Socially Responsible Engagement*

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Abstract

Investors increasingly invest in a socially responsible manner. However, there is only limited evidence on whether and when this affects the investment decisions of firms. This paper examines the role of depreciation cycles of physical assets in shaping the effectiveness of socially responsible engagements. The costs of improving the sustainable performance of physical assets decline with their depreciation, given lower secondary market prices and operational downtime. Using unique micro-level data of investments in physical assets of listed real estate firms, we exploit exogenous variation in the timing of engagements relative to depreciation cycles of real assets to identify differences in engagement effectiveness on firms. We find that socially responsible engagements lead to an increase in sustainable investments only if they coincide with renovation periods of physical assets. Conversely, engagement is ineffective outside renovation periods. These sustainable performance improvements appear additional, as conventional renovations and property sales are unaffected by engagement. This shows that not only the selection of firms but also the timing of engagements plays a crucial role in transitioning to a more sustainable economy.

Key words: Socially Responsible Investing (SRI), Environmental Social Governance (ESG), Additionality

JEL codes: G11, M14, Q56

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1 Introduction

Socially responsible investing (SRI) is an investment approach in which investors strive to reduce the externalities of firms in conjunction with conventional financial considerations. This investment approach is increasingly prevalent in financial markets, with over 5,000 institutional investors covering 121 trillion USD assets under management conforming to the United Nations Principles of Responsible Investing in 2022. One of the most prominent SRI approaches is engagement, where investors initiate environmental or socially oriented proxy votes at shareholder meetings.[1] However, there is only limited evidence of whether and under which conditions engagement generates a positive impact on the environment and society.

In this paper, we assess the effectiveness of socially responsible engagement to promote firms' sustainable investment behavior. Engagement is frequently studied through the investor's lens and its selection in firms. Investors typically engage with firms where they believe their influence can yield more significant results (Akey and Appel, 2019; Naaraayanan et al., 2021). For instance, investors often engage with firms that are more sustainable (Barko et al., 2021), attain higher profits (Dimson et al., 2015), and are larger than the average firm (Busch et al., 2023). Further, investor success in engagement is higher when engagement topics are financially material (Grewal et al., 2016; Bauer et al., 2022) or mitigate tail risk (Hoepner et al., 2021). Due to this investor focus, the effectiveness of engagement in affecting firms' behavior is still an open question in socially responsible investing.

One vital aspect of the effectiveness of engagement lies in the ability of firms to improve the sustainable performance of their physical assets. The EPA argues that 89% of US emissions originate from industries heavily relying on physical assets, such as real estate, manufacturing, and transportation (EPA, 2022). Improving the sustainable performance of these industries involves retrofitting such physical assets. The capital adjustment costs of these retrofits

[1]There are several tools and approaches available in socially responsible investing. Three, in particular, play an active role in the industry. First, screening involves the evaluation of investments based on environmental and social criteria, either excluding or including them accordingly (tilting) (Oehmke and Opp, 2020; Broccardo et al., 2022; Berk and van Binsbergen, 2021; Edmans et al., 2022). Second, engagement empowers investors to utilize their ownership rights to shape corporate conduct and practices (Dimson et al., 2015; Levit, 2019; He et al., 2024). Finally, certifications and labels provided by third-party entities serve as signals of performance, commitment, and intentions in various social and environmental issues (Berg et al., 2021; Bams and van der Kroft, 2024). Understanding the impact of these tools on behavior and discerning their suitability in different contexts are vital questions for investors to address.

are strongly dependent on the depreciation of physical assets due to the irreversibility of investments and operational downtime (Mauer and Ott, 1995; Cooper and Haltiwanger, 2006; Livdan and Nezlobin, 2021). To elaborate, delaying retrofits of physical assets until they are more depreciated increases the time that assets are operational. Further, the absolute loss associated with selling or discarding replaced assets declines over time with residual values. Consequently, the costs of sustainable performance improvements vary over the depreciation cycles of physical assets.

We assess the depreciation cycles of physical assets in the listed real estate market using comprehensive microdata on building retrofit permits across the US. Our data includes 359,022 retrofit permits for the universe of properties owned by US listed real estate firms (N=61,870) from 1990 to 2022. The data allows us to identify sustainable retrofits that enhance the sustainable performance of properties by reducing its emissions (e.g., switching to LED lighting or installing solar panels) or improving the working/living conditions of occupants (upgrading HVAC system). In addition, the data enables us to identify the exact timing of retrofit cycles using a jump-diffusion algorithm since obtaining permits is mandatory before starting large renovations.

Socially responsible engagement is solely effective in improving sustainable performance during the period that physical assets are being retrofitted. We estimate the effectiveness of engagement in a difference-in-differences setting, where we compare the share of sustainable permits issued when engagements occur during retrofit cycles or in the three quarters before or after retrofit cycles. Using this specification, we find that sustainable permit issuance increases by 4.67 percentage points, 22% of the average share of sustainable permits, when engagement coincides with retrofit cycles. In contrast, engagement outside of retrofit cycles does not improve the sustainable performance of properties. Further, it even appears to reduce sustainable permit issuance by 23% of average sustainable permit issuance.

Our results are solely driven by successful engagements. Not all proxy votes are successful and voted through on annual meetings or withdrawn by firms. For successful socially responsible engagements during retrofit cycles, we observe an economically prominent increase reflecting 64% of the average share of sustainable permits. However, even successful engagements do not improve sustainable permit issuance when unaligned with physical depreciation cycles. Further, unsuccessful engagements reduce the share of sustainable retrofit permits by 31% during retrofit cycles.

We provide suggestive evidence that these sustainable permit increases are additional to firms' decision-making. First, we show that engagement during retrofit cycles does not affect conventional permit issuance beyond the electrical permits required for HVAC installation. Second, we do not observe that real estate firms abnormally change the composition of their portfolio and sell less sustainable properties.[2] Third, we do not find that buyers of sold properties reduce the subsequent rate of sustainable retrofitting after engagements during retrofit cycles. These results highlight the importance of accurately timing engagement to align with the depreciation cycles of physical assets in improving sustainable performance.

This paper contributes to the literature on socially responsible investing by highlighting the critical role of timing in improving firms' sustainable performance. Dating back to the classical debate on "exit" versus "voice" (Hirschman, 1972; McCahery et al., 2016), the socially responsible investing literature frequently studies whether (partial) divestment or engagement can improve firms' sustainable performance (Broccardo et al., 2022). For instance, Oehmke and Opp (2020) show that socially responsible investors need to internalize externalities regardless of ownership to improve aggregate sustainable performance. Pástor et al. (2021) and Pástor et al. (2022) theoretically and empirically show the expected return consequences of investors' tastes for sustainable firms. Edmans et al. (2022) study the trade-offs between blanket exclusion and portfolio tilting in reducing externalities. Where this literature often models representative firms in a static investment scenario, we show that within-firm variation in the costs of sustainable performance improvements, given the physical depreciation of assets, moderates the effectiveness of sustainable investing. Therefore, strategically allocating sustainable investment efforts across both firms and time could aid improving aggregate sustainable performance, especially when a critical mass of socially responsible investments is lacking (Berk and van Binsbergen, 2021)

[2] Berk and van Binsbergen (2021) propose a similar mechanism for heterogeneous investors and portfolio tilting. Specifically, socially responsible investors effectively give voting rights on brown firms to conventional investors who further deteriorate their externalities. This effect can be pronounced when cost of capital is strongly affected (Hartzmark and Shue, 2023).

We further contribute to the literature that studies the efficacy of socially responsible engagements by showing that engagement affects managerial decision-making on environmental and social topics. Early socially responsible engagement literature focused on the financial (Dimson et al., 2015; Bauer et al., 2022) or risk (Hoepner et al., 2021) consequences of engagement. More recent work addresses engagements' impact on sustainable performance. For instance, Akey and Appel (2019) and Naaraayanan et al. (2021) study how hedge fund activism and the Boardroom Accountability Project affected toxic releases in the US manufacturing industry, Azar et al. (2021) and Busch et al. (2023) investigated the carbon emission consequences of proxy voting and big three engagement, Barko et al. (2021) used a proprietary engagement dataset to study the sustainable and financial performance consequences of behind-the-scenes activism, Kahn et al. (2023) studied latent engagement through random variation in long-term sustainable investor ownership, and Dimson et al. (2021) analyzed the results of and mechanisms behind coordinated PRI engagements. We contribute to this literature by analyzing the responses of firms to socially responsible engagement rather than by taking the investor perspective. Specifically, our micro-level data enables us to study the ex-ante decision-making process of firms on environmental and social topics as opposed to studying ex-post aggregate sustainable performance measures. This enables us to rule out most alternative explanations, such as variations in conventional business activities and the extensive margin of sustainable performance.

Section 2 discusses the institutional setting of real estate and retrofitting. Section 3 describes and validates our data. Section 4 elaborates on our identification strategy, the detection of retrofit cycles, and our empirical specification. Section 5 explains our results. Section 6 concludes.

2 Institutional setting

2.1 The publicly listed Real Estate market

The publicly listed real estate market consists primarily of Real Estate Investment Trusts. The business model of REITs is to acquire and lease properties to generate income flows for their shareholders. Most REITs focus on a specific property type since operating real estate properties efficiently requires specialized knowledge. Among these property types are offices, multi-family, industrial, health care, shopping malls, hospitality, and specialty properties such as cell towers, self-storage, and data centers. Due to this specialization, there are only 204 U.S. listed REITs at the end of 2022. However, the publically listed REIT market is significant given its 1.2 trillion USD market capitalization and 3 trillion USD managed properties.[3]

Reducing externalities in real estate through retrofitting has a first-order impact on aggregate U.S. externalities. Real estate is one of the largest sources of externalities in the economy. Roughly 40 percent of carbon dioxide emissions come from the building and real estate sector. The vast majority of these emissions, 72%, arises from the operation of properties and associated energy consumption (i.e., heating and cooling), while 28% is explained by embodied carbon in the construction phase.[4] In addition, from a social perspective, on average people spend 90% of their time indoors. One example of externalities associated with working and living indoors is heightened levels of air pollution that significantly affect strategic decision-making (Allen et al., 2016; Künn et al., 2023) and health outcomes (Jones, 1999).

2.2 Sustainable Retrofitting and Their Environmental and Social Implications

Improving the operational efficacy of properties in both environmental and social dimensions through retrofitting plays a significant role in aggregate externalities. We use the EnergyStar guidelines to identify environmental retrofits. EnergyStar is a governmental agency operated by the United States Environmental Protection Agency that, among others, tracks the environmental performance of U.S. properties. In its most recent guidelines, EnergyStar identifies

[3]In addition to the equity REITs discussed here, there are also mortgage REITs that provide debt financing to the real estate industry. We do not consider mortgage REITs in our study as they are unable to perform retrofits due to a lack of direct control over the buildings they finance.

[4]https://www.eia.gov/tools/faqs/faq.php?id=86&t=1#:~:text=In%202022%2C%20the%20combined%20end,British%20thermal%20units%20(Btu).%26text=This%20was%20equal%20to%20about,use%20energy%20consumption%20in%202022., https://www.gresb.com/nl-en/what-is-embodied-carbon-in-the-real-estate-sector-and-why-does-it-matter/, and https://www.epa.gov/report-environment/indoor-air-quality#:~:text=Importance%20of%20Indoor%20Air%20Quality,-%E2%80%9CIndoor%20air%20quality&text=Americans%2C%20on%20average%2C%20spend%20approximately,higher%20than%20typical%20outdoor%20concentrations.

HVAC systems, heating and cooling, and building envelope retrofits as critical ways to reduce energy consumption and curb emissions.[5] In addition, Kontokosta (2016) perform a survey on REIT-owned (and non-REIT owned) office properties, and similarly identify HVAC systems, building envelope improvements, lighting retrofits, and energy management systems as critical ways to improve the energy efficiency of properties.

We rely on the social property performance rating system of WELL and Fitwel to identify sustainable retrofitting. WELL and Fitwel are leading providers of social performance indicators and designates the accessibility of properties, water and air quality, amenities, and aesthetics as critical social performance indicators.[6] Allen and Macomber (2020) further define healthy buildings as properties that attain proper levels of ventilation, air quality, temperature, moisture, dust & pests, safety & security, water quality, noise, and lighting & view. Given the above, REITs can reduce their externalities by sustainably retrofitting properties in ways that improve the HVAC system, the building envelope, esthetics, and amenities.

REITs are constrained in the timing of substantive retrofits (including sustainable and conventional ones). Minor sustainable retrofits, such as installing smart thermostats or solar panels, can be installed at the discretion of REITs. However, the U.S. Department of Energy Office of Scientific and Technical Information argues that substantive sustainable retrofitting, such as replacing HVAC mechanical systems or building envelope improvements, often requires significant restructuring of properties and capital investment.[7] Consequently, leasing and using properties during these substantive retrofits is infeasible as construction and the lack of heating or cooling force a majority of building space to be vacated and tenants to be displaced. Since displacing tenants reduces rental income, Kontokosta (2016) find that REITs strive to overlap substantive sustainable retrofitting with conventional retrofitting to save costs. Moreover, displacing tenants is often impossible, given ongoing lease contracts, forcing REITs to postpone (sustainable) retrofits until the majority of leases come to the end. For these reasons, substantive sustainable retrofitting needs to be aligned with conventional major retrofitting activities.

The constraints in retrofit timing instigate REIT-specific retrofit cycles. REITs will only

[5] `https://www.energystar.gov/buildings/tools-and-resources/building-upgrade-manual`
[6] `https://www.wellcertified.com/` and `https://www.fitwel.org/esg`
[7] `https://www.osti.gov/biblio/824856`

retrofit individual properties when their equipment is sufficiently depreciated, and lease terms permit it (Kontokosta, 2016). These property-level spikes in retrofitting activity, which we define as retrofit cycles, generalize to the REIT level due to REIT-specific tax regulation. For REITs to be considered similar to mutual funds and prevent double taxation, they should be relatively passive in their investment strategies and distribute most of their income. Particularly, REITs are required to pay out 90% of their income to shareholders and attain 90% of their income from operating properties (see Geltner et al., 2014, for further details on REITs and their tax rules). This 90% distribution clause constrains REITs from financing extensive retrofits through internally generated funds, forcing them to rely on repeated equity or debt issuance. Due to fixed costs of issuing debt or equity (Smith Jr, 1986), REITs have the incentive to jointly retrofit multiple properties, instigating REIT-level retrofit cycles. Given the above, socially responsible engagement mainly effectively reduces externalities through sustainable retrofitting during retrofit cycles because REITs align sustainable with conventional retrofits.

3 Data

3.1 REIT properties

We identify which properties are operated by REITs using CoStar and S&P SNL Real Estate. CoStar and SNL are widely-used datasets that capture a broad range of property characteristics such as property age, type, size, rent, location, and ownership (see Eichholtz et al., 2010; Ling et al., 2020). We collect this information for a diverse sample of REITs and properties from 1990Q1 to 2022Q4. We identify properties for 207 REITs operating in the Office (35), Shopping Center (32), Diversified (28), Specialty & Self-Storage (26), Hotel (20), Multifamily (18), Healthcare (17), Industrial (15), Other Retail (12), Self-Storage (7), and Manufactured Homes (4) segments. 149 of these REITs remain active at the end of our sample, covering 82% of the market capitalization and the number of REITs in the market.[8]

We collect information on 61,870 REIT-owned properties. These properties reside in the Retail (28,287), Industrial (7,918), Office (7,148), Specialty & Self-Storage (6,049), Health

[8] https://www.reit.com

Care (4,157), Multifamily (3,905), Shopping Center (2,967), Hospitality (842), Hotel (447), and Manufactured Homes (150) segments. The average property spans 91k square feet and is 30 years old. Figure 3 shows that these properties are geographically dispersed across the United States, emphasizing population-dense areas such as California, Florida, and New York. In addition to property information, we collect accounting information from Compustat, market capitalization and total returns from CRSP, and EnergyStar, LEED, and WELL certificates at the property level.

3.2 Socially responsible engagment

We collect information on all public (socially responsible) engagements for S&P1500 firms from the Institutional Shareholder Services (ISS) proxy voting dataset. ISS is a commonly used dataset that identifies every step of the proxy voting process (Busch et al., 2023; He et al., 2024). First, it tracks whether proposed votes are legal and accepted by the SEC. Second, it observes whether firms comply with stockholders' demands and withdraw the proposal. Third, it records voting outcomes of proposals during shareholder meetings. In addition to engagement outcomes, ISS also classifies engagements as either governance or environmental and social.[9,10]

We collect 176 governance and 53 environmental and social (ES) engagement events for our REIT sample, totaling 229 engagements. Environmental and social engagements are socially responsible as they strive to reduce firms' environmental and social externalities. 54.72% of these socially responsible engagements are withdrawn and accepted by the firm, and 45.28% are omitted by the SEC or failed in a proxy vote. This distribution of successful and unsuccessful socially responsible engagement events is reminiscent of He et al. (2024), who similarly find

[9] He et al. (2024) argue that some engagements classified as socially responsible by ISS are governance engagements. In untabulated analyses, we adopt the ISS and the He et al. (2024) classification and find no economically meaningful differences in our results.

[10] Large institutional investors sometimes privately engage with firms as a first step in the engagement process (Levit, 2019). Here, they directly talk with management and voice their opinion on the firm's (environmental and social) performance (Dimson et al., 2015; Bauer et al., 2022). When these private discussions are unsatisfactory, they can initiate a public proxy voting procedure observable in the ISS dataset. We do not have access to private engagement campaigns as they are often highly heterogeneous across investors, less coordinated between investors, and intentionally hard to observe since they are kept private. However, our sole reliance on public engagements is likely to, if anything, understate the impact of engagement on externality reductions because firms did not acquiesce with stockholder demands in the private stage and thus oppose the engagement relatively more (Levit, 2019).

that socially responsible engagements are almost exclusively unsuccessful when it reaches the proxy vote stage. Despite the relatively small number of socially responsible engagements in the data, we retain a meaningful sample due to the granularity of permit information at the property level.

3.3 Building Renovation Records

We use BuildZoom to assess the externalities of the publicly listed real estate market at the property level. BuildZoom is a data provider that collects building permit information including both new construction and existing building retrofits for commercial and residential properties throughout the United States. It does so by standardizing regulatory permit depositories across U.S. counties. BuildZoom collects 110 million permits over 32.9 million properties, dating back to the start of the 20th century, and strongly increased coverage as of 1990. These properties are dispersed across 50 states with a predominant focus on Florida (19.01%), California (15.70%), Texas (9.59%), and North Carolina (4.34%). BuildZoom captures a substantive portion of retrofitting activity due to the legal necessity to apply for permits when renovating or constructing properties. To illustrate, the U.S. Census reports 44.4 million new construction permits since 1990, while BuildZoom identifies 108.5 million permits across multiple categories (including new construction) over a similar timeframe.[11]

In addition to observing when and for which property permits are issued, Buildzoom also categorizes permits into 29 categories.[12] Furthermore, BuildZoom collects information on the completion status of permits, their contractors, estimated execution values, and permit fees.

This categorization enables us to observe property-level environmental and social externality reductions by identifying sustainable permits using the listed guidelines of EnergyStar and Fitwel. In its most recent guidelines, EnergyStar determines air distribution (HVAC) systems, heating and cooling, and building envelope retrofits as critical ways to reduce energy con-

[11] `https://fred.stlouisfed.org/series/PERMIT`

[12] Namely, Bathroom Remodelling, Decks and Porches, Demolition, Docks, Doors, and Windows, Electrical Work, Excavation and Grading, Fences, Flatwork Concrete, Foundations, Garage Construction, HVAC systems, Home Addition, Kitchen Remodel, Landscape, Mechanical Work, Mobile Homes, Multi-Room Remodel, New Construction, Patios, Paving, Driveways, and Sidewalks, Plumbing, Pool and Spa Construction, Retaining Walls, Roofing, Sewer Laterals, Siding, Signage, Solar Installation.

sumption and curb emissions.[13] Therefore, we consider doors and windows, HVAC systems, retaining walls, roofing, and solar installations as sustainable retrofits from an environmental perspective. In addition to HVAC improvements, we classify landscaping, patios, paving, driveways, and sidewalks as socially sustainable because these permits most closely align with the exterior design, amenities, and the accessibility of properties. We follow the approach of WELL and Fitwel to classify socially relevant permits. WELL and Fitwell consider the accessibility of properties, water and air quality, amenities, and design as critical social performance indicators.[14]

We connect BuildZoom permit data to REIT properties by geospatial matching address and coordinate information. This approach enables us to retrieve permit information for more than 99 percent of properties operated by all the REITs in the US, at 99% matching accuracy. For these 62k properties, we observe 281,081 conventional permits with an average reported value of 109,241 dollars per permit; and 77,941 sustainable retrofit permits with an average value of 168,074 dollars per permit, totaling 43.8 billion dollars.[15] This translates into 4.54 conventional and 1.26 sustainable permits per property in our study period. In Table 1, we display the frequency of all permits and indicate whether they are classified as conventional or sustainable based on the definitions of EnergyStar and Fitwel.

We validate the accuracy of our sustainable retrofit permit classification by showing that sustainable permits reduce environmental negative externalities. Large commercial properties in New York (NY), Boston (MA), and Cambridge (MA) have to report their energy consumption and estimated carbon emissions on an annual basis, given the Local Law 87, BERDO, and BEUDO energy registry regulations, respectively.[16] We manually match this emission information to properties operated by REITs and analyze their permits. In Table 2, we regress the CO_2 intensity of properties expressed as kilograms per square feet on the number of sustainable, environmental, social, and conventional permits, controlling for REIT- and time-fixed effects

[13] https://www.energystar.gov/buildings/tools-and-resources/building-upgrade-manual

[14] https://www.wellcertified.com/ and https://www.fitwel.org/esg

[15] BuildZoom indicates that these permit values likely represent a lower bound for realized expenses as fees paid to local governments often depend on estimated permit costs.

[16] See https://www.nyc.gov/html/gbee/html/plan/ll87.shtml, https://www.boston.gov/departments/environment/building-emissions-reduction-and-disclosure, and https://www.cambridgema.gov/CDD/zoninganddevelopment/sustainabledevelopment/buildingenergydisclosureordinance.

as well as baseline property emission intensity.

Sustainable permits directly reduce emissions. Table 2 Column (1) shows that each additional sustainable retrofit permit reduces CO_2 emission intensity by 0.193 kg per square footage. This effect is economically relevant compared to an average emission intensity of 8.695 kilograms per square footage. Specifically, issuing one additional sustainable permit reduces a property's carbon emissions by 2.22%. When we decompose the effect into those retrofit permits with environmental and social purposes in Columns (2) and (3), we find that solely environmental-purpose permits reduce emissions. In Columns (4) and (5), we perform falsification tests and see that the share of conventional permits has no explanatory power on emissions. Moreover, the impact of environmental-purpose permits on emission intensity is unchanged after we correct for overlap in the timing with social-purpose and conventional permits.

Environmental permits also explain CO_2 emission beyond commonly used third-party certification. In Columns (6) to (9), we regress LEED, EnergyStar, and WELL certificates on CO_2 emission intensities and find that primarily LEED certificates aid in explaining the environmental externalities of properties. Nevertheless, when we jointly control for these certificates and permit issuance in Column (10), we find that environmental permits retain a large share of their impact on externalities beyond what is captured in certification. Regarding economic impact, issuing eight environmental permits reflects moving from a non-LEED-certified property to a LEED platinum property. These analyses indicate that our classification of BuildZoom permits can adequately identify sustainable retrofitting that significantly affects the externalities of properties.

4 Method

4.1 Retrofit Cycles

BuildZoom permit information enables us to detect the precise starting and completion dates on which property owners conduct their retrofit projects without being hindered by the delay in data availability between the start of retrofit cycles, their completion, and their presence in archival datasets like energy registries. This timely discovery of externality reductions is critical for identifying the impact of socially responsible engagement.

We define retrofit cycles as periods in which properties owned by REITs experience abnormally high quantities of permits. We empirically identify the timing of these cycles by estimating their average duration and starting date. Using permit completion statuses, we observe that the average implementation of a permit is completed approximately three quarters after approval. Moreover, we similarly observe a three-quarters duration of retrofit cycles by analyzing the persistence of an abnormally high density of permit issuances within REITs. Given the above, we estimate that the average retrofit cycle lasts three quarters.

We identify retrofit cycle starting points using a jump detection algorithm. Particularly, we uncover these jumps by considering differences between the contemporaneous and one-period lead (t and $t+1$) and the two-period lagged ($t-1$ and $t-2$) average level of permits for every REIT by quarter. Specifically, we classify potential retrofit cycle initiations following a jump detection when the forward-looking permit average are larger than the backward-looking permit averages plus a one standard deviation in the number of permits of that REIT in our study period, $\frac{Permits_{i,t}+Permits_{i,t+1}}{2} \geq \frac{Permits_{i,t-1}+Permits_{i,t-2}}{2} + \sigma_i$. This approach resembles the λ statistic presented in Lee and Mykland (2008) but incorporates forward-looking ($_{t+1}$) information to better calibrate multi-period jumps in-sample.[17]

One concern with the above jump detection specification is that it mechanically introduces overlap in retrofit cycles. Typical jump detection algorithms consider 1-period jumps (Lee and Mykland, 2008). In contrast, retrofit cycles last three quarters. Despite correcting for one-quarter-ahead permit issuance, our algorithm will locate multiple starting points for some retrofit cycles when the permit increase is sufficiently large. We correct this overlap by computing the increase in permits for every potential retrofit start within REITs. Since retrofit cycles are defined as periods with abnormal permit levels, their starting points should reflect

[17]Our specification of retrofit cycles is robust to the number of lags used to compute the average forward-looking and backward-looking permits to one, two, three, or four quarters. Moreover, our specification is unchanged for less conservative cut-off points that identify retrofit cycles when the forward-looking permit averages are larger than the sum of backward-looking averages and the standard deviation divided by the number of quarters considered. Furthermore, our findings persist when considering the length of retrofit cycles at two or four quarters. We employ the current specification as it best fits the observed retrofit cycle length and average permit duration observed in the data.

the most significant jump in permits within the span of the retrofit cycle. Therefore, we remove all potential retrofit cycle starting points three quarters before, during, or after the most significant permit increase. Subsequently, we repeat this process iteratively, moving from the potential retrofit start with the largest to the smallest permit increase until no overlap in timing remains. This iterative removal of jumps mechanically removes overlap in jump detection without imposing potentially too strict jump thresholds and type 1 errors. Using this approach, we categorize 3,076 out of 11,802 REIT-quarter observations three quarters before, during, or after retrofit cycles.

The above detection approach cleanly identifies retrofitting cycles. Figure 2 displays the relative occurrence of permits surrounding retrofitting cycles. We express permits as percentage deviations from REIT-specific averages to provide a fair comparison across REITs. Figure 2 offers two aspects that indicate accurate jump detection. First, the permit jump is sizeable, reaching over 300% more permit issuance than usual at the start of retrofitting cycles. This signals that we are, on average, able to identify levels of high permit issuance. Second, the jump in permits is stark as reflected by the lack of a pre-cycle increase in permits and negligibly higher levels of permit issuance just after retrofitting cycles. This indicates that we identify retrofitting cycles' starting points and duration with reasonable precision.

4.2 Identification strategy

We use the timing of socially responsible engagement relative to retrofit cycles as an identification strategy for the impact of engagement on externality reductions. Externality reductions can only feasibly occur when REITs perform sustainable retrofits during conventional retrofitting cycles. Therefore, we argue that socially responsible engagement is able to reduce externalities only when it coincides with these cycles. To use this timing as random variation in the effectiveness of engagement, we need to first verify that engagement is exogenous of retrofit cycles. To this end, we empirically validate that the timing of socially responsible engagement is exogenous of retrofit cycles. Subsequently, we show that retrofit cycles do not adversely affect the success rates of socially responsible engagement. Last, we find that property depreciation, vacancy rates, and macroeconomic indicators drive retrofit cycles but not socially responsible engagement.

Engagement does not predict retrofit cycles. Figure 4 tests whether engagement predicts retrofit cycles. In this Figure, we display the regression coefficients and confidence intervals of contemporaneous, lagged, and lead engagement indicators, using the one-period lagged indicator as the reference category. We correct for potential variation in the ability of socially responsible investors to time their engagements more accurately for specific REITs or in certain periods by introducing lagged total returns, log size, and leverage ratio as REIT characteristics, REIT fixed effects, and time fixed effects. Across all periods, we do not observe that socially responsible investors accurately time their engagement activities to coincide with retrofit cycles. This suggests that socially responsible engagement does not instigate retrofit cycles.[18]

The lack of explanatory power of engagement on retrofit cycles is not explained by improvements in engagement timing of socially responsible investors. In our sample, socially responsible investing is becoming increasingly prominent over time, and investors prioritize externality reduction more strongly at the end of the sample rather than at its start. Further, investors might learn from successfully timing of past engagements and improve their precision moving forward. Therefore, socially responsible engagement might predict retrofit cycles at the end of the sample while displaying no overall predictive power. In Table 3, we rule out this possibility by regressing time-interacted engagement dummies on retrofit cycle dummies without finding any indication that the timing of socially responsible engagement coincides more strongly with retrofit cycles over time. We observe similar results by interacting a time scalar with engagement dummies in untabulated analyses. This lack of improved accuracy over time, in conjunction with no cross-sectional correlation, indicates that engagement is exogenous of retrofit cycles.

We argue and test that the success of socially responsible engagement is also exogenous of retrofit cycles. One potential alternative concern for our identification would be that the probability of REITs complying with socially responsible engagement demands increases during retrofit cycles. Specifically, more frequent engagement successes would positively affect the aggregate impact of socially responsible engagement on sustainable permit issuance without

[18]See Appendix C for the Tables that accompany Figures 4 and 5. Here, we also split the analysis by all, governance, and socially responsible engagements and find the same patterns in engagement timing and success.

improving engagement's efficacy. Further, one reason why socially responsible engagement could be more frequently successful is that REITs can better sustainably retrofit their properties during retrofit cycles as properties are already experiencing significant retrofits. In a similar empirical setting as proposed in Figure 4, we test whether engagement is more likely to be successful during retrofit cycles. Despite the above-mentioned concerns, we do not observe any increase in the probability of successful engagement due to retrofit cycles.

To further support the claim that retrofit cycles and socially responsible engagement are exogenous, we show that retrofit cycles are driven by property depreciation, vacancy rates, and macroeconomic conditions, while engagement is not. As described in the institutional setting, we anticipate that REITs retrofit depreciated properties with high vacancy rates. Moreover, we expect REITs to retrofit their properties more frequently when the costs of retrofitting are relatively low and benefits are high, in advantageous macroeconomic conditions. To this end, we regress retrofit cycles and socially responsible engagement on the indicators of property depreciation, vacancy rates, and macroeconomic conditions in Table 4.

Retrofit cycles are indeed driven by property depreciation and vacancy. In Table 4 Column (1), we regress the average time in years since properties owned by a REIT last received a permit and the average U.S. Census metropolitan area vacancy rate, where available, for all properties owned by a REIT on the occurrence of retrofit cycles. We show that property depreciation explains retrofit cycles as retrofit cycles become 0.22% more likely, on average, for every additional year REITs' properties have since last permit. Moreover, we also find that a 1% increase in the average metropolitan area vacancy rate of properties increases the probability of retrofit cycles by 1.24%.

Macroeconomic conditions and retrofit profitability also explain retrofit cycles. In Table 4 Column (2), we regress the U.S. Federal Housing Finance Agency All-Transactions House Price Index, NBER downturns, U.S. Bureau of Labor Statistics Producer Price Index on Construction Materials, and the International Monetary Fund Global Energy Price Index on the occurrence of retrofit cycles. From a macroeconomic perspective, we expect a negative relation between property prices and NBER recessions to retrofit cycles. Low property prices indicate high vacancy rates that allow REITs to retrofit more readily, and NBER recessions indicate poor economic conditions that lower lease demand. We empirically validate these expectations as the probability of retrofit cycles declines with 0.71% and 3.11% for a 1% increase in average property prices and during NBER recessions, respectively. From a retrofit profitability side, we anticipate that higher construction materials increase the cost of retrofitting, and higher energy prices increase the benefits of retrofitting through energy efficiency improvements. We find that a one percentage point increase in the construction costs decreases the probability of retrofit cycles by 0.09%. In contrast, a similar increase in energy prices increases the likelihood of retrofit cycles by 0.05%. In Column (3), we simultaneously regress the specifications presented in Columns (1) and (2) and observe generally similar results, except for property returns that turn insignificant after explicitly controlling for vacancy rates. Therefore, property depreciation, vacancy rates, and macroeconomic conditions explain retrofit cycles.

On the other hand, socially responsible engagement is not driven by property depreciation, vacancy rates, and macroeconomic conditions. In 4 Columns (4) to (6), we replicate the analyses presented in Columns (1) to (3) for the occurrence of socially responsible engagement. We do not observe any significant effect of property depreciation, vacancy rates, and macroeconomic conditions on socially responsible engagement across all specifications. Given the above, we argue that socially responsible engagement is not intentionally timed to coincide with retrofit cycles as engagement has no direct explanatory power on retrofit cycles, and retrofit cycles are explained by property and macroeconomic conditions, whereas socially responsible engagement is not.

4.3 Empirical specification

We quantify the impact of socially responsible engagements on externality reductions using the following Equation:

$$\text{Sustainable Permits } (\%)_{i,t} = \alpha + \beta_1 * \text{Engagement}_{i,t} + \beta_2 * \text{Retrofit Cycle}_{i,t} + \\ + \beta_3 * \text{Engagement}_{i,t} * \text{Retrofit Cycle}_{i,t} + \gamma_{i,t} + \psi_i + \psi_t + \varepsilon_{i,t} \quad (1)$$

Equation 1 displays a difference-in-differences specification in which Sustainable Permits $(\%)_{i,t}$

represents the number of sustainable permits divided by the total number of permits of all properties operated by REIT i at quarter t as assigned in Table 1. This share of sustainable permits is value-weighted within REIT by the number of permits properties receive to account for un-retrofitted properties. $\text{Engagement}_{i,t}$ is a dummy variable that indicate whether REIT_i experiences an engagement at quarter t . $\text{Retrofit Cycle}_{i,t}$ is a dummy variable that indicates whether REIT_i experiences a retrofit cycle at quarter t . We define $\text{Engagement}_{i,t}$ as all socially responsible engagements, successful socially responsible engagements, and unsuccessful socially responsible engagements in separate regressions of our main specification. $\gamma_{i,t}$ introduces the REIT's one-quarter lagged total return index, log total assets, and book leverage as REIT controls.

We manually assign treatment and control groups in our staggered Difference-in-Differences approach. Carefully considering treatment and control groups in Difference-in-Differences specifications is critical when the timing of treatment across observations is heterogeneous (Roth et al., 2023). Specifically, Goodman-Bacon (2021) shows that improper comparisons can arise when already treated firms are used as control group, violating the parallel trend assumption. A common way to address these concerns is to adopt the specification of Callaway and Sant'Anna (2021) or Sun and Abraham (2021) that explicitly incorporate never-treated and not-yet-treated observations as a control group or employ heterogeneous treatment effects over time. An implicit assumption of these models is that treatment is permanent. However, we cannot adopt this assumption in the case of socially responsible engagement and retrofit cycles. To elaborate, our identification relies on the fact that improvements in the sustainable performance of properties through sustainable retrofitting are predominantly feasible during retrofit cycles. After retrofit cycles are completed, we do not expect to observe persistent improvements in the share of sustainable permits because major property improvements window has already taken place. Therefore, we cannot directly employ the estimation techniques of Callaway and Sant'Anna (2021) or Sun and Abraham (2021).

The "improper comparison" critique associated with heterogeneous treatment timing plays a minor role as our identification imposes temporary treatment assignments. Imagine a REIT being engaged socially responsibly at the start of a retrofit cycle in 2010Q1. According to our identification strategy, the effect of the engagement should wear off after the retrofit cycle is completed in 2010Q3. Consequently, this REIT can be used for at most three quarters as an improper control group when analyzing the impact of engagement of other REITs. Under the permanent treatment assumption of Callaway and Sant'Anna (2021), the timespan of improper comparison is 13 times larger, ranging from 2010Q1 to the end of our sample in 2022Q4. Moreover, the likelihood of overlapping timing in treatment is relatively small, conditional on the timespan, as retrofit cycles and engagement occur infrequently.

Despite its limited impact, we address the heterogeneous treatment timing critique of Goodman-Bacon (2021) in three ways. First, we minimize improper comparisons across REIT by using the three quarters before, during, and after retrofit cycles in our empirical setting with REIT fixed effects (ψ_i). This event-style setup extracts the relative effectiveness of socially responsible engagement during retrofit cycles compared to just before or after such cycles within REIT. With this, we simultaneously reduce potential improper comparisons between treatment and control by shortening the time window and correcting for a priori levels of REIT-specific sustainable permits.[19]

Second, we further refine the specification by introducing time fixed effects (ψ_t) that correct for deviations in the average share of sustainable permits over time across REITs. This controls for potential technological improvements in externalities reductions and an increase in socially responsible investors over time. Further, it lowers the likelihood of potential heterogeneity in treatment effect over time, as discussed in Sun and Abraham (2021).

Last, we curtail improper comparisons within REITs by removing cycles where REITs experience opposite engagement events. Specifically, we omit the three quarters before, during, and after retrofit cycles where REITs experience unsuccessful socially responsible engagement when analyzing the impact of successful socially responsible engagement and vice versa for unsuccessful engagement. Not omitting these instances shifts the REIT fixed effects and positively biases our results as the baseline level of permits is lower (higher) for (un)successful socially responsible engagement, artificially increasing the magnitude of engagements on sustainable permits. In subsequent analyses, we also correct for overlap with governance en-

[19]Employing REIT fixed effects is viable as we have thirty-two years of data, and REITs experience retrofit cycles approximately every seven years.

gagements. Appendix B validates our results across five alternative difference-in-differences specifications.

As retrofit cycles are exogenous of socially responsible engagement, socially responsible engagement that coincides with retrofit cycles should increase the share of sustainable permits and reduce REIT externalities. In other words, we expect β_3 to be positive and significant for successful socially responsible engagements. In contrast, we argue that unsuccessful socially responsible engagement signals to REITs that their investors insufficiently care about externality reductions. Therefore, we anticipate that unsuccessful socially responsible engagement reduces the share of sustainable permits, and β_3 is negative.

5 Socially responsible engagement and externality reductions

Socially responsible engagement has a double-edged impact on externalities. We analyze the effect of successful and unsuccessful socially responsible engagement before, during, and after retrofit cycles on the share of sustainable retrofit permits using raw data in Figure 1. Even in a setting without controls, we observe that REITs perform more sustainable retrofits when socially responsible engagement succeeds during retrofit cycles. In contrast, failed socially responsible engagement permanently reduces the share of sustainable permits.

Table 5 more formally displays the impact of socially responsible engagement during retrofit cycles on sustainable retrofits as specified in Equation 1. In all specifications, baseline engagement dummies represent the effect of socially responsible engagement three quarters before or after retrofit cycles on the share of sustainable permits. The interaction effect of engagement with retrofit cycles indicates the impact of engagement that occurs during retrofit cycles when added to the baseline effect. For ease of interpretation, we report all marginal effects of engagement during retrofit cycles in the table where significant. This analysis captures the intensive margin of socially responsible engagement on sustainable retrofits.

In Table 5 Column (1), we regress the occurrence of socially responsible engagement events during and outside retrofit cycles on the share of sustainable permits issued by REITs. For socially responsible engagements outside retrofit cycles, we observe a decline in the share of sustainable permits by 4.99 percentage points. In economic terms, this represents a 22.99% reduction in sustainable permits given an average share of sustainable permits of 21.71% (see Table 1). Conversely, the share of sustainable permits increases by 4.67 percentage points or 22.62% during retrofit cycles. This disparity in the effectiveness of engagement during and outside retrofit cycles validates our identification strategy.

Successful socially responsible engagement reduces the externalities of firms. For our identification strategy to work, we should observe more extensive sustainable retrofits when successful socially responsible engagement occurs during retrofit cycles instead of before or after such cycles. In Column (2), we detect a reduction in the share of sustainable permits for successful socially responsible engagement before and after retrofit cycles. However, successful socially responsible engagement that coincides with retrofit cycles significantly increases the share of sustainable permits by 13.95 percentage points. This effect is economically sizeable as it represents an increase in the share of sustainable permits of 64.26%. These results validate that successful socially responsible engagement reduces the externalities of firms.

In contrast to successful socially responsible engagement, unsuccessful socially responsible engagement curtails sustainable retrofitting intensity. In Column (3), we find that unsuccessful socially responsible engagement reduces the share of sustainable permits outside retrofit cycles by 5.63 percentage points. As anticipated, there is little additional negative effect of unsuccessful socially responsible engagement on sustainable permits during retrofit cycles because REITs would have only performed unprofitable sustainable retrofits during successful and accurately timed socially responsible engagement. In economic terms, the share of sustainable permits declines by respectively 25.93% and 31.32% for outside and during cycle unsuccessful socially responsible engagement. The combination of sustainable performance improvements for successful engagement and sustainable performance reductions for unsuccessful engagement indicates that socially responsible engagement poses a double-edged strategy in reducing aggregate externalities.

One potential concern for inferring the impact of socially responsible engagement on externality reductions is that socially responsible engagements might coincide with governance engagements. Overlapping governance and socially responsible engagement timing is possible, as engagement frequently occurs during shareholder meetings. Further, socially responsible investors could also shape the sustainable decision-making of firms by installing more sustainability-oriented board members via governance engagements. We address these concerns in Table 6.

Table 6 analyses the impact of governance engagements on the relation between socially responsible engagement and sustainable retrofits. Column (1) estimates the effect of governance engagement on sustainable retrofitting as falsification analysis using Equation 1. Here, we observe a slight reduction in the share of sustainable permits of 0.84 percentage points when REITs experience a governance engagement outside retrofit cycles. We also see a further reduction in this share when governance engagement falls inside retrofit cycles although this effect is statistically insignificant. Since this reduction in sustainable retrofitting is unrelated to retrofit cycles and governance engagements appear to reduce rather than increase the extent to which REITs sustainably retrofit their properties, they are unlikely to drive the positive effect of successful socially responsible engagement during retrofit cycles.

Even though the impact of governance engagement is negligible, we explicitly test whether introducing outside and during retrofit cycle governance engagements in Columns (2) to (4) affects our results. After controlling for the impact of governance engagements, the increase and decline in the share of sustainable permits during retrofit cycles for successful and unsuccessful socially responsible engagements changed from 13.95 to 14.32 percentage points, and negative 6.80 to negative 4.90 percentage points. In other words, the impact of socially responsible engagements on externality reductions is statistically and economically unchanged, or slightly more positive, after controlling for governance engagements.

5.1 Property sales

We analyze whether the impact of socially responsible engagement is additional to externality reductions by considering the composition of REIT portfolios and the intensity to which they perform conventional retrofits. The most straightforward way for REITs to reduce their externalities is through their intensive margin by performing sustainable retrofits. However, another channel through which REITs can reduce their direct externalities is to adjust their portfolios by selling less sustainable properties and buying more sustainable ones. This extensive margin can potentially increase externalities as more polluting properties could be sold to less sustainable property owners that further deteriorate the externalities of liquidated properties.[20] For this reason, we analyze whether successful socially responsible engagement instigates portfolio reallocations.

The positive impact of successful socially responsible engagement on externality reductions is not affected by property sales. Table 7 analyzes property sales in a similar setting to Equation 1. In Columns (1) to (3), we regress the share of the properties liquidated by REITs over their total number of properties on all, successful, and unsuccessful socially responsible engagements, respectively. We do not observe that aggregate or successful socially responsible engagements induce abnormal property sales regardless of retrofit cycles. However, unsuccessful engagement during retrofit cycles appears to reduce property sales by 0.27 percentage points. This provides an initial indication that property sales do not substantively reduce the externality reductions associated with successful socially responsible engagement and potentially worsen the negative consequences related to unsuccessful socially responsible engagement.

To further support this claim, we analyze a sub-sample in which we trace sustainable retrofitting after properties have been liquidated from REIT portfolios. Notably, we compute the weighted share of sustainable permits over conventional permits for all properties sold by REITs up to one year after their sale.[21] Table 7 Column (4) regresses dummies for successful and unsuccessful socially responsible engagement on the share of sustainable permits after properties have been sold. Here, we do not observe any statistically significant reduction in the share of sustainable permits due to successful or unsuccessful socially responsible engagement. Given the absence of abnormal property sales due to engagement, the low baseline level of property sales, and the persistence in sustainable retrofits after the sale, we rule out the impact of property sales on the efficacy of successful socially responsible engagement in reducing

[20] See the work of Berk and van Binsbergen (2021) for an analogous line of reasoning for socially responsible and conventional investors and divestment in high externality stocks.

[21] We cannot substantively extend this analysis beyond one year without running out of observations. REITs sell properties in less than 90% of the time surrounding retrofit cycles. This further support our claim that liquidating unsustainable properties diminishes the impact of engagement on externality reductions. However, it also imposes substantial sample constraints in replicating Equation 1. Due to these constraints, we are forced to omit interaction terms for outside and during retrofit cycle effects, omit REIT fixed effects, and replace time fixed effects with year fixed effects.

externalities.

5.2 Conventional Permits

In addition to property liquidation, the extent to which REITs alter their conventional retrofitting activities is relevant for the additionality of socially responsible engagement in reducing aggregate externalities. We investigate this channel by considering the impact of engagement on the number of *conventional* permits issued by REITs. We previously argued that engagement is exogenous of retrofit cycles because these cycles are driven by depreciation in the physical characteristics of properties. One consequence of physical depreciation in the attributes of properties is that they need to be improved regardless of socially responsible engagement pressures. Consequently, we anticipate that the number of conventional permits does not substantially decline when REITs receive successful socially responsible engagement during retrofit cycles. However, the number of electrical permits could marginally increase as performing major retrofits to HVAC systems also requires REITs to file additional conventional electrical permits. Therefore, an increase in the share of sustainable permits in conjunction with no decrease in non-electrical conventional permits would provide direct evidence of the additionality of socially responsible engagement in reducing externalities.

Socially responsible engagement does not impede conventional retrofitting. Table 8 follows Equation 1 using the number of conventional permits as the dependent variable in Columns (1) to (3). We find that socially responsible engagement increases the number of conventional permits by 4.79, 6.62, and 3.28 for all, successful, and unsuccessful socially responsible engagements during retrofit cycles, respectively. Despite statistical significance, these increases in conventional permits are economically marginal, given an 80.28 standard deviation of conventional permits.

This increase in conventional permits is entirely explained an increase in electrical permits required for HVAC installation. In Columns (4) to (6), we observe statistically significant increases in the number of electrical permits for all and successful socially responsible engagement during retrofit cycles. However, unsuccessful socially responsible engagements that do not improve HVAC permits display no (jointly) significant effect on electrical permits. Further, we observe no effect of any, successful, or unsuccessful socially responsible engagement on non-electrical conventional permits during retrofit cycles. These results validate that socially responsible engagement does not substantively alter conventional retrofitting behavior. In other words, socially responsible engagement is additional to the business process of firms and solely affects the intensive margin of externalities.

6 Conclusion

This paper provides evidence that socially responsible engagement reduces negative externalities. Using unique identification in the public real estate market and a novel dataset on property-level permits, we find that successful socially responsible engagement reduces the intensive margin of property externalities by forcing firms to perform more sustainable retrofits. In contrast, unsuccessful socially responsible engagement curtails sustainable retrofitting. Furthermore, we show that the impact of socially responsible engagement on externality reductions is additional as the intensive margin of externalities declines and the extensive margin remains unchanged. Specifically, socially responsible engagement does not affect the composition of properties operated by REITs or conventional permits. Therefore, socially responsible engagement poses an effective but potentially double-edged tool to curb aggregate externalities.

This paper provides useful insights for socially responsible investors and policymakers. We show that socially responsible investors engaging with firms on social and environmental issues can lead to meaningful and additional positive outcomes. In the meantime, socially responsible investors should strategically form allies in their engagement attempts to increase the likelihood of success so as to minimize the double-edged consequences of unsuccessful engagement. Real world examples of such strategies include Climate Action 100+, Net Zero Asset Managers, or the United Nations Principals of Responsible Investment. In line with current regulatory developments, we recommend that policymakers enforce or incentivize (commercial) property owners to perform more sustainable retrofits because heightened regulatory pressure could reduce the threshold for successful socially responsible engagement. Alternatively, regulators could impose more stringent environmental and social requirements in the construction of new buildings. Last, standardized reporting requirements on social and environmental externalities could also enable more effective engagement by enabling socially responsible investors to time their engagement activities accurately.

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Tables and Figures

Table 1: Permit categories

This table displays the number of permits and sustainability characteristics by permit categories. 21.71% is classified as sustainable

Permit categories	Number of permits	Sustainable
Bathroom Remodel	805	
Decks	37	
Demolition	1,512	
Docks	1	
Doors and Windows	340	Yes
Electrical	219,613	
Excavation and Grading	173	
Fences	47	
Flatwork & Concrete	351	
Foundations	258	
Garage Construction	158	
HVAC	56,259	Yes
Home Addition	4,695	
Kitchen Remoddeling	1,233	
Landscape	85	Yes
Mechanical Work	16,496	
Mobile Homes	613	
Multi-Room Remoddeling	31	
New Construction	6,187	
Patios	870	Yes
Paving, Driveways, and sidewalks	432	Yes
Plumbing	18,500	
Pool and Spas	792	
Retaining Walls	106	Yes
Roofing	18,965	Yes
Sewer Laterals	103	
Siding	351	Yes
Signage	9,476	
Solar Installations	533	Yes
Total	359,022	77,941

Table 2: CO_2 Emissions, sustainable permits, and third-party certification

This table analyzes the impact of sustainable permits on the CO_2 emissions of properties. It does so by matching BuildZoom permit data with the Local Law 87 (New York, NY), BERDO (Boston, MA), and BEUDO (Cambridge, MA) energy registries. These energy registries require commercial properties above certain size limits to report their exact energy use, energy source, and CO_2 emissions yearly. We analyze the CO_2 emission intensity of properties in annual kilogram to square foot emissions as the dependent variable in every specification. Baseline CO_2 emissions represent the first observed CO_2 emissions of a property in the dataset. Using the baseline emissions is preferable over using property fixed effects as fixed effects compress the impact of permit issuance by removing the average emissions of properties before and after retrofitting. In addition, we also analyze whether permit issuance explains CO_2 emissions beyond frequently used third-party certification of sustainable properties such as LEED, EnergyStar, and WELL. LEED and EnergyStar are indicators of the environmental performance of properties, whereas WELL captures the Social aspect. EnergyStar and WELL are either 0 or 1 depending on whether the property has the certificate. LEED takes the values 0 (no certificate), 1 (Bronze), 2 (Silver), 3 (Gold), and 4 (Platinum). REIT-level clustered standard errors are given in parentheses. ***, **, and * denotes significance at the 1%, 5%, and 10% level.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Sustainable permits	-0.193***									
	(0.066)									
Environmental permits		-0.194***			-0.243***					-0.179***
		(0.066)			(0.084)					(0.061)
Social permits			0.409		0.303					-0.143
			(0.260)		(0.520)					(0.592)
Conventional permits				0.025	0.097					0.108
				(0.081)	(0.093)					(0.095)
LEED						-0.484***			-0.389***	-0.375***
						(0.170)			(0.120)	(0.113)
EnergyStar							-0.971		-0.500	-0.467
							(0.679)		(0.645)	(0.659)
WELL								-0.455	-0.273	-0.285
								(0.428)	(0.296)	(0.294)
Average CO_2 intensity (kg/sqft)	8.695	8.695	8.695	8.695	8.695	8.695	8.695	8.695	8.695	8.695
Observations	3,996	3,996	3,996	3,996	3,996	3,996	3,996	3,996	3,996	3,996
Adjusted R-squared	0.714	0.714	0.714	0.714	0.714	0.715	0.715	0.714	0.715	0.716
Time fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REIT fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Baseline CO_2 intensity	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 3: Engagement does not predict retrofit cycles

This table verifies whether socially responsible engagement coincides with retrofit cycles more frequently over time. We do so by regressing contemporaneous engagement dummies interacted with time dummies for periods from 2006 to 2011, 2012 to 2017, and 2018 to 2022. The dependent variable is a dummy that indicates whether a retrofit wave is happening at this point in time. REIT controls capture lagged quarterly total returns, log total assets, and the leverage ratio. In Columns (1) to (3), we respectively consider all engagements, governance engagements, and socially responsible engagements. REIT-level clustered standard errors are given in parentheses. ***, **, and * denotes significance at the 1%, 5%, and 10% level.

VARIABLES	(1) Cycle	(2) Cycle	(3) Cycle
$year = 2006 - 2011$	-0.037	-0.038	-0.039
	(0.053)	(0.055)	(0.056)
$year = 2012 - 2017$	-0.139	-0.140	-0.140
	(0.217)	(0.219)	(0.218)
$year = 2018 - 2022$	-0.069	-0.070	-0.069
	(0.101)	(0.103)	(0.102)
$Engagement_t$	0.013	-0.028	-0.003
	(0.020)	(0.043)	(0.004)
$Engagement_t$ X $year = 2012 - 2017$	-0.036	0.005	0.102
	(0.056)	(0.007)	(0.127)
$Engagement_t$ X $year = 2018 - 2022$	-0.051	-0.002	-0.021
	(0.092)	(0.012)	(0.047)
Engagement type	All	Governance	SRI
Observations	11,802	11,802	11,802
Adjusted R-squared	0.035	0.035	0.035
REIT controls	YES	YES	YES
Time FX	NO	NO	NO
REIT FX	YES	YES	YES

Table 4: Explaining Retrofit Cycles

This table regresses indicators of property depreciation, vacancy rates, and macroeconomic conditions on retrofit cycles and socially responsible engagement. Years since retrofit indicates the number of years each individual property belonging to a REIT has not experienced a permit, averaged to the REIT level. Vacancy rate metropolitan (%) reflects the U.S. Census vacancy rate of the metropolitan area where each individual property resides, averaged to the REIT level. House price returns (%) indicate logarithmic returns on the US Federal Housing Agency house price index. NBER recession indicates quarters that are flagged as economic downturns by NBER. Construction materials price index reflects the US Bureau of Labor Statistics material construction index. Energy price index represents the International Monetary Fund's global energy price index. The dependent variable in Columns (1) to (3) are dummies indicating retrofit cycles, and the dependent variable in Columns (4) to (6) indicates socially responsible engagements retrieved from ISS. REIT-level clustered standard errors are given in parentheses. ***, **, and * denotes significance at the 1%, 5%, and 10% level.

VARIABLES	Retrofit Cycle			SRI engagement		
	(1)	(2)	(3)	(4)	(5)	(6)
Years since retrofit	0.215**		0.294***	0.020		-0.010
	(0.088)		(0.089)	(0.022)		(0.027)
Vacancy rate metropolitan (%)	1.240***		0.468**	0.005		0.035
	(0.186)		(0.203)	(0.058)		(0.059)
House price returns (%)		-0.708**	-0.506*		0.039	0.042
		(0.285)	(0.294)		(0.048)	(0.055)
NBER recession		-3.108**	-3.179**		0.076	0.055
		(1.438)	(1.453)		(0.172)	(0.178)
Construction materials price index		-0.089***	-0.094***		0.007*	0.008*
		(0.017)	(0.017)		(0.004)	(0.004)
Energy price index		0.047***	0.039***		0.002	0.001
		(0.008)	(0.009)		(0.002)	(0.002)
Observations	11,436	11,436	11,436	11,436	11,436	11,436
Adjusted R-squared	0.021	0.028	0.029	0.005	0.006	0.006
REIT controls	YES	YES	YES	YES	YES	YES
REIT FX	YES	YES	YES	YES	YES	YES

Table 5: Socially responsible engagement and externality reductions

This table regresses all, successful, and unsuccessful public socially responsible engagements on the occurrence of retrofit cycles in Columns (1) to (3). We consider the ratio of sustainable over total permits issued for all properties owned by a REIT as a dependent variable across these specifications. Cycle represents a dummy variable equal to 1 in the three quarters during which REITs experience retrofit cycles and 0 in the three quarters before or after these cycles. ES engagement is a dummy variable that indicates whether a REIT experiences a socially responsible engagement. Observations with unsuccessful and successful engagements have been removed from Columns (2) and (3) to allow for a fair comparison of the impact of successful and unsuccessful socially responsible engagement. REIT controls capture quarterly total returns, REIT size (ln total assets), and leverage. Standard errors clustered at retrofit cycle level in parentheses. ***, **, and * denotes significance at the 1%, 5%, and 10% level.

VARIABLES	(1)	(2)	(3)
ES Engagement	-4.992***		
	(0.656)		
Cycle X ES Engagement	9.902***		
	(1.323)		
ES Engagement successful		-3.191***	
		(0.919)	
Cycle X ES Engagement successful		17.528***	
		(1.136)	
ES Engagement unsuccessful			-5.631***
			(0.661)
Cycle X ES Engagement unsuccessful			-0.961
			(4.671)
Cycle	-0.243**	-0.385**	-0.208***
	(0.113)	(0.128)	(0.095)
Average share sustainable permits (%)	21.71	21.71	21.71
Marginal Effects ES Engagement during cycle (%)	4.67	13.95	-6.80
Observations	3,076	3,025	3,025
Adjusted R-squared	0.162	0.163	0.166
REIT controls	YES	YES	YES
Time fixed effects	YES	YES	YES
REIT fixed effects	YES	YES	YES

Table 6: Governance and Socially Responsible engagement

This table provides a falsification analysis of the impact of socially responsible engagement on sustainable retrofitting by considering the impact of governance engagement. In Column (1), we regress governance engagement outside and during retrofit cycles on the share of sustainable permits. In Columns (2) to (4), we replicate the results of Table 5 when explicitly correcting for governance engagement. REIT controls capture quarterly total returns, company size (ln total assets), and leverage. Standard errors clustered at retrofit cycle level in parentheses. ***, **, and * denotes significance at the 1%, 5%, and 10% level.

VARIABLES	(1)	(2)	(3)	(4)
Governance Engagement	-0.835**	-0.199	-0.793*	-0.408
	(0.345)	(0.425)	(0.465)	(0.341)
Cycle X Governance Engagement	-0.503	-1.310***	-1.029***	-0.023
	(0.326)	(0.320)	(0.349)	(0.582)
ES Engagement		-4.710***		
		(0.164)		
Cycle X ES Engagement		9.788***		
		(0.535)		
ES Engagement successful			-2.737***	
			(0.534)	
Cycle X ES Engagement successful			17.435***	
			(1.565)	
ES Engagement unsuccessful				-4.822***
				(0.024)
Cycle X ES Engagement unsuccessful				0.129
				(3.992)
Cycle	-0.194*	-0.224**	-0.379***	-0.209**
	(0.109)	(0.106)	(0.115)	(0.085)
Average share sustainable permits (%)	21.71	21.71	21.71	21.71
Marginal Effects ES Engagement during cycle (%)	-	4.85	14.32	-4.90
Observations	3,076	3,076	3,025	3,025
Adjusted R-squared	0.161	0.161	0.163	0.165
REIT controls	YES	YES	YES	YES
Time FX	YES	YES	YES	YES
REIT FX	YES	YES	YES	YES

Table 7: Extensive margin and socially responsible engagement

This table analyzes the impact of socially responsible engagement on abnormal property sales (Columns (1) to (3)) and sustainable permit issuance after properties are sold (Column (4)). In Columns (1) to (3), we use the share of properties sold in percentage points as a dependent variable. In Column (4), we take the value-weighted 1-year forward-looking share of sustainable permits of properties that REITs have sold as a dependent variable. REIT controls capture quarterly total returns, company size (ln total assets), and leverage. Standard errors clustered at retrofit cycle level in parentheses. ***, **, and * denotes significance at the 1%, 5%, and 10% level.

VARIABLES	(1)	(2)	(3)	(4)
		Sold (%)		**Sustainable permits after sale (%)**
ES engagement	0.843*			
	(0.468)			
Cycle X ES engagement	-0.153			
	(0.692)			
ES engagement successful		1.837		-7.339
		(2.838)		(13.703)
Cycle X ES engagement successful		-0.141		
		(2.926)		
ES engagement failed			0.625***	-10.321
			(0.092)	(6.865)
Cycle X ES engagement failed			-0.991***	
			(0.271)	
Cycle	0.113***	0.115***	0.094***	1.782
	(0.037)	(0.037)	(0.035)	(1.499)
Observations	3,076	3,025	3,025	286
Adjusted R-squared	0.138	0.138	0.130	0.033
REIT controls	YES	YES	YES	YES
Year FX	NO	NO	NO	YES
Time FX	YES	YES	YES	NO
REIT FX	YES	YES	YES	NO

Table 8: Conventional permits and socially responsible engagement

This table regresses all, successful, and unsuccessful socially responsible engagement specifications during and outside retrofit waves on the occurrence of conventional permits in Columns (1) to (3), electrical permits in Columns (4) to (6), and conventional non-electrical permits in Columns (7) to (9). We expect no additional impact of socially responsible engagement on conventional retrofitting except for an increase in electrical permits required for HVAC installation. Therefore, we separately regress all conventional permits, electrical conventional permits that should increase with sustainable permits, and non-electrical conventional permits that should be unaffected. REIT controls capture quarterly total returns, company size (ln total assets), and leverage. Standard errors clustered at retrofit cycle level in parentheses. ***, **, and * denotes significance at the 1%, 5%, and 10% level.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Conventional			Electrical (related)			Non-Electrical (non-related)		
ES Engagement	-4.128***			-3.002**			-1.126***		
	(0.925)			(1.321)			(0.397)		
Cycle X ES Engagement	8.922***			6.098***			2.824*		
	(1.635)			(0.123)			(1.512)		
ES Engagement successful		-4.122***			-3.964**			-0.158	
		(0.541)			(1.736)			(1.195)	
Cycle X ES Engagement successful		10.740***			9.410***			1.330	
		(2.118)			(0.271)			(2.389)	
ES Engagement unsuccessful			-4.094***			-2.801			-1.293
			(1.083)			(1.815)			(0.733)
Cycle X ES Engagement unsuccessful			7.376***			3.835**			3.541*
			(0.130)			(1.821)			(1.951)
Cycle	10.658***	10.668***	10.635***	8.953***	8.978***	8.946***	1.706***	1.690***	1.689***
	(0.477)	(0.485)	(0.458)	(0.440)	(0.443)	(0.429)	(0.037)	(0.042)	(0.029)
Observations	3,076	3,025	3,025	3,076	3,025	3,025	3,076	3,025	3,025
Adjusted R-squared	0.929	0.930	0.929	0.911	0.912	0.911	0.786	0.787	0.786
REIT controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FX	YES	YES	YES	YES	YES	YES	YES	YES	YES
REIT FX	YES	YES	YES	YES	YES	YES	YES	YES	YES

Figure 1: (Un)successful Engagement, Externality Reductions, and Retrofit Cycles

Figure 1 displays the unadjusted share of sustainable over total permits before, during, and after retrofit cycles demeaned at the pre-retrofit cycle level. To investigate the impact of socially responsible engagement on sustainable retrofitting during retrofit cycles, the distance from -1 to 0 should also be interpreted as we use Epanechnikov kernel densities. The time to retrofit cycle indicates the distance in time between the current time and the quarter that signals the start of a retrofit cycle. To elaborate, the values -2 or 3 respectively represent two quarters before and three quarters after the initiation of a retrofit wave.

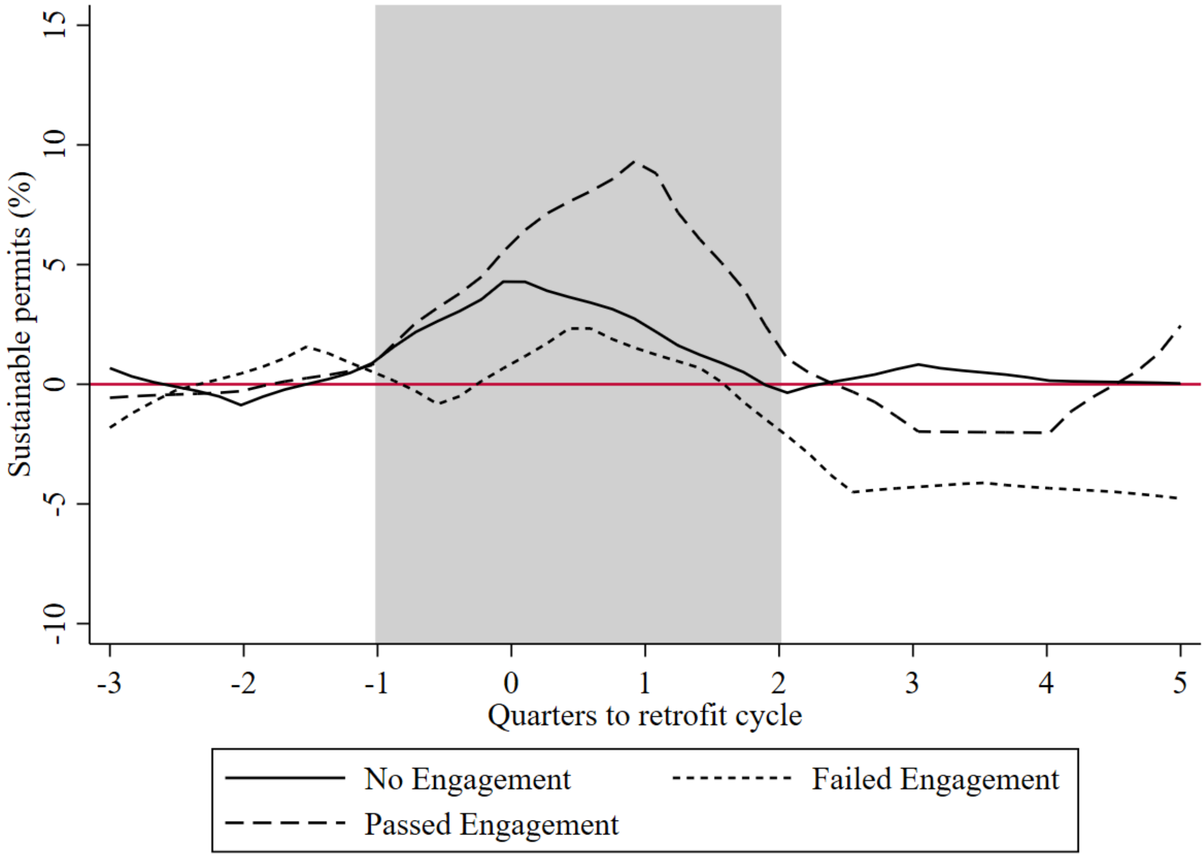


Figure 2: Timing of retrofit cycles

Figure 2 displays permit issuance around renovation cycles. Permit issuance is expressed as percentage deviations from the REITs' average permit issuance on a quarterly basis. Our identification of retrofit cycles is at least moderately accurate due to the sharp increase in permit issuance that is almost exclusively present during identified retrofitting cycles.

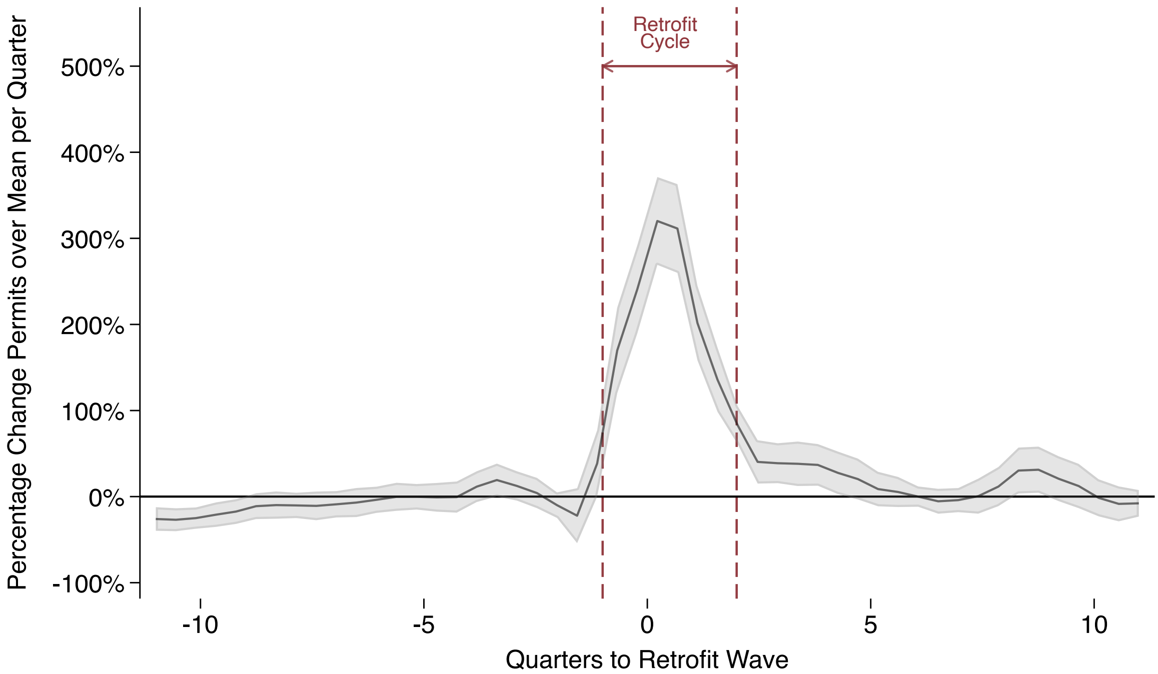


Figure 3: Property location

Figure 3 displays the location of all REIT-owned properties in our sample by county. The majority of properties reside in Boston, California, Chicago, Florida, New York, Texas, and Seattle.

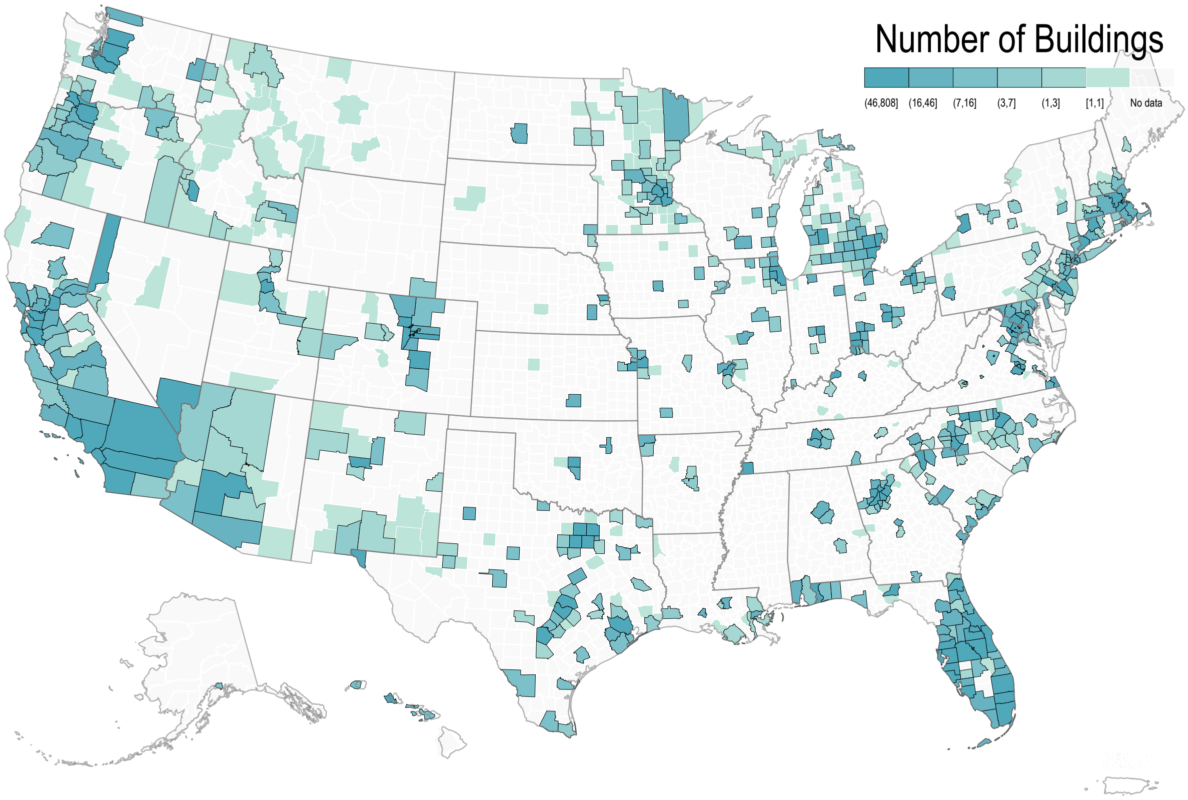


Figure 4: Does Engagement Predict Retrofit Cycles?

Figure 4 shows that engagement has no predictive power over the timing of retrofit cycles. The x-axis represents lags and leads in engagement relative to the current time q. Spikes represent the 90% and 95% confidence intervals around the estimated coefficients. The periods $< q-3$ and $> q+3$ represent a categorical variable that indicates whether a REIT was engaged at any point in time more than a year ago or more than a year after the engagement. Period $q-1$ is removed as a reference category. The y-axis represents the probability of retrofit cycles.

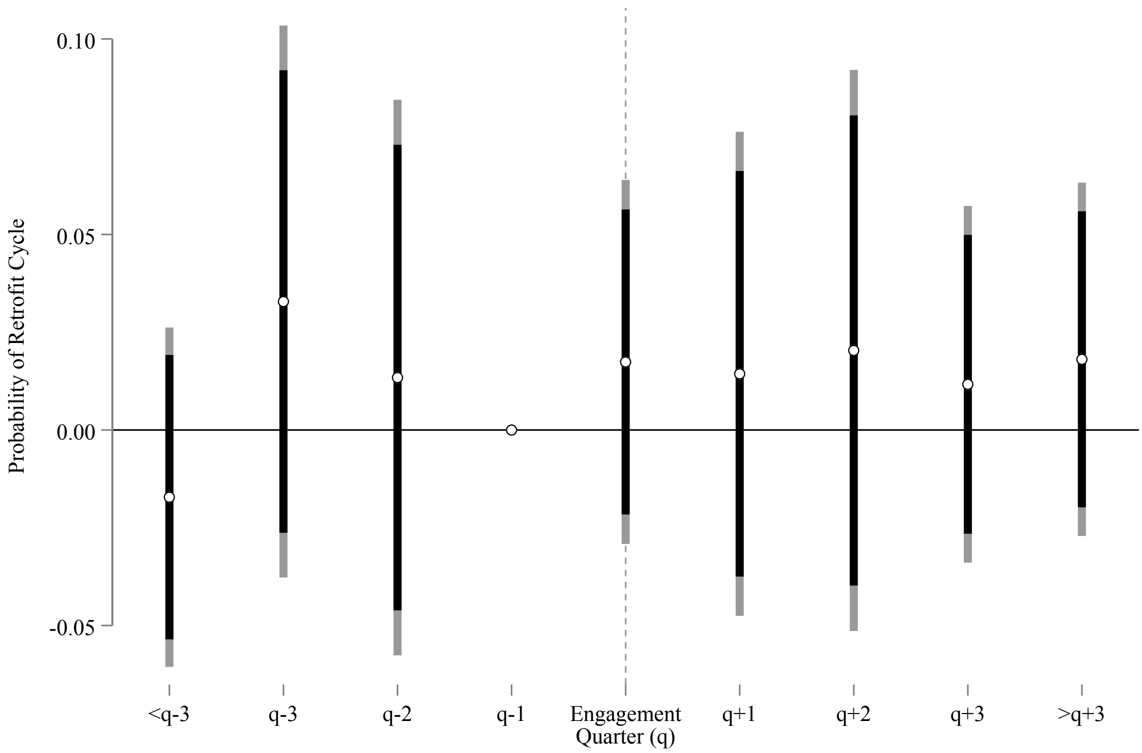
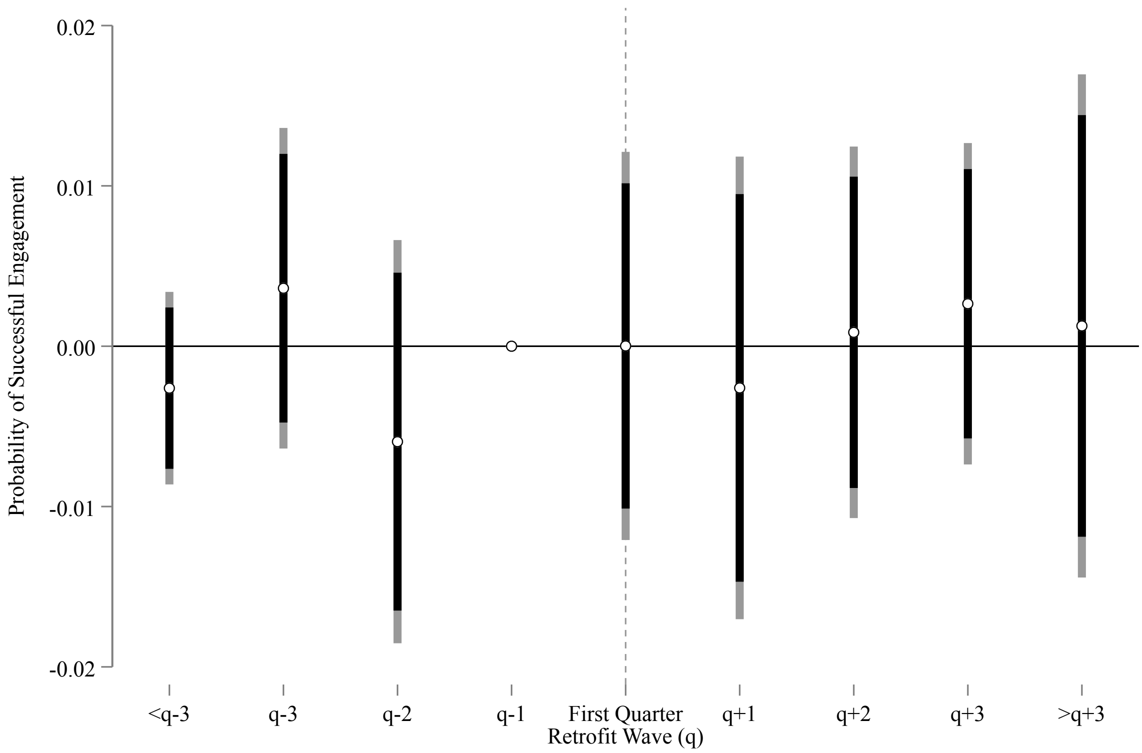


Figure 5: Are Engagements during Retrofit Cycles more Successful?

Figure 5 shows that engagements during retrofit cycles are not more successful. The x-axis represents lags and leads in retrofit cycles relative to the current time q. Spikes represent the 90% and 95% confidence intervals around the estimated coefficients. The periods $< q-3$ and $> q+3$ represent a categorical variable that indicates whether a REIT had retrofitting cycles at any point in time more than a year ago or more than a year after the engagement. Period $q-1$ is removed as a reference category. The y-axis represents the probability of successful engagement.



Internet Appendix

Appendix A Cycle detection algorithm validation

In this Appendix, we provide further robustness on our retrofit detection strategy. Accurately detecting retrofit cycles is paramount for the reliability of our findings, as we use the timing of these cycles as an identification strategy for the impact of socially responsible engagement on externality reduction. We strive to be as accurate as possible in detecting retrofit cycles using property-level permit information. The advantage of this microdata is that it shows us the exact date REITs start retrofitting their properties with great accuracy. However, the drawback of this approach is that we need to use a detection algorithm to identify the duration and timing of retrofit cycles, as there is no pre-defined approach in the literature. To alleviate concerns that the choice of retrofit cycle detection algorithm drives our results, we provide 35 alternative retrofit cycle detection approaches and validate our findings. This Appendix shows that substantial deviations in our retrofit cycle detection algorithm result in limited differences in detected retrofit cycles across REITs. Moreover, we reproduce Table 5 and find that different cycle detection strategies produce similar results.

Retrofit detection algorithms can differ in three key dimensions, namely the length of retrofit cycles, the manner of jump detection, and the stringency of the jump threshold. The equation below represents a generalized detection setup.

$$\frac{\sum_{j=1}^{q} Permit_{i,t-1+j}}{q} - \frac{\sum_{j=1}^{q} Permit_{i,t-j}}{q} \geq Threshold_i \quad (2)$$

In this Equation, $Permits_{i,t}$ represents the number of permits REIT i receives at quarter t on its properties. q describes the number of lags used to detect jumps. $Threshold_i$ determines the REIT-specific threshold that REIT i must clear to identify the quarter as a retrofit cycle starting point. The retrofit cycle algorithm that best fits our data uses three-quarter retrofit cycle lengths, a two-lag identification period (q=2), and a one standard deviation jump threshold ($Threshold_i$ = σ). To validate robustness, we deviate our detection by varying the retrofit cycle length, the number of lags used to observe jumps in permits, and the threshold that classifies jumps in permits as initiations of retrofit cycles.

The first way in which we deviate our detection strategy is by employing retrofit cycle lengths of two, three, and four quarters. The length of retrofit cycles is paramount for our specification as it alters the event window in our difference-in-differences estimation. We reduce type two errors when we assume retrofit cycles are relatively short, as fewer quarters are classified as retrofit waves. However, having shorter retrofit cycle windows increases the odds of type one errors in correctly identifying retrofit cycles. The inverse is true for using broader retrofit cycle lengths. Incorrectly detecting the start of retrofit cycles could affect our results as we would classify during retrofit engagements as outside retrofit cycle engagements and vice versa. We use retrofit cycle lengths of two, three, and four quarters to alleviate these concerns.

The second way we deviate our detection algorithm is by altering the number of lags used to detect jumps in permits (q). We measure permit jumps by computing the difference between contemporaneous and forward-looking compared to backward-looking permits. In other words, we detect jumps in permits by analyzing how many permits are being issued right now and in the upcoming quarter(s) compared to the past quarters' level of permits. The advantage of introducing more lags is that it enforces a relatively long-lived deviation in the level of permits. However, the disadvantage of using additional lags is that it more readily detects shallow permit increases as retrofit cycles. Since we argue that retrofit cycles represent sharp increases in the number of permits and using one lag ($q = 1$) overidentifies insufficiently persistent permit jumps as retrofit cycles, we initially chose two lags ($q = 2$). Nevertheless, we adopt different levels of forward-looking and backward-looking permit windows using one, two, three, and four lags to validate robustness.

Last, we adopt multiple retrofit cycle jump detection thresholds. In the initial model, we use a one standard deviation difference between forward-looking and backward-looking permits as the condition to detect retrofit cycles. Since we used two lags, it would mean that the average of the two periods' forward-looking and backward-looking permits is jointly one standard deviation. The threshold stringency can affect our findings as an insufficiently stringent threshold could detect conventional property maintenance as retrofitting cycles. Introducing these false positives would underestimate the true impact of socially responsible engagement during retrofit cycles on sustainable permits. In contrast, too stringent thresholds might detect only the most prominent retrofit cycles and could lead to overestimated and selective results. To validate the persistence of detected retrofit cycles under different thresholds, we adopt one standard deviation, one standard deviation divided by the number of lags employed, and two standard deviations divided by the number of lags used as thresholds.

Our retrofit cycle detection algorithm is highly correlated with the 35 robustness specifications. To ensure a valid retrofit detection algorithm, we show that changing its parameters does not substantially affect retrofit cycle detection. Table A1 shows correlations across the main and 35 robustness retrofit detection algorithms. In most cases, perfect correlations are impossible by construction due to deviations in retrofit cycle lengths. Nevertheless, when we consider detection algorithms that deviate in one way from our main specification, we observe average correlations of 70.49%. Our primary measure has an average correlation of 50.31% to overall 35 specifications. Correlations are structurally lowest when permit jumps are observed using one or four lags, as many small spikes in permit issuance and relatively long but shallow increases are detected as retrofit waves. Since sudden jumps in permits characterize retrofit cycles, it is understandable that deviating from the detection period significantly impacts accuracy. Our specification is not substantively affected by the jump detection threshold or the length of retrofit cycles. Last, the 35 robustness specifications are also strongly correlated with each other, indicating at least a common trend in the detection of retrofit cycles regardless of specification.

Table A1: Correlation matrix of alternative retrofit cycle detection

This table shows the coefficients of 35 retrofit detection algorithms. Column (1) represents our preferred specification that best fits the observed permit data, the other 35 Columns represent alternative detection algorithms that differ in three dimensions, The first dimension is the length of retrofit cycles of two, three, and four quarters (L). The second dimension of variation is the number of lags employed to measure jumps in permits, ranging from one to four quarters (q). Last, we differ the threshold to make the detection of retrofit cycles more or less frequent (T). The thresholds we employ are one standard deviation σ, one standard deviation divided by the number of lags employed to detect the jump $\frac{\sigma}{n}$, and two standard deviations divided by the number of lags employed to detect jumps in permits $\frac{2*\sigma}{n}$. Correlations equal to one are displayed as -.

L	q	T	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)
3	2	σ	-
2	1	σ	0.403	-
2	2	σ	0.804	0.445	-
2	2	σ	0.478	0.312	0.557	-
2	4	σ	0.360	0.225	0.433	0.593	-
2	1	$\frac{\sigma}{n}$	0.403	-	0.445	0.312	0.225	-
2	2	$\frac{\sigma}{n}$	0.647	0.479	0.819	0.460	0.352	0.479	-
2	3	$\frac{\sigma}{n}$	0.428	0.342	0.514	0.695	0.427	0.342	0.604	-
2	4	$\frac{\sigma}{n}$	0.357	0.269	0.444	0.470	0.635	0.269	0.471	0.603	-
2	1	$\frac{2*\sigma}{n}$	0.355	0.851	0.395	0.259	0.179	0.851	0.481	0.346	0.276	-
2	2	$\frac{2*\sigma}{n}$	0.588	0.443	0.752	0.418	0.319	0.443	0.918	0.582	0.462	0.485	-
2	3	$\frac{2*\sigma}{n}$	0.393	0.316	0.476	0.643	0.392	0.316	0.565	0.925	0.581	0.347	0.592	-
2	4	$\frac{2*\sigma}{n}$	0.333	0.253	0.417	0.439	0.597	0.253	0.450	0.576	0.939	0.272	0.468	0.603	-
3	1	σ	0.455	0.799	0.345	0.242	0.171	0.799	0.365	0.253	0.199	0.668	0.331	0.229	0.184	-
3	3	σ	0.599	0.328	0.515	0.807	0.513	0.328	0.424	0.546	0.398	0.271	0.382	0.500	0.369	0.359	-
3	4	σ	0.477	0.237	0.416	0.569	0.808	0.237	0.335	0.397	0.498	0.187	0.301	0.362	0.465	0.258	0.652	-
3	1	$\frac{\sigma}{n}$	0.455	0.799	0.345	0.242	0.171	0.799	0.365	0.253	0.199	0.668	0.331	0.229	0.184	-	0.359	0.258	-
3	2	$\frac{\sigma}{n}$	0.812	0.423	0.653	0.390	0.288	0.423	0.797	0.504	0.385	0.426	0.725	0.468	0.366	0.483	0.493	0.386	0.483	-
3	3	$\frac{\sigma}{n}$	0.547	0.347	0.473	0.553	0.368	0.347	0.555	0.796	0.523	0.353	0.530	0.729	0.498	0.381	0.686	0.462	0.381	0.647	-
3	4	$\frac{\sigma}{n}$	0.477	0.269	0.413	0.446	0.506	0.269	0.447	0.560	0.796	0.282	0.437	0.538	0.742	0.300	0.511	0.626	0.300	0.519	0.660	-
3	1	$\frac{2*\sigma}{n}$	0.398	0.674	0.300	0.193	0.130	0.674	0.364	0.255	0.200	0.792	0.365	0.253	0.195	0.843	0.295	0.203	0.843	0.485	0.387	0.309	-
3	2	$\frac{2*\sigma}{n}$	0.741	0.391	0.596	0.352	0.257	0.391	0.728	0.483	0.378	0.429	0.793	0.489	0.380	0.443	0.445	0.347	0.443	0.913	0.620	0.510	0.488	-
3	3	$\frac{2*\sigma}{n}$	0.503	0.318	0.436	0.510	0.336	0.318	0.519	0.733	0.505	0.353	0.538	0.792	0.522	0.349	0.632	0.422	0.349	0.603	0.921	0.637	0.387	0.629	-
3	4	$\frac{2*\sigma}{n}$	0.446	0.252	0.386	0.416	0.473	0.252	0.426	0.534	0.745	0.280	0.444	0.560	0.793	0.280	0.476	0.586	0.280	0.495	0.631	0.936	0.305	0.515	0.663	-
4	1	σ	0.387	0.678	0.295	0.197	0.136	0.678	0.307	0.200	0.157	0.555	0.273	0.176	0.143	0.848	0.296	0.209	0.848	0.403	0.304	0.238	0.701	0.363	0.272	0.219	-
4	2	σ	0.854	0.350	0.687	0.407	0.305	0.350	0.542	0.354	0.291	0.300	0.488	0.319	0.269	0.429	0.532	0.415	0.429	0.680	0.473	0.401	0.371	0.615	0.430	0.372	0.472	-
4	3	σ	0.559	0.312	0.442	0.691	0.441	0.312	0.359	0.454	0.331	0.254	0.319	0.412	0.306	0.357	0.857	0.583	0.357	0.456	0.571	0.446	0.290	0.408	0.521	0.412	0.375	0.618	-
4	4	σ	0.465	0.261	0.389	0.503	0.693	0.261	0.314	0.340	0.413	0.208	0.279	0.306	0.382	0.285	0.625	0.857	0.285	0.375	0.431	0.519	0.225	0.333	0.390	0.482	0.294	0.507	0.683	-
4	1	$\frac{\sigma}{n}$	0.387	0.678	0.295	0.197	0.136	0.678	0.307	0.200	0.157	0.555	0.273	0.176	0.143	0.848	0.296	0.209	0.848	0.403	0.304	0.238	0.701	0.363	0.272	0.219	-	0.472	0.375	0.294	-
4	2	$\frac{\sigma}{n}$	0.686	0.363	0.552	0.327	0.240	0.363	0.674	0.417	0.318	0.359	0.606	0.382	0.299	0.446	0.433	0.332	0.446	0.846	0.560	0.443	0.445	0.764	0.517	0.419	0.496	0.804	0.504	0.410	0.496	-
4	3	$\frac{\sigma}{n}$	0.507	0.328	0.403	0.467	0.309	0.328	0.473	0.672	0.441	0.329	0.446	0.610	0.418	0.373	0.579	0.410	0.373	0.598	0.845	0.587	0.377	0.568	0.770	0.558	0.393	0.557	0.676	0.477	0.393	0.662	-
4	4	$\frac{\sigma}{n}$	0.457	0.292	0.383	0.388	0.426	0.292	0.421	0.482	0.671	0.303	0.408	0.461	0.621	0.320	0.485	0.527	0.320	0.504	0.616	0.843	0.334	0.493	0.593	0.783	0.337	0.500	0.528	0.616	0.337	0.553	0.689	-
4	1	$\frac{2*\sigma}{n}$	0.331	0.566	0.249	0.150	0.096	0.566	0.303	0.198	0.156	0.666	0.302	0.193	0.151	0.708	0.235	0.156	0.708	0.401	0.307	0.244	0.840	0.402	0.304	0.238	0.835	0.407	0.302	0.229	0.835	0.494	0.397	0.349	-
4	2	$\frac{2*\sigma}{n}$	0.623	0.333	0.501	0.292	0.211	0.333	0.612	0.398	0.313	0.364	0.667	0.399	0.313	0.407	0.388	0.294	0.407	0.768	0.535	0.435	0.450	0.841	0.539	0.437	0.451	0.730	0.452	0.365	0.451	0.908	0.631	0.543	0.499	-
4	3	$\frac{2*\sigma}{n}$	0.466	0.300	0.369	0.428	0.280	0.300	0.441	0.616	0.425	0.331	0.454	0.666	0.439	0.339	0.531	0.372	0.339	0.558	0.774	0.567	0.378	0.577	0.840	0.588	0.355	0.510	0.620	0.433	0.355	0.615	0.917	0.664	0.396	0.641	-
4	4	$\frac{2*\sigma}{n}$	0.426	0.273	0.356	0.359	0.397	0.273	0.400	0.458	0.625	0.301	0.411	0.481	0.666	0.298	0.451	0.492	0.298	0.479	0.588	0.786	0.330	0.498	0.619	0.840	0.313	0.465	0.490	0.574	0.313	0.525	0.656	0.932	0.344	0.547	0.693	-

Appendix B Alternative Difference-in-Differences Specifications

This Appendix explores eight alternative Difference-in-Differences specifications as robustness to Table 5. These analyses aim to validate the underlying assumptions that our identification imposes on the Difference-in-Differences setup.

As a first step, we analyze the impact of using an event-style setup Difference-in-Differences estimator. Our identification strategy relies on the principle that socially responsible engagement is primarily effective in promoting sustainable retrofitting during retrofit cycles. To accommodate this, we choose a relatively constrictive event window to measure the effects of engagement surrounding retrofit cycles. One potential downside of using this event window approach is that it eliminates a large share of the sample and is possibly too constrictive. To address this concern, we repeat our analysis for the entire sample of observation and anticipate smaller effect sizes in this alternative specification as our identification becomes less precise.

We start by assessing the aggregate effect of engagement on the share of sustainable permits without enforcing an event-style setup in Column (1). In Panels A to C, we observe no impact of all, successful, or unsuccessful socially responsible engagement on the share of sustainable permits. These analyses indicate that the timing of successful socially responsible engagement is essential in its impact on externality reductions.

Our main findings are not driven by the event study Difference-in-Differences specification. In Columns (2) of Panels A to C, we perform our Difference-in-Differences analyses without constraining the sample to the three quarters before, during, and after the event study. We find a reminiscent impact to Table 5 for all, successful, and unsuccessful socially responsible engagements during retrofit cycles on the share of sustainable permits. For all, successful and unsuccessful engagements during retrofit cycles, the marginal effects are 2.82, 13.33, and -7.76 for the non-event study and 4.67, 13.95, and -6.80 for the event study specifications, respectively. These statistically and economically similar marginal effects show that our event-style Difference-in-Differences analysis does not drive our results.

As a second step, we validate the robustness of our findings using property-level heterogeneity in externality reduction demands. Successful socially responsible engagements reduce the externalities of firms through increased sustainable permit issuance. Therefore, it would not be unreasonable to assume that the extent to which REITs acquiesce to socially responsible engagement demands varies with the external pressure their properties face to become more sustainable. Specifically, we anticipate that properties in states that impose more stringent commercial energy codes extensively comply with engagement demands since they face higher transition risks.[22] Similarly, we anticipate that properties in democratic voting states face a higher demand to issue sustainable permits and, therefore, will experience more sustainable permits for successful socially responsible engagement during retrofit cycles.

In Columns (3) and (4), we validate our results by showing that REITs issue more sustainable permits during retrofit cycles under stringent energy requirements. In Panel A Columns (3) and (4), we find that the impact of socially responsible engagement during retrofit cycles is significantly more positive when energy requirements are stringent. Specifically, where the aggregate effect for all properties in Column (2) increases sustainable permits by 2.82 percentage points, engagement increases sustainable permits by 6.08 percentage points under stringent energy requirements and even reduces the share by 5.05 percentage points for properties that face below median strict energy codes.

We find a similar pattern when we split this aggregate effect into successful and unsuccessful socially responsible engagement. Specifically, successful socially responsible engagement during retrofit cycles increases the share of sustainable permits by 19.50 percentage points in highly energy-regulated properties and reduces the share of sustainable permits by 9.43 percentage points in less stringently regulated environments. For unsuccessful socially responsible engagement, we observe reductions of 7.31 for properties that face above-median energy code stringency and would otherwise receive sustainable retrofits and no statistically significant effect for below-median energy code stringency properties that would a priori be less likely to be sustainably retrofitted.

In Columns (5) and (6), we further validate our initial results by showing that REITs issue more sustainable permits during retrofit cycles in democratic states. Like the energy code

[22] See `https://www.energycodes.gov/state-portal` for a complete overview of the commercial and residential energy codes across states.

analysis, we find significantly lower sustainable permit issuance for properties in red states during socially responsible engagements. This effect is mirrored in successful and unsuccessful socially responsible engagement during retrofit cycles, as the share of sustainable permits increases is approximately double for successful engagement in blue states as opposed to red states. Similarly, when engagement is unsuccessful, sustainable permit issuance more strongly declines in red compared to blue states. These two heterogeneity analyses align with the logic of our main results and support that successful socially responsible engagement reduces externalities, while unsuccessful engagement increases externalities.

In a last validation analysis, we deviate the treatment duration of REITs after engagement. Following our identification strategy, we argue that socially responsible engagement is primarily effective in reducing externalities during retrofit cycles. We accommodate this in our Difference-in-Differences analysis by assuming that engaged REITs only remain treated for the duration of the retrofit cycle. However, it could be the case that once treated REITs remain treated across retrofit cycles or even outside of these cycles. To test whether this assumption drives our results, we replicate the full sample analysis while assuming that engaged REITs and engaged REITs during retrofit cycles remain treated throughout the end of the sample in Columns (7) and (8).

We observe a somewhat more grim representation of the impact of engagement on sustainable permits across treatment duration. In Columns (7) and (8) of Panel A, we find that socially responsible engagement during retrofit cycles reduces the share of sustainable permits by 3.83 and 2.48 percentage points, contrasting the positive impact of engagement depicted in Table 5. For successful socially responsible engagement during retrofit cycles, we observe 12.08 and 12.85 percentage points increases in the share of sustainable permits in Columns (7) and (8). These effects are reminiscent of the estimated added value of socially responsible engagement on the share of sustainable 13.33 and 13.95 percentage points increases in Column (2) and Table 5. For unsuccessful socially responsible engagements during retrofit cycles, we observe reductions in the share of sustainable permits of 10.51 and 11.48 percentage points in Columns (7) and (8) compared to 7.76 and 6.80 percentage points in Column (2) and Table 5. These results suggest that both the positive and negative consequences of (un)successful socially responsible engagement on sustainable performance are long-lasting. Given the above persistence in our findings across event style and full sample Difference-in-Differences analyses, property characteristics heterogeneity, and treatment effects duration, we argue that the methodological configurations that support our identification strategy do not significantly drive our results.

Table B1: Alternative Difference-in-Differences specifications

This Table displays eight alternative specifications of Table 5. In Panels A, B, and C, we employ these specifications for all socially responsible engagements, successful socially responsible engagements, and unsuccessful socially responsible engagements, respectively. In Column (1), we perform the principal analysis without the Difference-in-Differences two-way fixed effects term on the whole sample to assess the aggregate effect of engagement on sustainable permits unconditional to retrofit cycles. In Column (2), we perform the same full-sample analysis with the two-way fixed effects component. In Columns (3) to (6), we perform full sample Difference-in-Differences analyses that aggregate the share of sustainable permits by property-state characteristics. Columns (3) and (4) compute the percentage of sustainable permits by states with above and below median U.S. Department of Energy commercial property energy code stringency. Columns (5) and (6) aggregate sustainable permits by properties in blue and red states. Columns (7) and (8) adopt a specification in which we assume that REITs who experience socially responsible engagement and REITs who experience socially responsible engagements during retrofit cycles remain treated after the retrofit cycle until the end of the sample.

Panel A: All ES Engagements

VARIABLES	(1) All	(2) All	(3) Stringent energy code	(4) Loose energy code	(5) Blue	(6) Red	(7) All	(8) All
ES Engagement	-0.230	-0.777***	-3.029***	6.153***	-2.304***	9.916***	-5.691***	-6.188***
	(1.252)	(0.226)	(0.855)	(0.035)	(0.437)	(0.485)	(0.031)	(1.431)
Cycle X ES Engagement		3.517***	8.042***	-10.520***	4.744***	-21.551***	1.911*	3.730***
		(0.661)	(0.055)	(1.660)	(0.196)	(0.812)	(1.041)	(0.458)
Cycle	0.097	0.078	1.081***	-0.680	-0.880***	1.197***	-0.050	-0.018
	(0.384)	(0.387)	(0.153)	(0.736)	(0.021)	(0.393)	(0.332)	(0.400)
Observations	8,009	8,009	6,981	5,972	6,775	5,974	8,009	8,009
Adjusted R-squared	0.121	0.121	0.118	0.101	0.128	0.081	0.123	0.122
REIT controls	YES	YES	YES	YES	YES	YES	YES	YES
Time FX	YES	YES	YES	YES	YES	YES	YES	YES
REIT FX	YES	YES	YES	YES	YES	YES	YES	YES

Table B1 – continued

Panel B: Successful ES Engagements

VARIABLES	(1) All	(2) All	(3) Stringent energy code	(4) Loose energy code	(5) Blue	(6) Red	(7) All	(8) All
ES Engagement successful	0.982	-1.000***	-7.589***	17.859***	-4.253***	4.196***	-3.286**	-1.322*
	(3.889)	(0.280)	(0.456)	(0.477)	(0.165)	(0.053)	(1.478)	(0.738)
Cycle X ES Engagement successful		14.273***	26.040***	-26.613***	15.419***	-0.486	15.326***	14.117***
		(1.415)	(1.204)	(1.628)	(1.255)	(1.347)	(2.653)	(1.260)
Cycle	0.096	0.057	1.049***	-0.673	-0.899***	1.103***	0.043	0.053
	(0.385)	(0.388)	(0.151)	(0.731)	(0.023)	(0.397)	(0.397)	(0.386)
Observations	8,009	8,009	6,981	5,972	6,775	5,974	8,009	8,009
Adjusted R-squared	0.121	0.121	0.119	0.101	0.128	0.081	0.122	0.121
REIT controls	YES	YES	YES	YES	YES	YES	YES	YES
Time FX	YES	YES	YES	YES	YES	YES	YES	YES
REIT FX	YES	YES	YES	YES	YES	YES	YES	YES

Table B1 – continued

Panel C: Unsuccessful ES Engagements

VARIABLES	(1) All	(2) All	(3) Stringent energy code	(4) Loose energy code	(5) Blue	(6) Red	(7) All	(8) All
ES Engagement unsuccessful	-1.778	-0.463***	2.468**	-10.175***	-0.218	22.680***	-6.491***	-10.260***
	(2.060)	(0.119)	(1.220)	(0.844)	(0.993)	(1.555)	(2.351)	(2.377)
Cycle X ES Engagement unsuccessful		-7.414***	-10.934***	10.281***	-6.060***	-50.208***	-4.119***	-1.283
		(0.232)	(1.564)	(1.378)	(0.985)	(0.226)	(1.245)	(1.203)
Cycle	0.098	0.118	1.157***	-0.732	-0.834***	1.202***	0.108	0.064
	(0.380)	(0.380)	(0.163)	(0.739)	(0.014)	(0.387)	(0.381)	(0.381)
Observations	8,009	8,009	6,981	5,972	6,775	5,974	8,009	8,009
Adjusted R-squared	0.121	0.121	0.118	0.101	0.128	0.082	0.122	0.123
REIT controls	YES	YES	YES	YES	YES	YES	YES	YES
Time FX	YES	YES	YES	YES	YES	YES	YES	YES
REIT FX	YES	YES	YES	YES	YES	YES	YES	YES

Appendix C Predictability of retrofit cycles and engagement success

This Appendix displays the regression Tables of Figures Figures 4 and 5 for engagements in general and engagement by governance and socially responsible types. In Table C1, we regress contemporaneous, lagged, and lead public engagement specifications on the occurrence of retrofit cycles. In Columns (1) to (3), we respectively consider all engagements, governance engagements, and socially responsible engagements. The dependent variable is a dummy that indicates whether a retrofit cycle occurs at this point in time. The timestamps $_{t-4+}$ and $_{t+4+}$ indicate a dummy variable that captures engagements for all periods one year before or after the current point of time. Lagged quarterly total returns, log total assets, and the leverage ratio are considered in each regression as REIT characteristics. Similar to Figure 4, we find that all coefficients are statistically insignificantly different from zero, indicating that engagement has no predictive power over the timing of retrofit cycles.

Table C2 employs a similar empirical setup as Table C1 and considers whether retrofit cycles affect the probability of engagement success. Therefore, we regress contemporaneous, lagged, and lead retrofit cycle indicators on the likelihood of successful engagement. In Columns (1) to (3), we respectively consider all engagements, governance engagements, and socially responsible engagements. Similar to Figure 5, retrofit cycles do not increase the likelihood of successful engagement of any type.

Table C1: Engagement does not predict retrofit cycles

This table regresses contemporaneous, lagged, and lead engagement specifications on the occurrence of retrofit cycles. In Columns (1) to (3), we respectively consider all engagements, governance engagements, and socially responsible engagements. The dependent variable is a dummy that indicates whether a retrofit cycle occurs at this point in time. The timestamps $_{<q-3}$ and $_{>q+3}$ indicate all periods one year before or after the current point of time. REIT controls capture quarterly total returns, log total assets, and leverage. REIT-level clustered standard errors are given in parentheses. ***, **, and * denotes significance at the 1%, 5%, and 10% level.

VARIABLES	(1)	(2)	(3)
$Engagement_{<q-3}$	-0.001	-0.024	0.007
	(0.021)	(0.035)	(0.019)
$Engagement_{q-3}$	0.028	-0.002	0.027
	(0.035)	(0.055)	(0.031)
$Engagement_{q-2}$	-0.006	0.003	-0.021
	(0.029)	(0.046)	(0.027)
$Engagement_{q}$	-0.010	0.020	-0.029
	(0.023)	(0.047)	(0.026)
$Engagement_{q+1}$	0.030	0.014	0.037
	(0.031)	(0.050)	(0.034)
$Engagement_{q+2}$	0.021	-0.022	0.034
	(0.033)	(0.047)	(0.041)
$Engagement_{q+3}$	0.023	-0.049	0.050
	(0.027)	(0.030)	(0.032)
$Engagement_{>q+3}$	0.021	-0.007	0.037*
	(0.021)	(0.024)	(0.022)
Engagement type	All	Governance	SRI
Observations	10,641	10,641	10,641
Adjusted R-squared	0.040	0.040	0.041
REIT controls	YES	YES	YES
Time FX	YES	YES	YES
REIT FX	YES	YES	YES

Table C2: Engagement success and retrofit cycles

This table regresses contemporaneous, lagged, and lead retrofit cycle indicators on successful engagement activities. In Columns (1) to (3), we respectively consider the probability of a REIT experiencing successful engagements, successful governance engagements, and successful socially responsible engagements. The timestamps $_{<q-3}$ and $_{>q+3}$ indicate all periods one year before or after the current point of time. REIT controls capture quarterly total returns, log total assets, and leverage. REIT-level clustered standard errors are given in parentheses. ***, **, and * denotes significance at the 1%, 5%, and 10% level.

VARIABLES	(1)	(2)	(3)
$Cycle_{<q-3}$	-0.002	0.001	-0.002
	(0.003)	(0.003)	(0.002)
$Cycle_{q-3}$	0.006	0.007	-0.001
	(0.005)	(0.005)	(0.001)
$Cycle_{q-2}$	-0.003	-0.001	-0.002
	(0.007)	(0.007)	(0.002)
$Cycle_{q}$	-0.000	-0.000	-0.000
	(0.006)	(0.006)	(0.002)
$Cycle_{q+1}$	-0.000	-0.000	-0.000
	(0.007)	(0.006)	(0.003)
$Cycle_{q+2}$	-0.003	-0.003	0.000
	(0.006)	(0.005)	(0.003)
$Cycle_{q+3}$	0.005	0.006	-0.000
	(0.006)	(0.005)	(0.001)
$Cycle_{>q+3}$	0.004	0.004	-0.000
	(0.006)	(0.005)	(0.002)
Engagement type	All	Governance	SRI
Observations	10,641	10,641	10,641
Adjusted R-squared	0.072	0.063	0.011
REIT controls	YES	YES	YES
Time FX	YES	YES	YES
REIT FX	YES	YES	YES