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Perceived tax obstacles and corporate environmental activities

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Abstract

This study examines the impact of perceived tax obstacles regarding tax rates and administration on corporate environmental activities including green investment and environmental information disclosure. The empirical results reveal that firms perceiving tax rates or administration as obstacles are more likely to engage in green investment and environmental information disclosure. Mechanism analysis indicates that this positive relationship is likely driven by firms' tendency to use internal funds to support capital expenditures. These findings highlight a previously underexplored consequence of tax obstacles, offering new insights into how businesses adjust their environmental strategies when faced with tax rates and tax administration obstacles.

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1. Introduction

This study aims to examine the effect of perceived tax obstacles on corporate environmental activities. Tax obstacles have been one of the primary factors hindering enterprise operations (Lee, 2014; Mohammed & Bunyaminu, 2021). Previous studies emphasize the negative effects of actual tax obstacles in exacerbating financial constraints and hindering firms' investment and innovation (Djankov et al., 2010; Pan & Zhang, 2025; Yang et al., 2025).However, the effect of perceived tax obstacles on firms' environmental behavior has been largely overlooked. Addressing this gap is essential to understanding how firms strategically respond when they view tax-related issues as obstacles. This paper, using data from the Business Environment and Enterprise Performance Surveys, examines the impact of perceived tax obstacles on corporate environmental behavior by focusing on when the tax rates and administrations are perceived as obstacles to firm operations.

Rooted in the dominant barriers perspective, the concept of perceived tax obstacles reflects the view that a firm's actual or potential growth is constrained by tax-related factors such as tax rates and tax administration (Doern, 2009; Wang, 2016; Davies et al., 2019; Mohammed & Bunyaminu, 2021). Excessively high tax rates and frequent inspections by tax officials are often perceived by firms as obstacles to business operations (Ellul et al., 2016; Zhang, 2019; Xiang, 2021), particularly when tax liabilities exceed firms' income levels (Mohammed & Tangl, 2024).

Our empirical findings indicate that when firms perceive tax rates or tax administration as obstacles, they significantly increase corporate environmental activities including green investment and environmental information disclosure. The results remain consistent after a set of robustness checks that address potential endogeneity concerns and employ alternative measures of environmental activities and tax obstacles. Furthermore, mechanism analysis indicates that firms facing perceived tax obstacles are more likely to use internal funds for fixed assets, which is probably the underlying channel through which perceived tax obstacles affect corporate environmental activities.

This research contributes to the literature in several ways. First, due to data availability (Richardson et al., 2015), prior studies have not distinguished between actual and perceived tax obstacles. They emphasize that objective tax burdens lead to financial constraints, thereby reducing firms' investment and ESG performance (Djankov et al., 2010; Liu et al., 2022; He et al., 2024). We contribute to previous research by examining how firms' perception of tax obstacles is associated with proactive environmental initiatives. Second, we demonstrate the underlying channel through which perceived tax obstacles influence ESG commitment. Firms perceiving tax obstacles strategically use internal funds for environmental projects, both to demonstrate compliance and to take advantage of potential tax deductions for green investments. Third, to our knowledge, this is the first study to empirically examine the impact of perceived tax obstacles on corporate environmental activities. By highlighting tax obstacles as a critical determinant, this study complements research on the effects of the external business environment on firms' environmental behavior (Qi et al., 2023; Yang, 2023).

In the following section, Section 2 is literature review and hypothesis. Section 3 describes the data, key variables, and models. Afterward, Section 4 describes empirical results and Section 5 concludes this study.

2. Literature review and hypotheses

2.1 Tax obstacles

Tax obstacles influence corporate business strategy. Specifically, firms that perceive tax rate as obstacle often report relatively high effective tax rates (ETRs), which are measured as the ratio of actual corporate income tax paid to pre-tax profits (Djankov et al., 2010; Mohammed & Tangl, 2024). High ETRs require firms to pay taxes on profits, which directly influences managerial decision-making. Owing to agency problems, managers may prioritize short-term or excessive profits at the expense of the firm's long-term interests (Gryglewicz et al., 2020; Wellalage & Kumar, 2021). However, high ETRs constrain managers' ability to retain profits for personal benefits by requiring firms to pay a larger share of their earnings in taxes. At the same time, managers are encouraged to allocate retained earnings toward tax-efficient activities that mitigate tax burdens (Graham, 2003; Fu & Zhang, 2025). In many countries, tax policies are designed to encourage investment by allowing firms to deduct capital expenditures on fixed assets from taxable income (Zwick & Mahon, 2017; Fan & Liu, 2020). For firms perceiving tax rate as an obstacle, allocating resources to such investments serves as an effective strategic response, as these activities not only generate tax benefits but also signal compliance with governmental policy objectives (Hall & Jorgenson, 1967; Xu & Zwick, 2024).

On the other hand, firms that perceive tax administration obstacles often encounter frequent and disruptive inspections, leading to higher compliance costs and greater regulatory uncertainty (Richardson et al., 2015; Blaufus et al., 2023). These firms must allocate time and resources to prepare documentation, hire external experts (e.g., lawyers and accountants) , and manage interactions with tax authorities, which may divert attention from their core business activities (Belnap et al., 2024; Gallemore & Jacob, 2025). Inspections also make tax avoidance more difficult, limiting managers' ability to retain earnings for opportunistic purposes (Alm et al., 2016; Boning et al., 2020). As a result, managers are incentivized to redirect internal funds toward policy-aligned or deductible investments. Moreover, tax authorities can obtain information by inspecting a company's financial accounts and tangible assets (Zhang et al., 2022). Firms that perceive tax administration as an obstacle anticipate potential penalties and reputational risks if they provide insufficient or inaccurate disclosures. In response, they increase transparency and enhance the quality of the information they disclose (Hanlon et al., 2014; Zhang et al., 2022).

2.2 Corporate environmental activities

Environmental activities mainly contain green investment and environmental information disclosure. Green investment aims to reduce firms' environmental impact and support adaption to climate change (Yang, 2023). Firms invest in environmental projects to demonstrate compliance with regulations, thereby avoiding penalties or gaining policy incentives (Fu & Geng, 2019; Yin et al., 2025; Peng et al., 2025). From liquidity management perspective, firms primarily rely on retained earnings or internal funds to finance green investments, as these sources are less risky and more flexible compared to external financing (Noailly & Smeets, 2022; Bacchiocchi et al., 2024). In addition, internal funds often involve lower costs, face fewer tax or regulatory constraints than external financing (Ameli et al., 2021; Ullah et al., 2021; He et al., 2024). As environmental issues become more prominent, firms that perceive tax obstacles may choose to invest internal funds in green projects.

Environmental information disclosure contributes to environmental sustainability and is a part of environmental governance. Compared to green investment, environmental disclosure typically involves lower financial costs, making it a cheaper way to demonstrate environmental responsibility (Bansal & Clelland, 2004; Wu et al., 2020). Companies disclose such information to convey environmentally friendly and sustainable development signals to stakeholders (Clarkson et al., 2019; Huang et al., 2025). Firms under regulatory scrutiny usually disclose corporate social responsibility reports to indicate responsible governance and gain support from government authorities (Lyon & Maxwell, 2011; Marquis et al., 2016).

Similarly, when firms perceive tax obstacles, increased regulatory oversight incentivizes them to provide detailed environmental disclosures, thereby signaling compliance and mitigating the likelihood of additional regulatory scrutiny.

Based on the above analyses, firms perceiving tax rates and tax administration as obstacles tend to respond strategically to mitigate these pressures. Under such conditions, firms may increase green investment and environmental information disclosure to obtain tax deductions and signal compliance with regulatory requirements.

Collectively, we propose the following hypotheses:

H1a: Firms facing tax administration obstacles will be more likely to engage in environmental investment.

H1b: Firms facing tax rate obstacles will be more likely to engage in environmental investment.

H2a: Firms facing tax administration obstacles will be more likely to disclose environmental information.

H2b: Firms facing tax rate obstacles will be more likely to disclose environmental information.

3. Data, variables, and models

3.1 Data sources

Our empirical analysis employed the data from the recent wave of the Business Environment and Enterprise Performance Surveys (BEEPS), which included a Green Economy Module on green investment and management practices. The survey was conducted by the European Bank for Reconstruction and Development, the European Investment Bank, and the World Bank Group between 2018 and 2020. Besides the green module, the BEEPS provides data on financing sources and variables reflecting the business environment for firms in the non-agricultural and non-finance private economy. After deleting firms with missing values, we obtain a sample of 26,145 firms covering 41 countries. See Appendix Table A1 for the sample distribution by country.

3.2 Key variables

In the survey, firms reported whether they had adopted a set of ten environmentally friendly measures. These measures included heating and cooling improvements; more on-site climate-friendly energy generation; machinery and equipment upgrades; energy management practices; waste minimization, recycling and waste management; air pollution control measures; upgrades of vehicles; improvements to lighting systems; water management and other pollution control measures. Firms were also asked whether they completed four types of external audits regarding energy consumption, water usage, CO_2 emissions, or other pollutants. Based on these responses, two key environmental variables are constructed as follows:

GI – A dummy variable equaling one if the number of environmentally friendly measures adopted by a firm exceeds the industry average, and 0 otherwise.

Disclosure – A dummy variable equaling one if the number of external environmental audits issued by a firm exceeds the industry average, and 0 otherwise.

Tax obstacle variables are based on firms' answers to the questions about whether tax rates or tax administration being the obstacles to their daily operations.

Tax-Rate – A dummy variable equaling one for firms perceiving tax rates as very severe, major, or moderate obstacles to the operations, and zero otherwise.

Tax-Administration – A dummy variable equaling one for firms perceiving tax administration as very severe, major or moderate obstacles to the operations, and zero otherwise.

We tabulate the sample distribution by the two tax obstacles as follows. The interdependence between tax rate and administration obstacles are reflected by the great proportions of firms (71.7%) that experienced none of the two types of obstacles or both of them. However, 22.5% of the sample firms only faced tax rate obstacles, indicating the distinct role of tax rates in shaping firms' perceptions of fiscal barriers.

		Tax-Administration	
		= 0	= 1
Tax-Rate	= 0	9641	1230
	= 1	5877	9397

3.3 Control variables

Following prior studies (Ma et al., 2024; Zhang, 2023), this paper includes a set of firm-level characteristics as control variables that may influence corporate environmental activities. These variables include firm size (*Small-Firm*, *Medium-Firm*), firm age (*Firm-Age*), export orientation (*Exporter*), ownership structure (*Government-Ownership*, *Foreign-Ownership*), legal status (*Corporation*), group affiliation (*Part*), leadership gender (*Female-Led*), market competition (*Competition*), and firms' location (*Small-City*, *Medium-City*). Appendix Table A2 reports the definitions of the key and control variables.

3.4 Econometric models

Since the dependent variables GI and *Disclosure* are binary, we apply a logit model to evaluate the impact of tax obstacles on firms' environmental activities. The baseline model is in the form of:

$$\Pr(Environmental\text{-}Activity_i = 1 | Tax\text{-}Obstacles_i, \boldsymbol{X}) = f(Z_i) \quad (1)$$

$$Z_i = a_0 + a_1 Tax\text{-}Obstacles_i + \sum_{k=1}^{m} b_k X_i + U_i \quad (2)$$

where Pr (•) is a logistical distribution function, conditional on $Tax\text{-}Obstacles$, and control variables and dummies for countries and industrial sectors (the vector $\boldsymbol{X}$); U_i is an error term. There are two models: Model A for GI and Model B for *Disclosure*. For each model, there are two regressions with tax obstacles represented by *Tax-Rates* and *Tax-Administration*, respectively.

4. Empirical analysis

4.1 Descriptive statistics analysis

Table 1 presents descriptive statistical analysis. The mean value of *GI* is 0.43, with a standard deviation of 0.49, indicating that 43% of firms in the sample adopted more green investment measures than the industry average. The mean value of *Disclosure* is 0.16, suggesting that 16% of firms conducted more environmental disclosure than their peers. Regarding perceived tax obstacles, *Tax-Administration* has a mean of 0.41, while *Tax-Rates* is higher at 0.58. This suggests that more than half of the firms perceive tax rates as an obstacle to their daily operations, and a substantial share of sample firms view tax administration procedures as an obstacle. The relatively high mean values of these two tax obstacle variables highlight the widespread concern among firms about the fiscal environment in which they operate (Mohammed & Bunyaminu, 2021).

Table 1. Descriptive statistics.

Variables	Mean	Std. D.	Min	Q1	Median	Q3	Max
GI	0.43	0.49	0.00	0.00	0.00	1.00	1.00
Disclosure	0.16	0.36	0.00	0.00	0.00	0.00	1.00

Tax-Rates	0.58	0.49	0.00	0.00	1.00	1.00	1.00
Tax-Administration	0.41	0.49	0.00	0.00	0.00	1.00	1.00
Small-Firm	0.46	0.50	0.00	0.00	0.00	1.00	1.00
Medium-Firm	0.33	0.47	0.00	0.00	0.00	1.00	1.00
Firm-Age	2.79	0.89	0.00	2.30	2.89	3.26	7.62
Exporter	0.23	0.42	0.00	0.00	0.00	0.00	1.00
Government-Ownership	0.01	0.11	0.00	0.00	0.00	0.00	1.00
Foreign-Ownership	0.08	0.28	0.00	0.00	0.00	0.00	1.00
Corporation	0.58	0.49	0.00	0.00	1.00	1.00	1.00
Part	0.11	0.32	0.00	0.00	0.00	0.00	1.00
Female-Led	0.16	0.37	0.00	0.00	0.00	0.00	1.00
Competition	0.45	0.50	0.00	0.00	0.00	1.00	1.00
Small-City	0.42	0.49	0.00	0.00	0.00	1.00	1.00
Medium-City	0.19	0.39	0.00	0.00	0.00	0.00	1.00

4.2 Main results

Table 2 reports the estimation results for GI (Model A) and *Disclosure* (Model B). The coefficients of *Tax-Rates* and *Tax-Administration* are all significant and positive, indicating the failure to reject the relevant four hypotheses. Thus, firms that perceive tax rates or tax administration as obstacles are more likely to engage in environmentally friendly investments and to disclose environmental information. Specifically, tax rate obstacles increase the probability of investing in green technology and disclosing environmental information by 4.26 and 2.63 percentage points, respectively; while the counterparts for tax administration obstacles are 4.13 and 2.62, respectively. For each environmental activity, tax rate obstacle has a stronger impact than tax administration activity.

For control variables, the coefficients on *Firm-Age*, *Exporter*, *Corporation*, *Part* are positive and significant, meaning that firms that are older, export-oriented, organized as corporations, or part of larger business groups are more likely to engage in both green investment and environmental disclosure. The coefficients on *Small-Firm*, *Medium-Firm*, and *Competition* are negative and significant, indicating that smaller firms and those facing intense competition are less likely to engage in green investment and environmental disclosure.

Table 2. Estimated marginal effects on GI (Model A) and *Disclosure* (Model B).

Variable	*GI*		*Disclosure*	
Tax-Rates	0.0426***		0.0263***	
	(0.0072)		(0.0043)	
Tax-Administration		0.0413***		0.0262***
		(0.0073)		(0.0042)
Small-Firm	-0.2617***	-0.2613***	-0.1046***	-0.1045***
	(0.0096)	(0.0096)	(0.0054)	(0.0054)
Medium-Firm	-0.1262***	-0.1255***	-0.0569***	-0.0566***
	(0.0093)	(0.0093)	(0.0049)	(0.0049)
Firm-Age	0.0113***	0.0116***	0.0193***	0.0194***
	(0.0040)	(0.0040)	(0.0023)	(0.0023)
Exporter	0.1039***	0.1037***	0.0411***	0.0409***
	(0.0086)	(0.0087)	(0.0048)	(0.0048)
Government-Ownership	0.0517	0.0505	0.0256*	0.0248*
	(0.0314)	(0.0315)	(0.0141)	(0.0142)
Foreign-Ownership	0.0054	0.0043	0.0335***	0.0327***
	(0.0123)	(0.0123)	(0.0061)	(0.0061)
Corporation	0.0377***	0.0375***	0.0119**	0.0117**
	(0.0091)	(0.0091)	(0.0054)	(0.0054)
Part	0.0632***	0.0616***	0.0154***	0.0141**
	(0.0108)	(0.0108)	(0.0058)	(0.0059)
Female-Led	-0.0185**	-0.0190**	-0.0041	-0.0044
	(0.0093)	(0.0093)	(0.0055)	(0.0055)
Competition	-0.0390***	-0.0393***	-0.0099**	-0.0102**
	(0.0071)	(0.0071)	(0.0042)	(0.0042)
Small-City	0.0498***	0.0500***	0.0282***	0.0282***
	(0.0086)	(0.0086)	(0.0052)	(0.0052)
Medium-City	0.0377***	0.0370***	0.0243***	0.0238***
	(0.0100)	(0.0100)	(0.0058)	(0.0058)
Country dummies	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes
pseudo-R^2	0.0937	0.0936	0.1421	0.1421
Observations	26145	26145	26145	26145

Note: This table reports the logit regression results examining the impact of perceived tax obstacles on firms' environmental activities. *GI* equals 1 if a firm adopts more environmentally friendly investment measures than the industry average and 0 otherwise. *Disclosure* measures whether a firm discloses more environmental information than its industry peers. *Tax-Rates* equals 1 if a firm perceives tax rates as an obstacle, and *Tax-Administration* equals 1 if a firm perceives tax administration as an obstacle; both equal 0 otherwise. *, **, and *** stand for the significance level of 10%, 5%, and 1%, respectively. Robust standard errors are in brackets.

4.3 Mechanism analysis

Tax rates and administration may affect environmental behaviors through their impact on firms' liquidity management. In the survey, firms reported whether they used internal funds or retained earnings to purchase fixed assets (*CapEx*), which serves as a proxy for firms' liquidity management strategy. We further estimated the effect of tax-related obstacles on firms' capital expenditures, and the results are presented in Table 3. The coefficients on *Tax-Rates* and *Tax-Administration* are positive and significant, implying that firms facing tax-related obstacles are more likely to use internal funds for capital expenditures, probably including green investment.

Table 3. Estimated marginal effects on CapEx.

Variable	*CapEx*	
Tax-Rates	0.0333***	
	(0.0059)	
Tax-Administration		0.0184***
		(0.0059)
Small-Firm	-0.1366***	-0.1363***
	(0.0074)	(0.0074)
Medium-Firm	-0.0632***	-0.0627***
	(0.0070)	(0.0070)
Firm-Age	-0.0113***	-0.0112***
	(0.0032)	(0.0031)
Exporter	0.0709***	0.0707***
	(0.0066)	(0.0066)
Government-Ownership	-0.0085	-0.0092
	(0.0218)	(0.0219)
Foreign-Ownership	0.0190**	0.0176*
	(0.0091)	(0.0091)
Corporation	-0.0018	-0.0020
	(0.0074)	(0.0074)
Part	0.0141*	0.0129
	(0.0082)	(0.0082)
Female-Led	-0.0113	-0.0114
	(0.0073)	(0.0073)
Competition	-0.0212***	-0.0211***
	(0.0057)	(0.0057)
Small-City	0.0008	0.0006
	(0.0070)	(0.0070)
Medium-City	-0.0070	-0.0076
	(0.0079)	(0.0079)
Country dummies	Yes	Yes
Sector dummies	Yes	Yes
pseudo-R^2	0.1268	0.1261
Observations	26145	26145

Note: This table reports the results of regressions examining the effect of perceived tax obstacles on firms' use of internal funds for capital expenditures (*CapEx*). *, **, and *** stand for the significance level of 10%, 5%, and 1%, respectively. Robust standard errors are in brackets.

4.4 Additional analysis

4.4.1 Joint Impact

There is probably a joint impact of tax rate and administration obstacles on environmental activities. In response, we re-estimated Models A and B by using the following interaction terms: Rates (= 0)-Administration (= 0) (the base), Rates (= 0)-Administration (= 1), Rates (= 1)-Administration (= 0), and Rates (= 1)-Administration (= 1). In Table 4, the interaction term for firms facing both obstacles simultaneously (Rates = 1 and Administration = 1) is positive and statistically significant, suggesting that the combined presence of both types of tax obstacles significantly increases the likelihood of green investment and environmental information disclosure. High perceived tax rates encourage managers to allocate internal funds toward tax-efficient activities, while perceived tax administration obstacles heighten regulatory scrutiny. Together, these pressures reinforce environmental investments and disclosure, producing stronger pro-environmental behavior than either obstacle alone.

Table 4. Estimated marginal effects on GI and Disclosure for models including interaction terms between tax rate and tax administration obstacles.

Variable	*GI*	*Disclosure*
Rates (= 1)-Administration (= 0)	0.0575***	0.0291***
	(0.0162)	(0.0097)
Rates (= 0)-Administration (= 1)	0.0394***	0.0216***
	(0.0090)	(0.0054)
Rates (= 1)-Administration (= 1)	0.0585***	0.0369***
	(0.0086)	(0.0050)
Small-Firm	-0.2619***	-0.1046***
	(0.0096)	(0.0054)
Medium-Firm	-0.1262***	-0.0568***
	(0.0093)	(0.0049)
Firm-Age	0.0116***	0.0194***
	(0.0040)	(0.0023)
Exporter	0.1037***	0.0408***
	(0.0087)	(0.0048)
Government-Ownership	0.0517	0.0255*
	(0.0315)	(0.0141)
Foreign-Ownership	0.0056	0.0335***
	(0.0123)	(0.0061)
Corporation	0.0375***	0.0117**
	(0.0091)	(0.0053)
Part	0.0629***	0.0150**
	(0.0108)	(0.0058)
Female-Led	-0.0187**	-0.0042
	(0.0093)	(0.0055)
Competition	-0.0395***	-0.0103**
	(0.0071)	(0.0042)
Small-City	0.0502***	0.0285***

	(0.0086)	(0.0052)
Medium-City	0.0373***	0.0244***
	(0.0100)	(0.0058)
Country dummies	Yes	Yes
Sector dummies	Yes	Yes
pseudo-R^2	0.0941	0.1428
Observations	26145	26145

Note: This table reports the results of regressions examining the joint impact of perceived tax rate and tax administration obstacles on firms' environmental activities. *, **, and *** stand for the significance level of 10%, 5%, and 1%, respectively. Robust standard errors are in brackets.

4.4.2 Impact of the gap between perceived and actual tax obstacles

To examine how firms' perception bias regarding tax obstacles influences environmental behavior, we construct measures of the gap between perceived and actual tax obstacles. Specifically, we regress perceived tax obstacles on observable indicators of actual tax burdens and use the residuals as gap measures (Wang et al., 2024). The specification of this regression is similar to Model (1). A positive residual indicates that a firm's perceived tax obstacles exceed its actual tax burden, while a negative residual indicates that perceived obstacles are below the objective burden. Actual tax obstacles are measured using two survey-based indicators: (1) the number of tax administration visits, reflecting the frequency of inspections, and (2) the percentage of total annual sales paid as informal payments to public officials to "get things done". Higher values of these indicators reflect greater actual tax obstacles faced by firms (Alm et al., 2016; Xiang, 2021). Based on these regressions, we construct *Gap–Tax–Rate* and *Gap–Tax–Admin*, representing perception gaps in tax rate and tax administration obstacles, respectively.

Table 5 reports the results. The coefficients on both gap variables are statistically positive, indicating that larger gaps between perceived and actual tax obstacles are associated with a higher likelihood of engaging in green investment and environmental disclosure. These findings suggest that firms' perceptions of tax pressure, beyond the objective tax environment, play an important role in shaping environmental behavior.

Table 5. Estimated marginal effects based on gap between perceived and actual tax obstacles

Variable	*GI*		*Disclosure*	
Gap-Tax-Rate	0.0165***		0.0099***	
	(0.0033)		(0.0020)	
Gap-Tax-Admin		0.0163***		0.0086***
		(0.0033)		(0.0019)
Small-Firm	-0.2612***	-0.2613***	-0.1044***	-0.1045***
	(0.0097)	(0.0097)	(0.0054)	(0.0054)
Medium-Firm	-0.1249***	-0.1252***	-0.0555***	-0.0556***
	(0.0094)	(0.0094)	(0.0049)	(0.0050)
Firm-Age	0.0091**	0.0092**	0.0173***	0.0173***
	(0.0041)	(0.0041)	(0.0023)	(0.0023)
Exporter	0.1047***	0.1045***	0.0397***	0.0396***
	(0.0087)	(0.0087)	(0.0048)	(0.0048)
Government-Ownership	0.0428	0.0429	0.0224	0.0224

	(0.0316)	(0.0317)	(0.0142)	(0.0142)
Foreign-Ownership	0.0029	0.0030	0.0319***	0.0318***
	(0.0124)	(0.0124)	(0.0061)	(0.0062)
Corporation	0.0384***	0.0384***	0.0129**	0.0129**
	(0.0092)	(0.0092)	(0.0054)	(0.0054)
Part	0.0613***	0.0613***	0.0126**	0.0124**
	(0.0110)	(0.0110)	(0.0059)	(0.0059)
Female-Led	-0.0189**	-0.0189**	-0.0029	-0.0029
	(0.0094)	(0.0094)	(0.0055)	(0.0055)
Competition	-0.0368***	-0.0367***	-0.0086**	-0.0086**
	(0.0072)	(0.0072)	(0.0042)	(0.0042)
Small-City	0.0514***	0.0514***	0.0285***	0.0283***
	(0.0086)	(0.0086)	(0.0052)	(0.0052)
Medium-City	0.0382***	0.0383***	0.0232***	0.0230***
	(0.0101)	(0.0101)	(0.0058)	(0.0058)
Country dummies	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes
pseudo-R^2	0.0946	0.0945	0.1423	0.1421
Observations	26145	26145	26145	26145

Note: This table presents regression results examining how the gap between perceived and actual tax obstacles affects firms' environmental activities. *, **, and *** stand for the significance level of 10%, 5%, and 1%, respectively. Robust standard errors are in brackets.

4.5 Robustness checks

4.5.1 Controlling for endogeneity

To address potential endogeneity arising from systematic differences between firms that perceived tax obstacles and those that did not, we applied a Propensity Score Matching (PSM) approach to estimate Models A and B. Specifically, we applied 1:1 nearest neighbor matching without replacement to match firms that perceived tax obstacles with observationally similar firms that did not, improving the comparability between treatment and control groups. The new estimated results (Appendix Table A3) are consistent with the baseline results.

4.5.2 Alternative measure

In the main regressions, environmental behavior is measured as whether a firm's activities exceed the industry average. As a robustness check, we replaced the average with the industry median. The results, reported in the first four columns of Appendix Table A4, are consistent with the main findings. Furthermore, the main results are based on measures of environmental activities and tax obstacles over the past years. Although perceived tax obstacles likely reflect persistent institutional conditions and their impact on environmental behaviors may not change drastically in the short run, this may still lead to a timing mismatch between the two sets of variables and raise concerns about the direction of causality. To improve timing alignment, we used a new environmental variable, *Environmental-Strategy*, which reflects firms' future commitments to environmental issues based on their responses to whether they have strategic objectives mentioning environmental or climate change issues. We re-estimated Models A and B using the new environmental variable and reported the results in the last two columns of Appendix Table A4. The findings imply that tax obstacles affect firms' future environmental

commitments, providing support for a positive relationship between tax obstacles and environmental activities.

We further replace the binary measures of perceived tax obstacles with ordered responses reflecting the intensity of perceived obstacles. *Tax-Rate-Intensity* and *Tax-Admin-Intensity* represent firms' perceived severity of tax rate and tax administration obstacles, respectively. They are measured on a 0–4 scale ranging from "No obstacle" to "Very severe obstacle". Appendix Table A5 presents the estimated results. The coefficients on both ordered variables remain positive and significant, consistent with the baseline results, confirming the positive association between perceived tax obstacles and firms' environmental activities.

5. Conclusion

This study investigated the impact of perceived tax obstacles—due to tax rates and tax administration—on corporate environmental activities, including green investment and environmental information disclosure. We find that firms perceiving these tax obstacles are more likely to engage in both types of environmental activities. The results remain robust when accounting for potential endogeneity and using alternative measures for key variables. We further examine the underlying mechanisms and find that tax obstacles increase firms' incentives to allocate internal funds for environmental initiatives. This study provides evidence that tax-related obstacles motivate firms to strategically allocate resources toward environmental initiatives, and highlights the importance of considering firms' subjective perceptions of tax pressures when designing policies to promote green investment and enhance environmental information disclosure.

Although this study is the first to examine how perceived tax obstacles, including tax rates and administrative obstacles, affect environmental activities, some limitations and caveats should be noted. This study employs cross-sectional data for empirical analysis; thus, we cannot fully rule out potential reverse causality issues. Future study can use the panel data to control fully for firm heterogeneity and test the lagged impact of tax obstacles on environmental activities. Additionally, firms' perception about tax obstacles may depend on some factors, such as cultural values, which may affect the link between these obstacles and environmental activities. This is another venue left for future research.

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Appendix

Table A1. Sample distribution.

Country	Survey years	Observations
Albania	2018, 2019	368
Armenia	2019, 2020	519
Azerbaijan	2019, 2020	204
Belarus	2018, 2019	590
Bosnia and Herzegovina	2019	352
Bulgaria	2019, 2020	736
Croatia	2018, 2019	404
Cyprus	2018, 2019	347
Czech Republic	2018, 2019, 2020	498
Egypt	2019, 2020	3016
Estonia	2018, 2019	353
Georgia	2019, 2020	561
Greece	2018, 2019	595
Hungary	2018, 2019, 2020	790
Italy	2018, 2019	742
Jordan	2019	255
Kazakhstan	2019	1376
Kyrgyz	2018, 2019	222
Latvia	2018, 2019	355
Lebanon	2019, 2020	349
Lithuania	2018, 2019	531
Malta	2019	356
Moldova	2019	236
Mongolia	2018, 2019	331
Montenegro	2018, 2019	359
Morocco	2018,2019, 2020	150
North Macedonia	2018, 2019	612
Poland	2019	353
Portugal	2018, 2019, 2020	1303
Romania	2018, 2019, 2020	1043
Russia	2018, 2019	757
Serbia	2018, 2019	1303
Slovak Republic	2019, 2020	356
Slovenia	2018, 2019	410
Tajikistan	2019	402
Tunisia	2019, 2020	302
Turkey	2018, 2019	563
Turkish Cypriot Community	2019	1331
Ukraine	2018, 2019	1287
Uzbekistan	2019	1192
West Bank and Gaza	2019	336
Sum		26145

Table A2. Variable definitions.

Variable	Definition
GI	= 1 for firms with greater GI score than the industry average, and 0 otherwise.
Disclosure	= 1 for firms with greater disclosure score than the industry average, and 0 otherwise.
Tax-Rates	= 1 for firms perceiving tax rates being very severe, major obstacles, or moderate to the operations, and 0 otherwise.
Tax-Administration	= 1 for firms perceiving tax administration being very severe, major obstacles, or moderate to the operations, and 0 otherwise.
Small-Firm	= 1 for firms with 5-19 employees, and 0 otherwise.
Medium-Firm	= 1 for firms with 20-99 employees, and 0 otherwise.
Firm-Age	Firm age in years and logarithm.
Exporter	= 1 for exporters, and 0 otherwise.
Government-Ownership	= 1 for firms owned partly by governments, and 0 otherwise.
Foreign-Ownership	= 1 for firms owned partly by foreign investors, and 0 otherwise.
Corporation	= 1 for shareholding firms, and 0 otherwise.
Part	=1 for firms belonging to larger establishments, and 0 otherwise.
Female-Led	= 1 for firms with female top managers, and 0 otherwise.
Competition	= 1 for firms with too many competitors to count, and 0 otherwise.
Small-City	= 1 for firms in the location with population less than 50,000.
Medium-City	= 1 for firms in the location with population between 50,000 and 250,000.

Table A3. Estimated marginal effects based on the PSM approach.

Variable	*GI*		*Disclosure*	
Tax-Rates	0.0469***		0.0262***	
	(0.0081)		(0.0047)	
Tax-Administration		0.0411***		0.0265***
		(0.0078)		(0.0045)
Small-Firm	-0.2650***	-0.2483***	-0.1023***	-0.1002***
	(0.0105)	(0.0107)	(0.0058)	(0.0059)
Medium-Firm	-0.1217***	-0.1171***	-0.0523***	-0.0540***
	(0.0102)	(0.0104)	(0.0054)	(0.0054)
Firm-Age	0.0168***	0.0104**	0.0207***	0.0187***
	(0.0048)	(0.0044)	(0.0027)	(0.0025)
Exporter	0.1010***	0.1059***	0.0395***	0.0397***
	(0.0099)	(0.0096)	(0.0054)	(0.0052)
Government-Ownership	0.0536*	0.0606	0.0275*	0.0345*
	(0.0318)	(0.0445)	(0.0142)	(0.0190)
Foreign-Ownership	0.0049	0.0058	0.0336***	0.0277***
	(0.0127)	(0.0144)	(0.0063)	(0.0071)
Corporation	0.0209**	0.0374***	0.0088	0.0124**
	(0.0104)	(0.0098)	(0.0062)	(0.0057)
Part	0.0646***	0.0700***	0.0148**	0.0145**
	(0.0119)	(0.0118)	(0.0064)	(0.0063)
Female-Led	-0.0244**	-0.0109	0.0000	-0.0122**
	(0.0104)	(0.0105)	(0.0060)	(0.0062)
Competition	-0.0285***	-0.0371***	-0.0113**	-0.0063
	(0.0080)	(0.0078)	(0.0047)	(0.0045)
Small-City	0.0525***	0.0441***	0.0261***	0.0288***
	(0.0096)	(0.0096)	(0.0057)	(0.0058)
Medium-City	0.0328***	0.0309***	0.0235***	0.0246***
	(0.0105)	(0.0113)	(0.0059)	(0.0065)
Country dummies	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes
pseudo-R^2	0.0947	0.0946	0.1447	0.1405
Observations	21742	21254	21742	21254

Note: This table presents the results of Propensity Score Matching (PSM) estimations for Models A (*GI*) and B (*Disclosure*). *, **, and *** stand for the significance level of 10%, 5%, and 1%, respectively. Robust standard errors are in brackets.

Table A4. Estimated marginal effects for alternative measures of environmental behavior.

Variable	*GI-Median*		*Dis-Median*		*Environmental-Strategy*	
Tax-Rates	0.0459***		0.0263***		0.0125***	
	(0.0073)		(0.0043)		(0.0045)	
Tax-Administration		0.0431***		0.0262***		0.0335***
		(0.0073)		(0.0042)		(0.0044)
Small-Firm	-0.2567***	-0.2562***	-0.1046***	-0.1045***	-0.1215***	-0.1216***
	(0.0097)	(0.0097)	(0.0054)	(0.0054)	(0.0056)	(0.0056)
Medium-Firm	-0.1229***	-0.1221***	-0.0569***	-0.0566***	-0.0581***	-0.0580***
	(0.0094)	(0.0094)	(0.0049)	(0.0049)	(0.0052)	(0.0052)
Firm-Age	0.0136***	0.0138***	0.0193***	0.0194***	0.0088***	0.0091***
	(0.0041)	(0.0040)	(0.0023)	(0.0023)	(0.0024)	(0.0024)
Exporter	0.1024***	0.1022***	0.0411***	0.0409***	0.0584***	0.0579***
	(0.0087)	(0.0087)	(0.0048)	(0.0048)	(0.0049)	(0.0049)
Government-Ownership	0.0425	0.0413	0.0256*	0.0248*	0.0595***	0.0589***
	(0.0318)	(0.0318)	(0.0141)	(0.0142)	(0.0165)	(0.0166)
Foreign-Ownership	0.0098	0.0086	0.0335***	0.0327***	0.0351***	0.0353***
	(0.0123)	(0.0123)	(0.0061)	(0.0061)	(0.0065)	(0.0065)
Corporation	0.0377***	0.0374***	0.0119**	0.0117**	0.0209***	0.0207***
	(0.0091)	(0.0091)	(0.0054)	(0.0054)	(0.0059)	(0.0059)
Part	0.0601***	0.0585***	0.0154***	0.0141**	0.0464***	0.0455***
	(0.0108)	(0.0108)	(0.0058)	(0.0059)	(0.0060)	(0.0060)
Female-Led	-0.0190**	-0.0195**	-0.0041	-0.0044	0.0004	0.0000
	(0.0093)	(0.0093)	(0.0055)	(0.0055)	(0.0058)	(0.0058)
Competition	-0.0369***	-0.0372***	-0.0099**	-0.0102**	-0.0057	-0.0066
	(0.0071)	(0.0071)	(0.0042)	(0.0042)	(0.0045)	(0.0045)
Small-City	0.0488***	0.0490***	0.0282***	0.0282***	0.0038	0.0041
	(0.0086)	(0.0086)	(0.0052)	(0.0052)	(0.0055)	(0.0055)
Medium-City	0.0407***	0.0400***	0.0243***	0.0238***	0.0065	0.0060
	(0.0100)	(0.0100)	(0.0058)	(0.0058)	(0.0062)	(0.0061)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
pseudo-R^2	0.0912	0.0911	0.1421	0.1421	0.1128	0.1149
Observations	26145	26145	26145	26145	26145	26145

Note: This table reports the effects of perceived tax obstacles on firms' environmental behavior using alternative dependent variables. Columns 1–4 use *GI-Median* and *Dis-Median*, indicating whether a firm's environmental activities or disclosure exceed the industry median. Columns 5–6 use *Environmental-Strategy*, capturing firms' future commitments based on strategic objectives mentioning environmental or climate issues. *, **, and *** stand for the significance level of 10%, 5%, and 1%, respectively. Robust standard errors are in brackets.

Table A5. Estimated marginal effects of ordered tax obstacles on environmental behavior

Variable	*GI*		*Disclosure*	
Tax-Rate-Intensity	0.0152***		0.0119***	
	(0.0027)		(0.0016)	
Tax-Admin-Intensity		0.0173***		0.0125***
		(0.0028)		(0.0016)
Small-Firm	-0.2622***	-0.2610***	-0.1052***	-0.1043***
	(0.0097)	(0.0096)	(0.0054)	(0.0053)
Medium-Firm	-0.1263***	-0.1254***	-0.0572***	-0.0566***
	(0.0093)	(0.0093)	(0.0049)	(0.0049)
Firm-Age	0.0115***	0.0117***	0.0194***	0.0194***
	(0.0040)	(0.0040)	(0.0023)	(0.0023)
Exporter	0.1042***	0.1040***	0.0411***	0.0409***
	(0.0087)	(0.0087)	(0.0048)	(0.0048)
Government-Ownership	0.0518*	0.0513	0.0260*	0.0254*
	(0.0314)	(0.0315)	(0.0141)	(0.0142)
Foreign-Ownership	0.0059	0.0045	0.0343***	0.0329***
	(0.0123)	(0.0123)	(0.0061)	(0.0061)
Corporation	0.0378***	0.0380***	0.0119**	0.0120**
	(0.0091)	(0.0091)	(0.0054)	(0.0054)
Part	0.0629***	0.0610***	0.0154***	0.0136**
	(0.0108)	(0.0108)	(0.0058)	(0.0058)
Female-Led	-0.0188**	-0.0191**	-0.0043	-0.0046
	(0.0093)	(0.0093)	(0.0055)	(0.0055)
Competition	-0.0393***	-0.0394***	-0.0103**	-0.0105**
	(0.0071)	(0.0071)	(0.0042)	(0.0042)
Small-City	0.0497***	0.0497***	0.0284***	0.0282***
	(0.0086)	(0.0086)	(0.0052)	(0.0052)
Medium-City	0.0381***	0.0371***	0.0252***	0.0241***
	(0.0100)	(0.0100)	(0.0058)	(0.0058)
Country dummies	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes
pseudo-R^2	0.0936	0.0937	0.1429	0.1430
Observations	26145	26145	26145	26145

Note: This table reports the estimation results using ordered measures of tax obstacles as alternative independent variables. *Tax-Rate-Intensity* and *Tax-Admin-Intensity* range from 0 ("No obstacle") to 4 ("Very severe obstacle"), reflecting increasing perceived tax pressure. *, **, and *** stand for the significance level of 10%, 5%, and 1%, respectively. Robust standard errors are in brackets.