsequent B-G rounds. The lack of a significant difference in the Pre-IPO stage might indicate a convergence as companies mature and prepare for public markets, or it could be due to the limited sample size in that category. These findings support the notion of a round size discount for green enterprises in the main venture capital funding stages, aligning with some aspects of Hypothesis 1 and suggesting that the dynamics of funding for green versus non-green ventures evolve as they progress through different financing rounds.

Furtuer, table 5 presents a striking pattern: green ventures experience a significant disadvantage in single-round investment amounts during the intermediate financing rounds (e.g., Series B to C), while performing better in both earlier (Seed, A) and later

(D, E) rounds. This U-shaped relationship mirrors the well-documented "valley of death" in innovation financing but exhibits a more pronounced negative dip for green ventures, suggesting a potential "horror valley" effect—a term adapted from robotics (Mori, 1970) to describe the discomfort investors feel when a venture is almost but not quite ready for scale.

In the intermediate stage, green ventures face a triple challenge: technological uncertainty, market validation gaps, and increasing capital intensity. At this juncture, the initial promise of the green technology must be translated into commercial viability, yet many green innovations require longer development cycles and face higher regulatory and infrastructure barriers. Investors, particularly those with shorter time horizons, may perceive these ventures as being in a "gray zone"—too mature for early-stage risk capital but not yet de-risked enough for growth-stage or private equity investment.

This perception is exacerbated by information asymmetry and cognitive biases. Intermediate-stage green ventures often operate in complex, science-based domains (e.g., clean energy, biotech), making due diligence more challenging. Investors may apply heuristic judgments, perceiving green ventures as "riskier" or "slower to exit" based on stereotypes rather than firm-specific fundamentals (Kahneman, 2011). The result is a funding gap where green ventures are penalized precisely at the stage where they need substantial capital to scale. The eventual recovery in later rounds suggests that only the most resilient green ventures survive this "horror valley," often with the support of specialized green funds or strategic corporate investors who possess the technical expertise and patience to navigate the transition to commercialization.

Table 5 presents a heterogeneity analysis examining whether the "green discount" in venture capital financing differs between deals involving individual investors and those dominated by institutional investors. Column (1) shows a baseline regression for a subsample of rounds with individual investors, while Column (2) focuses on institutional-investor-led rounds. Column (3) pools the full sample and includes an

interaction term between green status (Green) and a dummy for individual investor participation (Inv_Person).

The main effect of Green is consistently negative and highly significant across all specifications, confirming the presence of a green discount—green startups receive approximately **11 – 12% less funding per round** than non-green peers, on average.

Crucially, the interaction term $\text{Green} \times \text{Inv_Person}$ in Column (3) is **statistically insignificant**. This implies that the magnitude of the green discount **does not differ significantly** between transactions involving individual investors and those led by institutions. In other words, despite theoretical expectations that individual investors might exhibit stronger pro-environmental preferences, we find no empirical evidence that they mitigate the green discount relative to institutional investors in the Chinese VC market during our sample period.

Control variables behave as expected: later-stage rounds attract more capital ($\text{Stage} > 0$), subsequent financing rounds receive less per round ($\text{RoundN} < 0$), and strategic investors increase deal size ($\text{Inv_Strategyn} > 0$). The inclusion of province and year fixed effects (implied by the high R^2 and consistent coefficient patterns) ensures robust identification.

These results suggest that the undervaluation of green startups is a systemic market phenomenon, **not driven by investor type**, and likely stems from broader factors such as information asymmetry, lack of standardized ESG metrics, or misaligned risk-return perceptions—challenges that affect both retail and professional investors alike.

[Table 6 is about here](#)

4.4. Endogeneity and robustness discussion

One of the key concerns in empirical research is the potential for reverse causality, where the dependent variable might influence the independent variable. In this study, we argue that reverse causality is unlikely to be a significant issue. Specifically, the amount of financing received and the number of financing rounds are highly unlikely

to alter whether a company is classified as green or not. The classification of a company as green is primarily determined by its adherence to environmental standards and practices, such as those outlined by the International Capital Market Association (ICMA) Green Bond Principles and China's Green Bond Support Project Directory (2021 Edition). These criteria are based on long-term strategic decisions and operational practices rather than short-term financial inputs. Therefore, while venture capital investments can support green initiatives, they do not fundamentally change the green status of a company. Columns (1) in table 6 presents the results of 1:1 matching, indicating that after accounting for the matched sample, the coefficient for Green is negative and statistically significant at the 1% level. This suggests that green companies receive significantly lower ventures funding amounts in USD compared to non-green ones.

To further mitigate concerns about endogeneity, we have incorporated several methodological approaches. First, we included a comprehensive set of control variables that capture various aspects of company characteristics, investment strategies, and market conditions. These controls help account for observable factors that could potentially confound the relationship between green status and financing outcomes. Additionally, we employed fixed effects models to address unobserved heterogeneity. By including company fixed effects, we control for time-invariant characteristics specific to each firm that could otherwise bias our estimates. This approach helps ensure that any observed relationships between green status and financing outcomes are not driven by omitted variables that vary across firms but remain constant over time. Furthermore, we applied clustered standard errors at both the country and year levels to account for potential correlation within clusters, thereby enhancing the robustness of our statistical inferences.

For robustness discussion, table 7 presents the results of robustness tests for the regression model with the dependent variable being the single investment amount. The table includes four different specifications to ensure the robustness of the estimated effects: columns (2) deleting samples before 1998, columns (3) using sample trimming,

columns (4) applying country-clustered standard errors, and columns (5) applying country and year-clustered standard errors. Across all specifications, green remains consistently significant, indicating that green enterprises receive lower single-round investment amounts compared to non-green enterprises. Specifically, the coefficient green ranges from -0.1182 ($p < 0.01$) in the first specification to -0.1124 ($p < 0.01$) in the fourth specification, suggesting a robust negative effect.

[Table 7 is about here](#)

The robustness test presented in Table 8 demonstrates that the inclusion of control variables and alternative trimming methods does not significantly alter the positive relationship between the green classification of financing events or companies and total venture capital investment amounts. Specifically, the coefficient for Green remains statistically significant at the 1% level across different specifications, ranging from 0.1011 to 0.1063 for total investment amount and from 0.8073 to 1.0830 for the number of rounds, indicating that green projects receive more substantial funding and are involved in more financing rounds compared to non-green projects. Additionally, the introduction of Green2, an alternative binary variable coded as 1 if the industry to which the company belongs matches the International Capital Market Association (ICMA) Green Bond Principles, also shows a significant positive effect on both total investment amount and the number of rounds, supporting the consistency of our findings under different classification criteria.

These results align with previous studies that highlight the premium associated with green investments, suggesting that investors may be willing to allocate more resources to environmentally sustainable projects. The high R-squared values in models (1) through (3), which include control variables, further validate the explanatory power of our model, while the lower R-squared values in models (4) through (6) indicate that additional factors beyond green classification play a role in determining venture capital investment decisions. Overall, the robustness tests presented in Table 7 provide strong

evidence supporting the hypothesis that green enterprises receive higher total venture capital investment amounts and more financing rounds compared to non-green firms.

[Table 8 is about here](#)

4.5. Further discussion

To gain a deeper understanding of the factors contributing to the observed round size discount for green tech innovation enterprises, we conducted a mediation analysis. Identifying the underlying logic is crucial for both advancing academic understanding of green finance and informing targeted policy interventions. While our baseline results indicate a funding disadvantage for green projects in single rounds, exploring the conditions under which this discount is more or less pronounced can provide valuable insights into investor behavior and market dynamics. This analysis aims to unpack potential drivers of this discount, focusing on three key areas: the influence of governmental policy support, the role of market preferences for green initiatives, and the impact of perceived risk associated with green ventures.

Our approach to identifying these mediations involves examining interaction effects between our primary variable of interest and variables representing each of these three potential drivers. We hypothesize that stronger policy incentives for green finance at the regional level might mitigate the discount by signaling government commitment and reducing investor uncertainty. Similarly, greater market preference for green investments could lead to increased demand and potentially larger investment amounts for green projects. Finally, we explore whether the perceived risk associated with green ventures, which we proxy using the company's development stage, plays a role in the funding discount. We expect that later-stage, more mature green companies might be perceived as less risky, potentially leading to a smaller discount or even a premium.

The data for our mediator variables come from several sources. For Policy Incentives and Market Preferences, we utilize data from the "Local Green Finance Development Report 2018" published by the Central University of Finance and

Economics. This report provides comprehensive assessments of green finance development across 31 provincial regions in China, allowing us to derive measures for the strength of local policy support and the level of market engagement in green finance. We use the scores provided in this report for our initial mediation analysis (Table 9). For robustness (Table 10), we use the rankings of these scores across regions, where a higher rank indicates stronger policy or market orientation towards green finance. Our proxy for Risk Perceptions is a binary variable derived from the financing stage of the company. In our initial analysis (Table 8), this variable (Stagelate) is equal to 1 if the company is in the mature stage (Stage=4) and 0 otherwise. For the robustness check, we broaden this definition (Stagelate2) to include both mature (Stage=4) and expansion (Stage=3) stages, capturing a wider range of later-stage companies with potentially lower perceived risk. We then examine the interaction terms between the Green variable and these proxies in our regression models to assess their moderating effects on the single investment amount.

Figure 3 is about here

Table 9 presents the results of our mediation analysis, where we investigate potential factors that could explain the observed round size discount for green projects (as seen in Table 2). We examine three potential mediations: Policy Incentives, Market Preferences, and Risk Perceptions, by including interaction terms with the green variable in separate regressions where the dependent variable is the single investment amount. All models in Table 9 include the same set of control variables as in the full baseline model (Table 2, Column 5).

Column (1) explores the role of Policy Incentives, using the interaction term. The coefficient for this interaction term is positive and highly statistically significant. This suggests that in regions with stronger policy incentives for green finance (as indicated by a higher value of the Policy variable from the "Local Green Finance Development Report 2018", the round size discount experienced by green projects is significantly

reduced. The coefficient for Policy itself is negative and highly significant, indicating that in general, stronger policy incentives are associated with smaller single investment amounts, potentially due to a larger number of smaller projects being funded. The direct effect of Green remains negative and highly significant, indicating a discount for green projects in the absence of policy incentives.

Column (2) investigates the impact of Market Preferences, using the interaction term. The coefficient is positive and highly statistically significant. This suggests that in regions with stronger market preferences for green finance (indicated by a higher value of the Market variable from the "Local Green Finance Development Report 2018"), the round size discount experienced by green projects is also significantly reduced. Similar to the policy incentives, the coefficient for Market itself is negative and highly significant, suggesting that stronger market preferences are generally associated with smaller single investment amounts. The direct effect of Green remains negative and highly significant, indicating a discount for green projects when market preferences are weaker.

Column (3) examines the role of Risk Perceptions, using the interaction term. The variable Stagelate is a binary indicator equal to 1 if the company is in the mature stage (Stage=4) and 0 otherwise, serving as a proxy for lower perceived risk. The coefficient is positive but not statistically significant. This suggests that the round size discount for green projects does not significantly differ between mature-stage companies (with potentially lower perceived risk) and those in earlier stages. The coefficient for Stagelate is negative and highly significant, indicating that mature-stage companies generally receive smaller single investment amounts compared to earlier-stage companies, possibly due to different funding needs or investor strategies at later stages. The direct effect of Green remains negative and highly significant, indicating a discount for green projects even when not in the mature stage.

In summary, the mediation analysis suggests that both Policy Incentives and Market Preferences for green finance play a significant role in mitigating the round size discount observed for green projects. Stronger policy support and greater market

enthusiasm for green finance appear to alleviate the initial funding disadvantage faced by green tech innovation enterprises. However, our proxy for Risk Perceptions, based on the maturity stage of the company, does not show a statistically significant moderating effect on the green discount. These findings highlight the importance of both top-down policy signals and bottom-up market forces in shaping the financing landscape for sustainable innovation. They also suggest that while maturity might generally influence investment amounts, it doesn't fundamentally alter the green discount in the way that policy and market preferences do.

[Table 9 is about here](#)

Table 10 presents the robustness checks for our mediation analysis, employing alternative measures for the key variables of interest. Specifically, we use the rankings of policy incentives (Policyrank) and market preferences (Marketrank) instead of their raw scores, and a broader definition for late-stage companies (Stagelate2) to proxy for risk perceptions. The dependent variable remains the single investment amount, and all models include the same set of control variables as in the baseline regression.

Column (1) revisits the role of Policy Incentives using the interaction term. The coefficient for this interaction term is positive and statistically significant. This finding is consistent with the original mediation analysis (Table 8, Column 1), suggesting that higher policy incentive rankings (indicating stronger incentives) are associated with a reduction in the round size discount for green projects. The coefficient for Policyrank is negative and significant, similar to the effect of the raw policy score. The coefficient for Green remains negative and significant.

Column (2) re-examines the impact of Market Preferences using the interaction term. The coefficient for this interaction term is positive and statistically significant. This result also aligns with the original mediation analysis (Table 9, Column 2), indicating that higher market preference rankings are associated with a smaller round

size discount for green projects. The coefficient for Marketrank (labeled as Market in the table) is negative and significant, consistent with the effect of the raw market preference score. The coefficient for Green remains negative and significant.

Column (3) provides a robustness check for Risk Perceptions using the interaction term. Here, Stagelate2 equals 1 if the company is in either the mature (Stage=4) or expansion (Stage=3) stage. The coefficient is positive but not statistically significant. This finding is consistent with the original mediation analysis (Table 9, Column 3), suggesting that our proxy for lower risk perception in later-stage companies does not significantly moderate the round size discount for green projects. The coefficient for Stagelate2 (labeled as Stagelate in the table) is positive and highly significant, indicating that companies in the expansion or mature stages tend to receive larger single investment amounts compared to earlier-stage companies in this specification. The coefficient for Green remains negative and significant.

The robustness checks presented in Table 10 largely confirm the findings of our initial mediation analysis. Using rankings for policy incentives and market preferences yields similar results, strengthening the evidence that both factors play a role in mitigating the round size discount for green projects. The broader definition of late-stage companies as a proxy for lower risk perceptions continues to show an insignificant moderating effect. These results provide further confidence in the identified mediators through which the green discount in single investment amounts is influenced.

Table 10 is about here

A growing body of literature suggests that the development of regional green finance whether reflected in market depth, institutional infrastructure, or policy support can alleviate financing frictions faced by environmentally oriented firms. In this context, China's Green Finance Reform Pilot Policy represents a quasi-natural experiment designed to accelerate such regional development through targeted institutional innovation. Launched in June 2017 by the People's Bank of China and five other

ministries, the first batch of pilot zones was established in five provinces/regions: Zhejiang, Jiangxi, Guangdong, Guizhou, and Xinjiang. These zones were granted flexibility to experiment with green credit, green bonds, environmental information disclosure, and incentive mechanisms tailored to local conditions, with the explicit goal of channeling more private capital toward sustainable projects.

Given that both market-driven green finance development and policy support appear capable of reducing the per-round “green discount” in venture capital, it follows that a coordinated policy initiative like the Green Finance Reform Pilot which bundles regulatory incentives, fiscal subsidies, and institutional capacity-building, should theoretically generate comparable or even stronger effects.

The regression results provide compelling evidence that the establishment of Green Finance Reform Pilot Zones in China significantly mitigates the “green discount” in venture capital financing. Specifically, the coefficient on *green4* is -0.149 ($p < 0.001$), confirming that green startups receive approximately 13.8% less funding per round than non-green peers in non-pilot regions or pre-reform periods, consistent with a market undervaluation of environmental externalities.

Crucially, the interaction term *green* and *green_finance_pilot* is positive and highly significant ($\beta = 0.377$, $p < 0.001$). This implies that in pilot provinces after the reform, the funding gap for green startups is not only closed but reversed, suggesting a prompt 25.5% premium⁷ in single-round investment size for green firms within pilot zones⁸.

Economically, this indicates that institutional reforms such as enhanced disclosure requirements, fiscal incentives, and risk-sharing mechanisms introduced in pilot areas effectively internalize environmental benefits, align investor incentives, and reduce information asymmetry around green technologies. The negative main effect of *green_finance_pilot* (-0.082) reflects lower baseline funding in pilot provinces (possibly due to regional development disparities), but this is more than offset by the

⁷ The net effect becomes $-0.149 + 0.377 = +0.228$.

⁸ The results of the parallel trends test are presented in Appendix Table 2 and Appendix Figure 1.

strong positive interaction with green status.

Table 11 is about here

The event study analysis provides compelling evidence supporting the parallel trends assumption underlying the difference-in-differences design. The coefficients on the interaction terms between green status and treatment group, measured across years relative to the policy implementation in 2016 (baseline), are generally statistically insignificant prior to the reform.

The absence of a clear, statistically significant pre-treatment trend supports the validity of the parallel trends assumption. Most crucially, the point estimate for 2017, which captures the immediate policy effect, turns significantly positive. This indicates that following the implementation of the Green Finance Reform Pilot policy, green startups in pilot provinces experienced a significant increase in single-round funding amounts, effectively reversing the previously observed "green discount". The magnitude suggests an approximate 26% premium in natural log terms, demonstrating the effectiveness of institutional reforms in internalizing environmental benefits and correcting market mispricing of green innovations.

5. Conclusion and implications

5.1. Conclusion

This study aimed to investigate the manifestation of a "green premium" within the landscape of venture capital in China, the largest emerging economy, specifically examining the impact of green initiatives on single financing amount, number of financing rounds, and total financing capital. In contrast to the classical financial markets, where green investments often exhibit excess returns or issue discounts, the green premium in venture capital is more pronounced in terms of quantitative characteristics. Employing a comprehensive dataset of 79,120 financing events across 36,570 Chinese enterprises from the Qingke database from 1998 to 2017, empirical

study reveals a series of robustness results, showing that compared to non-green industries, single-round venture capital investments in green industries are approximately 10% lower. However, green industry enterprises receive an additional 0.8 financing rounds on average. Consequently, the total venture capital invested in individual green industry firms ultimately exceeds that of non-green firms by around 10%.

Specifically, **first**, we observed a consistent round size discount for green projects in single financing rounds, particularly in the Series A and subsequent stages of venture capital funding. This finding supports our first hypothesis (H1) and aligns with the notion that investors may initially exhibit caution or perceive higher risks associated with green technologies, leading to smaller individual investments. **Second**, while we did not directly test the number of rounds at the individual project level in our regression analysis within this section, the test on total funding suggests that green companies do attract significantly higher total funding, which indirectly implies a greater need for and potentially a higher number of financing rounds over their lifespan, lending support to Hypothesis 2. **Finally**, our results robustly demonstrate that despite the smaller individual round sizes observed in later stages, green tech innovation enterprises ultimately amass a significantly larger aggregate capital infusion compared to their non-green counterparts, strongly supporting Hypothesis 3. This suggests that while green ventures might face initial valuation or risk-perception headwinds in specific funding rounds, the long-term investment appetite for sustainable innovation leads to a net positive effect on their overall funding. These findings are consistent with the growing body of literature highlighting the increasing importance of sustainability considerations in investment decisions, although our results also underscore the nuances and stage-specific dynamics within this trend.

5.2. Policy Implications

The findings of this study offer several important implications for policymakers seeking to foster sustainable technological development in China. Given the crucial role

of green tech innovation in achieving environmental goals, it is imperative to address the observed round size discount and further leverage the overall funding advantage for green enterprises.

Firstly, to mitigate the round size discount experienced by green tech ventures, particularly in the crucial expansion and mature stages, policymakers could consider implementing targeted financial incentives. This could include government-backed co-investment funds specifically earmarked for green tech companies in these later stages, reducing the perceived risk for private investors and encouraging larger funding rounds. Additionally, tax incentives or subsidies tied to the size of investment in green tech ventures could help to offset the observed discount and attract more substantial capital commitments. This aligns with the arguments in the literature (e.g., Mazzucato, 2013) for strategic government intervention to shape markets and support socially desirable innovations like green technologies.

Secondly, to further capitalize on the long-term funding advantage for green enterprises, policies should aim to strengthen the green finance ecosystem. This includes promoting the development of specialized green investment funds, enhancing transparency and standardization in green project definitions and reporting, and facilitating greater access to green bonds and other sustainable financing instruments for tech innovation companies. Creating platforms that connect green tech ventures with institutional investors and impact investors with a long-term investment horizon could also be beneficial. This resonates with the growing emphasis on ESG investing and the need for robust green financial infrastructure as discussed in prominent finance journals (e.g., Giglio et al., 2021).

Thirdly, the contrasting findings across different development stages suggest the need for stage-specific policy interventions. While seed-stage green ventures might experience a slight premium, the later-stage discount warrants more attention. Policies could focus on providing enhanced support and resources for green tech companies as they scale up from early to expansion and mature stages. This might include tailored mentorship programs, access to specialized infrastructure, or streamlined regulatory

processes for green technologies.

Furthermore, efforts should be made to enhance investor education and awareness regarding the long-term value and potential of green technologies. Addressing any perceived higher risks or uncertainties associated with green innovation through better information dissemination and showcasing successful green tech ventures could encourage larger and more frequent investments.

Finally, policymakers should continue to refine and expand the green finance taxonomy and provide clear guidelines for classifying green projects and companies. This would reduce information asymmetry and facilitate smoother access to green financing options for tech innovation enterprises. By implementing these targeted policy measures, China can further strengthen its position as a leader in sustainable technological development and ensure that green innovation enterprises receive the necessary financial support to drive a greener future.

References

- Acemoglu, D., Aghion, P., Bursztyn, L., & Hémous, D. (2012). The environment and directed technical change. *American Economic Review*, 102(1), 131-66.
- Aibai, A., Huang, X., Luo, Y., & Peng, Y. (2019). Foreign direct investment, institutional quality, and financial development along the Belt and Road: An empirical investigation. *Emerging Markets Finance and Trade*, 55(14), 3275 – 3294.
- Amit, R., Brander, J., & Zott, C. (1998). Why do venture capital firms exist? Theory and evidence. *Journal of Finance*, 53(6), 2277-2315.
- Andersson, M., Bolton, P., & Samama, F. (2016). Green versus brown: Valuing climate and carbon risk. *Financial Analysts Journal*, 72(1), 31-51.
- Baker, M., Bergstresser, D., & Serafeim, G. (2018). Financing the response to climate change: The pricing and ownership of US green bonds. *Journal of Financial Economics*, 129(3), 693-710.
- Bolton, P., & Kacperczyk, M. (2021). Do investors care about carbon risk? *Journal of Financial Economics*, 152(1), 195-219.
- Brunnermeier, S. M., & Cohen, M. A. (2003). Determinants of environmental innovation adoption: A firm-level examination. *Journal of Environmental Economics and Management*, 45(1), 27-48.
- Choi, J. J., Gao, F., & Jiang, W. (2020). Attention to environmental, social, and governance issues and the IPO market. *Journal of Financial Economics*, 138(3), 749-767.
- Demirgüç-Kunt, A., Kral, P., & Honohan, P. (2022). Environmental footprint and bank loan choices. *The World Bank Economic Review*, 36(3), 633-653.
- Dorfleitner, G., Halbritter, G., & Nguyen, M. (2015). Measuring corporate sustainability: What do investors want?. *Business Strategy and the Environment*, 24(2), 95-109.
- El Ghouli, S., Guedhami, O., Kwok, C. C., & Mishra, D. R. (2011). Does corporate social responsibility affect the cost of capital? *Journal of Banking & Finance*, 35(9), 2388-2406.
- Flammer, C. (2021). Corporate green bonds. *Management Science*, 67(10), 6705-6729.
- Giglio, S., Kelly, B., & Stroebe, J. (2021). Climate Finance. *Annual Review of Financial Economics*, 13, 157-179.
- Gillan, S. L., Koch, A., & Starks, L. T. (2021). Firms and social responsibility: A review of ESG and CSR research in corporate finance. *Journal of Corporate Finance*, 66, 101888.
- Gompers, P. A. (1995). Optimal investment, monitoring, and the staging of venture

capital. *Journal of Finance*, 50(5), 1461-1489.

Gompers, P., & Lerner, J. (2001). The venture capital revolution. *Journal of Economic Perspectives*, 15(2), 145 – 168.

Hall, B. H., & Lerner, J. (2010). Venture capital and public policy. National Bureau of Economic Research.

He, C., Chen, T., & Zhu, S. (2021). Do not put eggs in one basket: Related variety and regional economic resilience in post crisis era. *Industrial and Corporate Change*, 30(6), 1655 – 1676.

He, C., & De Boer, J. (2018). The principle of relatedness in regional economic development: A review and synthesis. *Regional Studies*, 52(1), 1 – 12.

Hémous, D. (2022). Environmental policy and technical change. In *Handbook of climate change economics* (Vol. 4, pp. 1-60). Edward Elgar Publishing.

Kahneman, D. (2011). *Thinking, fast and slow*. Farrar, Straus and Giroux.

Marquis, C., & Toffel, M. W. (2010). Scrutiny, norms, and organizational control: The case of corporate environmental reporting. *Organization Science*, 21(5), 1083 – 1100.

Kerr, S. P. (2002). Venture capital and the incentive to patent. *Journal of Economics & Management Strategy*, 11(1), 123-153.

Luo, J., & Tang, Y. (2016). Corporate social responsibility and innovation: a structural analysis. *Strategic Management Journal*, 37(12), 2601-2621.

Matsumura, E. M., Prakash, R., & Vera-Munoz, S. C. (2014). Firm-value effects of carbon emissions and carbon disclosures. *The Accounting Review*, 89(2), 695-724.

Mazzucato, M. (2013). *The entrepreneurial state: Debunking public vs. private sector myths*. Anthem Press.

Mori, M. (1970). The uncanny valley. *Energy*, 7(4), 33 – 35.

Pastor, L. (2020). Portfolio choice and asset pricing with climate risk. *Journal of Financial Economics*, 138(2), 276-299.

Popp, D. (2019). Environmental policy and innovation: A survey. In *Handbook of environmental economics* (Vol. 4, pp. 351-396). Elsevier.

Qi, H., Fu, H., Yang, J., & Ai, W. (2024). Economic Policy Uncertainty and Syndication: Evidence from China's Venture Capital Market. *Emerging Markets Finance and Trade*, 60(14), 3431–3457.

Riedl, A., & Serafeim, G. (2017). ESG and Shareholder Value. *Review of Accounting Studies*, 22(4), 1182-1225.

Sahlman, W. A. (1990). The structure and governance of venture-capital organizations. *Journal of Financial Economics*, 27(2), 473-521.

Spence, A. M. (1973). Job market signaling. *The Quarterly Journal of Economics*, 87(3), 355-374.

Stern, N. (2007). The economics of climate change: the Stern review. Cambridge University Press.

Tang, X., Yao, X., Dai, R., and Wang, Q., (2024) Does green matter for crowdfunding? International evidence, *Journal of International Financial Markets, Institutions and Money*, 92,101950.

Yao, X. (2025). The Green Premium in Sustainable Fintech: Cross-Country Evidence. *Finance Research Letters*, 77, May 2025, 107131.

Yao, X. and Tang. X (2021). Does financial structure affect CO2 emissions? Evidence from G20 countries. *Finance Research Letters* 41.

Yoshino, N., & Taghizadeh-Hesary, F. (2016). Major challenges facing green finance. *ADBI Working Paper Series*, (586).

Zerbib, O. D. (2017). The effect of green bond issuance on the issuer's corporate social responsibility performance. *Journal of Banking & Finance*, 76, 71-90.

Zhou, Y., & Chen, J. (2023). Macro-prudential policy and bank systemic risk: Cross-country evidence based on emerging and advanced economies. *Emerging Markets Finance and Trade*, 59 (4), 1035–1047.

Acknowledgments

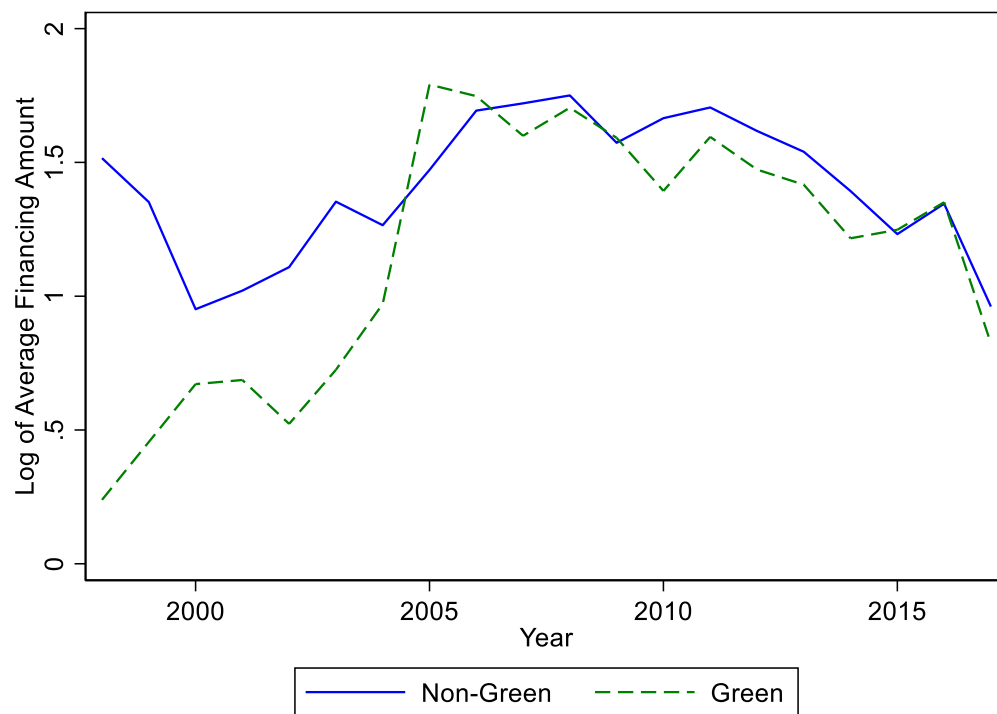
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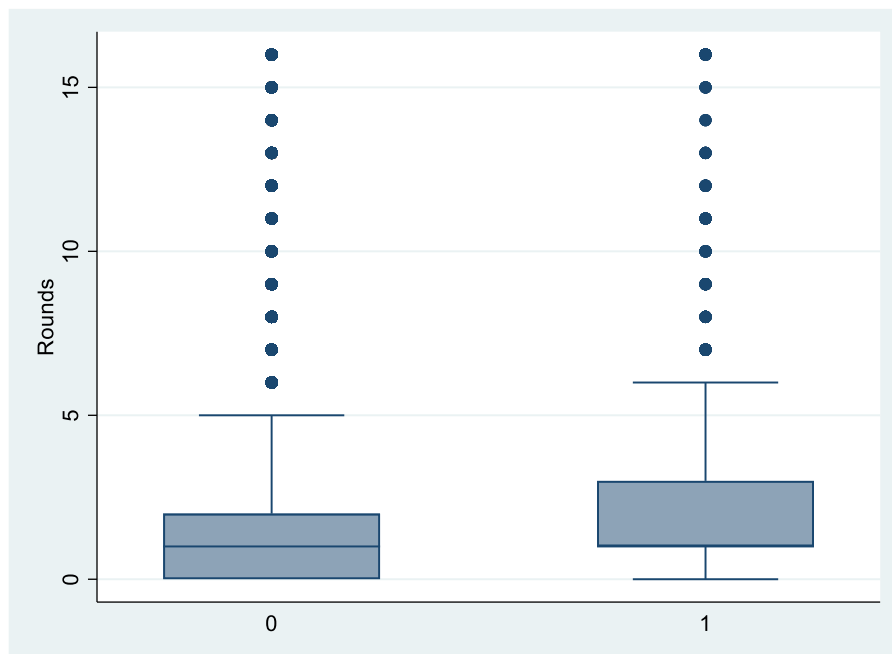
Figure and tables

Figure 1. Single Venture Capital Investments Amount

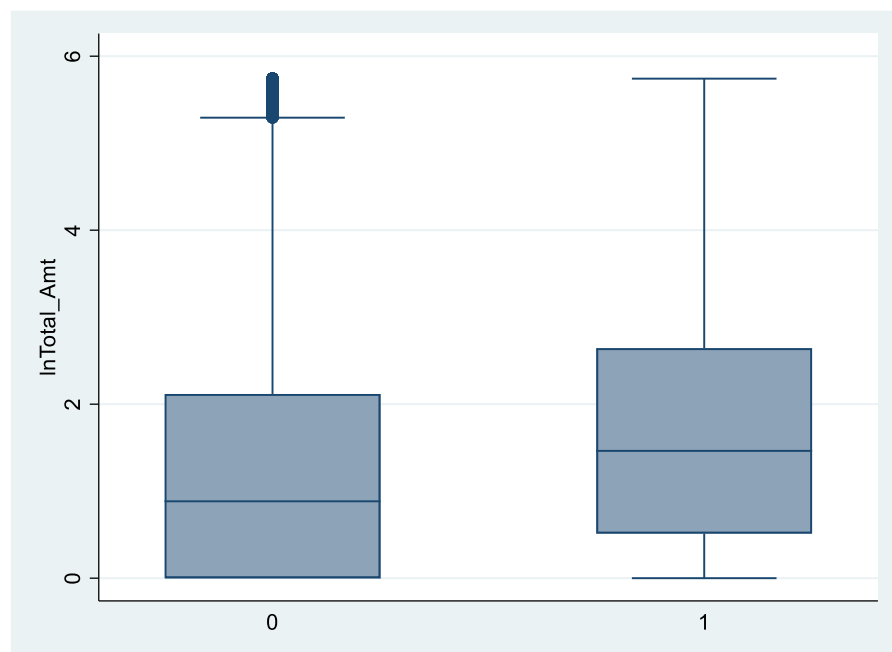


Note: This figure illustrates the annual amounts of single venture capital investments in both green and non-green firms from 1998 to 2017.

Figure 2. Comparison of Venture Capital Investment Amounts and Rounds

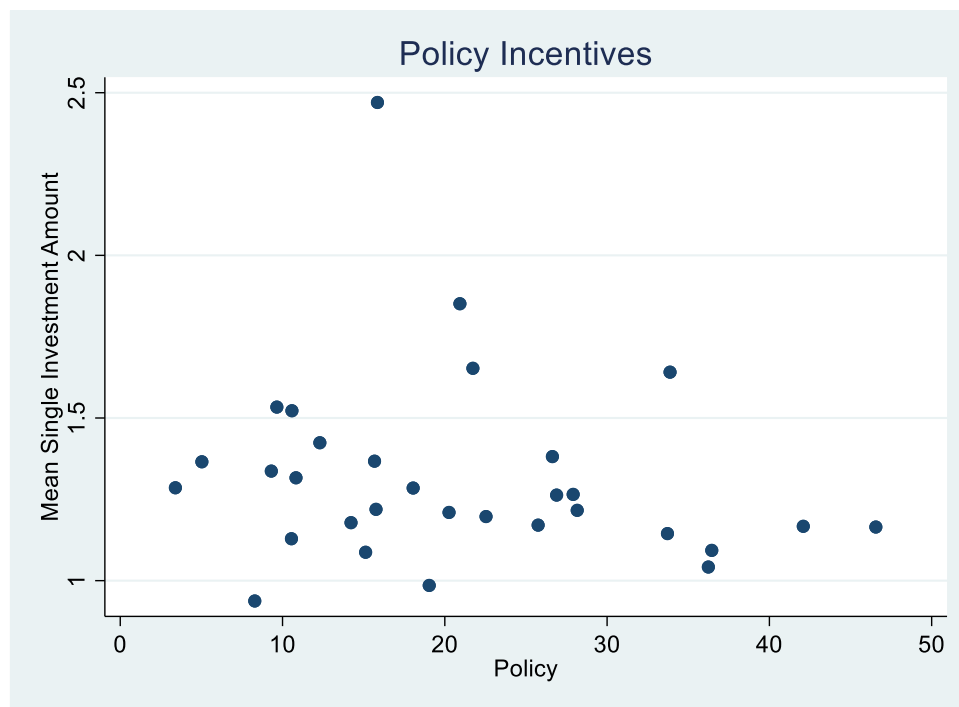


(a) Total Investment Rounds

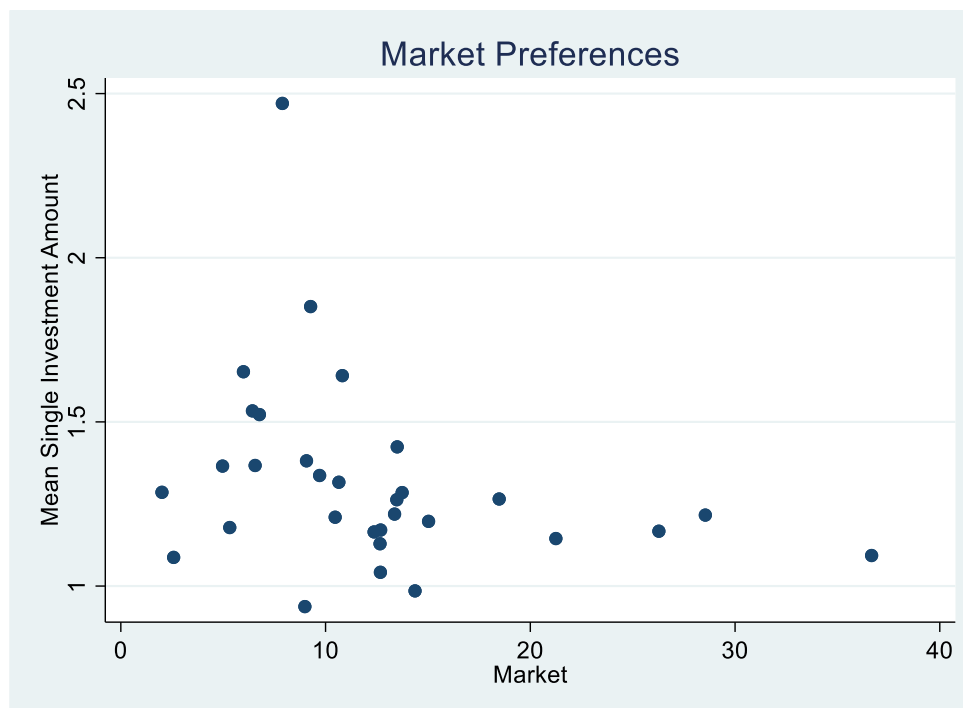


(b) Total Investment Amounts

Figure 3. Mediation Test of the Green Premium



(a) Policy Incentives



(b) Market Preferences

Table 1. Descriptive Statistics

Panel A Full Samples(Single round amount)

Variables	Observations	Mean	SD	Min	Median	Max
lnAmtSingle	79120	1.2577	1.179	.0099	.9439	6.8897
Green	79120	0.0416	0.200	0	0	1
Green2	79120	0.0454	0.208	0	0	1
Stage	79120	2.8047	0.994	1	3	4
Round	79120	7.3175	5.429	2	4	16
Inv_Person	79120	0.1242	0.330	0	0	1
Inv_Strategy	79120	1.1863	0.467	1	1	10
Cur_Type	79120	1.3432	0.762	1	1	16
State	79120	4.9486	9.870	1	2	51
Year	79120	2014.4593	3.037	1991	2015	2017

Panel B Full Samples(Total amount and Rounds)

Variables	Observations	Mean	SD	Min	Median	Max
lnAmtTotal	36570	1.3016	1.454	0	.9002	11.8032
Rounds	36570	7.1831	5.302	2	4	16
Green	36570	0.0339	0.181	0	0	1
Green2	36570	0.0373	0.189	0	0	1
Stage	36570	2.6251	1.026	1	3	4
State	36570	5.8581	11.083	1	2	51
Year	36570	2013.5046	3.575	1991	2015	2017

Panel C Comparison between Green and Non-Green samples

Variables	Non-Green		Green		MeanDiff
	Observations	Mean (1)	Observations	Mean (2)	Mean (1-2)
lnAmtSingle	79120	1.260	4171	1.221	0.039**
lnAmtTotal	36570	1.281	1282	1.709	-0.428***
Rounds	36570	1.668	1282	2.651	-0.982***

Note: ***, **, * indicate statistical significance at the level of 1%, 5% and 10%, respectively.

Table 2. Baseline regression
(Dependent Variable: Single Investment Amount)

	(1)	(2)	(3)	(4)	(5)
Green	-0.0390** (-2.3736)	-0.0885*** (-5.3534)	-0.1468*** (-9.1534)	-0.1238*** (-7.8101)	-0.1124*** (-7.1099)
Stage		0.1414*** (34.3316)	0.1835*** (48.2396)	0.1852*** (48.5003)	0.1975*** (51.1258)
Round			-0.0712*** (-114.0674)	-0.0605*** (-94.2746)	-0.0575*** (-76.4141)
Inv_Person				0.0045 (0.4231)	0.0357*** (3.3541)
Inv_Strategy				0.3163*** (26.9892)	0.3305*** (28.4511)
Cur_Type				0.3236*** (29.7952)	0.2470*** (22.8090)
State					0.0162*** (26.6192)
Year					-0.0093*** (-5.9011)
Constant	1.2597*** (290.6624)	0.8373*** (70.0811)	1.2667*** (102.1753)	0.4082*** (16.5634)	19.0248*** (6.0184)
Observations	79120	79120	79120	79120	79120
R ²	0.0001	0.0132	0.1268	0.1741	0.1841
ADJ. R ²	0.0000	0.0132	0.1268	0.1740	0.1841

Note: ***, **, * indicate statistical significance at the level of 1%, 5% and 10%, respectively. Robust standard t-value are in parentheses.

Table 3. Baseline regression
(Dependent Variable: Total Investment Amount and Rounds)

	(1)	(2)	(3)	(4)
	Rounds	Rounds	Total Amount	Total Amount
Green	0.7355** (2.0533)	0.8073* (1.9437)	0.4259*** (10.5602)	0.1011** (2.5759)
Controls	No	Yes	No	Yes
Constant	2.1046*** (6.2623)	1.6901** (2.4538)	1.2872*** (169.3971)	-0.0762*** (-3.3501)
Observations	36570	36570	36570	36570
R ²	0.0010	0.0015	0.0028	0.1649
Adj. R ²	0.0009	0.0015	0.0028	0.1648

Note: ***, **, * indicate statistical significance at the level of 1%, 5% and 10%, respectively. Robust standard t-value are in parentheses.

Table 4: Heterogeneity Test: Enterprises at Different Stages

	(1)	(2)	(3)	(4)
	Seed	Startup	Expansion	Maturity
Green	0.2769* (1.8717)	-0.0508 (-1.0441)	-0.1003*** (-4.8371)	-0.1201*** (-4.5948)
Round	-0.0723*** (-28.2798)	-0.0723*** (-45.7008)	-0.0601*** (-49.6113)	-0.0447*** (-29.4354)
Inv_Person	0.0001 (0.0057)	-0.0530*** (-2.7381)	0.1045*** (6.3323)	0.0268 (1.1165)
Inv_Strategy	0.5509*** (5.2258)	0.5072*** (18.9854)	0.4169*** (23.1211)	0.1386*** (7.2877)
Cur_Type	0.2578*** (7.9311)	0.1561*** (9.4177)	0.2378*** (14.1124)	0.2982*** (12.6509)
State	0.0033** (2.2693)	0.0124*** (13.8656)	0.0224*** (24.3904)	0.0295*** (12.8763)
Year	0.0261*** (5.5029)	0.0297*** (11.2730)	0.0041* (1.7952)	-0.0766*** (-20.3412)
Constant	-52.0227*** (-5.4442)	-59.0607*** (-11.1279)	-7.4564 (-1.6241)	155.4838*** (20.5032)
Observations	7578	13352	29167	29023
R ²	0.2013	0.2039	0.2270	0.1470
Adj. R ²	0.2006	0.2035	0.2268	0.1468

Note: ***, **, * indicate statistical significance at the level of 1%, 5% and 10%, respectively. Robust standard t-value are in parentheses.

Table 5. Heterogeneity Test: Investments in Different Rounds

	(1)	(2)	(3)	(4)
	Pre-A	A	B-G	Pre-IPO
Green	0.0759 (0.8218)	-0.0911*** (-3.9212)	-0.2257*** (-7.2425)	-0.2148 (-0.6947)
Stage	0.0775*** (9.3135)	0.1213*** (15.5885)	-0.0681*** (-4.9918)	-0.4956*** (-4.8935)
Round	-0.0558*** (-10.1855)	- -	0.2059*** (17.9724)	0.3488** (2.2913)
Inv_Person	0.0114 (0.7104)	0.0278* (1.8560)	0.0086 (0.3758)	-0.4873*** (-2.6902)
Inv_Strategy	0.4758*** (7.2442)	0.4704*** (26.2566)	0.1706*** (8.7840)	0.3572** (2.3611)
Cur_Type	0.1197*** (7.9736)	0.1742*** (11.4871)	0.3264*** (13.1945)	0.8739*** (3.1284)
State	0.0046*** (5.8360)	0.0130*** (14.6376)	0.0185*** (19.5437)	0.0215*** (2.9364)
Year	-0.0165*** (-3.1660)	-0.0054*** (-2.8858)	0.0354*** (12.0311)	0.0790** (2.4259)
Constant	33.8046*** (3.2171)	11.1574*** (2.9467)	-70.8794*** (-11.9399)	-159.4153** (-2.4277)
Observations	11261	25940	15249	390
R ²	0.0830	0.1194	0.1453	0.3251
Adj. R ²	0.0823	0.1191	0.1449	0.3110

Note: ***, **, * indicate statistical significance at the level of 1%, 5% and 10%, respectively. Robust standard t-value are in parentheses.

Table 6. Heterogeneity Test: Individual Investors vs. Institutional Investors

	(1)	(2)	(3)
Green	-0.1161*** (-3.1849)	-0.1173*** (-6.7947)	-0.1178*** (-6.8416)
Stage	0.2404*** (22.1719)	0.2144*** (44.6331)	0.2140*** (49.0249)
Roundn	-0.0216*** (-9.0371)	-0.0562*** (-63.0286)	-0.0530*** (-63.9420)
Inv_Strategyn	0.4008*** (11.5739)	0.3020*** (25.3722)	0.3149*** (27.6990)
Cur_Typen	0.3767*** (15.4308)	0.2249*** (19.6541)	0.2467*** (22.8827)
Staten	0.0035 (1.0420)	0.0170*** (27.1774)	0.0163*** (26.7006)
Inv_Person			0.0121 (1.0947)
Green* Inv_Person			-0.0185 (-0.4586)
Constant	0.7425 (0.9560)	1.3722*** (2.8225)	1.2942*** (2.6690)
Observations	10357	68763	79120
R ²	0.1859	0.1966	0.1932
Adj. R ²	0.1837	0.1962	0.1929

Table 7. Robustness test
(Dependent Variable: Single Investment Amount)

	(1)	(2)	(3)	(4)	(5)
	1:1 Matching	Delete Samples Before 1998	Sample Trimmed	Country Clustered Standard Errors	Country and Year Clustered SE
Green	-0.0903*** (-6.4340)	-0.1182*** (-7.3940)	-0.0965*** (-6.2641)	-0.1124*** (-9.2570)	-0.1124*** (-6.9110)
Stage	0.2458*** (11.3649)	0.1965*** (50.7227)	0.1973*** (53.7182)	0.1975*** (15.8283)	0.1975*** (14.4145)
Round	-0.0530*** (-21.4138)	-0.0555*** (-72.4194)	-0.0521*** (-72.8688)	-0.0575*** (-18.1672)	-0.0575*** (-8.6605)
Inv_Person	-0.0103 (-0.3366)	0.0254** (2.3593)	0.0282*** (2.8193)	0.0357 (1.0947)	0.0357 (0.6080)
Inv_Strategy	0.2057*** (5.8454)	0.3361*** (32.6512)	0.2803*** (26.6097)	0.3305*** (36.5983)	0.3305*** (27.2372)
Cur_Type	0.0686*** (4.0078)	0.2727*** (24.4068)	0.2172*** (22.1668)	0.2470** (2.3598)	0.2470** (2.6129)
State	0.0208*** (11.6445)	0.0154*** (25.1816)	0.0154*** (27.9779)	0.0162*** (4.3374)	0.0162** (2.5186)
Year	-0.0077 (-1.5084)	-0.0244*** (-12.8287)	-0.0087*** (-5.8858)	-0.0093*** (-3.6961)	-0.0093*** (-115.0373)
Constant	16.2818 (1.5838)	49.5017*** (12.9203)	17.8865*** (6.0272)	19.0248*** (3.6963)	19.0248*** (3.34e+04)
Observations	8342	77402	75358	79120	79120
R ²	0.2955	0.1899	0.1777	0.1841	0.1841
Adj. R ²	0.2949	0.1899	0.1776	0.1841	0.1841

Note: ***, **, * indicate statistical significance at the level of 1%, 5% and 10%, respectively. Robust standard t-value are in parentheses.

Table 8. Robustness test
(Dependent Variable: Total Investment Amount and Rounds)

	(4)	(5)	(6)	(1)	(2)	(3)
	Rounds		Total Amount			
	Clustered Standard Errors	1% Trimmed	Variables Replacement	Clustered Standard Errors	Sample Trimmed	Variables Replacement
Green	0.8073* (1.6257)	1.0830*** (11.9838)		0.1011*** (3.3878)	0.1063*** (2.7364)	
Green2			0.7888* (1.9553)			0.1621*** (4.1748)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	1.6901* (1.8160)	1.0869*** (62.7405)	1.6891** (2.4509)	-0.0762 (-0.4153)	-0.0645*** (-2.8843)	-0.0751*** (-3.3025)
Observations	36570	35839	36570	36570	35839	36570
R ²	0.0011	0.0327	0.0013	0.1649	0.1671	0.1652
Adj. R ²	0.0011	0.0326	0.0013	0.1648	0.1671	0.1651

Note: ***, **, * indicate statistical significance at the level of 1%, 5% and 10%, respectively. Robust standard t-value are in parentheses.

Table 9. Mediations check
(Dependent Variable: Single Investment Amount)

	(1)	(2)	(3)
	Policy Incentives	Market Preferences	Risk Perceptions
Green*Policy	0.0049*** (3.1365)		
Green*Market		0.0052*** (3.0357)	
Green*Stagelate			0.0464 (0.9466)
Policy	-0.0043*** (-10.0878)		
Market		-0.0043*** (-9.8253)	
Stagelate			-0.1180*** (-6.8778)
Green	-0.2557*** (-5.7564)	-0.2310*** (-6.3214)	-0.1576*** (-3.4226)
Stage	0.1964*** (49.9125)	0.1925*** (48.6616)	0.2421*** (30.3182)
Controls	Yes	Yes	Yes
Constant	49.1399*** (14.4852)	48.1024*** (14.1610)	50.4646*** (14.8255)
Observations	71720	71720	71720
R ²	0.1287	0.1286	0.1280
Adj. R ²	0.1287	0.1286	0.1279

Note: ***, **, * indicate statistical significance at the level of 1%, 5% and 10%, respectively. Robust standard t-value are in parentheses.

Table 10. Mediations check with robustness test
(Dependent Variable: Single Investment Amount)

	(1)	(2)	(3)
	Policy Incentives	Market Preferences	Risk Perceptions
Green*Policyrank	0.0053*** (2.6782)		
Green*Marketrank		0.0054** (2.5426)	
Green*Stagelate2			0.0195 (0.6005)
Policy	-0.0050*** (-8.7346)		
Market		-0.0067*** (-10.4628)	
Stagelate			0.1563*** (11.5911)
Green	-0.2375*** (-5.3019)	-0.2545*** (-4.8974)	-0.1220*** (-6.3877)
Stage	0.1951*** (49.5437)	0.1905*** (47.8725)	0.1350*** (23.6789)
Controls			
Constant	48.9238*** (14.4152)	47.8074*** (14.0709)	49.5870*** (14.6248)
Observations	71720	71720	71720
R ²	0.1284	0.1290	0.1290
Adj. R ²	0.1284	0.1289	0.1289

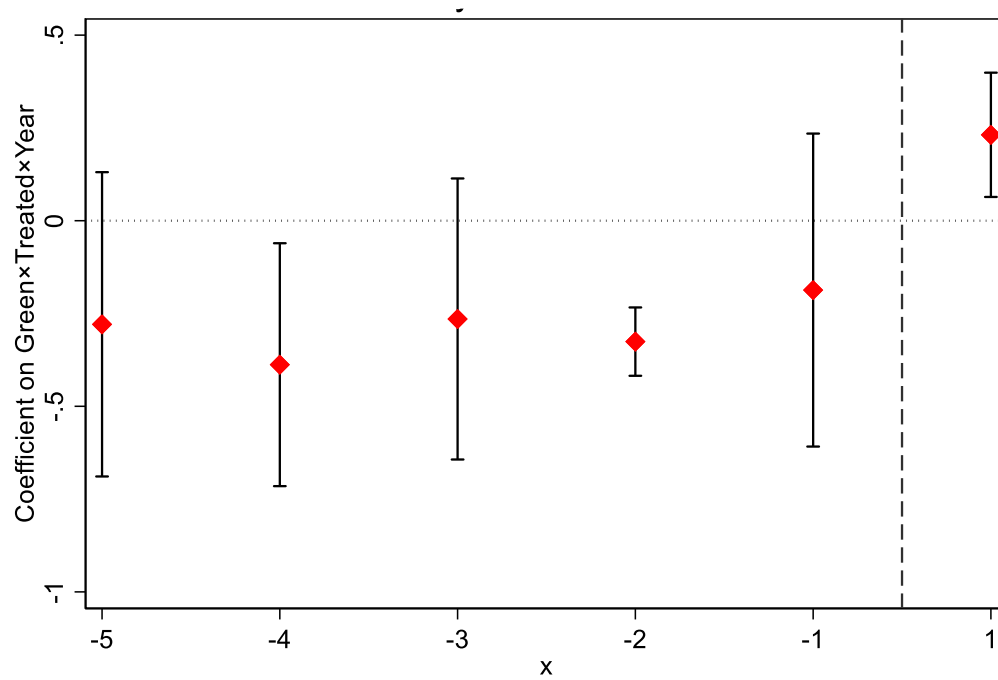
Note: ***, **, * indicate statistical significance at the level of 1%, 5% and 10%, respectively. Robust standard t-value are in parentheses.

Table 11. Event Study Estimates of the Green Finance Reform Pilot Policy

	(1)	(2)
Green	-0.1341*** (-7.4244)	-0.1413*** (-7.8629)
Green_Finance_Pilot	-0.1625*** (-12.5004)	-0.0771*** (-5.6632)
Green*Pilot	0.3705*** (6.0766)	0.3736*** (6.1321)
Stage	0.1914*** (47.6449)	0.2043*** (44.8982)
Roundn	-0.0615*** (-92.4962)	-0.0573*** (-69.4044)
Inv_Strategyn	0.3370*** (30.5051)	0.3212*** (28.5925)
Cur_Typen	0.2549*** (21.5679)	0.2448*** (20.9201)
Staten	0.0152*** (24.1985)	0.0161*** (25.3881)
Year_Fixed	No	Yes
Constant	0.4147*** (18.3132)	0.5086*** (18.3279)
Observations	71082	71082
R ²	0.1896	0.1953
Adj. R ²	0.1895	0.1952

Note: ***, **, * indicate statistical significance at the level of 1%, 5% and 10%, respectively. Robust standard t-value are in parentheses.

Figure A1. The results of the parallel trends



Note: This figure presents the event study estimates of the interaction between green firm status and treatment group across years relative to the policy implementation in 2016 (baseline year). The x-axis represents the relative year, with the vertical dashed line marking the policy year (2017).

Table A1. Variable and Definition

Variable	Definition
lnAmtSingle	Natural logarithm of the amount of funding received in a single financing round, measured in USD.
Rounds	Total number of financing rounds received by a company up to the point of observation.
lnAmtTotal	Natural logarithm of the total amount of funding received by a company across all financing rounds, measured in USD.
Green	Binary variable coded as 1 if the industry to which the company belongs matches the 'China Green Industry Guidance Catalogue (2019 Edition)', and 0 otherwise.
Green2	An alternative binary variable coded as 1 if the industry to which the company belongs matches the International Capital Market Association (ICMA) Green Bond Principles.
Stage	Categorical variable indicating the stage of the company when receive venture capital. (Seed=1, Startup=2, Expansion=3, Maturity=4, 4 types).
Round	Sequential number of the financing round for a given company (e.g., Pre-A, A, B, C, D, E, F, G, Pre-IPO, etc., 16 types).
Inv_Person	Binary variable indicating whether individual investors participated in the financing round (1) or not (0).
Inv_Strategy	Categorical variable indicating the investment strategy of the participating investors (e.g., value investing, growth investing, etc.).
Cur_Type	Categorical variable indicating the currency type in which the financing was conducted (e.g., RMB, USD, etc.).
State	Categorical variable representing the province or region where the company is located.
Year	The year in which the financing event occurred (Panel A) or the year of the first financing event for the company (Panel B).
Policy	Regional policy support scores engagement in green finance reported in Local Green Finance Development Report 2018
Market	Regional market development scores engagement in green finance reported in Local Green Finance Development Report 2018
Stagelate	Equal to 1 if the company is in the mature stage (Stage=4) and 0 otherwise.

Highlights

- Investigates VC preferences for green enterprises in an emerging market.
- Employing 79,120 financing events across 36,570 enterprises from 1991 to 2017.
- Analyzes green financing from single-round, total, and round perspectives.
- Finds green firms receive lower single-round investments on average.
- Green ventures receive more financing rounds and more total VC investments.