Corporate Green Revenues and Cash Holdings

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Abstract

Green revenue refers to the percentage of revenue generated by environmentally friendly or sustainable business activities, such as GHG emission reduction, etc. We use Chinese National Development and Reform Commission's *2019 Green Industry Guiding Catalogue* to identify corporate green revenues of listed firms in Chinese financial markets during a period from 2010 to 2021. We find that firms with higher percentage of green revenues are associated with lower level of cash holdings. This finding holds for several robustness analyses that address endogeneity concerns. Further analysis shows that green revenues on cash holdings is through the channel of reducing financial constraints, lowering corporate risks, and mitigating agency problem. Further evidence shows that the reduction in cash holdings caused by green revenues is more pronounced among firms with weak internal control, state ownership or located in provinces with more public attention of environmental protection.

Keywords: Cash Holdings; Green Revenues; Climate Change; Agency Problem;

JEL Classification: G32; G38; Q54; M14;

1 Introduction

A slang term called "cash is king" reflects the importance of cash in firms' operations. The literature has spawned numerous hypotheses about the determinants of cash holdings. The extant literature mainly indicates that firms hold cash for transaction purposes (Baumol, 1952; Meltzer, 1963), precautionary motive (Bates et al., 2009; Opler et al., 1999), and the agency cost motive (Dittmar and Mahrt-Smith, 2007; Harford et al., 2008; Jensen, 1986). Based on these motives, the current literature identifies several firm characteristics that determine corporate cash holdings (Cui et al., 2018; Deshmukh et al., 2021; Liu et al., 2015; Subramaniam et al., 2011).

Climate risk has become one of the most pressing issues of our time. Global warming and more frequent extreme weather substantially impact society and the economy. Given this adverse background, firms are supposed to enhance green revenues shares and achieve sustainable development (Shrivastava, 1995)[1]. However, prior research on cash holdings has paid little attention to the role of firm's green revenues in shaping cash policy. Therefore, exploring the relation between firm's green revenues and cash holdings present a promising avenue for research, that can deepen our understanding of corporate cash holdings.

We posit that there are two channels via which green revenues affect cash holdings. First, green revenues decrease cash holdings via lowering precautionary motivation. On one hand, the raising of environmental risk awareness, such as climate changes, air pollution, etc., investors start to incorporate climate or environmental risk in their investment decisions. It turns out that firms with high environmental / climate risk suffer from higher financial costs (Chava, 2014; Javadi and Masum, 2021). Green revenues reflect the effect of corporate business activities on surrounding environment. More revenues generated from green activities suggest a relatively better environmental performance and a lower environmental risk (Dumrose et al., 2022; Sharfman and Fernando, 2008). Moreover, green revenues generate positive publicity and goodwill among various stakeholders, and also create stable value through increased brand loyalty (Jacobs et al., 2010; Zhou et al., 2020). In this vein, we expect green revenue is negatively related to a firm's financial constraints, which suggests a lower precautionary motive to hold cash. On the other hand,

[1] According to China's *2019 Green Industry Guiding Catalogue*, green revenues are revenues generated through products or solutions that offer a significant environmental improvement in one or more Green Industries: energy-saving environmental protection industry, cleaner production industry, clean energy industry, eco-environmental industry, green upgrading of infrastructure, and green service (Source: 2019 Green Industry Guiding Catalogue – SESEC IV Archive 2016 – 2020 https://sesec.eu/Archive/2019/others/2019-green-industry-guiding-catalogue/).

green revenue reduces a firm's green transition risk, which shrinks the demands for holding cash for risk management. Transition risk is the amalgamation of a wide range of shocks, including changes in climate policy, reputational impacts, shifts in market preferences and norms, and technological innovation (Bolton and Kacperczyk, 2021b, 2021a). Green revenues are obtained for economic activities that are environmentally sustainable (Lucarelli et al., 2020). Bolton and Kacperczyk (2021a) find that non-green firms are tied to fossil-fuel energy use, returns are affected by fossil-fuel energy prices and commodity price risk. Relatedly, these firms may be exposed to carbon pricing risk and other regulatory interventions to limit emissions. The firms that are most reliant on fossil energy are more exposed to technology risk from lower-cost renewable energy. While, with the usage of clean energy and green technologies in production, firms achieving green revenues obviously face fewer above risks. Further, Sautner et al.(2022) find that transitional activities increase a firm's resilience to climate change risks, which provides more direct evidence on the role of green revenues in risk mitigation. Thus, a firm with more green revenue has lower precautionary motive to hold cash to manage transition risk.

Second, green revenues impact cash holdings via changing agency costs. On one hand, green revenues reduce agency costs. First, as a socially responsible behavior, firms' green revenues achievement reflects a manager's personal preferences to be a good corporate citizen and stems from his/her ethical orientation. Existing literature also find that CSR constrains a manager's self-serving actions (Hoi et al., 2013; Lanis and Richardson, 2012). Second, firms' green revenue enhances the reputation through its environmental engagement. Reputation serves as an informal enforcement mechanism against opportunistic behavior (Atanasov et al., 2012). When self-interest behavior is detected, the negative publicity likely impairs the firm's positive image and reduces the associated benefits, eventually causing damage to managers' personal interests that are tied to the image of the firm (Gao et al., 2014). In other words, firms with good green revenue engagement would not be engaging in value-destroying behaviors that would be expected to destroy a firms' reputation. In this vein, we expect green revenue is negatively related to a firm's agency problems, which leads to fewer cash holdings. Based on above analyses, the relation between green revenues and cash holdings is an empirical question.

We conduct our analysis using a sample of China. China is the pioneer in green finance[2]. Earlier in 2012, China Banking Regulatory Commission (CBRC) had issued the *Green Credit Guidelines*. Following the guidelines, the Chinese financial regulator specified statistic requirements of 12 energy-saving and environmentally friendly projects and services for green credits. In December 2015, People's Bank of China (PBoC) issued the *Green Bond Endorsed Project Catalogue*. The catalogue divided different green projects into six main categories and 38 sub-segments, and its preparation referred to the Green Bond Principles (GBP) and Climate Bond Initiative (CBI). The central bank also specified that green economic activities should focus on three purposes, environmental improvement, climate change response, and conservation and efficient use of resources. Later, the Chinese government released the *Green Industry Guiding Catalogue* in 2019, which, for the first time, defined the range of green industries. The guidance included six primary categories with 30 second-level and 211 third-level categories, regarded as a baseline for the stipulation of afterward green standards like green enterprise standard and revisions of existing policies such as the above green bond project list. Compared with EU Taxonomy which requires large EU firms to disclose their Taxonomy-aligned activities in 2023, Chinese firms has been affected by green revenues-related policies for much longer time. This means we can get sufficient green revenues data using Chinese sample.

We investigate the implication of green revenues for cash holdings using a large sample of 29,198 firm-year observations in the China from 2010 to 2021. We construct a measure, *%Green Rev*, based on the ratio of green revenues to total revenues. The classification of green revenues depends on *2019 Green Industry Guiding Catalogue*. We find that firms with more green revenues exhibit lower level of cash holdings. The economic magnitude of the effect is also substantial. The effect from a one-standard-deviation change in green revenues, is about 3.31% of the effect from a one-standard-deviation change in cash holdings. To address the endogenous problems caused by omitted variables and reverse causality. Firstly, we exploit the issue of *2019 Green Industry Guiding Catalogue* that was unexpectedly issued in 2019 as a quasi-natural experiment and employ a difference-in-differences test. By adopting a difference-in-differences approach, we compare changes in cash holdings around the issue of *2019 Green Industry Guiding Catalogue* between firms with green revenues (the treatment group) and those without green revenues (the control

[2] Sustainable finance definitions and taxonomies in China | Developing Sustainable Finance Definitions and Taxonomies | OECD iLibrary (oecd-ilibrary.org) https://www.oecd-ilibrary.org/sites/5abe80e9-en/index.html?itemId=/content/component/5abe80e9-en

group). Our results indicate that firms with green revenues experienced a greater decline in cash holdings than those in the control group in the period following the *2019 Green Industry Guiding Catalogue*. Secondly, using we construct an instrument using the industrial average value of *%Green Rev*. Our inference remains unaltered under this instrumental variable approach. Finally, we use the entropy balancing method in Hainmueller (2012) to achieve covariate balance in the two groups of with- and without-green revenues firms. After using the matched sample, our results still hold.

We also conduct a battery of robustness tests to investigate the cash holdings effect of green revenues. First, we use a change model and find consistent reuslts. Second, our results remain similar when we use alternative measure of cash holdings. Third, our results are also robust if we focus on the long-term effect of green revenues on cash holdings.

To further identify the mechanisms that drive the baseline results, we design three sets of channel analyses. In the first set of analyses, we split *%Green Rev* into two groups: those with high financial constraints and those with low financial constraints. In the second set of tests, we split *%Green Rev* into high-risk group and low risk group. In the third setting, we split *%Green Rev* into high agency problem group and low agency problem group. Consistent with our expectation, the negative relation between green revenues and cash holdings only exists in high financial constraints group, high firm-risk group, and high agency problem group. Our results are further corroborated by several moderating analyses. We conjecture and find that the impact of green revenues on cash holdings is more pronounced for firms with internal control weakness, located in provinces with higher public attention to environment protection, and are state owned.

This study makes several contributions to the literature. First, the findings enrich our understanding of the positive effect of green revenues. The prior literature has mainly documented the effect of green revenues on firm environmental performance (Dumrose et al., 2022), financial performance (Jabbour et al., 2015; Palmer and Truong, 2017), and investor's judgement (Chrzan et al., 2021; Flammer, 2013). To the best of our knowledge, this study is the first to explore the effect of firm's transitional activities on firm's financial decision. We add to this stream of literature by showing that green revenues decrease firms cash holding. Second, we contribute to the cash holding literature. The literature has spawned numerous determinants of cash holdings. These economic determinants include product market competition (Fresard, 2010), the firm life cycle (Dittmar and Duchin, 2010), and the customer relationship (Itzkowitz, 2013), etc. We

propose, and find direct evidence consistent with, green revenues as determinants of cash holdings that are new to the cash holdings literature. Third, by integrating two separate strands of literature on finance and green revenues, we identify and examine three channels through which green revenues may affect cash holdings. China released a series of documents to help promote green development through clarifying the definition of "green" as well as harmonizing differing standards for sustainability. Thus, our potential channels have practical implications. Governments, investors, accountants, auditors could be interested to our findings.

The rest of this paper proceeds as follows. Section 2 reviews the literature and articulates hypothesis and associated empirical prediction as motivated by recent theories. Section 3 describes the data and defines the variables used in our empirical analyses. Section 4 presents the empirical analyses for the relation between green revenues and cash holdings. Section 5 explores the channels for the main results. Section 6 presents cross-sectional analyses. Finally, section 7 concludes.

2 Hypothesis Development

Corporate green revenues affect cash holdings through two possible mechanisms: (1) pre-cautionary motive; (2) agency costs.

Precautionary motive

Precautionary is one of the well-documented motives for firms to hold cash. Cash provides a buffer against financial distress and adverse shocks (Bates et al., 2009). Consistent with this perspective, Opler et al. (1999) document that firms with high cash flow uncertainty tend to hold more cash than other firms. Lei et al. (2021) find that firms accumulate more cash when it faces credit risk contagion effect. Bates et al. (2009) show that the precautionary motive for cash holdings is increased for firms whenever their cash flows become riskier. We argue that a higher level of corporate green revenue reduces precautionary motive by alleviating financial constraints and mitigating corporate green transition risk.

First, prior literature (Myers and Majluf, 1984) shows that external financing is often uncertain and costly because of information asymmetry and the fluctuation of the economic environment. Cash reserves enable firms to maintain smooth investment curves without having to access external capital markets, which saves transaction costs associated with debt and equity issuances (Faulkender and Wang, 2006). Since the raising of environmental risk awareness, such

as climate changes, air pollution, etc., investors start to incorporate climate or environmental risk in their investment decisions. It turns out that firms with high environmental / climate risk suffer from higher financial costs (Chava, 2014; Javadi and Masum, 2021). Green revenues reflect the effect of corporate business activities on surrounding environment. More revenues generated from green activities suggest a relatively better environmental performance and a lower environmental risk. For instance, Dumrose et al. (2022) show that firms' green revenues are highly related to the firms' E (Environmental) component of the ESG score. Sharfman and Fernando (2008) show that firms benefit from improved environmental risk management through lowered costs of debt and equity capital. Moreover, green revenues generate positive publicity and goodwill among various stakeholders, and also create stable value through increased brand loyalty (Jacobs et al., 2010; Zhou et al., 2020). In this vein, we expect green revenue is negatively related to a firm's financial constraints, which suggests a lower precautionary motive to hold cash.

Second, green revenue reduces a firm's green transition risk, which shrinks the demands for holding cash for risk management. Transition risk is the amalgamation of a wide range of shocks, including changes in climate policy, reputational impacts, shifts in market preferences and norms, and technological innovation (Bolton and Kacperczyk, 2021a, 2021b). Green revenues are obtained for economic activities that are environmentally sustainable (Lucarelli et al., 2020). Bolton and Kacperczyk (2021a) find that non-green firms are tied to fossil-fuel energy use, returns are affected by fossil-fuel energy prices and commodity price risk. Relatedly, these firms may be exposed to carbon pricing risk and other regulatory interventions to limit emissions. The firms that are most reliant on fossil energy are more exposed to technology risk from lower-cost renewable energy. While, with the usage of clean energy and green technologies in production, firms achieving green revenues obviously face fewer above risks. Further, Sautner et al. (2022) find that transitional activities increase a firm's resilience to climate change risks, which provides more direct evidence on the role of green revenues in risk mitigation. Thus, a firm with more green revenue has lower precautionary motive to hold cash to manage transition risk.

Agency Problem

The separation of ownership and controls cause the well-known agency problem (Jensen and Meckling, 1976). In face of the conflict of interests between managers and shareholders, managers tend to maximize their value rather than shareholders' value. The argument on the agent's self-satisfying behavior is based on the rationality of human behavior, which states that human actions

are rational and motivated to maximize their own ends (Shapiro, 2005). The free cash flow theory proposed by Jensen (1986) argue that managers tend to hold more cash because cash facilitates managers to achieve their personal goals. (Dittmar et al., 2003) documents a positive relationship between the severity of agency problem and cash holdings.

However, whether green revenues are associated with an increase or decrease in agency cost is controversial. On the one hand, green revenues reduce agency cost. First, as a socially responsible behavior, firms' green revenues achievement reflects a manager's personal preferences to be a good corporate citizen and stems from his/her ethical orientation. Existing literature also find that CSR constrains a manager's self-serving actions, such as tax aggressiveness (Hoi et al., 2013; Lanis and Richardson, 2012), earnings management (Kim et al., 2012). Second, firms' green revenue enhances the reputation through its environmental engagement. In classical theoretical settings with incomplete contracts and information asymmetry, reputation serves as an informal enforcement mechanism against opportunistic behavior (Atanasov et al., 2012). When self-interest behavior is detected, the negative publicity likely impairs the firm's positive image and reduces the associated benefits, eventually causing damage to managers' personal interests that are tied to the image of the firm. For example, Gao et al. (2014) document that firm's investment in CSR builds a positive image and imposes additional costs on executives' informed trading, thus decrease informed trading. Green revenue achievement should restrain managerial opportunistic behavior. In other words, firms with good green revenue engagement would not be engaging in value-destroying behaviors that would be expected to destroy a firms' reputation. In this vein, we expect green revenue is negatively related to a firm's agency problems, which leads to fewer cash holdings.

On the other hand, green revenues can cover up managers' self-interest behavior (Ferrell et al., 2016). From an agency cost view, managers' over-committing to green industries is for their private benefits or for hedging purposes to overcome negative events by signaling to various stakeholders that the company is partially altruistic. Using their reputation and positive perception in the market, managers create a symbolic altruistic image of the firm to obtain positive support from investors and stakeholder when a negative outcome is revealed in the market due to weak/failed business strategy and decisions (McCarthy et al., 2017). If managers are motivated by personal benefits arising from their corporate actions, based on the agency cost perspective, we expect that managers achieve more green revenue to facilitate and offset the negative effect arising

from their empire building activities. Based on this inference, firms with high green revenues holds more cash.

Overall, we proposed the following hypotheses:

HYPOTHESIS 1a: The level of green revenue is negatively related to corporate cash holdings.

HYPOTHESIS 1b: The level of green revenue is positively related to corporate cash holdings.

HYPOTHESIS 2: The relation between the level of green revenue and corporate cash holdings is channeled by precautionary motive.

HYPOTHESIS 3: The relation between the level of green revenue and corporate cash holdings is channeled by agency problem.

3 Data Description

3.1 Green Revenue

We follow the standard of green revenues come from National Development and Reform Commission's *2019 Green Industry Guiding Catalogue* (hereinafter referred to as the *Catalogue*) to identify corporate green revenue. China released the *Catalogue* in 2019, which identifies the green economic activities. The *Catalogue* includes six primary categories with 30 second-tier and 211 third-tier activities[3]. Specifically, we extract a breakdown of a firm's revenue from different economic activities from Choice Database. Our sample period spans from 2010 to 2021. We obtain 10,251 rows of unique economic activity. We consider the revenue generated from the economic activities that belong to the list of activities in *Catalogue* as green revenue. We construct two variables to measure green revenue: (1) *Green Rev Dummy*: an indicator that equals one if firm has green revenue; (2) *%Green Rev*: the aggregated green revenue of a firm scaled by total revenue.

Take Tunghsu Azure Renewable Energy Co., Ltd. (Stock number: 000040.SZ) as an example: according to the classification of Choice Database, Tunghsu Azure Renewable Energy Co., Ltd. achieves revenues from Property and House Leasing (3.69%), New Energy Sources (58.68%), Ecological and Environmental Protection (4.74%), Supply Chain (32.89%) in 2021. Based on the list of *Catalogue*, the medium two segment revenues are green revenues-aligned. Therefore, the

[3] The six primary categories are energy conservation and environmental protection, clean production, clean energy, eco-environment, infrastructure green upgrade, and green services.

Green Rev Dummy of Tunghsu Azure Renewable Energy Co., Ltd. equals one and the value of *%Green Rev* is 63.42%.

Revenues Breakdown by Choice Database	%Revenue	Classified into Green Revenues according to *Catalogue*	Categories in *Catalogue*	*Green Rev Dummy*	*%Green Rev*
Property and House Leasing	3.69%	No	-	0	3.69%
New Energy Sources	58.68%	Yes	Energy Conservation and Environmental Protection	1	58.68%
Ecological and Environmental Protection	4.74%	Yes	Eco-Environment	1	4.74%
Supply Chain	32.89%	No	-	0	32.89%
Total	100	-	-	1	63.42% (58.68% + 4.74%)

Figure 1 plots the average green revenues by year. This result indicates a gradual improvement in green revenues over time. Figure 2 presents the distribution of green revenues by industry, this result show that the green revenues vary across industries. Moreover, the five most green industries are Water Conservancy, Environment and Public Facility Management (N); Production and Supply of Power, Gas, and Water (D); Mining and Quarrying (B); Petroleum, Chemical, Rubber, and Plastic (C4) and Industry of Resident Service, Repair and Other Services (O).

[Please Insert Figure 1 and Figure 2 about here]

3.2 Cash Holdings and Other Variables

We extract corporate cash holdings data from CSMAR database. Following prior literature (Dittmar et al., 2003; Opler et al., 1999; Xu et al., 2016), we define cash holdings (*Cash*) as the logarithm of the ratio of cash and marketable securities to total non-cash assets (total assets minus cash and marketable securities). We also use the logarithm of cash-to-total assets (*Cash_Asset*), raw value (*Cash_Value*), and cash to sales revenues (*Cash_Revenue*) as alternative measures.

To isolate the effect of green revenue on cash holdings, following prior research (Cui et al., 2018), we incorporate control variables as follow in our regression model: firms size (*Size*), the natural logarithm of total assets; leverage (*Leverage*), the ratio of firm's total debts to total assets; net working capital (*Working Cap*), current asset exclusive of cash (defined above) minus current

liabilities, scaled by total assets; capital expenditure (*CAPEX*), the ratio of capital expenditures divided by total assets; cash flow (*Operating CF*), the ratio of net cash flow from operations over total assets; cash flow volatility (*Std Operating CF*), the standard deviation of the firm's operating cash flow ratio (defined above) over the past five year; revenue growth (*Growth*), the growth rate of sales revenues by year; book-to-value ratio (*Book to Mkt*), the value of total asset divided by the market value of equity (price per share at the end of the fiscal year multiplied by the number of shares outstanding); research and development ratio (*R&D*), the ratio of research and development expenses to total noncash assets; dividend (*Dividend*), an indicator that equals to one if there is cash dividend in a firm-year, and zero otherwise; board size (*Board Size*), the natural logarithm of number of board members; percentage of independent boards (*Inden*), the ratio of number of independent boards to total number of board members; the ownership of the largest shareholder (*Top1*); the ownership of institutional shareholder (*Institution*).

3.3 Sample Construction

We construct our sample starting from all Chinese A-share listed firms during a period from 2010 to 2021. Our sample begins in 2010 because this is the first year that the Choice database began to collect firm's revenue fraction. We merge green revenues data with financial data using firm's six-digit stock number and year and obtain 32,660 firm-year observations. We then exclude: (i) financial firms because the disclosure requirements and accounting rules are significantly different for this regulated industry; (ii) ST and PT observations due to their abnormal financial conditions[4]; (iii) observations with negative net assets; and (iv) firm-year observations with missing information for the necessary firm-level variables. We arrive at a final sample including 28,198 firm-year observations (3,922 individual firms). The detailed sample selection procedure is reported in Appendix A.

Table 1 reports the sample distribution by year (Panel A) and industry (Panel B). As shown in Panel A, the total number of listed firms increases from 1,217 in 2010 to 3,711 in 2021. Panel

[4] ST stands for Special Treatment. To give investors warnings about the firms' risks, "ST" will be added to the firms' stock codes when their audited net profits are negative for two consecutive fiscal years or the audited net assets per share in the most recent year is lower than 1 RMB yuan. Adding this symbol aims to warn investors to be cautious about investing in such stocks. For ST companies, if there is another problem, such as continuing to lose money in the next year and reaching the limit of three consecutive years of losses in the "Company Law", PT will be processed. The PT system is a special arrangement adopted by the stock exchange for the stock circulation of companies whose listing is suspended.

B tabulates the distribution of firms by industries[5]. The top five industries are manufacturing (65.05%), information technology (6.87%), wholesale and retail (4.86%), real estate (4.12%), and gas and water production and supply (3.4%), as are consistent with the industry composition in China's economy.

[Please Insert Table 1 about here]

Table 2 reports the descriptive statistics of interested variables. In our sample, the average cash holding ratio is 23.3%. We find that only about 15.5% firm-year observations have positive green revenue, and 23.64% firm observations achieve green revenue over the sample period. While the percentage of green revenue to total revenue is about 7.1% on average with standard deviation about 22.7%. It suggests a remarkable variation in green revenue ratio across firms. The summary statistics of control variables are comparable to those reported in prior studies (Chang et al., 2021; Cui et al., 2018).

[Please Insert Table 2 about here]

4 Empirical Evidence on Green Revenues and Cash Holdings

4.1 Research design and baseline results

First, we conduct univariate analyses to compare the means of cash holdings between the group of firms with green revenues (*Green Rev Dummy* = 1) and without green revenues (*Green Rev Dummy* = 0). Panel A of Table 3 shows that the mean of cash holding ratio in green-revenue group is significantly lower than that in non-green-revenue group. The absolute difference of cash holding ratio between these groups is about 4.5%. Comparing with the mean of cash holding ratio, about 23.3%, in our sample, this magnitude is not trivial, about 19.3%[6]. Further, we split the full sample into subsamples according to firm size, financial leverage ratio and book-to-market ratio, respectively, and perform similar univariate analysis. As reported in Panel B, C and D of Table 3,

[5] We use the *Industry Classification of Listed Companies* issued by the China Securities Regulatory Commission (CSRC) in 2012.

[6] The absolute difference of cash holding ratio (4.5%) divided by the mean of cash holding ratio in our sample (23.3%) is about 19.3%.

we find that the difference of average cash holding ratio is more pronounced for the firms with small size, low financial leverage and low book-to-market ratio.

[Please Insert Table 3 about here]

Next, we compose a regression model as follow to investigate the relationship between green revenues and corporate cash holdings:

$$Cash_{i,t} = \beta_0 + \beta_1 Green\ Rev\ Dummy_{i,t} / \%Green\ Rev_{i,t} + \beta_2 Size_{i,t} + \beta_3 Leverage_{i,t} + \beta_4 Working\ Cap_{i,t} + \beta_5 CAPEX_{i,t} + \beta_6 Operating\ CF_{i,t} + \beta_7 Std\ Operating\ CF_{i,t} + \beta_8 Growth_{i,t} + \beta_9 Book\ to\ Mkt_{i,t} + \beta_{10} R\&D_{i,t} + \beta_{11} Dividend_{i,t} + \beta_{12} Board\ Size_{i,t} + \beta_{13} Inden_{i,t} + \beta_{14} Top1_{i,t} + \beta_{15} Institution_{i,t} + Year + Firm + \delta_{i,t} \quad (1)$$

where $Cash_{i,t}$ denotes the cash holdings of firm *i* in year *t*; $\%Green\ Rev_{i,t}$ is the ratio of green revenues to total revenues. $Green\ Rev\ Dummy_{i,t}$ is an indicator that equals to one when firm *i* has positive green revenues in year *t* and zero otherwise. Following Petersen (2009), standard errors are clustered at firm level. We also include the year and firm fixed effects in model (1). All the continuous variables are winsorized at the 1% levels at both tails to alleviate the influence of extreme values.

Table 4 tabulates regression results. We document a significant and negative relationship between green revenue proxies and cash holdings ratio. It suggests that the firms with positive green revenues tend to hold less cash on average. Economically, the presence of positive green revenue is associated with about 1.7% decline of cash holdings. A one-standard deviation increase in *%Green Rev* (0.227) is associated with 3.31% (0.029×0.227/0.199) decline of cash holdings on average.

Firms choose to disclose green revenues if the perceived benefits of doing so outweigh the perceived costs, and managers' evaluations of the perceived benefits and costs of disclosing are unobservable. This means our regression may be affected by self-selection bias. To correct for self-selection, we estimate the Heckman model (Heckman, 1979) using the Full Information Maximum Likelihood (FIML) approach; that is , we estimate the the Model (1) jointly with the disclosure-choice model. Correcting for self-selection bias allows us to make inferences about the average effect of green revenues on corporate cash holdings for all the firms in the sample, not just for the firms that disclose their green revenues.

We follow Matsumura et al.(2014) to model managers' disclosure decisions as a function of various firm- and industry-level characteristics. Model (2) shows the probit model we use to examine the disclosure choice:

$$\begin{aligned} Disclose\ Green\ Rev_{i,t} = {} & \beta_0 + \beta_1 Size_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 Working\ Cap_{i,t} + \beta_4 CAPEX_{i,t} + \\ & \beta_5 Operating\ CF_{i,t} + \beta_6 Std\ Operating\ CF_{i,t} + \beta_7 Growth_{i,t} + \beta_8 Book\ to\ Mkt_{i,t} + \beta_9 R\&D_{i,t} + \\ & \beta_{10} Dividend_{i,t} + \beta_{11} Board\ Size_{i,t} + \beta_{12} Inden_{i,t} + \beta_{13} Top1_{i,t} + \beta_{14} Institution_{i,t} + \beta_{15} PropDiscl_{i,t} + \\ & Year \times Industry + \delta_{i,t} \end{aligned} \quad (2)$$

where *Disclose Green Rev* is an indicator variable that is coded as 1 if the firm discloses its green revenue in year *t*, and 0 otherwise. *PropDiscl* is defined as the ratio of firms disclosing their green revenues in year t to the total firms in the industry in our sample in year *t* (using the 2-digit CSRC code). We also include joint fixed effect of year and industry.

We calculate the Inverse Mills Ratio (*Inverse Mills Ratio*) from the disclosure-choice model (Model (2)), and then include it in the Model (1). The testing results of second-stage of the Heckman approach are reported in column (3) and (4). The coefficients of *Inverse Mills Ratio* are significant in both columns, which indicates that our sample exists sample selection bias. After correcting for selection bias, the coefficients on *Green Rev Dummy* and *%Green Rev* remain positive and significant. Therefore, the conclusion is qualitatively the same as before.

[Please Insert Table 4 about here]

4.2 Endogeneity analysis

We document a significantly positive relationship between green revenue proxies and cash holding ratio in previous sections. Since transition to green economic activities to generate revenue is a not an exogenous decision, it is possible that green revenue indicator and ratio are driven by corporate cash holdings or other possible omitted variables. In this section, we use three approaches to address the possible endogeneity concerns.

a. A quasi-natural experiment

We use the *Catalogue* issued in 2019 by Chinese government as a quasi-natural experiment to explore the relation between green revenue and firm's cash holdings. The publication of Catalogue provides official guideline to identify green economic activities for firms, financial institutions and regulators, which directly affects the firms with green revenues. Moreover, the

publication of *Catalogue* is less likely driven by corporate cash holdings. We employ a difference-in-differences regression model to conduct analysis. Specifically, we split our sample into treatment and control groups. We use a dummy variable (*Treat*) to represent the treatment and control group. Firms gain green revenues in 2018 form the treatment group (*Treat* = 1) and firms without green revenues in 2018 form the control group (*Treat* = 0). A binary variable (*Treat*) equals one if the firm fall into the treated group and equals zero if it falls into the control group. We introduce an indicator (*CataloguePost*) that equals one if an observation is in 2019 or after (before the issuance of *Catalogue*), and zero otherwise. Then, we replace the *%Green Rev* in Model (1) with the interaction term of *Treat* and *CataloguePost* (*Treat*×*CataloguePost*) and re-estimate the Model (1).

As reported in column (1) of Panel A in Table 5, we document a significantly negative coefficient for the interaction term between *Treat* and *CataloguePost*. It suggests that the average cash holdings of treatment group decline more in contrast to that of the control group after the publication of *Catalogue*. Further, we examine the dynamic effect of the *Catalogue* on treatment and control groups. Particularly, we introduce five dummies, Pre^2, Pre^1, $Post^0$, $Post^1$ and $Post^2$, where Pre^j ($Post^j$) equals one for observations j years before (after) the publication of the *Catalogue*. If it is the *Catalogue* rather than other concurrent macroeconomic shocks affect the relationship between green revenues and cash holdings, we expect to observe significantly negative coefficients only for the interaction term with the *Post* dummy variables but not for those with the *Pre* dummies. As reported in column (2) of Panel A in Table 5, we document significantly negative coefficients only for $Treat_i \times Post^0_t$ and $Treat_i \times Post^1_t$, which is consistent with our expectation and provides further support on effect of green revenue on cash holdings.

b. Instrumental variables approach

We use the mean of green revenue within an industry (*Mean %Green Rev*) excluding the interested firm as an instrumental variable[7]. Since firms in the same industry have similar product structures and operating characteristics with a competitive relationship, it is highly likely that the level of green revenue of other firms in the same industry is positively related to the green revenue

[7] The industry classification is based on the 2012 CSRC industry classification standard. We use three-digit codes to classify all industries.

of the interested firm. As reported in column (1) of Panel B in Table 5, we document a significantly positive relationship between *Mean %Green Rev* and green revenue proxies. The under identification test results (Lagrange multiplier (LM statistic)) reveal that the excluded instruments are relevant. Moreover, there is no proof to show that the mean of green revenue of other firms in an industry has any direct relationship with a firm's cash holdings. The weak instrument test results show that the excluded instruments are correlated with the endogenous regressors, because the Kleibergen-PAAP Wald *F* statistic is greater than Stock and Yogo's critical value (i.e, 16.38) at 10%. Thus, the Kleibergen-PAAP Wald *F* statistic shows that a weak instrument is not a concern with our estimates.

We use two-stage OLS and report the regression results in Panel B in Table 5. As expected, we document a significantly negative coefficients for the instrumented green revenue ratio (*Instrumented %Green Rev*$_i$). It provides further support for the negative effect of green revenue on corporate cash holdings.

[Please Insert Table 5 about here]

C. Entropy Balancing Approach

To ensure that with- and without- green revenues sample firms are comparable in observable firm-level characteristics, we adopt an entropy balancing method proposed by Hainmueller (2012). Entropy balancing is a covariate balancing technique that uses an iterative process to reweight control sample observations until the means (and other higher order moments) of the control sample covariate distributions approximately equal those in the treatment sample (Hainmueller 2012). Specifically, we first match the treatment group (firms with green revenues) and the control group (firms without green revenues) based on our control variables in Model (1). We balance on all three moments: mean, variance, and skewness. The results reported in Panel A of Table 6 show that the differences in mean, variance and skewness values of control variables between with and without green revenue samples become negligible after the entropy balancing procedure is implemented. This suggests that the level of homogeneity between with and without green revenue samples is high. Next, we use the entropy-balanced sample to re-estimate Model (1). The results are shown in Panel B of Table 6. Our baseline results still hold based on the matched sample.

[Please Insert Table 6 about here]

4.3 Other robustness checks

We report other robust checks in this subpart. We use the change in the percentage of green revenue ($\triangle$*%Green Rev*$_{i,t}$) to measure firms' green transition level. Larger value of $\triangle$*%Green Rev*$_{i,t}$ means higher green transition level. In order to examine how the average level of cash holdings has changed in response to the green transition, we test using a change model as follows:

$$\begin{aligned}\triangle Cash_{i,t} &= \beta_0 + \beta_1 \triangle \%Green\ Rev_{i,t} + \beta_2 \triangle Size_{i,t} + \beta_3 \triangle Leverage_{i,t} + \beta_4 \triangle Working\ Cap_{i,t} \\ &+ \beta_5 \triangle CAPEX_{i,t} + \beta_6 \triangle Operating\ CF_{i,t} + \beta_7 \triangle Std\ Operating\ CF_{i,t} + \beta_8 \triangle Growth_{i,t} \\ &+ \beta_9 \triangle Book\ to\ Mkt_{i,t} + \beta_{10} \triangle R\&D_{i,t} + \beta_{11} \triangle Dividend_{i,t} + \beta_{12} \triangle Board\ Size_{i,t} + \beta_{13} \triangle Inden_{i,t} \\ &+ \beta_{14} \triangle Top1_{i,t} + \beta_{15} \triangle Institution_{i,t} + Year + Firm + \delta_{i,t}\end{aligned} \tag{3}$$

where all of the variables in Model (1) are replaced by their changes from *t*-1 to *t*. Panel A in Table 7 reports the relation between firm's green transition and firm cash holdings. The coefficient on $\triangle$*%Green Rev* is significantly negative.

Panel B in Table 7 presents the robust results by using alternative measures of cash holding. Following Beuselinck et al. (2021) and Fresard (2010), columns (1) - (4) employ *Cash_Asset*, *Cash_Value*, *Cash_Adj*, and *Cash_Revenue* as our dependent variables to verify the robustness in this paper. The coefficients on *%Green Rev* in columns (1) - (4) are significantly negative, supporting the conclusion that *%Green Rev* has a negative effect on firm cash holdings. Panel C in Table 6 presents the results using the value of *Cash* in year *t*+1, *t*+2, *t*+3 as alternative dependent variables. The negative and significant coefficients on *%Green Rev* confirm that the main conclusion remains by considering the long-term effect of green revenue.

[Please Insert Table 7 about here]

5 Channel Analysis

5.1 Financial constraints

With respect to the financial constraints channel, we argue that one mechanism through which green revenues mitigate cash holdings level is by reducing the financial constraints. We thus estimate the following equation:

$$Cash_{i,t} = \beta_0 + \beta_1 \%Green\ Rev_{i,t} \times High\ SA_{i,t} / \%Green\ Rev_{i,t} \times High\ Zscore_{i,t} + \beta_2 \%Green\ Rev_{i,t} \times Low\ SA_{i,t} / \%Green\ Rev_{i,t} \times Low\ Zscore_{i,t} + \beta_3 Size_{i,t} + \beta_4 Leverage_{i,t} + \beta_5 Working\ Cap_{i,t} + \beta_6 CAPEX_{i,t} + \beta_7 Operating\ CF_{i,t} + \beta_8 Std\ Operating\ CF_{i,t} + \beta_9 Growth_{i,t} + \beta_{10} Book\ to\ Mkt_{i,t} + \beta_{11} R\&D_{i,t} + \beta_{12} Dividend_{i,t} + \beta_{13} Board\ Size_{i,t} + \beta_{14} Inden_{i,t} + \beta_{15} Top1_{i,t} + \beta_{16} Institution_{i,t} + Year + Firm + \delta_{i,t} \quad (4)$$

where we capture a firm's financial constraints by *SA* index and *Zscore* (Altman, 1968; Hadlock and Pierce, 2010). *SA* is defined as $0.043 \times FirmSize^2 - 0.040 \times FirmAge - 0.737 \times FirmSize$, where *FirmSize* is the natural log of firm's total asset, *FirmAge* is the number of years since the firm was listed on the exchange. Higher values of *SA* indicate greater degree of financial constraints. We also use Altman's (1968) *Zscore* as an alternative measure of financial constraints. *Zscore* measure captures financial distress and the likelihood of bankruptcy in the near term. Lower values of *Zscore* indicate greater financial distress and will be correlated with a greater degree of financial constraints. The sample is partitioned by the values of these two measures. *High SA* firms are those with *SA* among the top thirds of *SA* indexes in same year of our sample, and *Low SA* firms are those with *SA* among the bottom thirds of *SA* indexes in same year of our sample. Similarly, *High Zscore* firms are those with *Zscore* among the top thirds of *Zscore* in same year of our sample, and *Low Zscore* firms are those with *Zscore* among the bottom thirds of *Zscore* in same year of our sample. If green revenues mitigate cash holdings by facilitating batter access to external capital, then we predict the significantly negative results are shown in *High SA* firms and *Low Zscore* firms.

Table 8 presents the regression results. For firms with higher *SA* or lower *Zscore*, green revenues significantly reduce cash holdings. Conversely, for firms with lower *SA* or higher *Zscore*, green revenues insignificantly impact cash holdings. Using Wale tests, we find the significant magnitude difference between the coefficients of $\%Green\ Rev_{i,t} \times High\ Zscore$ and $\%Green\ Rev_{i,t} \times Low\ Zscore$. However, the Wald tests fall short of finding the difference between the coefficients of $\%Green\ Rev_{i,t} \times High\ SA$ and $\%Green\ Rev_{i,t} \times Low\ SA$. Collectively, these results weakly suggest that the effect of green revenues on reducing cash holdings is stronger for firms that are financially constrained. Consistent with our expectation, green revenues reduce cash holdings via decreasing financial constraints degree.

[Table 8 about here]

5.2 Firm risk

With respect to the firm risk channel, we argue that the green revenues can decrease the firms' risk. To test this conjecture, we examine whether green revenues have a stronger effect on reducing firm cash holdings for firms that have higher profitability volatility. We estimate the following regression model:

$$\begin{aligned} Cash_{i,t} = {} & \beta_0 + \beta_1 \%Green\ Rev_{i,t} \times High\ Std\ ROA_{i,t} / \%Green\ Rev_{i,t} \times High\ Climate \\ & Policy\ Uncertainty_t + \beta_2 \%Green\ Rev_{i,t} \times Low\ Std\ ROA_{i,t} / \%Green\ Rev_{i,t} \times Low \\ & Climate\ Policy\ Uncertainty_t + \beta_3 Size_{i,t} + \beta_4 Leverage_{i,t} + \beta_5 Working\ Cap_{I,t} \\ & + \beta_6 CAPEX_{i,t} + \beta_7 Operating\ CF_{i,t} + \beta_8 Std\ Operating\ CF_{i,t} + \beta_9 Growth_{i,t} \\ & + \beta_{10} Book\ to\ Mkt_{i,t} + \beta_{11} R\&D_{i,t} + \beta_{12} Dividend_{i,t} + \beta_{13} Board\ Size_{i,t} + \beta_{14} Inden_{i,t} \\ & + \beta_{15} Top1_{i,t} + \beta_{16} Institution_{i,t} + Year + Firm + \delta_{i,t} \end{aligned} \quad (5)$$

where we capture a firm's risks by *Std ROA* and *Climate Policy Uncertainty*. *Std ROA* is defined as standard deviation of *ROA* over the past five year, where *ROA* is the return-to-asset ratio. Higher value of *Std ROA* indicates greater degree of firm risks. We also use Chinese climate policy uncertainty (*Climate Policy Uncertainty*) developed by Lee and Cho (2022) to represent climate-related risk. The sample is partitioned by the values of these measures. *High Std ROA* firms are those with *Std ROA* among the top thirds of *Std ROA* in same year of our sample, and *Low Std ROA* firms are those with *Std ROA* among the bottom thirds of *Std ROA* in same year of our sample. Similarly, *High Climate Policy Uncertainty* are those with *Climate Policy Uncertainty* among the top thirds of *Climate Policy Uncertainty* in whole sample years, and *Low Climate Policy Uncertainty* are those with *Climate Policy Uncertainty* among the bottom thirds of *CPU* in whole sample years. If green revenues mitigate cash holdings by decreasing firm risks, then we predict the significantly negative results are shown in *High Std ROA* and *High Climate Policy Uncertainty* firms.

Table 9 presents the regression results. For firms with higher *Std ROA* or in years with high climate policy uncertainty, green revenues significantly reduce cash holdings. Conversely, for firms with lower *Std ROA* or in year with low climate policy uncertainty, green revenues insignificantly impact cash holdings. The coefficients corresponding to the two group of firms are significantly different from each other whenever we use *Std ROA* or *Climate Policy Uncertainty* to indicate firm risks (See Wald test reported in Table 9). Collectively, these results suggest that

the effect of green revenues on reducing cash holdings is stronger for firms facing high risks. Consistent with our expectation, green revenues reduce cash holdings via decreasing firm risks.

[Table 9 about here]

5.3 Agency problem

With respect to the agency problem channel, we argue that the green revenues can decrease the firms' agency problem. To test this conjecture, we examine whether green revenues have a stronger effect on reducing firm cash holdings for firms that have higher agency problem. We estimate the following regression model:

$$\begin{aligned} Cash_{i,t} = {} & \beta_0 + \beta_1\, \%Green\ Rev_{i,t} \times High\ Expense_{i,t} / Green\ Rev_{i,t} \times High\ Turnover_{i,t} \\ & + \beta_2 \%Green\ Rev_{i,t} \times Low\ Expense_{i,t} / \%Green\ Rev_{i,t} \times Low\ Turnover_{i,t} + \beta_3 Size_{i,t} \\ & + \beta_4 Leverage_{i,t} + \beta_5 Working\ Cap_{i,t} + \beta_6 CAPEX_{i,t} + \beta_7 Operating\ CF_{i,t} \\ & + \beta_8 Std\ Operating\ CF_{i,t} + \beta_9 Growth_{i,t} + \beta_{10} Book\ to\ Mkt_{i,t} + \beta_{11} R\&D_{i,t} \\ & + \beta_{12} Dividend_{i,t} + \beta_{13} Board\ Size_{i,t} + \beta_{14} Inden_{i,t} + \beta_{15} Top1_{i,t} + \beta_{16} Institution_{i,t} + \\ & Year + Firm + \delta_{i,t} \end{aligned} \tag{6}$$

where we capture a firm's agency problem by *Expense* and *Turnover* (Ang et al., 2000). *Expense* is defined as firm's general & administrative expenses rate. Higher values of *Expense* indicate greater degree of agency problem. We also use *Turnover* as an alternative measure of firm risks. *Turnover* is measured by firm's sales-to-assets ratio. The low sales to total assets ratio can result from poor investment decisions (e.g., investing in negative net-present-value assets) or from management's shirking (e.g., exerting too little effort to help generate revenue), which can reflect higher agency problem level (Ang et al., 2000). The sample is partitioned by the values of these two measures. *High Expense* firms are those with *Expense* among the top thirds of *Expense* in same year of our sample, and *Low Expense* firms are those with *Expense* among the bottom thirds of *Expense* in same year of our sample. Similarly, *High Turnover* firms are those with *Turnover* among the top thirds of *Turnover* in same year of our sample, and *Low Turnover* firms are those with *Turnover* among the bottom thirds of *Turnover* in same year of our sample. If green revenues mitigate cash holdings by curbing firm agency problem, then we predict the significantly negative results are shown in *High Expense* firms and *Low Turnover* firms.

Table 10 presents the regression results. Green revenues significantly reduce cash holdings only for firms with higher *Expense* or lower *Turnover*. The coefficients corresponding to the two group of firms are significantly different from each other whenever we use *Expense* or *Turnover*

to indicate firms' type I agency problems (See Wald test reported in Table 10) Collectively, these results suggest that the effect of green revenues on reducing cash holdings is stronger for firms facing high level of agency problem. Consistent with our expectation, green revenues reduce cash holdings via decreasing agency problem.

[Table 10 about here]

6 Moderating Effects

6.1 Internal control

As an effective governance mechanism, internal control quality can mitigate agency costs and managerial self-interest behavior. Gao and Jia (2016)find that firms with internal control weakness have less value of liquid assets, highlighting a unique governance role of internal control in mitigating unresolved agency problems. Thus, we expect that internal control weakness positively moderates the relationship between green revenues and corporate cash holdings.

To test this conjecture, we construct *Internal Control Weakness*, which indicates the firm's internal control is valid or not. *Internal Control Weakness* is equal to one when the firm's internal control is valid and zero otherwise. We add the interaction term between *%Green Rev* and *Internal Control Weakness* (*%Green Rev×Internal Control Weakness*) and single term *Internal Control Weakness* into baseline regression model. Column (1) of Table 11 presents the regression results. The coefficient of the interaction term is -0.021 and statistically significant at the 10% level. This result is in line with our expectation[8].

6.2 Public attention to environment protection

Public attention to environment captures the investors preference to sustainable firms. El Ouadghiri et al. (2021) report that public attention to environmental issues has a significantly positive (negative) effect on the returns on US sustainability (conventional) stock indices. Gutsche and Ziegler (2019) find that sustainable investors accelerate the process of buying stocks of sustainable firms to reward them and to divest stocks of conventional firms to punish them when

[8] We also use the natural logarithm of the internal control index (*Internal Control*) of each firm which comes from the DIB internal control and risk management database. DIB's internal control index is a composite index that reflects the internal control quality based on the listed firm's internal control disclosure, internal control assessment, and auditing/assurance reports. After adding interaction term between *%Green Rev* and *Internal Control* (*%Green Rev×Internal Control*) and single term *Internal Control* into baseline regression model, we find a significant positive coefficient of *%Green Rev×Internal Control*. This results also indicates that higher level of internal control can be the buffer of agency problems.

their awareness to environmental issues increases. Green revenues achievement reflects that firms operate business activities toward a greener environment and sustainable economy. Thus, these firms face less friction in outside funding with public attention to environment increasing. We expect that the public attention to environment protection positively moderates the relationship between green revenues and corporate cash holdings.

To test this conjecture, we construct *Environment Focus*, which is measured by the times that the public uses "environment protection" as keywords to search in the Baidu search engine (index.baidu.com) in each province annually, which is sourced by the Baidu search engine and collected manually. Baidu is the leading search engine for Chinese Internet users, which is also recognized as the "Chinese Google". In May 2019, Baidu accounted for 64.55% of the market share of all search queries performed in China, and it dominated the China mobile search engine market with a market share of 78.63%. The search volume reported by Baidu is thus likely to be representative of the Internet search behavior of the general population. Because the Baidu Index is only available since 2011, our raw Index ranges from 2011 to 2021 at a daily frequency. We add the interaction term between %*Green Rev* and *Environment Focus* (%*Green Rev* × *Environment Focus*) and single term *Environment Focus* into baseline regression model. Column (2) of Table 11 presents the regression results. The coefficient of the interaction term is -0.063 and statistically significant at the 10% level. This result is in line with our expectation.

6.3 Ownership status

In China, firms have significant state ownership, which gives us the opportunity to examine whether the role of green revenues on cash holdings is different for state-owned enterprises (SOEs) and non-state-owned enterprises (non-SOEs). In particular, due to the implicit government guarantee, SOEs should have fewer financial constraints and therefore less precautionary incentives to hoard cash relative to non-SOEs. First, the Chinese government has the "deep-pockets" that could support the firms they own (Ding et al., 2021). Second, the SOEs have advantages in the credit market as Chinese banks have different lending practice for two types of firms in that they prefer lending to SOEs than to non-SOEs (Cull et al., 2015). As a result, compared with non-SOEs, the cash holding motive will decrease in larger extent if SOEs have green revenues. We expect that the state ownership positively moderates the relationship between green revenues and corporate cash holdings.

To test this conjecture, we construct *SOE*, which equals one if the firm is state owned and zero otherwise. We add the interaction term between *%Green Rev* and *SOE* (*%Green Rev×SOE*) and single term *SOE* into baseline regression model. Column (3) of Table 11 presents the regression results. The coefficient of the interaction term is -0.042 and statistically significant at the 5% level. This result is in line with our expectation.

[Table 11 about here]

7 Conclusion

Our paper is the first in the literature to explore whether firm's green revenues impact firms' cash policy. Using Chinese listed firms during the period 2011 to 2021, we find that green revenues are negatively associated with a firm's cash holdings, and the results still hold under several robustness, including difference-in-differences test, instrument variable approach, and so on. Further studies show that the mitigating effect of green revenues on cash holdings are through the channels of reducing financial constraints, lowering firm risks regarding operating and transition, and mitigating agency problems. Finally, we prove that reduction in cash holdings caused by green revenues is more pronounced in firms with internal control weakness, in firms located with more public environmental protection attention, and in state-owned firms.

Our paper has following potential contributions. First, our research enriches the studies of green revenues by paying attention to its effect on corporate cash management. Firms' sustainable behavior has long been regarded as a crucial determinant of firm's financial behavior. However, no one has ever explored its potential effect on corporate cash holdings. Our findings suggest that green revenues can mitigate cash holdings derived from the financial constraints, precautionary motive, and manger's self-behavior, filling an important gap in the literature. Second, this study furthers the literature on the determinants of corporate cash holdings. Prior research mainly focuses on the effect of firm characteristics on cash holdings, but ignores how sustainable behavior, a key response to climate risk, influences firm's cash policy. Our work reveals that green revenues can shape a firm's cash holdings, thus filling the gap in extant literature. Third, these findings can lend support to the rationale of increased regulatory oversight of firms' sustainable development.

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Appendix A: Data Screening Procedures

This appendix reports the sample screening procedure. The initial sample consists of firms listed on the Shanghai and Shenzhen Stock Exchanges in China from 2010 to 2021.

	# of Obs.	# of Firms
Initial sample between 2010 and 2021	**32,660**	**4,520**
Less:		
(1) observations from financial industry	-765	4,427
(2) ST and PT observations	-608	4,294
(3) observations with missing values	-2,188	3,943
(4) Observations with negative net assets	-831	3,922
Final sample	**28,198**	**3,922**

Appendix B: Variable Definition

Variable	Definition	Source
Cash Holding Variable		
$Cash_{i,t}$	The natural logarithm of sum of cash and marketable securities to noncash assets.	CSMAR Database
$Cash_{i,t+1}$	The natural logarithm of cash to noncash assets in year t+1. Cash includes cash and marketable securities.	CSMAR Database
$Cash_{i,t+2}$	The natural logarithm of cash to noncash assets in year t+2. Cash includes cash and marketable securities.	CSMAR Database
$Cash_{i,t+3}$	The natural logarithm of cash to noncash assets in year t+3. Cash includes cash and marketable securities.	CSMAR Database
$Cash\_Adj_{i,t}$	The adjusted value of $Cash_{i,t}$ in industry. $Cash\_Adj_{i,t}=\frac{Cash_{i,t}-meanCash_{j,t}}{sdCash_{j,t}}$, where *meanCash* indicates the mean value of $Cash_{i,t}$ in firm's industry, *sdCash* is the standard deviation of $Cash_{i,t}$ in firm's industry.	CSMAR Database
$Cash\_Asset_{i,t}$	The natural logarithm of cash to total assets. Cash includes cash and marketable securities.	CSMAR Database
$Cash\_Revenue_{i,t}$	The natural logarithm of cash to sales revenues. Cash includes cash and marketable securities.	CSMAR Database
$Cash\_Value_{i,t}$	The natural logarithm of raw cash holdings. Cash includes cash and marketable securities.	CSMAR Database
Green Revenue Variables		
$Green\ Rev\ Dummy_{i,t}$	A dummy variable that equals one of firm has green revenue in one year and zero otherwise.	Choice Database
$\%Green\ Rev_{i,t}$	The ratio of green revenue to sales revenue.	Choice Database
Firm Variables		

Book to Mkt$_{i,t}$	The book value of assets divided by the market value of assets (the book value of assets minus the book value of equity plus the market value of equity).	CSMAR Database
Board Size$_{i,t}$	The natural logarithm of directors in the board.	CSMAR Database
CAPEX$_{i,t}$	Capital expenditures scaled by total noncash assets.	CSMAR Database
Operating CF$_{i,t}$	Operating cash flow scaled by total noncash assets.	CSMAR Database
Change$_t$	A dummy variable that equals one if a firm's green revenue turns from zero to positive in sample years and zero otherwise.	—
Dividend$_{i,t}$	A dummy variable that equals one if firm pays cash dividends in a given year and zero otherwise.	CSMAR Database
Growth$_{i,t}$	The ratio of current year's sales minus prior year's sales to prior year's sales.	CSMAR Database
High Expense$_{i,t}$	A dummy variable that equals one if a firm's general & administrative expenses rate is in the top third of the whole sample in the same year and zero otherwise.	CSMAR Database
High SA$_{i,t}$	A dummy variable that equals one if a firm's *SA Index* is in the top third of the whole sample in same year and zero otherwise. $SA=0.043 \times FirmSize^2-0.040 \times FirmAge-0.737 \times FirmSize$, where *FirmSize* is the natural log of firm's total asset, *FirmAge* is the number of years since the firm was listed on the exchange.	CSMAR Database
High Std ROA$_{i,t}$	A dummy variable that equals one if a firm's standard deviation of return-on-asset for	CSMAR Database

	the past five years is in the top third of the whole sample in the same year zero otherwise.	
High Turnover$_{i,t}$	A dummy variable that equals one if a firm's sale-to-assets ratio multiplied by -1 is in the top third of the whole sample in the same year and zero otherwise.	CSMAR Database
High Zscore$_{i,t}$	A dummy variable that equals one if a firm's *Zsocre* is in the top third of the whole sample in same year and zero otherwise.	CSMAR Database
Internal Control$_{i,t}$	The natural log of firm's internal control score extract from DIB Database.	DIB Internal Control and Risk Management Database
Internal Control Weakness$_{i,t}$	A dummy variable that equals to one if firm's internal control is not valid and zero otherwise.	CSMAR Database
Inden$_{i,t}$	the ratio of independent directors to the number of board members.	CSMAR Database
Institution$_{i,t}$	Total number of shares held by institution investors divided by the total number outstanding shares of the firm.	CSMAR Database
Instrumented %Green Rev$_{i,t}$	The instrumented *%Green Rev*.	—
Leverage$_{i,t}$	The ratio of total liabilities to total noncash assets.	CSMAR Database
Low Expense$_{i,t}$	A dummy variable that equals one if a firm's general & administrative expenses rate is in the bottom third of the whole sample in the same year and zero otherwise.	CSMAR Database
Low SA$_{i,t}$	A dummy variable that equals one if a firm's *SA Index* is in the bottom third of the whole sample in same year and zero otherwise. $SA=0.043 \times FirmSize^2-0.040 \times FirmAge-0.737 \times FirmSize$, where *FirmSize* is the natural log of	CSMAR Database

	firm's total asset, *FirmAge* is the number of years since the firm was listed on the exchange.	
Low Std ROA$_{i,t}$	A dummy variable that equals one if a firm's standard deviation of return-on-asset for the past five years is in the bottom third of the whole sample in the same year zero otherwise.	CSMAR Database
Low Turnover$_{i,t}$	A dummy variable that equals one if a firm's sale-to-asset ratio multiplied by -1 is in the bottom third of the whole sample in the same year and zero otherwise.	CSMAR Database
Low Zscore$_{i,t}$	A dummy variable that equals one if a firm's *Zsocre* is in the bottom third of the whole sample in same year and zero otherwise.	CSMAR Database
Mean %Green Rev$_{i,t}$	Average *%Green Rev*$_{i,t}$ in firm's same industry in one year	—
Pre_t^2	A dummy variable that equals one if sample year is in 2017 and zero otherwise.	—
Pre_t^1	A dummy variable that equals one if sample year is in 2018 and zero otherwise.	
$Post_t^0$	A dummy variable that equals one if sample year is in 2019 and zero otherwise.	—
CataloguePost$_t$	An event dummy that equals one from 2019 to 2021 and zero from 2016 to 2018.	—
PostChange$_t$	A dummy variable that equals one in and after the year when a firm's green revenue turns from zero to positive.	—
$Post_t^1$	A dummy variable that equals one if sample year is in 2020 and zero otherwise.	—

$Post_t$ [2]	A dummy variable that equals one if sample year is in 2021 and zero otherwise.	—
$R\&D_{i,t}$	The ratio of research and development expenses to total noncash assets.	CSMAR Database
Std Operating $CF_{i,t}$	The standard deviation of cash flow from operations over past five years.	CSMAR Database
$Size_{i,t}$	The natural logarithm of book assets.	CSMAR Database
$SOE_{i,t}$	A dummy variable that equals one if firm is state owned and zero otherwise.	CSMAR Database
$Top1_{i,t}$	The ownership of the largest shareholder.	CSMAR Database
$Treat_i$	A dummy variable that equals one if a firm has green revenue in 2018 and zero otherwise.	—
Working $Cap_{i,t}$	The ratio of free cash flow to total noncash assets; Free cash flow=EBITDA-taxes-interest-dividends.	CSMAR Database
Macro Variable		
Environment $Focus_{p,t}$	The times that the public uses "environment protection" as keywords to search in the Baidu search engine in each province annually.	index.baidu.com
High Climate Policy Uncertainty$_{i,t}$	A dummy variable that equals to one if *Climate Policy Uncertainty* in a year is on the top third of *Climate Policy Uncertainty* in the whole sample years. *Climate Policy Uncertainty* is measured by the annually mean value of monthly Chinese climate policy uncertainty index calculated by Lee and Cho (2022).	https://sites.google.com/view/twitter-chn-epu/home
Low Climate Policy Uncertainty$_{i,t}$	A dummy variable that equals to one if *Climate Policy Uncertainty* in a year is on the top third of *Climate Policy*	https://sites.google.com/view/twitter-chn-epu/home

	Uncertainty in the whole sample years. *Climate Policy Uncertainty* is measured by the annually mean value of monthly Chinese climate policy uncertainty index calculated by Lee and Cho (2022).

Table 1: Sample Distribution by Year and Industry

Our sample consists of non-financial firms listed on the Shanghai or Shenzhen Stock Exchanges during a period from 2010 to 2021. Panel A reports sample distribution by year. Panel B reports sample distribution by industry according to the Industry Classification of Listed Companies issued by the China Securities Regulatory Commission (CSRC) in 2012.

Panel A: Sample distribution by year

year	# of Firms.	Percent
2010	1,217	4.32%
2011	1,525	5.41%
2012	1,804	6.40%
2013	1,970	6.99%
2014	1,948	6.91%
2015	2,011	7.13%
2016	2,251	7.98%
2017	2,520	8.94%
2018	2,972	10.54%
2019	3,012	10.68%
2020	3,257	11.55%
2021	3,711	13.16%
Total	28,198	100%

Panel B: Sample distribution by industry

Industry Code	Industry	# of Obs.	Percent
A	Agriculture, forestry, animal husbandry and fishery	361	1.28%
B	Mining industry	671	2.38%
C	Manufacturing industry	18,343	65.05%
D	Industry of electric power, heat, gas and water production and supply	959	3.40%
E	Construction industry	720	2.55%
F	Wholesale and retail industry	1,371	4.86%
G	Transport, storage and postal service industry	892	3.16%
H	Accommodation and catering industry	84	0.30%
I	Industry of information transmission, software and information technology services	1,936	6.87%
K	Real estate industry	1,162	4.12%
L	Leasing and commercial service industry	324	1.15%
M	Scientific research and technical service industry	274	0.97%
N	Water conservancy, environment and public facility management industry	379	1.34%
O	Industry of resident service, repair and other services	16	0.06%
P	Education	26	0.09%
Q	Health and social work	70	0.25%
R	Industry of culture, sports and entertainment	379	1.34%
S	Diversified industries	231	0.82%
Total	—	28,198	100%

Table 2: Descriptive Statistics

This table presents the descriptive statistics of interested variables in our sample. The detailed definitions of variables are reported in Appendix B.

Variables	# of Obs.	Mean	S.D.	5th	25th	50th	75th	95th
$Cash_{i,t}$	28,198	0.233	0.199	0.043	0.102	0.170	0.292	0.656
Green Rev Dummy$_{i,t}$	28,198	0.155	0.362	0.000	0.000	0.000	0.000	1.000
%Green Rev$_{i,t}$	28,198	0.071	0.227	0.000	0.000	0.000	0.000	0.777
$Size_{i,t}$	28,198	22.223	1.283	20.474	21.295	22.030	22.940	24.668
$Leverage_{i,t}$	28,198	0.510	0.218	0.160	0.337	0.507	0.673	0.878
Working Cap$_{i,t}$	28,198	0.057	0.231	-0.331	-0.099	0.052	0.213	0.446
$CAPEX_{i,t}$	28,198	0.065	0.061	0.003	0.020	0.046	0.090	0.193
Operating CF$_{i,t}$	28,198	0.065	0.095	-0.080	0.011	0.057	0.111	0.232
Std Operating CF$_{i,t}$	28,198	0.068	0.056	0.014	0.032	0.053	0.086	0.180
$Growth_{i,t}$	28,198	0.380	0.960	-0.300	-0.021	0.139	0.424	1.721
Book to Mkt$_{i,t}$	28,198	0.617	0.251	0.214	0.423	0.612	0.804	1.036
$R\&D_{i,t}$	28,198	0.013	0.024	0.000	0.000	0.000	0.020	0.061
$Dividend_{i,t}$	28,198	0.736	0.441	0.000	0.000	1.000	1.000	1.000
Board Size$_{i,t}$	28,198	2.241	0.176	1.946	2.079	2.303	2.303	2.485
$Inden_{i,t}$	28,198	0.376	0.054	0.333	0.333	0.364	0.429	0.500
$Top1_{i,t}$	28,198	0.344	0.149	0.133	0.228	0.322	0.444	0.620
$Institution_{i,t}$	28,198	0.436	0.247	0.032	0.229	0.454	0.636	0.818

Table 3: Univariate Analysis

This table reports the univariate analysis results on the effect of green revenue on cash holdings. In Panel A, we split full sample into two groups according to the availability of green revenue, shows univariate analysis results of full sample. Panel B shows the univariate analysis is employed among three levels of firm size (*Size*). Panel C reports the univariate analysis among three levels of financial leverage (*Leverage*). Panel D shows the univariate analysis by three levels of book-to-market (*Book to Mkt*) value. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Full sample

	Firms without Green Revenue		*Firms with Green Revenue*		Difference
	# of Obs	The Means of *Cash*	*# of Obs*	The Means of *Cash*	
$Cash_{i,t}$	23,828	0.240	4,370	0.195	0.045*** (13.72)

Panel B: Univariate analysis by size

Size	*Firms without Green Revenue*		*Firms with Green Revenue*		Difference
	# of Obs	The Means of *Cash*	*# of Obs*	The Means of *Cash*	
Small	8,202	0.288	1,279	0.232	0.056*** (8.09)
Medium	7,887	0.232	1,512	0.198	0.035*** (6.47)
Big	7,739	0.196	1,579	0.162	0.034*** (7.87)

Panel C: Univariate analysis by financial leverage

Leverage	*Firms without Green Revenue*		*Firms with Green Revenue*		Difference
	# of Obs	The Means of *Cash*	*# of Obs*	The Means of *Cash*	
Low	8,167	0.283	1,314	0.229	0.054*** (7.95)
Median	7,917	0.219	1,482	0.185	0.034*** (6.56)
High	7,744	0.215	1,574	0.175	0.040*** (8.28)

Panel D: Univariate analysis by book-to-market ratio

Book to Mkt	*Firms without Green Revenue*		*Firms with Green Revenue*		Difference
	# of Obs	The Means of *Cash*	*# of Obs*	The Means of *Cash*	
Low	8,114	0.276	1,367	0.219	0.057*** (8.94)
Median	7,821	0.242	1,578	0.193	0.049*** (8.96)
High	7,893	0.200	1,425	0.174	0.027*** (5.40)

Table 4: Green Revenues and Corporate Cash Holdings: Baseline Results

The table reports the regression results to examine the effect of green revenue on corporate cash holdings. The dependent variable is the ratio of cash and cash equivalents to total noncash assets. *Green Rev Dummy*$_{i,t}$ is an indicator that equals one if firm *i* has green revenue in year *t*, and zero otherwise. *%Green Rev*$_{i,t}$ is the green revenue scaled by total revenue. Column (1)-(2) report OLS regression results. Column (3)-(4) report the regression results of the 2nd stage of Heckman Selection Model. *Inverse Mills Ratio*$_{i,t}$ is the inverse Mills ratio obtained from the 1st stage of Heckman Selection Model. The definitions of variables are reported in Appendix B. The standard errors are clustered by firm. *t*-statistics are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	OLS		*2nd Stage of Heckman Selection Model*	
	Green Rev Dummy$_{i,t}$	*%Green Rev*$_{i,t}$	*Green Rev Dummy*$_{i,t}$	*%Green Rev*$_{i,t}$
Dependent Variables	*Cash*$_{i,t}$	*Cash*$_{i,t}$	*Cash*$_{i,t}$	*Cash*$_{i,t}$
Green Revenue	-0.017**	-0.029**	-0.015**	-0.025*
	(-2.41)	(-2.23)	(-2.11)	(-1.94)
Inverse Mills Ratio$_{i,t}$			0.068***	0.069***
			(3.70)	(3.75)
Size$_{i,t}$	-0.062***	-0.062***	-0.062***	-0.062***
	(-13.70)	(-13.72)	(-12.94)	(-12.97)
Leverage$_{i,t}$	0.128***	0.128***	0.130***	0.130***
	(7.62)	(7.64)	(7.51)	(7.52)
Working Cap$_{i,t}$	0.009	0.010	0.017	0.018
	(0.55)	(0.59)	(1.02)	(1.06)
CAPEX$_{i,t}$	0.378***	0.379***	0.386***	0.387***
	(13.33)	(13.36)	(13.19)	(13.22)
Operating CF$_{i,t}$	0.469***	0.469***	0.498***	0.499***
	(25.91)	(25.94)	(25.22)	(25.27)
Std Operating CF$_{i,t}$	0.479***	0.480***	0.491***	0.492***
	(10.89)	(10.90)	(10.51)	(10.52)
Growth$_{i,t}$	-0.001	-0.001	-0.001	-0.001
	(-1.05)	(-1.07)	(-1.03)	(-1.05)
Book to Mkt$_{i,t}$	0.137***	0.137***	0.146***	0.146***
	(13.93)	(13.96)	(14.30)	(14.34)
R&D$_{i,t}$	0.579***	0.581***	0.565***	0.568***
	(4.51)	(4.53)	(4.27)	(4.30)
Dividend$_{i,t}$	0.041***	0.041***	0.044***	0.044***
	(15.37)	(15.36)	(14.94)	(14.95)
Board Size$_{i,t}$	0.013	0.013	0.015	0.014
	(0.85)	(0.83)	(0.95)	(0.93)
Inden$_{i,t}$	-0.006	-0.007	-0.010	-0.010
	(-0.17)	(-0.17)	(-0.25)	(-0.26)
Top1$_{i,t}$	-0.046*	-0.047*	-0.041	-0.041
	(-1.72)	(-1.73)	(-1.48)	(-1.48)
Institution$_{i,t}$	0.188***	0.189***	0.189***	0.190***
	(10.55)	(10.62)	(10.13)	(10.19)
Constant	1.246***	1.246***	1.215***	1.215***
	(12.03)	(12.06)	(11.13)	(11.15)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
# of Obs.	28,198	28,198	27,313	27,313
Adj. R-sq	0.636	0.636	0.621	0.621

Table 5: Endogeneity Analyses

This table presents the regression results after addressing endogeneity concerns using difference-in-difference and instrumental variable approaches. In Panel A, we use the publication of 2019 Green Industry Guiding Catalogue (GIGC) as a quasi-natural experiment to conduct a difference-in-differences test. The dependent variable is the ratio of cash and cash equivalents to total noncash assets in both columns. Column (1) of Panel A reports the DID regression results. *Treat* is a dummy variable that equals one if a firm has green revenues in 2018, and zero otherwise. *CataloguePost* is an indicator that equals one after 2018 and zero otherwise. Column (2) of Panel A shows the regression results of dynamic effects of the publication of 2019 GIGC. Pre^j ($Post^j$) equals one if the observation is *j* year before (after) the publication of GIGC. Panel B reports the results of the 2-stage OLS regressions using instrumental variable approach. We use the average $\%Green\ Rev_{i,t}$ of other firms in the same industry ($Mean\ \%Green\ Rev_{i,t}$) without the interested firm as instrumental variables. $Instrumented\ \%Green\ Rev_{i,t}$ is the predicted $Green\ Rev_{i,t}$ in the 1st stage regression. The definitions of variables are reported in Appendix B. The standard errors are clustered by firm. *t*-statistics are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Difference-In-Differences Test

	(1)	(2)
	OLS	
Dependent Variables	$Cash_{i,t}$	$Cash_{i,t}$
$Treat_i \times CataloguePost_t$	-0.016***	
	(-3.00)	
$Treat_i \times Pre^3_t$		0.001
		(0.10)
$Treat_i \times Pre^2_t$		0.000
		(0.03)
$Treat_i \times Post^0_t$		-0.020***
		(-4.01)
$Treat_i \times Post^1_t$		-0.019***
		(-3.41)
$Treat_i \times Post^2_t$		-0.008
		(-1.27)
Other Control	Yes	Yes
Year FE	Yes	Yes
Firm FE	Yes	Yes
# of Obs.	16,209	16,209
Adj. R-sq	0.718	0.718

Panel B: Instrumental Variable Estimation

	(1)	(2)
	1st Stage	*2nd Stage*
Dependent Variables	$Green\ Rev_{i,t}$	$Cash_{i,t}$
$Mean\ \%Green\ Rev_{i,t}$	0.330***	
	(5.91)	
$Instrumented\ \%Green\ Rev_{i,t}$		-0.184**
		(-2.05)
Other Controls	Yes	Yes
Year FE	Yes	Yes
Firm FE	Yes	Yes
# of Obs.	27,634	27,634
Adj. R-sq	0.808	0.099

Underidentification test:	
Kleibergen-Paap rk LM statistic	21.512
p-value	0.000
Weak indentification test:	
Kleibergen-Paap rk Wald F statistic	34.934
Stock-Yogo 10% maximal IV size (Critical value)	16.38

Table 6: Entropy Balancing Analysis

This table presents the regression results after using the balanced sample. In Panel A, we use entropy balancing method in Hainmueller (2012) and create balanced samples through adjusting differences between the two groups in covariate means, variances and skewness. The covariates include all control variables in baseline regression model. Panel B reports the results of baseline regression using matched sample. The definitions of variables are reported in Appendix B. The standard errors are clustered by firm. *t*-statistics are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Matching Using Entropy Balancing Technique

Differences in Observables (Covariates) after Entropy Balancing

	Treat			Control		
Covariates	Mean	Variance	Skewness	Mean	Variance	Skewness
Size$_{i,t}$	22.470	1.692	0.741	22.470	1.692	0.742
Leverage$_{i,t}$	0.541	0.042	-0.043	0.541	0.042	-0.043
Working Cap$_{i,t}$	0.031	0.046	0.231	0.031	0.046	0.231
CAPEX$_{i,t}$	0.066	0.004	1.572	0.066	0.004	1.573
Operating CF$_{i,t}$	0.050	0.006	0.451	0.050	0.006	0.452
Std Operating CF$_{i,t}$	0.061	0.002	2.478	0.061	0.002	2.478
Growth$_{i,t}$	0.445	0.983	4.003	0.445	0.982	4.004
Book to Mkt$_{i,t}$	0.648	0.057	0.021	0.648	0.057	0.021
R&D$_{i,t}$	0.011	0.000	2.601	0.011	0.000	2.601
Dividend$_{i,t}$	0.712	0.205	-0.935	0.712	0.205	-0.934
Board Size$_{i,t}$	2.242	0.029	-0.252	2.242	0.029	-0.251
Inden$_{i,t}$	0.374	0.003	1.249	0.374	0.003	1.250
Top1$_{i,t}$	0.334	0.022	0.583	0.334	0.022	0.583
Institution$_{i,t}$	0.429	0.061	0.026	0.429	0.061	0.026

Panel B: Green Revenues and Cash Holdings after Entropy Balancing

	(1)
	OLS
Dependent Variable	*Cash*$_{i,t}$
%Green Rev$_{i,t}$	-0.021*
	(-1.73)
Other Controls	Yes
Year FE	Yes
Firm FE	Yes
# of Obs.	28,198
Adj. R-sq	0.593

Table 7: Robustness Analysis

This table presents the regression results of robustness analyses. In Panel A, $Change_i$ is an indicator that equals one if a firm's green revenue turns from zero to positive, and zero otherwise. $PostChange_t$ is an indicator that equals one in and after the year when a firm's green revenue turns from zero to positive. Panel B reports results with alternative cash holding measurements. $Cash\_Asset_{i,t}$ is the ratio of cash and short-term investments to total noncash assets. $Cash\_Value_{i,t}$ is the natural logarithm of the value of cash and short-term investments. $Cash\_Adj_{i,t}$ is the industry-adjusted value of $Cash_{i,t}$. $Cash\_Revenue_{i,t}$ is the natural logarithm of the ratio of cash and short-term investments to sales revenues. Panel C reports the long-term effect of $\%Green\ Rev_{i,t}$ on cash holdings. $Cash_{i,t+1}$, $Cash_{i,t+2}$ and $Cash_{i,t+3}$ are the ratio of cash and short-term investment to total noncash assets in year t+1, t+2 and t+3, respectively. The definitions of variables are reported in Appendix B. The standard errors are clustered by firm. t-statistics are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Green Transition

	(1)
	OLS
Dependent Variables	$\triangle Cash_{i,t}$
$\triangle GR_{i,t}$	-0.037*
	(-1.89)
Other Controls	Yes
Year FE	Yes
Firm FE	Yes
# of Obs.	28,198
Adj. R-sq	0.637

Panel B: Alternative Cash Holding Measures

	(1)	(2)	(3)	(4)
	OLS			
Dependent Variables	$Cash\_Asset_{i,t}$	$Cash\_Value_{i,t}$	$Cash\_Adj_{i,t}$	$Cash\_Revenue_{i,t}$
$\%Green\ Rev_{i,t}$	-0.019***	-0.132***	-0.145**	-0.040*
	(-2.66)	(-2.59)	(-2.17)	(-1.85)
Other Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
# of Obs.	28,198	28,198	28,190	28,198
Adj. R-sq	0.637	0.877	0.574	0.613

Panel C: Long-Term Effects

	(1)	(2)	(3)
	OLS		
Dependent Variables	$Cash_{i,t+1}$	$Cash_{i,t+2}$	$Cash_{i,t+3}$
$\%Green\ Rev_{i,t}$	-0.025*	-0.031**	-0.033**
	(-1.81)	(-2.16)	(-2.40)
Other Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
# of Obs.	23,309	19,996	17,034
Adj. R-sq	0.612	0.616	0.625

Table 8: Channel Analysis: Financial Constraints

The table reports results of mechanism tests via which firm's green revenue impacts cash holdings. Panel A presents the results of financial constraints testing. *High* $SA_{i,t}$ is an indicator that equals one if a firm's *SA* Index is in the top third of the whole sample in same year and zero otherwise. *Low* $SA_{i,t}$ is a dummy variable that equals one if a firm's *SA* Index is in the bottom third of the whole sample in same year and zero otherwise. *High* $Zscore_{i,t}$ is an indicator that equals one if a firm's *Zscore* is in the top third of the whole sample in same year and zero otherwise. *Low* $Zscore_{i,t}$ is a dummy variable that equals one if a firm's *Zscore* is in the bottom third of the whole sample in same year and zero otherwise. *Zscore* is extracted from CSMAR database. The definitions of variables are reported in Appendix B. The standard errors are clustered by firm. *t*-statistics are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
	SA	*Zscore*
	OLS	
Dependent Variables	$Cash_{i,t}$	$Cash_{i,t}$
High Channel Variable$_{i,t}$×*%Green Rev*$_{i,t}$	-0.031***	0.005
	(-2.81)	(0.24)
Low Channel Variable$_{i,t}$×*%Green Rev*$_{i,t}$	-0.012	-0.031***
	(-0.54)	(-3.46)
Other Controls	Yes	Yes
Year FE	Yes	Yes
Firm FE	Yes	Yes
# of Obs.	28,198	28,049
Adj. R-sq	0.636	0.637
Wald Tests *p*-value *High Channel Variable*$_{i,t}$×*%Green Rev*$_{i,t}$ vs. *Low Channel Variable*$_{i,t}$×*%Green Rev*$_{i,t}$	0.403	0.093

Table 9: Channel Analysis: Firm Risk

The table reports results of mechanism tests via which firm's green revenue impacts cash holdings. Panel A presents the results of financial constraints testing. *High Std ROA*$_{i,t}$ is an indicator that equals one if a firm's standard deviation of return-on-asset for the past five years is in the top third of the whole sample in the same year and zero otherwise. *Low Std ROA*$_{i,t}$ is an indicator that equals one if a firm's standard deviation of return-on-asset for the past five years is in the bottom third of the whole sample in the same year and zero otherwise. *High Climate Policy Uncertainty*$_{i,t}$ is an indicator that equals one if a year's climate policy uncertainty is in the top third of the whole sample years and zero otherwise. *Low Climate Policy Uncertainty*$_{i,t}$ is a dummy variable that equals one if a year's climate policy uncertainty is in the bottom third of the whole sample years and zero otherwise. Climate policy uncertainty is calculated by Lee and Cho (2022). The definitions of variables are reported in Appendix B. The standard errors are clustered by firm. *t*-statistics are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
	Std ROA	*Climate Policy Uncertainty*
	OLS	
Dependent Variables	$Cash_{i,t}$	$Cash_{i,t}$
High Channel Variable$_{i,t}$×*%Green Rev*$_{i,t}$	-0.036***	-0.030***
	(-2.93)	(-4.20)
Low Channel Variable$_{i,t}$×*%Green Rev*$_{i,t}$	-0.006	0.004
	(-0.54)	(0.37)
Other Controls	Yes	Yes
Year FE	Yes	Yes
Firm FE	Yes	Yes
# of Obs.	27,008	28,198
Adj. R-sq	0.640	0.636
Wald Test *p*-value *High Channel Variable*$_{i,t}$×*%Green Rev*$_{i,t}$ vs. *Low Channel Variable*$_{i,t}$×*%Green Rev*$_{i,t}$	0.042	0.003

Table 10: Channel Analysis: Agency Cost

The table reports results of mechanism tests via which firm's green revenue impacts cash holdings. *High Expense*$_{i,t}$ is an indicator that equals one if a firm's general & administrative expenses rate is in the top third of the whole sample in the same year and zero otherwise. *Low Expense*$_{i,t}$ is an indicator that equals one if a firm's general & administrative expenses rate is in the bottom third of the whole sample in the same year and zero otherwise. *High Turnover*$_{i,t}$ is an indicator that equals one if a firm's total asset turnover ratio is in the bottom third of the whole sample in the same year and zero otherwise. *Low Turnover*$_{i,t}$ is an indicator that equals one if a firm's total asset turnover ratio is in the bottom third of the whole sample in the same year and zero otherwise. The definitions of variables are reported in Appendix B. The standard errors are clustered by firm. *t*-statistics are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
	Expense	*Turnover*
	OLS	
Dependent Variables	*Cash*$_{i,t}$	*Cash*$_{i,t}$
High Channel Variable$_{i,t}$×*%Green Rev*$_{i,t}$	-0.037*	0.030**
	(-1.90)	(2.55)
Low Channel Variable$_{i,t}$×*%Green Rev*$_{i,t}$	0.007	-0.034**
	(0.71)	(-2.43)
Other Controls	Yes	Yes
Year FE	Yes	Yes
Firm FE	Yes	Yes
# of Obs	28,198	28,198
Adj. R-sq	0.636	0.636
Wald Test *p*-value		
High Channel Variable$_{i,t}$×*%Green Rev*$_{i,t}$ vs. *Low Channel Variable*$_{i,t}$×*%Green Rev*$_{i,t}$	0.036	0.000

Table 11: Moderating Effect

This table reports results of moderating effect of internal control weakness, public attention to environmental protection, and firm's owner status on the relation between firm's green revenue and cash holdings. *Internal Control Weakness*$_{i,t}$ indicates firm's internal control weakness, which equals to one if firm has internal control weakness and zero otherwise. *Environment Focus*$_{i,t}$ is measured by the times that the public uses "environment protection" as keywords to search in the Baidu search engine (index.baidu.com) in each province annually. *SOE*$_{i,t}$ is a dummy variable that equals one if firm is state owned, and zero otherwise. The definitions of variables are reported in Appendix B. The standard errors are clustered by firm. *t*-statistics are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
	Internal Control Weakness	*Environment Focus*	*SOE*
	OLS		
Dependent Variables	*Cash*$_{i,t}$	*Cash*$_{i,t}$	*Cash*$_{i,t}$
Moderating Variable$_{i,t}$	0.008***	0.056**	-0.026***
	(2.62)	(2.38)	(-2.62)
%Green Rev$_{i,t}$×*Moderating Variable*$_{i,t}$	-0.021*	-0.063*	-0.042**
	(-1.75)	(-1.86)	(-2.07)
%Green Rev$_{i,t}$	-0.020	-0.030**	-0.015
	(-1.40)	(-2.24)	(-0.89)
Other Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
# of Obs	26,807	26,977	27,961
Adj. R-sq	0.643	0.645	0.636

Figure 1: Green Revenues by Year

The figure presents green revenue by year.

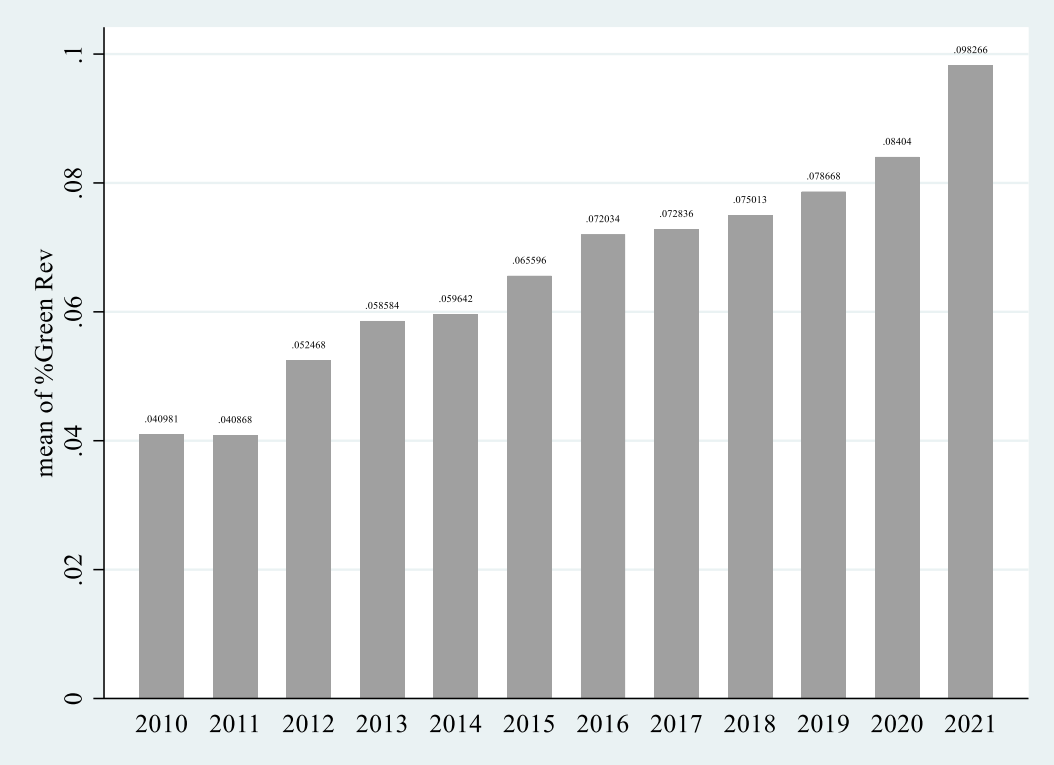

Figure 2: Green Revenues by Industry

The figure presents green revenue by industry. The industry classification is based on the 2012 CSRC industry classification standard. Since most of the firms belong to the manufacturing industry, the code for which begins with 'C', we use first two codes to classify the industries within the manufacturing industry. We use the first one code to classify other industries.