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Are green and healthy building labels counterproductive in emerging markets? An examination of office rental contracts in India

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ABSTRACT

Financial prudence compels businesses to improve their Environmental, Social, and Governance (ESG) performance when the marginal benefits, pecuniary or non-pecuniary, exceed the marginal costs. For many firms, renting green offices is a feasible ESG activity which may increase their willingness to pay higher rents. Analyzing over 17,000 green rental contracts in India between 2010 and 2022, we find that rents in green-labeled assets and those with health certification command significant premiums between 4 and 21%. However, green rents increased much faster compared to their non-green counterparts, and the propensity to rent green varies significantly across industry segments. We further examine how the market for green offices evolved after a mandatory ESG Disclosure Requirement was enacted in India in 2021. We find that suppliers (landlords) benefited from the regulation by disproportionately increasing rental rates. Existing tenants and foreign firms ended up paying higher rental prices while most other firms, including the assumed target groups of the new policy, redirected their green commitment away from green buildings. Although the policy may yield more positive results in the longer run, a reduced propensity to rent green offices is the opposite of what the ESG Disclosure Requirement tried to achieve.

1. Introduction

> "The social responsibility of business is to increase profits."
> -Milton Friedman, (The New York Times, 1970)

> "Businesses cannot be successful when the society around them fails."
> - Responsible Business Summit

Milton Friedman famously argued that businesses should focus on profit-making, leaving broader goals to governments (Tilman, 1976). Although Friedman's original argument has crystallized into a trope that is often recited out of context, firms have increasingly started adopting Corporate Social Responsibility (CSR) and Environmental, Social and Governance (ESG) goals (Russo-Spena et al., 2018). While CSR and ESG are voluntary commitments, their social or environmental impact is a desired outcome of assuming responsibility for broader concerns. Environmental benefits include energy efficiency, resource preservation, reduced local pollution and a reduction in carbon emissions. In recent decades, green buildings have emerged as a prominent means for achieving sustainability goals (Sharma, 2018). According to the Intergovernmental Panel on Climate Change (IPCC, 2023), buildings were responsible for 31% of global emissions. Buildings are also the fastest-growing sources of emissions. Seven out of 17 sustainable development goals (SDGs) established by the United Nations are related to buildings.[1]. As a result, several agencies have launched green-building certification systems that award green labels to buildings that qualify their respective standards. "Leadership in Energy & Environmental Design" (LEED) by the United States Green Building Council (USGBC), and WELL[2] label by the International Well-being Institute, have emerged as popular green building labels. Governments across the globe have launched policies to promote sustainable or green building practices. The European Union's Energy Performance of Buildings

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[1] https://worldgbc.org/sustainable-development-goals/These goals include Sustainable Cities and Communities, Climate Action, Clean Water and Sanitation, Good Health, Renewable Energy, Innovation and Infrastructure, and Responsible Consumption.

[2] WELL, although expressed in uppercase, is not an abbreviation. It refers to "well-being" of building occupants and is simply a green-building label. See https://www.usgbc.org/articles/what-well.

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Directive (EPBD) in Europe, the National Strategy for Energy Efficiency (NSEE) in Australia, the New Zealand Energy Efficiency and Conservation Strategy (NZEECS), and the Energy Conservation Amendment Bill (2022) in India are some examples. These broad policies have led to specific regulations to promote sustainable practices in the building and other sectors. Kok et al. (2011) shows that by 2010, 30% (11%) of offices in the US were already certified by Energy Star (LEED) ratings. Green buildings that have earned green certifications (e.g. LEED, WELL, etc.) by a rating agency (e.g. USGBC, IWBI, etc.) are termed as Green-labeled. Anecdotal evidence from recent years suggests that 38% of office spaces in USA[3] and 31% in India[4] are now green-labeled.

Sustainable practices improve firm performance (Mitra, 2022). Issuance of green bonds benefits existing shareholders of a firm (Tang and Zhang, 2020). Green loans are associated with more favorable underwriting standards (Devine and McCollum, 2022). Similarly, green buildings may have positive business and financial implications, e.g., higher energy efficiency, lower utility costs, more stable cash flows, higher occupancy, superior occupant well-being, etc. (Eichholtz et al., 2013, 2010; Fuerst et al., 2020; Fuerst and McAllister, 2011; Das and Wiley, 2014).

However, some studies (Chegut et al., 2019; Eichholtz et al., 2010) highlight increased costs associated with rendering a facility green. Thus, financial prudence calls for the marginal benefits of going green to exceed the marginal costs to ensure a positive NPV. When the estimated NPV is negative, landlords and tenants are faced with an ethical dilemma: Should they focus on broader sustainability goals, or on maximizing the immediate value of their shareholders? Ethical firms will redirect their resources to other Environmental, Social, and Governance (ESG) goals beyond green offices if they imply a negative NPV. Other firms will stop pursuing this goal altogether. Such situations impede the growth of green buildings. Thus, not only should green buildings ensure financial well-being, but the benefits should also be equitably distributed across stakeholders. When there are no perceived business benefits of green buildings, government policies may create incentives by mandating green practices (Thornton et al., 2007). However, the policy goals must be equitable across the demand and supply side players. Unless their policy implications are thoroughly validated, such policies often lead to a mismatch between decision-makers and affected communities (Faust and Smardon, 2001).

Just behind China and the USA, India is the third largest emitter of CO_2.[5] Climate change poses an immense sovereign risk to such nations (Boehm, 2022). India is also witnessing unprecedented growth in the supply of green buildings and was ranked third in green building spaces by USGBC.[6] Yet, research on green buildings have mostly focused on industrialized nations. and reliable evidence on green buildings in emerging markets -which are also major CO_2 emitters-is scarce. One study on green building pricing in an emerging market was presented by Costa et al. (2018) who report higher green premium for LEED-labeled buildings due to a relatively shortage of such buildings in the central business districts of global financial centers such as Sao Paulo.

Through the Companies Act 2013,[7] India became the first country to mandate large firms to allocate a part of their revenues towards CSR. In 2021, the Securities and Exchange Board of India (SEBI) announced a new framework that requires large listed firms to include an ESG disclosure in their statutory reports. There is ample anecdotal evidence[8] that firms chose to disclose renting green offices as an ESG activity. We examine how the behavior of the supply (landlord) and different segments of the demand (tenant) sides evolved after the regulation. However, outside of some selected developed nations, the adoption and business performance of green buildings have attracted scant scholarly attention. Some early studies in India (Mojumder et al., 2022; Mojumder and Singh, 2021; Sharma, 2018) have focused on opinion surveys to identify barriers and stakeholders' roles in green buildings. Balaban et al. (2017) analyzes case studies in Japan to assess the co-benefits of green buildings. Yadegaridehkordi et al. (2020) survey building professionals to identify indicators for green building manufacturing. Ofek & Portnov (2020) surveys consumers, architects, and contractors in Israel to estimate the willingness to pay (WTP) for green buildings. While these studies offer valuable exploratory directions for further research, they are unable to predict adoption rates of green practices of firms, or price premiums paid by them.

We analyze over 17,000 office rental contracts in India to examine the heterogeneous motivations for green offices. Our objectives are threefold: To examine (1) if green buildings command rental premiums; (2) if the propensity to rent green is higher in specific firm-types; and (3) if the ESG Disclosure Requirement affects rental premiums and propensity to rent green as desired. Our empirical method affords us a setting to examine how various metrics related to the demand and supply sides of sustainable facilities evolved after the introduction of the disclosure requirement.

The remainder of the paper is organized as follows. Section 2 synthesizes the literature and develops hypotheses. Section 3 describes the data and variables. We also present our methodology and empirical models in this section. Section 4 presents the results and discussion of the findings. Section 5 concludes the paper.

2. Background and hypotheses

2.1. Determinants of commercial rents

There is ample literature on the determinants of rental rates in commercial real estate buildings. Eichholtz et al. (2010) estimates a 5–10% rental premium in US green offices while Fuerst and McAllister (2011) estimates the premium at 20–25%. Other studies such as Das et al. (2011); Das and Wiley (2014); Chegut et al. (2010) also document significant rental premiums in green offices. Cross-sectional variations in the characteristics of rental facilities are widely included in hedonic models for office rents (e.g. (Plazzi et al., 2010),). Geltner et al. (2013); Shilton and Zaccaria (1994) relates facility size (area) to variations in rental rates. Besides, studies such as Dunse and Jones (1998); Fuerst and McAllister (2009) describe the association between contractual terms and rental rates.

2.2. Green building rating systems

In response to increased awareness about the sustainable built environment, several organizations have developed green building rating systems. For example, BREEAM (Building Research Establishment Environmental Assessment Method) was launched in the UK in 1990 by Building Research Establishment Global Ltd. In 2000, the USA witnessed the launch of LEED (Leadership in Energy and Environmental Design) and Energy Star by the US Green Building Council and Environmental

[3] https://www.usgbc.org/articles/2017-national-green-building-adoption-index-releases-data-growth.

[4] https://economictimes.indiatimes.com/industry/services/property-/-construction/31-of-total-office-spaces-in-top-6-cities-certified-as-green-buildings-report/articleshow/90334632.cms?from=mdr.

[5] https://worldpopulationreview.com/country-rankings/carbon-footprint-by-country.

[6] https://shorturl.at/apsU9.

[7] https://www.bseindia.com/downloads1/BSEs_Guidance_doc_on_ESG.pdf.

[8] For example, see 1. Economic Times: "Institutional investors, occupiers flock towards green-certified realty projects" https://shorturl.at/hiqG7 and 2. Times Now: "Green real estate is the new rage in India" https://shorturl.at/nqwGZ.

Protection Agency (EPA) respectively. Several other rating systems were launched across the globe, such as Green Mark in Singapore, Green Star in New Zealand, and NABERS (National Australian Built Environment Rating System) in Australia. In 2014, the International WELL Building Institute (IWBI) launched the WELL Building Standard in the US.

Although pursuing the same global purpose of sustainability, these rating systems differ from each other in their approaches. For example, LEED focuses on nine areas such as sustainable sites, water efficiency, energy, materials, indoor environmental quality, and integrative processes. WELL focuses on occupant health and well-being through 11 criteria, such as - air, water, light, thermal comfort, materials, and community. The focus on rating systems has leaned from simulated energy consumption to actual consumption (McAllister and Nase, 2023). Contrary to an earlier belief that nations would eventually converge to an energy performance certification standard, we observe a different kind of shift. Stakeholders within a national boundary can adopt varied (and multiple) rating types. Several rating systems have been adopted internationally and gained a global reputation. For example, despite the availability of domestic rating systems such as GRIHA (Green Rating for Integrated Habitat Assessment) by TERI (Tata Energy Research Institute) and IGBC (India Green Building Council) ratings, numerous buildings in India are LEED and WELL rated.

2.3. Economics of green building labels

2.3.1. Costs of green buildings

Green buildings imply higher costs to develop (Kahn and Kok, 2014). The cost of design fees, fittings, and finishes shoot up by nearly 30% when opting for BREEAM-rated buildings in the UK (Chegut et al., 2019). The overall costs increase by 7%–11% depending on the quality of construction (Chegut et al., 2019). Yet, higher costs are not prohibitive as the payback period of the marginal costs is usually within ten years. The higher costs of green buildings are, in some contexts, offset by numerous financial benefits.

2.3.2. Benefits of green buildings

Green buildings improve occupancy and occupant productivity (Wiley et al., 2010); and are associated with superior job satisfaction (Parida et al., 2021). LEED-certified retail bank branches in the US enjoy above-average deposit levels (Chang and Devine, 2019). Therefore, tenant organizations are willing to pay a premium for air quality, energy efficiency, recycling, natural light, and public transportation (Robinson et al., 2017). In commercial real estate, rental cash flows and asset values are positively correlated. Therefore, the impact of going green is broadly symmetric in terms of rents as well as values. During the first decade of the twenty-first century, green-rated office buildings in the US enjoyed broadly 5–10% rent premiums and about 20–25% price premium (Eichholtz et al., 2010; Fuerst and McAllister, 2011). Anecdotal evidence[9] suggests that green buildings reduce operating costs by around 20%. The perceived benefits led to a surge in the supply of green buildings. However, the increase in supply did not compromise the price or rental premiums in offices (Das and Wiley, 2014; Eichholtz et al., 2013) in the following years. Eichholtz et al. (2013) shows that energy efficiency is capitalized both in rents and prices. Green office buildings sell at a 19% price premium as observed in Finland, France, and Germany (Porumb et al., 2020). Green-Mark-rated buildings in Singapore enjoy 25%–33% price premiums. Over time, green building rating systems have developed different levels of ratings depending on the extent of goals achieved. For example, LEED ratings have four levels (in decreasing order of achievement): Platinum, Gold, Silver, and Certified. WELL, too, has four levels: Platinum, Gold, Silver, and Bronze. However, the premiums vary in a narrow band and are not necessarily correlated with the increasing rating levels (Dell'Anna and Bottero, 2021). Within a city, the premiums are independent of the location (i.e., the distance from the city center) (Porumb et al., 2020).

Green buildings are also associated with lower risk. For example, green buildings get leased up quickly (Fuerst et al., 2020), and are subject to reduced rental cash flow risk (Das and Wiley, 2014), but enjoy significant price premiums (Fuerst and McAllister, 2011). These advantages render green buildings more attractive to lenders, as green buildings "carry 34% less default risk" (An and Pivo, 2020). As a result, green buildings enjoy better loan terms. For similar reasons, green bonds exhibit a lower (or negative) correlation with stocks and commodities, rendering them attractive from a portfolio diversification standpoint (Nguyen et al., 2021).

2.3.3. Skepticism and heterogeneity in green premiums

Findings from studies in finance (Fatica et al., 2021; Block et al., 2021) suggest that stakeholders in a green building will compare the benefits of rating systems before paying a premium price. Financial benefits of Energy Star-labeled bank branches in the USA are unstable, but LEED-rated branches exhibit superior performance until several years after the initial certification (Chang and Devine, 2019). However, Olaussen et al. (2017) reports "no evidence of a price premium" in the Norwegian market. Wahlström (2016) reports a similar finding in Finland. The mixed results suggest that price premiums on green buildings are not universal, and must be established locally. Some scholars perceive green buildings with the lens of skepticism. Bowers et al. (2020) says that banks' adoption of green buildings "not attributable to their working better but to their looking better." According to De Simone and Pezoa (2021), green interventions are mainly aimed at establishing corporate legitimacy and end up diminishing the "environmental responsibilities of developers."

Nevertheless, the supply and demand for green buildings in India have surged in recent years, as discussed earlier. Considering the two sides' responses to be economically rational, we should expect green-labeled offices to command a rental premium. However, the premiums should vary with the rating systems. WELL certification covers more aspects of occupant well-being compared to LEED (Pineo and Rydin, 2018). The following hypotheses can be derived:

Hypothesis 1.a. Green-labeled offices in India command higher rental rates.

Hypothesis 1.b. WELL-label commands a higher premium than LEED.

2.4. Heterogeneous motivations to go green

The literature suggests mixed motivations among firms for going green. Classical models of asset pricing focus on maximizing financial wealth. However, Hart & Zingales (2017) argues that wealth is not synonymous with welfare, and as shareholders grow more prosocial, companies must also maximize nonpecuniary utilities. Few philanthropic investors are driven by personal (ethical) reasons, while others derive motivation from the economic benefits of going green (Meng et al., 2022). In venture capital funds, investors are known to derive non-pecuniary utility from impact investing, even when the funds are rationed, and the investor base has heterogeneous return expectations (Barber et al., 2021). Achieving sustainability is one such utility. Most institutional investors realize the importance of "Extra-financial determinants" of sustainability commitments in creating value for their firms. Therefore, firms engage in corporate social responsibility (CSR) to build social wealth for themselves.

However, firms are answerable to their shareholders and clientele, and investors begin to demand "compensation for their exposure to carbon emission risk" (Bolton and Kacperczyk, 2021). External stakeholders (investors and customers) demand sincerity in a firm's green commitments when the green initiatives are driven by ethical motivations (Fatica et al., 2021). Similarly, authenticity is a major factor when impact investors screen target enterprises (Block et al., 2021). An

[9] https://www.usgbc.org/press/benefits-of-green-building.

interpretation of these findings in the context of commercial office markets is that firms associated with higher carbon emissions must generate higher returns. Thus, renting green offices must promise concrete outcomes.

Given the trade-off between financial costs and benefits, superior performance of going green often comes with an economy of scale (Dixon-Fowler et al., 2013). Recent policy interventions, too, have increasingly focused on larger buildings (McAllister and Nase, 2023). By inference, larger firms will be more motivated to rent green offices and pay a premium rent. The rent premium is also influenced by the supply side, i.e., landlords. On the one hand, the valuation of buildings is a function of rental cash flows, and risk is in the cash flows. If a landlord derives utility from holding green buildings as a hedge against climate risks, it will lead to lower equilibrium returns (P'astor et al. , 2021). In other words, the marginal investment cost (i.e., a price for the hedging position) for a landlord naturally lowers expected returns given a stream of rental cash flows. To compensate for the higher investment cost of green buildings, landlords may increase the rent.

On the other hand, a tenant will agree to pay premium rents for green offices based on numerous conditions: (1) if the productivity gain in occupants enhances a tenant's profits, (2) if energy-saving benefits are passed on to the tenant, or (3) if external stakeholders (investors, customers, or regulators) incentivize going green. The complexity involved in going green makes it a challenging decision for a tenant, as it not only incurs additional costs, but the costs may also be highly uncertain. In short, the financial prudence of renting green by any tenant firm depends on NPV analysis. Therefore, firms acting in competitive markets must carefully weigh their marginal cost of renting green offices against the marginal benefits. A challenge with green buildings is that an owner can only control the design, whereas operations and compliance are up to the tenants (McAllister and Nase, 2023). The split incentives between landlords and tenants have led to low improvements in for-rent assets (Wrigley and Crawford, 2017). Confusion related to the benefits of going green has led to suboptimal landlord behavior. For example, Robinson et al. (2016) shows that hotels overcharge in green room rates, which leads to reduced demand (i.e., lower occupancy) and, hence, insignificant improvements to the revenues.

The inflated rent implies heterogeneous NPV across tenants, as their opportunity costs may vary. As a result, the demand and rental premium for green buildings weigh heavily on tenant characteristics. Consider firms exposed to reputation risks. Firms from certain "sensitive" industries (e.g., energy, including oil and gas; chemicals; paper and pulp; mining; and steel-making) have a stronger motivation for green investments (Garcia et al., 2017). While Garcia et al. (2017)'s identification of sensitive companies is based on their major socio-economic impact, Cai et al. (2012) documents a superior firm performance in "sinful" firms (i.e., firms belonging to alcohol, tobacco, gambling, weapons, nuclear, oil, cement, or biotech sectors) if they invest in CSR. Although still positive, the manufacturing sector enjoys relatively less pronounced benefits (Krekel et al., 2019).

In short, commitment to sustainability may vary with tenant types. There is some empirical evidence although fragmented - in support of this argument. For example, green buildings improve employee (occupant) performance, but the effect is the strongest in finance, retail, and service sectors (Krekel et al., 2019). In the finance sector, donors, lenders, and equity investors place value on different aspects when screening enterprises for impact investing (Block et al., 2021). As employee productivity is tied to firm performance and green buildings are associated with superior occupant well-being and productivity (Robinson et al., 2017; Chang and Devine, 2019), we should expect heterogeneity in green building adoption across industry sectors. In particular, sectors with core activities characterized by sedentary office work will exhibit a higher demand for green and healthy offices. It is therefore hypothesized that

Hypothesis 2. Propensity to rent green-labeled offices varies significantly and systematically by industry sector

2.4.1. Foreign firms

Whether a firm will be committed to sustainability would depend on its "leadership and ethical orientation of owners/managers" (Mitra, 2022). Sometimes, the sustainability agenda is driven by external stakeholders. Demand from customers (Dai et al., 2021), as well as investors (Bolton and Kacperczyk, 2021; Chowdhury et al., 2021; Tang and Zhang, 2020), are strong motivators for sustainability commitments. Sometimes, national-scale urban systems may foster environmental-friendly practices (Dawidowicz et al., 2023). Beyond improving shareholder value, investing in environment-friendly assets helps with reducing reputational risks (Hebb et al., 2010). Given their higher reputational risk in foreign markets, multinational corporations exhibit superior corporate social responsibility (compared to their domestic-only counterparts) to gain the legitimacy and confidence of local stakeholders (Zyglidopoulos et al., 2016). For example, in USA, foreign firms are associated with higher environmental disclosure in their CSR reporting that leads to their superior stock performance (Chowdhury et al., 2021).

Strategic businesses perceive government regulations as policy signals (Levie and Autio, 2011). The regulatory burden is more severe for foreign firms, in general, (Levie and Autio, 2011). Foreign firms in India, in particular, find the regulatory framework as onerous. The government's recent push on green businesses, frequent regulatory tweaks, high tariffs, red tape, and difficulty in doing business (Skariachan et al., 2022) are cited as common challenges to foreign firms. Faced with information asymmetry (Kang and Kim, 2010), the signals these firms pick from the sustainability regulations may motivate them to go green even if the regulation does not mandate them to do so.

Further, regulations in their home countries will also motivate foreign firms to go green. For example, a robust legislative framework for sustainability has led to a superior diffusion of green buildings in the MENA region (Ismaeel, 2019). The adoption of the United Nations (UN) Sustainable Development Goals (SDG) varies substantially across the 193 member nations of the UN, as reflected in the national SDG rankings. A regulatory focus in the home nation should also introduce an incentive for firms to go green. The third hypothesis to be tested is thus:

Hypothesis 3.a. Foreign firms have a higher preference for green offices

Hypothesis 3.b. Firms headquartered in nations with high SDG rankings have a higher revealed preference for green offices

2.5. Role of green regulations

Managers are likely to opt for green investments when doing so promises a positive NPV. If the NPV analysis does not favor going green, firms will not contribute toward the demand for green offices. Such findings have been reported in other contexts. For example, family-owned firms are known to disengage from pursuing broader goals when they are affiliated to a larger business group with a strong commitment to charitable foundations (Oh et al., 2023). In other words, they may pass the ethical responsibilities to parent companies when the ethical burden is not favorable to immediate profits.

When markets reward sustainable practices insufficiently for reaching binding national emission targets, governments may use incentives to stimulate decarbonization, or enforce disincentives for firms via regulations. Empirically, regulation-driven energy efficiency interventions such as tax breaks for landlords, subsidies for equipment installations, etc. have not always been able to overcome these market barriers (McAllister and Nase, 2023). Another problem of regulations is that they need to be flexible enough to accommodate a variety of market and technological developments. Kok et al. (2011) show that as energy prices soar, the adoption of energy-efficient technology is a more direct

response than adopting green building certification. It appears that regulations lead to sustainability-oriented initiatives only in the short term whereas more in-depth adjustment to the underlying physical risks of climate change evolves over the longer run (Stroebel and Wurgler, 2021). In such a scenario, when regulation mandates green adoption, the adoption will be naturally skewed towards firms that are directly affected by the regulation. Unless the implications of green policies are equitable, they are at risk of having negative social and societal consequences, for example by leading to "eco-gentrification" (Haase et al., 2022) or asymmetric distribution of costs and benefits for certain segments of a population.

2.5.1. ESG disclosure Requirements (2021) in India

Through the Companies Act 2013, India required large firms to allocate a part of their revenues towards CSR. Further, in May 2021, a government circular mandated the 1000 largest listed companies (by market capitalization) to include Environmental, Social, and Governance (ESG) disclosure in their annual reports. The ESG Disclosure Requirements (EDR) were voluntary in the 2021–22 financial year[10], but mandatory from the following [2022–23] financial year (earlier, such reports were mostly voluntary, or limited to a smaller set of large firms). In typical markets, whether such a regulatory push will increase demand would depend on the speed at which new supply is created. However, office spaces can not be built overnight, and the supply of real estate is extremely sticky in the short run (Geltner et al., 2013). Landlords capitalize on the phenomenon by increasing rents disproportionately (Diaz and Hansz, 2010). Such behavior is documented in Robinson et al. (2016), wherein hotels charge high green premiums on room rates. Therefore, such regulations still reduce the demand for green offices. Empirical evidence (Dalal and Thaker, 2019) suggests that good ESG performance enhancement is associated with superior financial performance. Renting green offices is one of the many options for ESG measures. Firms may also gear their efforts towards social or corporate governance measures, or simply pursue other environmental goals beyond renting green offices. Such an outcome is undesirable given the substantial carbon footprint attributed to buildings, and an increased concern related to climate change caused by carbon emissions.

Yet, while some firms directly affected by the EDR (i.e., Top-1000 firms by market capitalization) may pay a higher price for green rents, the overall demand for green rentals from the affected players will be negatively affected. Further, as foreign firms suffer from information asymmetry with respect to domestic firms (Kang and Kim, 2010), they overreact to signals (Gupta and Das, 2021). The overreaction may imply adopting more green offices to balance the decrease in demand from domestic firms. The end result may be suboptimal given the mismatch between broader policy goals and affected communities (Faust and Smardon, 2001).

Hypothesis 4.a. After the EDR, rental rates increase, but the demand decreases among affected parties

Hypothesis 4.b. After the EDR, rental rates, and the demand increase among foreign company tenants

3. Data and methodology

3.1. Data sources

We analyze a sample of 17,082 commercial office lease contracts between 2010 and 2022. The main data is provided by PropStack Analytics, a for-profit real estate data provider. The data covers nine major metropolitan cities from different parts of India.[11] Unlike residential rentals, commercial office rentals are less standardized.

PropStack provided a complete dataset comprising over 38,256 office rental contracts in major cities of India. As PropStack data is collected from public sources, it covers all contracts registered with local governments. Informal, unregistered leases may have been partially missed but it is unlikely that firms affected by the disclosure requirement would not register their contracts. While the asset and contract characteristics determine rental rates, the demand for green rentals is driven by tenant characteristics. PropStack provides detailed names of the tenant companies. These companies are of different types, and the same company may be spelled differently across lease contracts. From multiple sources (Bloomberg, Refinitiv Eikon, CMIE, and PrivateCircle), we collect a list of firms with their characteristics. This effort was aided by research assistants and library staff. Matching and tagging of these tenant firms with the taxonomy of categories was done manually, which may have introduced some minor errors in our data. Our final estimation sample consists of 17,082 observations. There is some possibility that our sample may be biased towards observations included in the final data.

3.2. Descriptive statistics

Tables 1 and 2 describe the data used in this study[12] Rents are usually quoted on a per-month basis for each square foot of the rented space. In our sample, they vary between INR 1 and INR 96/sqft/mon with a high standard deviation of 68. The space sizes vary in a wide range of 66 to 1.46 mil. sqft. Most contracts stipulate a fixed tenure. Some tenure lasts just a few months (rounded to zero), while others may span over decades. The contracts are mainly of two types: Lease that grants a right of exclusive possession versus Leave & License ("License") that only provides tenure rights without any exclusivity. Most (64%) contracts in our sample are Leases. Rental contracts may stipulate a lock-in period. Landlords may incur search costs every time a rental contract is signed with a new tenant. LockIn implies the length (months) of the tenure for which a tenant is liable to pay rent despite her decision to terminate the contract before the mentioned tenure. Landlords use LockIn as a

Table 1
Descriptive statistics of numerical variables.

Variable	Description	Mean	StDev	Min	Max
Rate	Rental rate (per sqft per month)	96	68	1	1512
Area	Area (sqft)	32,760	63642	66	1,460,000
Tenure	Contractual length of the rental contract (years)	4.94	2.85	0	81
LockIn	Contractual lock-in period (months)	22.83	20.95	0	180
CAM	Common area management fees (per sqft per month)	5	7	0	100
Security Deposit	Amount in Indian Rupees	3031.50	238,303.60	0	25,542,432
Parking	Number of parking spots	33	80	0	1645
SDG	SDG score	70	9	0	87

Note: This table provides descriptive statistics and definitions of continuous variables included in the study. The data relates to 17,083 commercial office rental contracts in India between 2010 and 2022. In 2022, a US dollar was roughly equivalent to Indian Rupees (INR) 80. Data source: PropStack.

[10] In India, the financial year starts in April, and ends in March.

[11] Bangalore, Chennai, Delhi, Gurgaon, Hyderabad, Kolkata, Mumbai, Noida, Pune.

[12] Table 1 provides the descriptive statistics of the numerical variables while Table 2 provides the proportions for categorical and binary variables.

Table 2
Descriptive statistics of categorical variables.

Variable	Description	Proportion
License	Leave & License contract (versus a Lease)	36.00%
Renewal	Renewal of an existing lease	19.00%
City: Location of the office		
Bangalore		20.00%
Chennai		9.60%
Delhi		3.40%
Gurgaon		14.00%
Hyderabad		7.70%
Kolkata		1.20%
Mumbai		35.00%
Noida		3.90%
Pune		5.90%
GreenStatus		
Green	LEED or WELL labeled	32.00%
LEED	LEED labeled	17.00%
WELL	WELL labeled	15.00%
Escalation		
Uncertain	Whether the rental escalation is uncertain (i.e., not pre-decided)	88.00%
RateContract		
Complex	Whether the rental escalation is not uniform (percent and/or frequency)	27.00%
GreenComplex	Whether the space is Green labeled, and has a Complex contract	6.90%
Post	Whether the lease is signed after the new ESG Reporting regulation	12.00%
Tenant Company Headquarter Nation		
CommonWealth	Australia, Canada, Ireland, NewZealand	6.40%
Developed.Asia	Japan, South Korea, Singapore	5.80%
EU	European	9.80%
MEast	Middle East	0.60%
Other	Others	0.90%
USA	USA	34.00%
Tenant Sector		
Sensitive	Energy (including oil and gas), Chemicals, Paper and Pulp, Mining, Steel	3.90%
Sinful	Alcohol, Tobacco, Weapons, Nuclear, Oil, Cement, and Biotech	1.40%
Top1000	Whether the tenant company is among the top-1000 by market capitalization	12.00%
ListedNon1000	Whether the tenant is a domestic listed firm, but not Top1000	0.70%

Note: This table provides descriptive statistics and definitions of binary variables included in the study. The data relates to 17,083 commercial office rental contracts in India between 2010 and 2022. Data source: PropStack.

protection against frequent re-leasing risk. 19% of the contracts are related to the renewal of existing leases. As commercial offices usually belong to commercial complexes, the contracts may include a common area management (CAM) clause that mandates a tenant to share a proportionate cost of managing shared spaces across tenants (e.g., lobby, lawn, etc.). Sometimes, the landlord includes CAM expenses in the gross rental quote, or the office building may not have other tenants. In such cases, there will be no CAM. The average CAM in our sample is INR 5/sqft/mon. The average security deposit is approximately Rs. 3000/sqft. 32% of the contracts in our sample are related to green buildings, of which LEED and WELL labels represent 17% and 15%, respectively.[13]

Given the long-term nature of rental contracts, the two parties (tenant and landlord) may pre-decide the pattern in which the rental rate will escalate (increase) in the future during the contractual terms. Only 12% of the leases categorically mention the escalation percentage. When the market rent outlooks are unstable, a landlord may peg the escalation rates to a market index (e.g., Consumer Price Index), or simply leave it to future negotiations, rendering the escalation as "uncertain." A contract may also mention a pre-decided interval at which rents will be revised in the future. Tenants tend to avoid signing long-term contracts due to market risk; but may ask the landlord to include a renewal (i.e., as a right of first refusal) clause in the contract. In such cases, the tenant has the option to continue or terminate the tenancy after the current contractual term is over. Such cases still leave a tenant in a disadvantaged position. Geltner et al. (2013) terms it as a "hold-up" problem. A tenant's opportunity cost of moving to another facility (given an unfavorable revision) is high, even if the contract offers an optionality to terminate an existing contract and move to another facility with a more favorable rental rate.

The original dataset provides complex, textual details on escalation terms. Consider this lease: The "Monthly Escalation" field has a value of "36,36,12" clubbed with another field "Percent Escalation" with a value of "15,15,5" and the "Cycle Escalation" specified as "once, once, every." This implies that the rates are fixed for two 3-year intervals that escalate at 15% after each interval, but in the later years, each year witnesses a 5% escalation. Applying some text-processing logic, we identify 27% contracts with "Elegant" escalation terms wherein the timing (frequency) and percentage of rental rate revisions are constant. The remaining 73% of the contracts are characterized by more complex escalation schedules wherein the revision frequency and/or escalation percentage are specified in numerous terms (e.g., 5% for the first 3 years, and 10% per two years thereafter). Complex rental contracts are cognitively difficult to interpret and warrant complex arithmetics to estimate their value.

We identified 12% companies that were among the Top-1000 by market capitalization[14] (Top1000), and nearly 1% as other domestic listed companies (ListedNon1000). Eventually, we identified each tenant by its industry sector. We collect tenant (firm) information from multiple sources. First, we create a standardized "sector" field using the numeric "North American Industry Classification System" (NAICS) taxonomy. The PrivateCircle data (on private firms) does not provide the NAICS codes. In such cases, we manually matched the "Industry" of firms with the NAICS codes. Based on Cai et al. (2012), and Garcia et al. (2017), we tagged whether a company belongs to "Sensitive" (energy, including oil and gas, chemicals, paper and pulp, mining, and steel-making) or "Sinful"(alcohol, tobacco, gambling, weapons, nuclear, oil, cement, and biotech) categories respectively. As 58% of the tenants are either subsidiaries (or branches) of companies headquartered abroad, we also identified their headquarters nations. We collected the United Nations Sustainable Development Goals (SDG) ranking[15] for each nation; and clubbed them in separate geographic groups.

3.3. Empirical models

Our study tests the hypotheses using a battery of empirical models on rental pricing and the choice for renting green offices. We are primarily interested in the evolution of green rental premiums after the ESG Disclosure Requirement (2021) was mandated. We examine three sets of models using Logit and OLS estimators.

3.3.1. Logit model for the choice of green rental contracts

The propensity of a firm to rent green offices ($\Pr(\text{GreenChoice}_i = 1 | x_i)$) given its characteristics (x_i) serves as a proxy for the demand propensity. These models also control for the location using submarket dummies. In the demand propensity models (GreenChoice) the main independent variables of interest are tenant categories (Top1000, ListedNon10000, Foreign), Tenant Sector (as dummy variables of categories e.g., Sensitive or Sinful) and headquarter (HQ) nations. The models control for time (Year − Quarter) and submarket locations using dummy variables. The first set of Logit models uses discrete rental

[13] As WELL includes most design criteria included in LEED, many WELL-labeled buildings are also LEED-labeled.

[14] corresponding to the year 2021.

[15] corresponding to the year 2021.

facility choices (Green versus non-Green contract) of tenants:

$$\Pr(\text{GreenChoice} = 1) = \Phi(\alpha + \beta_1.\text{TenantCharacteristics}_i + \beta_2.\text{HQNationCharacteristics}_i + \beta_3.\text{SectorCharacteristics}_i) \quad (1)$$

NationCharacterisics refers to the headquarters nation of the tenant firm (e.g., Geographic region and SDG ranking).

In the second set of models, we replace the dependent variable with ComplexGreenChoice. These Logit Models estimate the propensity of firms to rent offices with complex rental contracts, as described earlier.[16]

$$\Pr(ComplexGreenChoice = 1) = \Phi(\alpha + \beta_1.TenantCharacteristics_i + \beta_2.HQNationCharacteristics_i + \beta_3.SectorCharacteristics_i) \quad (2)$$

3.3.2. OLS models for rent determinantion

Next, the rental premium of green labels and the demand for green rentals is investigated. In the third set of hedonic models, we use ordinary least square (OLS) estimates for the rental rates. Our empirical models use the natural logarithm of (rental) "Rate" based on earlier studies (Eichholtz et al., 2013; Fuerst and McAllister, 2011; Das and Wiley, 2014). The main independent variables of interest for the rental rate.

(Rate) models are binary, specifying Green Status and Renewal-type contracts. The Rate models control for (rented) Area, Parking and contractual terms (Tenure, CAM, Security Deposit amount, complexity, and uncertainty in escalations), and time (dummies for Year-Quarter).[17]

$$\text{Ln}(\text{Rate}_i) = \alpha + \beta_1.\text{GreenStatus}_i + \beta_2.\text{Area}_i + \beta_3.\text{Contract}_i + \beta_4 \text{Y Q}_i + \beta_5.\text{Locality}_i \quad (3)$$

Here i denotes an individual contract. β is a vector of regression coefficients. GreenStatus is a set of dummy variables signifying the green-label status of the office. Area is the floor area rented in sq ft. Contract is a matrix characterizing contractual terms. The models control for time (Y ear − Quarter) and submarket locations using dummy variables.

Green Premium after the ESG Disclosure Requirements (2021).

In all three sets of models, we use a Difference-in-Difference (DID) setup to examine how the market for green office rental markets evolved after the Mandatory ESG Disclosure Requirements (2021 Q2). In the DID setup, the introduction of the ESG Disclosure Requirement (Post) serves as the "treatment." The five firm types (Top1000, Foreign, ListedNon1000, Sinful, Sensitive) and a contract type (Renewal) serve as the six "treatment groups" of tenant types (Post x TreatmentGroup). If the interaction between these six treatment groups and the treatment is statistically significant, it is an indication that the treatment group behaved differently from the control group after the disclosure requirements were introduced. The models control for time trends in the markets using annual dummy variables.

4. Results and discussion

4.1. Demand propensity for renting green offices

In Table 3, we examine the different propensities to rent green offices across tenant characteristics (Eqn (1)). As expected, the Top1000 domestically listed firms (by market capitalization) have a significantly higher propensity to rent green. We also find that smaller listed firms (ListedNon1000) have a significantly lower propensity. Dixon-Fowler et al. (2013) explains such findings: Larger firms will benefit more from green initiatives due to their larger scale, and R&D capabilities. A significantly negative coefficient for smaller listed firms also reflects their perception of negative NPV in renting green caused by rental premiums. We observe that, in general, the propensity to renew green rental contracts (Renewal) is significantly positive, implying a tenant's preference to continue leasing green assets.

There is strong evidence that tenants coming from "sensitive" industries have a significantly lower propensity to rent green offices providing support to Hypothesis 2. We have similar, although weaker, findings for "sinful" industries. These findings contradict the expectations based on earlier studies (Cai et al., 2012; Garcia et al., 2017). Our finding suggests that belonging to "Sensitive" or "Sinful" industries may call for other ways to improve perception beyond renting green offices, especially if renting green is perceived as a negative NPV proposition. Indeed, earlier studies have shown that several firms either invest in advertisements (Oh et al., 2017) or CSR (Jo and Na, 2012) to manage their public image.

The coefficient for Foreign (firms) is significant and positive, as expected from Hypothesis 3.a. Tenants from nations with wither SDG rankings, too, have a higher propensity to rent green. Column 2 suggests that tenants from almost all foreign regions (except the Middle East) are more inclined towards renting green offices, compared to domestic tenant firms. Therefore, we find support for Hypothesis 3.b.

Further, we examine the evolution of rents and demand propensity of green rents after the ESG Disclosure Requirement was enforced by the Government of India in 2021. We are primarily interested in the interaction of Post with tenant characteristics variables. Post is the dummy variable assuming the value of 1 if the rental contract is finalized after the announcement of the regulation. Although the regulation was announced sooner than it was rendered mandatory, its announcement conveys new information to stakeholders. As office rental tenures are long (average of 5 years, as shown in Table 1), a tenant intent on renting green will ensure compliance immediately after the announcement.

We find evidence that after the disclosure requirement, the propensity to rent green has fallen among the treatment group (i.e., Top1000 tenants for which the regulation is mandated), although it has increased among the listed firms that are not affected by the requirement (ListedNon1000). Thus, while the significant decrease in the Top1000 may reflect their disillusionment with green rents, the contrasting finding in the ListedNon1000 firms reflects their anxiety should they be subject to the requirement in the near future. The disillusionment of Top1000 firms is corroborated by our finding that there was a significant fall in the renewal of leases (Renewal) after the disclosure requirement.

In summary, we observe that the propensity to rent green varies by firm type: their industry sector and the sustainability commitment level of the countries where their headquarters are located. Larger firms and foreign firms have a significantly higher propensity to rent green, whereas sensitive and sinful industries are associated with a significantly lower propensity to rent green. Lease renewal, too, loads significantly on green leases. After the disclosure requirement, however, the response of tenants was asymmetric. Firms subject to the requirement (Top1000) exhibit a significantly reduced propensity to rent green. ListedNon1000 firms that are not subject to the requirement exhibit a marginal improvement in their propensity to rent green. It is possible that some of these firms may be at the cusp of falling within the ambit of disclosure requirements and may consider starting to rent green. However, the reduction of propensity to rent green among targeted larger firmsis an intriguing finding. A possible explanation for this seeming paradox is that firms faced with onerous rent clauses and above market rate asking rents, have shifted their ESG activities to other, less costly domains after the disclosure requirements, thereby evading possible rent-seeking activities of 'gatekeeper' green landlords. The results described in the next section test this conjecture, at least indirectly.

[16] These results are not reported in the current version of the paper.

[17] Some explanatory variables (Tenure, LockIn, CAM, SecurityDeposit, Parking) may also assume a value of zero. To avoid losing observations, we add 1 to these variables before calculating their natural logarithms.

Table 3
Model for tenant selection of green rental contracts.

Dependent variable: Green label yes/no	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	−3.78***	−3.78***	−3.77***	−3.79***	−3.85***	−3.79***
	(-4.45)	(-4.45)	(-4.44)	(-4.47)	(-4.55)	(-4.46)
Top1000	0.23***	0.19***	0.20***	0.20***	0.19***	0.19***
	−3.59	−3.18	−3.19	−3.19	−3.17	−3.15
ListedNon1000	−1.12***	−1.12***	−1.29***	−1.13***	−1.12***	−1.12***
	(-3.48)	(-3.49)	(-3.66)	(-3.51)	(-3.48)	(-3.49)
Foreign	0.71***	0.72***	0.71***	0.71***	0.71***	0.71***
	−12.01	−11.78	−12.01	−12.03	−11.96	−12.03
log(1 + SDG)	0.50***	0.50***	0.50***	0.50***	0.52***	0.50***
	−2.61	−2.61	−2.61	−2.63	−2.72	−2.63
Sensitive	−0.53***	−0.52***	−0.53***	−0.52***	−0.52***	−0.39***
	(-4.98)	(-4.96)	(-4.97)	(-4.93)	(-4.91)	(-3.57)
Sinful	−0.21	−0.21	−0.22	−0.22	−0.11	−0.2
	(-1.13)	(-1.15)	(-1.17)	(-1.16)	(-0.60)	(-1.05)
Renewal	0.28***	0.28***	0.28***	0.34***	0.28***	0.29***
	−6.77	−6.78	−6.79	−7.49	−6.77	−6.82
Post	0.13	0.12	0.1	0.21*	0.11	0.13
	−1.06	−0.89	−0.78	−1.66	−0.86	−1.08
Top1000:Post	−0.34*					
	(-1.82)					
Foreign:Post		−0.04				
		(-0.39)				
ListedNon1000:Post			1.66*			
			−1.87			
Renewal:Post				−0.40***		
				(-3.18)		
Sinful:Post					−1.18	
					(-1.54)	
Sensitive:Post						−1.65***
						(-3.45)
AIC	20682.07	20685.38	20682.77	20675.26	20682.42	20667.77
BIC	20899.04	20902.34	20899.74	20892.22	20899.38	20884.74
Log Likelihood	−10313	−10314.7	−10313.4	−10309.6	−10313.2	−10305.9
Deviance	20626.07	20629.38	20626.77	20619.26	20626.42	20611.77
Num. obs.	17133	17133	17133	17133	17133	17133
Year-Quarter	Yes	Yes	Yes	Yes	Yes	Yes

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

Note: This table presents the results of Logit models. The models are run on commercial office lease contracts from nine metropolitan cities of India between 2010 and 2022. The binary dependent variable specifies whether the rented facility is green-labeled or not. Top1000 is a dummy variable for Top-1000 domestic listed companies by market capitalization. ListedNon1000 is a dummy variable for smaller domestic listed companies. Foreign is a dummy variable signifying tenant firms with headquarters outside India. SDG is the Sustainable Development Goals (UN) rankings of the headquarter nations. Sensitive and Sinful are dummy variables characterizing tenant firms based on their sectors. Quantities in parentheses signify standard error unless stated otherwise.

4.2. Determinants of green office rents

Table 4 presents the results of hedonic models for rental rates (i.e., Eqn. (3)). In support of hypotheses 1. a and 1. b, we find statistically significant rental premiums in green-labeled offices. LEED-labeled offices command 4–8% and WELL-labeled offices command 9–12% higher rents than their non-green counterparts. Each percent increase in the rented area (sqft) reduces the rental rate (per sqft) by nearly 0.03%. Similarly, each percent increase in the tenure length is associated with a 0.06% decrease in rental rates, affirming the benefits from economies of scale (McAllister and Nase, 2023; Dixon-Fowler et al., 2013). Landlords prefer longer tenure,[18] as it reduces their re-leasing risks, and the corresponding costs of tenant-search. Therefore, a discount on longer tenures is expected.

Leave and Licence ("License") rental contracts are priced significantly lower in rent, as expected (as leases offer a superior quality tenure than licenses). The positive coefficients for LockIn, Securitydeposit, and CAM are somewhat surprising. If the gross rent is fixed, then an increase in security deposit or CAM charges should ideally be associated with a reduction in the base rent. Although the hedonic models explain 72% of variation in rents, these variables may be correlated with omitted variables correlated with the quality of the office space. Higher quality offices will systematically charge more in CAM, and the landlords may have the negotiating power to ask for more in security deposit (or Lock-In period).

When a contract is associated with the renewal of an existing contract, the rental rates are marginally higher (i.e., by 1%), although occasionally insignificant. This finding affirms the "hold-up" problem described earlier. Landlords have a higher negotiating power when an existing tenant wishes to continue business at the same address after an existing rental contract has expired. Tenants, however, tend to seek discounts when the rental rate escalations are explained by complex terms, i.e., when (RateContractComplex assumes larger values), or when the escalation rates are not categorically mentioned in the contract (i.e., EscalationUncertain = 1). In general, Table Table 4 suggests that the green premium in rentals is significant and substantial in India, in line with similar findings (Eichholtz et al., 2010; Fuerst and McAllister, 2011) reported in industrialized nations. However, to our knowledge, this is the first study to compare rental premiums across LEED and WELL labels, wherein WELL commands a 4–5 percentage point rental premium compared to LEED.

The lower part of Table 4 presents the results of the difference-in-difference (DID) analyses. After the disclosure requirement, the rental premium in LEED and WELL-rated offices increased by 4–5 and 9 percentage points, respectively. This finding explains why the demand propensity of green offices fell in Top1000 firms. This is an undesirable

[18] This may not be the case when tenant quality is uncertain. However, our sample is dominated by superior-quality corporate tenants spread across major metropolitan cities of India.

Table 4
Difference-in-difference model for rents in commercial office contracts.

Dependent variable: log(Rent)				
	(1)	**(2)**	**(3)**	**(4)**
(Intercept)	4.22***	4.22***	4.20***	4.20***
	(46.56)	(46.75)	(46.64)	(46.58)
log(Area)	−0.03***	−0.03***	−0.03***	−0.03***
	(-9.97)	(-10.01)	(-10.64)	(-10.70)
log(1 + Tenure)	−0.06***	−0.06***	−0.06***	−0.05***
	(-8.11)	(-8.40)	(-7.87)	(-7.76)
License	−0.07***	−0.07***	−0.06***	−0.06***
	(-5.02)	(-4.98)	(-4.52)	(-4.48)
log(1 + LockIn)	0.02***	0.02***	0.02***	0.02***
	(12.30)	(12.65)	(12.04)	(11.91)
log(1 + CAM)	0.02***	0.02***	0.02***	0.02***
	(9.26)	(7.58)	(6.82)	(7.21)
log(1 + SecurityDeposit)	0.01***	0.01***	0.01***	0.01***
	(4.15)	(4.11)	(3.98)	(3.98)
log(1 + Parking)	0.00	−0.00	−0.00	0.00
	(0.63)	(-0.14)	(-0.13)	(0.08)
Renewal	0.01*	0.01*	0.01	0.01
	(1.76)	(1.92)	(1.61)	(1.54)
RateContractComplex	−0.02***	−0.02***	−0.02***	−0.02***
	(-2.78)	(-2.74)	(-2.62)	(-2.62)
EscalationUncertain	−0.02*	−0.01	−0.01	−0.01
	(-1.78)	(-1.40)	(-1.24)	(-1.33)
Top1000	0.05***	0.05***	0.05***	0.05***
	(6.03)	(6.08)	(6.08)	(6.07)
ListedNon1000	−0.04	−0.04	−0.03	−0.03
	(-1.20)	(-1.22)	(-1.17)	(-1.16)
Foreign	0.08***	0.07***	0.07***	0.07***
	(10.99)	(10.75)	(10.34)	(10.37)
log(1 + SDG)	−0.06***	−0.06***	−0.06***	−0.06***
	(-3.77)	(-3.69)	(-3.72)	(-3.74)
Sensitive	−0.03*	−0.03**	−0.03*	−0.02*
	(-1.88)	(-2.01)	(-1.82)	(-1.76)
Sinful	0.01	0.01	0.01	0.01
	(0.35)	(0.60)	(0.58)	(0.51)
LEED	0.04***		0.08***	
	(4.85)		(8.65)	
Post	−0.02	−0.02	−0.03*	−0.03*
	(-1.03)	(-1.36)	(-1.83)	(-1.87)
LEED:Post	0.04*		0.05**	
	(1.75)		(2.31)	
WELL		0.09***	0.12***	
		(10.10)	(12.43)	
WELL:Post		0.09***	0.09***	
		(3.98)	(4.30)	
Green				0.09***
				(12.79)
Green:Post				0.07***
				(4.32)
R^2	0.72	0.72	0.72	0.72
Adj. R^2	0.72	0.72	0.72	0.72
Num. obs.	17133	17133	17133	17133
Year-Quarter	Yes	Yes	Yes	Yes

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

Note: This table presents the results of OLS models. The analysis is conducted on commercial office rental contract data from nine metropolitan cities in India between 2010 and 2022. The dependent variable Rate is specified in Indian Rupees per square foot per month. GreenStatus is a dummy variable specifying whether the facility is LEED or WELL-labeled. Area of the rented space is measured in sqft. Tenure is the contractual length in years. License is a dummy variable for "License and Leave" contract while the base group refers to "Lease" contract. LockIn is the contract lock-in period measured in months. CAM refers to common area management fees specified in INR per month per sqft. SecurityDeposit is specified in INR. Parking is the count of parking spots included in the rental contract. Renewal is a dummy variable specifying whether the contract relates to the renewal of an existing contract. rateContractComplex is a dummy variable for complex rental escalation terms. EscalationUncertain is a dummy specifying if the rental escalation is not specified in the contract. Quantities in parentheses present standard errors unless stated otherwise.

outcome of the disclosure requirement.

In the following two sets of analyses (Table 5 and Table 6), we divide our data into two subsamples: green and non-green offices. The subsample analyses are aimed at observing if the evolution of green or non-green rents was symmetric after the disclosure requirement. From Tables 5 and it is evident that the "hold-up" problem turned more severe. Lease renewal in green offices commanded an additional 5 percentage point rent increment. There is some evidence that foreign firms paid higher rents after the disclosure requirements. These findings support hypotheses 4. a and 4. b. Interactions (x Post) in Table 6 describe how rental rates evolved in non-green buildings after the disclosure requirement. Unlike in green rentals, the renewal in non-green rents does not exhibit any significance, although they are significant in green rentals. Also, rents in Top1000 firms are significantly higher in the non-green space, whereas the increase is insignificant in green rentals. The results imply that the hold-up problem turned more severe in green rentals. Also, with a reduced propensity to rent green along with a general increase in green rents, the Top1000 firms that were subjected to the disclosure requirement inclined towards non-green rentals that may have a significantly higher rent in such offices.

4.3. Graphical analysis

To further examine these trends, we run two additional analyses. First, we extract a constant-quality rental rate index[19] using baseline hedonic models (Eqn (1)), as shown in Fig. 1. These findings hint at the "hold up" problem described in (Geltner et al., 2013): After the EDR, the green rentals rates were increased disproportionately, and the contracts were made more complex, especially in green offices, which repelled some tenants from green offices. In markets characterized by liquidity and lower supply constraints, a confounding factor would be the excessive new supply in the face of the regulation that could heat the market up. However, real estate supply is sticky, and we examine the rental reaction immediately after the enforcement of regulation. Therefore, the figure suggests a general trend that the rents of green offices have been increasing significantly faster than non-green offices. The solid vertical line signifies the time at which the regulation was introduced.

The regulation had a negative impact on the propensity to rent green offices, in general, as reflected in Fig. 2. The GreenChoice index is the hedonic index extracted from the Logit model (EQ (2)). Further, we examine how the share of various types of rental contracts evolved over time, as shown in Fig. 3. The figure shows a secular upward trend in complex rental contracts, but the trend is mostly driven by green offices. Especially after the introduction of the regulation, the share of complex green rentals has increased significantly, which is correlated with a decrease in the share of green rentals. As the market has sustained a high escalation in rents for green offices, it is natural that the regulatory push will spur the supply of such assets. Fig. 4 reflects such a trend. The data is sourced from USGBC, which focuses on projects located in India. The number of new registrations (interests) with USGBC for LEED certifications suddenly increased after the regulation defying the market downturn caused by the COVID-19 pandemic during the period. This finding is in line with Haase et al. (2022) and Faust and Smardon (2001).

5. Conclusions

This study investigates a novel mandatory ESG Disclosure Requirement in India as an empirical setting to elucidate how commercial real estate markets evolve in the wake of significant government regulations related to ESG. We analyze nearly 17,000 office rental contracts signed across nine major metropolitan cities of India between 2010 and 2022.

[19] The hedonic index is created by exponentiating and standardizing the coefficient of Year-Quarter dummy variables.

Table 5
Difference-in-difference model for rents in green contracts.

Dependent variable: log(Rent) [Green Buildings]						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
(Intercept)	4.14***	4.15***	4.14***	4.16***	4.14***	4.14***
	(10.67)	(10.67)	(10.66)	(10.70)	(10.66)	(10.66)
log(Area)	−0.04***	−0.04***	−0.04***	−0.04***	−0.04***	−0.04***
	(-8.92)	(-8.98)	(-8.93)	(-8.96)	(-8.95)	(-8.93)
log(1 + Tenure)	−0.04***	−0.04***	−0.04***	−0.04***	−0.04***	−0.04***
	(-4.20)	(-4.11)	(-4.20)	(-4.16)	(-4.19)	(-4.20)
License	−0.14***	−0.14***	−0.14***	−0.14***	−0.14***	−0.14***
	(-6.50)	(-6.52)	(-6.53)	(-6.53)	(-6.50)	(-6.53)
log(1 + LockIn)	0.02***	0.02***	0.02***	0.02***	0.02***	0.02***
	(11.44)	(11.44)	(11.44)	(11.33)	(11.45)	(11.45)
log(1 + CAM)	0.00	0.00	0.00	0.00	0.00	0.00
	(0.71)	(0.71)	(0.71)	(0.66)	(0.71)	(0.71)
log(1 + SecurityDeposit)	−0.00	−0.00	−0.00	−0.00	−0.00	−0.00
	(-0.27)	(-0.28)	(-0.26)	(-0.25)	(-0.27)	(-0.27)
log(1 + Parking)	0.01**	0.01**	0.01**	0.01**	0.01**	0.01**
	(2.08)	(2.08)	(2.08)	(2.12)	(2.10)	(2.08)
Renewal	−0.00	−0.00	−0.00	−0.01	−0.00	−0.00
	(-0.40)	(-0.40)	(-0.40)	(-1.08)	(-0.39)	(-0.39)
RateContractComplex	−0.04***	−0.04***	−0.04***	−0.04***	−0.04***	−0.04***
	(-3.37)	(-3.43)	(-3.41)	(-3.44)	(-3.41)	(-3.41)
EscalationUncertain	−0.02*	−0.02	−0.02*	−0.02*	−0.02*	−0.02*
	(-1.68)	(-1.64)	(-1.68)	(-1.69)	(-1.66)	(-1.67)
Top1000	0.01	0.01	0.01	0.01	0.01	0.01
	(0.50)	(0.72)	(0.78)	(0.74)	(0.79)	(0.78)
ListedNon1000	−0.03	−0.03	−0.02	−0.03	−0.03	−0.03
	(-0.50)	(-0.45)	(-0.29)	(-0.48)	(-0.50)	(-0.50)
Foreign	0.04	0.03	0.04	0.04	0.04	0.04
	(1.58)	(1.36)	(1.57)	(1.59)	(1.57)	(1.58)
log(1 + SDG)	−0.05	−0.05	−0.05	−0.06	−0.05	−0.05
	(-0.58)	(-0.57)	(-0.58)	(-0.61)	(-0.57)	(-0.58)
Sensitive	−0.15***	−0.15***	−0.15***	−0.15***	−0.16***	−0.15***
	(-6.74)	(-6.81)	(-6.79)	(-6.84)	(-6.79)	(-6.80)
Sinful	0.07**	0.07**	0.07**	0.07**	0.07**	0.07*
	(2.05)	(2.08)	(2.06)	(2.10)	(2.03)	(1.95)
Post	−0.06**	−0.08***	−0.05**	−0.07***	−0.06**	−0.05**
	(-2.52)	(-3.04)	(-2.40)	(-2.94)	(-2.45)	(-2.42)
Top1000:Post	0.04					
	(0.94)					
Foreign:Post		0.04*				
		(1.86)				
ListedNon1000:Post			−0.07			
			(-0.39)			
Renewal:Post				0.05**		
				(2.12)		
Sensitive:Post					0.07	
					(0.67)	
Sinful:Post						0.05
						(0.29)
R2	0.87	0.87	0.87	0.87	0.87	0.87
Adj. R2	0.87	0.87	0.87	0.87	0.87	0.87
Num. obs.	5419	5419	5419	5419	5419	5419

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

Note: This table presents the results of OLS models. The analysis is limited to data on green commercial office rental contracts from nine metropolitan cities in India between 2010 and 2022. The dependent variable Rate is specified in Indian Rupees per square foot per month. GreenStatus is a dummy variable specifying whether the facility is LEED or WELL-labeled. Area of the rented space is measured in sqft. Tenure is the contractual length in years. License is a dummy variable for "License and Leave" contract while the base group refers to "Lease" contract. LockIn is the contract lock-in period measured in months. CAM refers to common area management fees specified in INR per month per sqft. SecurityDeposit is specified in INR. Parking is the count of parking spots included in the rental contract. Renewal is a dummy variable specifying whether contract relates to renewal of an existing contract. rateContractComplex is a dummy variable for complex rental escalation terms. EscalationUncertain is a dummy specifying if the rental escalation is not specified in the contract. Quantities in parentheses present standard errors unless stated otherwise.

Increased awareness about climate change has led to numerous measures taken by firms that are geared towards responding to global challenges. Green buildings are one such response. However, increased environmental performance may have cost implications. As a result, landlords charge premium rents for such offices. Proponents of green buildings highlight their business benefits while critics point to their hitherto limited contribution to curbing aggregate GHG emissions. Notwithstanding this criticism, green buildings have been shown to lead to numerous pecuniary and non-pecuniary benefits both for tenants and landlords. As tenant firms strive to maximize shareholder value, an increased rent must be justified by corresponding benefits. If neither of the two sides -landlords or tenants- perceive green practices as positive NPV propositions, governments may need to pass legislation to incentivize them. The impact of regulation depends on the NPV estimates of going green by tenants; and the price reaction from landlords. A risk with regulatory pushes is that landlords may "hold up" tenants who are directly affected by regulation and make them sign onerous rental contracts. Hence, regulations must be carefully designed to avoid creating a 'gatekeeper' situation for owners of a mandatory good, in this case green buildings, that enables landlords to engage in excessive rent-

Table 6
Difference-in-difference model for rents in non-green contracts.

Dependent variable: log(Rent) [Non-Green Buildings]						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
(Intercept)	4.36***	4.36***	4.36***	4.36***	4.35***	4.36***
	(39.43)	(39.41)	(39.42)	(39.40)	(39.38)	(39.28)
log(Area)	−0.03***	−0.03***	−0.03***	−0.03***	−0.03***	−0.03***
	(-9.72)	(-9.71)	(-9.72)	(-9.73)	(-9.71)	(-9.72)
log(1 + Tenure)	−0.06***	−0.06***	−0.06***	−0.06***	−0.06***	−0.06***
	(-6.50)	(-6.46)	(-6.49)	(-6.47)	(-6.49)	(-6.47)
License	−0.05***	−0.05***	−0.05***	−0.05***	−0.05***	−0.05***
	(-2.93)	(-2.97)	(-2.95)	(-2.96)	(-2.95)	(-2.96)
log(1 + LockIn)	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***
	(6.28)	(6.29)	(6.30)	(6.30)	(6.30)	(6.27)
log(1 + CAM)	0.02***	0.02***	0.02***	0.02***	0.02***	0.02***
	(5.38)	(5.41)	(5.36)	(5.42)	(5.39)	(5.41)
log(1 + SecurityDeposit)	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***
	(3.54)	(3.52)	(3.54)	(3.52)	(3.52)	(3.51)
log(1 + Parking)	0.00	0.00	0.00	0.00	0.00	0.00
	(0.42)	(0.35)	(0.33)	(0.36)	(0.37)	(0.36)
Renewal	0.02*	0.02*	0.02**	0.02**	0.02**	0.02*
	(1.96)	(1.94)	(1.98)	(2.22)	(1.97)	(1.95)
RateContractComplex	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01
	(-0.92)	(-0.92)	(-0.91)	(-0.91)	(-0.92)	(-0.92)
EscalationUncertain	0.00	0.00	0.00	0.00	0.00	0.00
	(0.32)	(0.34)	(0.33)	(0.35)	(0.34)	(0.34)
Top1000	0.05***	0.06***	0.06***	0.06***	0.06***	0.06***
	(4.63)	(5.53)	(5.57)	(5.54)	(5.54)	(5.54)
ListedNon1000	−0.04	−0.04	−0.06*	−0.04	−0.04	−0.04
	(-1.23)	(-1.24)	(-1.68)	(-1.24)	(-1.22)	(-1.24)
Foreign	0.08***	0.08***	0.08***	0.08***	0.08***	0.08***
	(9.41)	(8.92)	(9.48)	(9.45)	(9.46)	(9.44)
log(1 + SDG)	−0.07***	−0.07***	−0.07***	−0.07***	−0.07***	−0.07***
	(-3.61)	(-3.61)	(-3.63)	(-3.60)	(-3.60)	(-3.62)
Sensitive	0.01	0.01	0.01	0.01	0.02	0.01
	(0.53)	(0.51)	(0.52)	(0.54)	(0.89)	(0.52)
Sinful	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01
	(-0.36)	(-0.32)	(-0.40)	(-0.33)	(-0.28)	(-0.41)
Post	0.01	0.01	0.02	0.02	0.02	0.02
	(0.38)	(0.44)	(0.66)	(0.95)	(0.79)	(0.69)
Top1000:Post	0.06**					
	(2.01)					
Foreign:Post		0.01				
		(0.62)				
ListedNon1000:Post			0.25*			
			(1.89)			
Renewal:Post				−0.03		
				(-1.11)		
Sensitive:Post					−0.05	
					(-1.19)	
Sinful:Post						0.02
						(0.28)
R2	0.67	0.67	0.67	0.67	0.67	0.67
Adj. R2	0.66	0.66	0.66	0.66	0.66	0.66
Num. obs.	11714	11714	11714	11714	11714	11714

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

Note: This table presents the results of OLS models. The analysis is limited to non-green commercial office rental contracts data from nine metropolitan cities of India between 2010 and 2022. The dependent variable Rate is specified in Indian Rupees per square foot per month. GreenStatus is a dummy variable specifying whether the facility is LEED or WELL-labeled. Area of the rented space is measured in sqft. Tenure is the contractual length in years. License is a dummy variable for "License and Leave" contract while the base group refers to "Lease" contract. LockIn is the contract lock-in period measured in months. CAM refers to common area management fees specified in INR per month per sqft. SecurityDeposit is specified in INR. Parking is the count of parking spots included in the rental contract. Renewal is a dummy variable specifying whether the contract relates to the renewal of an existing contract. rateContractComplex is a dummy variable for complex rental escalation terms. EscalationUncertain is a dummy specifying if the rental escalation is not specified in the contract. Quantities in parentheses present standard errors unless stated otherwise.

seeking behavior, at least until new supply comes on stream which may take many years.

We examine OLS hedonic pricing models for rental rates. As expected, we observe significant premiums (WELL: 9–21%, LEED: 4–13%) on green-labeled offices. We observe that rental contracts with complex, or uncertain escalation terms obtain a discount; but landlords compensate for higher-quality assets by increasing contractual lock-in period, higher common area management (CAM) charges, or higher security deposit amounts. We find some evidence of the "hold up" phenomenon whereby landlords charge a considerably higher rent when a tenant is renewing her existing lease, especially in non-green assets.

Tenant estimates for the NPV of green rentals -and hence the demand for them-will vary based on the nature of their business. These estimates will also govern their propensity for renting green. Therefore, we use Logit models on the propensity of tenants to rent green spaces based on their characteristics. We find that the demand propensity is the highest

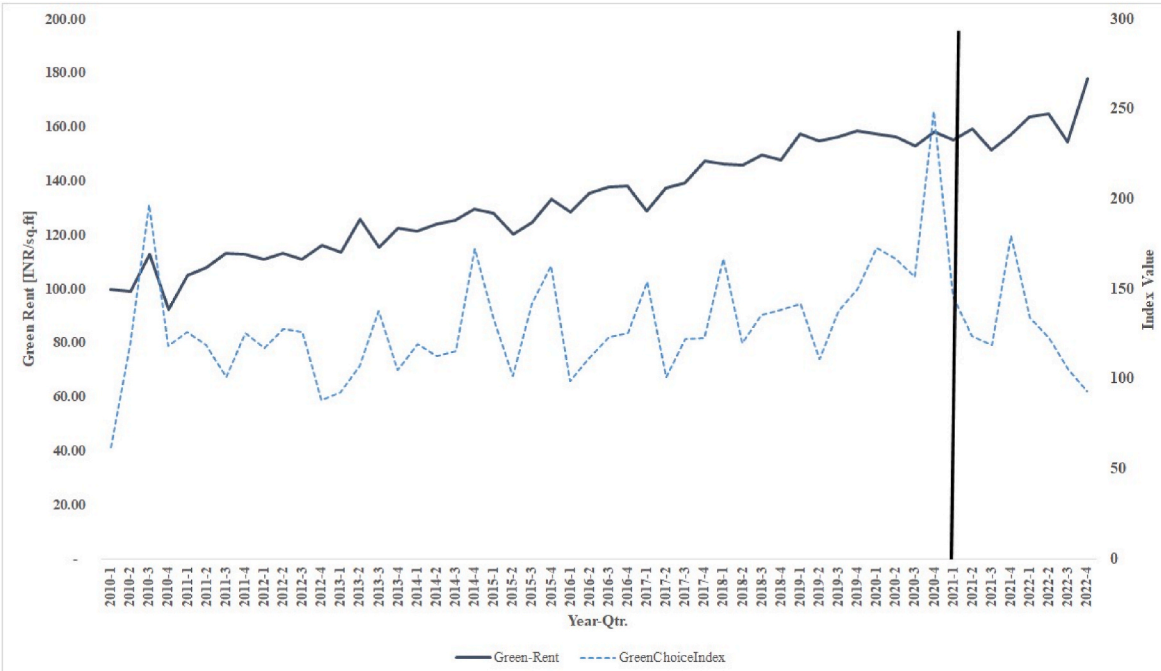

Fig. 1. Rental rate indices.
Source: Authors' econometric calculations based on data provided by PropStack.

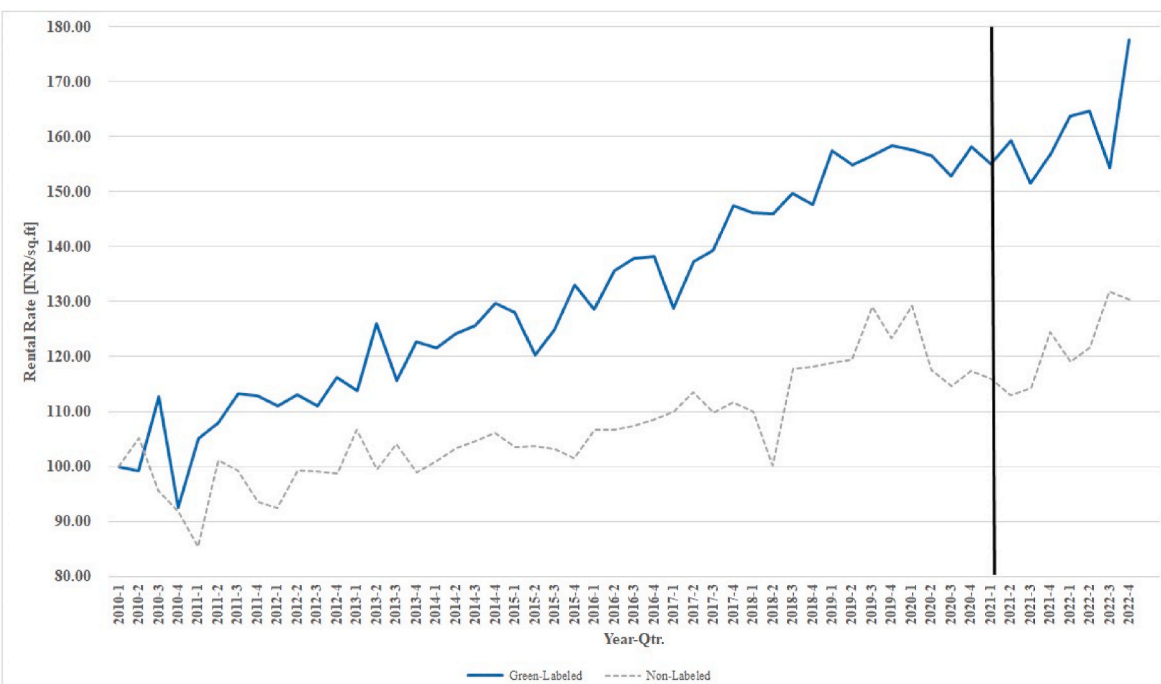

Fig. 2. Trends in rental rates and propensity to rent in green offices. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)
Source: Authors' econometric calculations based on data provided by PropStack.

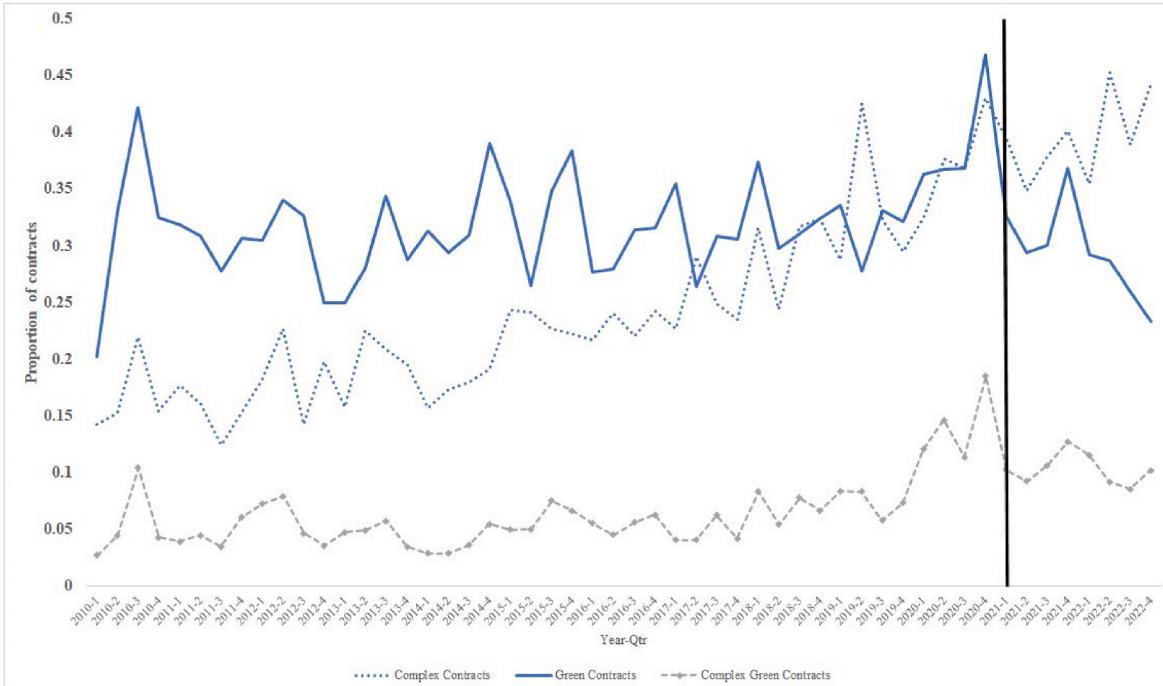

Fig. 3. Trends in the shares (proportions) of different types of rental contracts.
Source: Authors' econometric calculations based on data provided by PropStack.

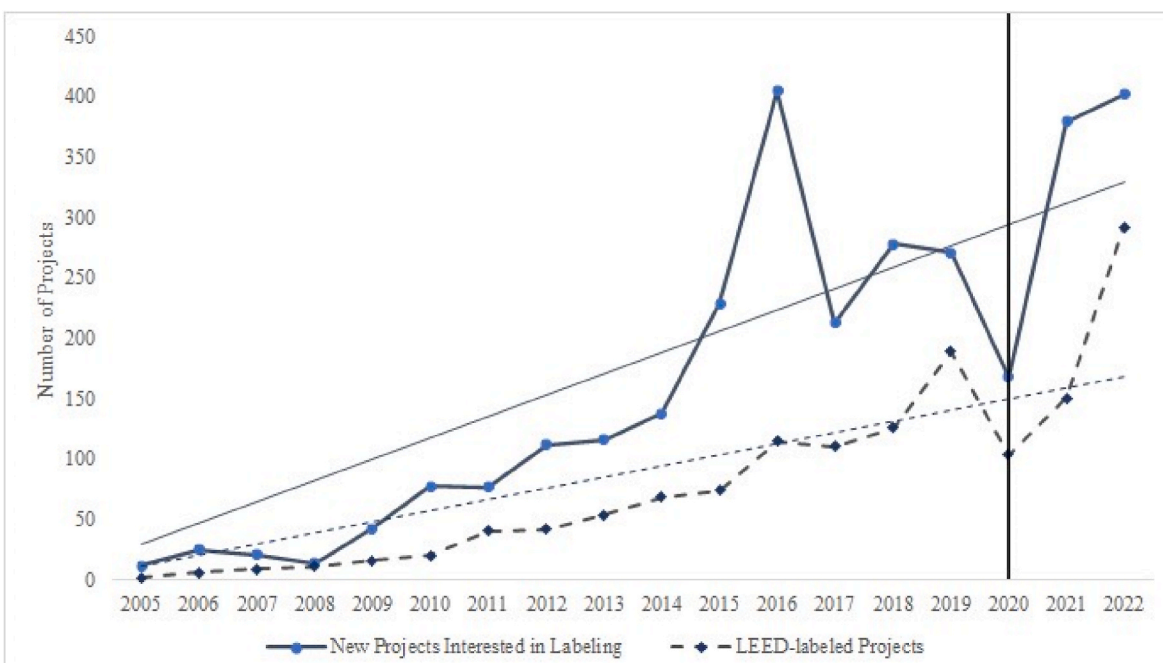

Fig. 4. Trends in the supply of usgbc LEED-labeled projects in India.
Source: Authors' calculations based on USGBC data.

among foreign firms.[20] In general, we find that firms linked to headquarter nations with more ambitious sustainability commitments (SDG ranks) are associated with a higher propensity to rent green offices. These findings are in line with studies conducted in other areas of business wherein foreign firms are faced with higher information asymmetry and must go that extra mile to establish their responsible credentials.

Propensity to rent green is also significantly higher in large, domestic listed firms (Top-1000 by market capitalization), and significantly lower

[20] Demand for Green Buildings in India is heterogeneous: Highest among Commonwealth nations (UK, Australia, Canada, New Zealand), followed (in decreasing order) by USA, EU, and Developed Asia (Japan, Singapore, Hong Kong, Taiwan). We do not find any significant difference between domestic firms and firms with headquarters in the Middle East (Saudi Arabia, UAE, Qatar, etc.). (These results are not reported in the current version of the paper).

in smaller listed firms. Large firms can capitalize on the benefits of going green due to their economies of scale, whereas smaller firms may find it to be a negative NPV proposition. The demand propensity models also exhibit substantial heterogeneity across industry sectors. Surprisingly, we find that sectors more vulnerable to image-related risks ("Sensitive" or "Sinful") exhibit lower demand propensity. Such firms may have lower payoffs against rental premiums in improving their image relative to more salient measures and may resort to other means such as CSR, or simply publicity campaigns.

Lower demand propensity in smaller firms and in these sensitive sectors suggest a higher price elasticity of demand for these firms that reduces demand among tenants who do not have a strong mandate for going green. Charging higher green premiums may have been more pronounced after the disclosure requirement was announced, directly affecting the largest (Top1000) domestic listed firms. This may hint towards a disproportionate reaction by landlords.

Finally, graphical analysis is used to illustrate market developments and the dynamics of the demand-supply balance. We find that rent escalations in green offices have significantly outpaced the rent in non-green offices. Post regulation, the green rents shoot up much higher. The landlord's enthusiasm reflects on the supply of green offices. Despite the COVID-19 pandemic, the regulation led to a surge in a new supply of LEED-labeled buildings (and interest by landlords in seeking the label) while several tenants moved away from renting green offices.

5.1. Managerial implications

Our study validates the presence of significant rental premiums in an emerging market that mimics several developed markets, the USA in particular. If ESG reporting is the motive, the choice of green labels is critical: LEED offices command 4–13 percentage point rental premium. WELL-labeled offices command an additional 5–8 percentage point rental premium (over LEED). Some firms may be able to offset the additional rental premium via improved wellness of the occupants, which may lead to non-pecuniary and indirect financial gains. However, this decision warrants a careful cost-benefit analysis. On the other hand, landlords must carefully assess the trade-off between reduced demand and higher rents in their green offices. If tenants find the rental premiums as onerous, they may redirect their ESG activities to pastures beyond renting green offices. After disclosure requirements came into force, firms directly affected by the requirement have significantly reduced their propensity to rent green offices. A disproportionate increase in green rents is salient. Tenant firms must explore more cost effective alternatives to adopt ESG policies. It appears that large increases in green asking rents in response to the disclosure requirements led to a reduction in the demand propensity of renting green among large listed companies and increased rent in non-green offices.

5.2. Policy implications

Our findings highlight the shortcomings of the regulatory framework that may increase the financial burden on a specific set of tenants, i.e. foreign firms and those who are compelled to continue in existing facilities by renewing an existing lease. Other tenants who can afford to do so, tend to redirect their attention away from renting green offices. While the regulation may promote the supply of more green buildings, regulators must introduce measures to moderate the overreaction of suppliers to establish green buildings as a beneficial proposition for all parties. Future studies could include additional green labels (GRIHA, IGBC, EDGE, etc.) in the analytical framework. Beyond rental rates, green labels also influence valuation, operating expenses, and cash flow risks. Future studies could examine these metrics in the context of other less industrialized nations. Further, not all green buildings are green-labeled. This study builds the groundwork for future studies on non-labeled buildings that nevertheless fulfil the criteria of a green or healthy building based on underlying material metrics. While the regulation may promote the supply of more green buildings, regulators must introduce measures to moderate the overreaction of suppliers to establish green buildings as a beneficial proposition for all parties.

CRediT authorship contribution statement

Anirban Banerjee: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Validation, Writing – original draft, Writing – review & editing. **Prashant Das:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Software, Visualization, Writing – original draft, Writing – review & editing. **Franz Fuerst:** Conceptualization, Project administration, Methodology. Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

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