The Green Transition: Evidence from Corporate Green Revenues*

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Abstract

We introduce a novel measure of revenues from green products and services for publicly listed firms worldwide that is not spanned by prior sustainability metrics used in the literature. We show that green revenues grew at an accelerated pace after the Paris Agreement. This growth has been driven by innovative US companies converting green patents into green revenues, as well as by firms with higher sustainability-focused institutional ownership before the Paris Agreement. Furthermore, we examine the stock returns of firms with green revenues and find modest evidence of a green alpha in the post-Paris period, primarily concentrated in US stocks.

Keywords: green revenues, sustainability, climate change, climate finance, green impact, ESG

JEL Classifications: G15, G18, G23, G30, Q55

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1 Introduction

The detrimental effects of climate change and environmental degradation pose a global challenge. Pressure has been put on companies worldwide to transition to "green" business models that are low carbon, resource efficient, and environmentally sustainable. The unexpected success of the 2015 Paris Agreement elevated the salience of environmental issues. However, there has been insufficient progress in the energy transition to achieve the emission reduction goals outlined in the agreement, and challenges persist in implementing a global carbon pricing scheme and other first-best policies to address wider environmental externalities (Tirole, 2008). To accelerate the "greening" of their economies, several jurisdictions have tried to introduce science-based green classification systems to define which economic activities are considered environmentally sustainable. The most prominent of these is the recent EU Taxonomy on Sustainable Finance (EUTSF), which addresses both climate change and other environmental goals such as biodiversity, environmental resource management, and pollution prevention.[1]

In this paper, we investigate the extent to which publicly listed firms around the world are generating "green revenues", that is, revenues coming from the sale of environmentally friendly products and services. We first start by showing that green revenues accelerated with the heightened emphasis on environmental issues spurred by the Paris Agreement and the prospect of follow-on regulation such as the EUTSF. This aligns with the recent model proposed by Inderst and Opp (2025), which suggests that a taxonomy of sustainable activities can facilitate the green transition, particularly in the presence of policy failures that hinder the implementation of first-best tools, such as carbon taxes. In addition, the model shows that taxonomies can address concerns related to greenwashing. Second, we ask what are the technological and market drivers behind the extent to which firms sell products and services that contribute positively to the environment. Third, we examine the financial consequences of green revenues and whether the transition to green business models comes at a cost to shareholder value.

[1] Regulation (EU) 2020/852 - see https://ec.europa.eu/sustainable-finance-taxonomy/ established in the context of the European Green Deal.

To address these questions, we use data from the FTSE Russell Green Revenues Classification System (GRCS), which, to our knowledge, is the first to provide comprehensive information on the extent to which firms generate revenues from green products and services. The GRCS assesses the impact of firms' economic activities not only on climate change mitigation and adaptation but also on other environmental concerns, such as water and resource use or pollution. The FTSE Russell classification provides a rules-based framework for identifying and measuring revenue from environmentally beneficial products and services in defined sectors for transparent market tracking. The data covers more than 16,000 publicly listed firms in 48 developed and emerging markets between 2008 and 2023. The GRCS classification precedes, but is similar in structure to the more recently introduced EUTSF.

The majority of firms have both green and non-green revenues. For example, Toyota generated about 30% of its revenues from green sources at the end of our sample period, mainly from its line of hybrid vehicles. However, some pure-play firms such as Tesla receive all (100%) of their revenues from green sources in the same year (93% from electric vehicles and 7% from solar panels and power storage). The example of Tesla illustrates how green revenues data differ from ESG ratings, as Tesla scores low on some ESG metrics that primarily assess the sustainability of a firm's operations or its conduct, rather than the environmental impact of its products.[2] The weak association between ESG ratings and green revenues is more generalized and goes beyond the case of Tesla. We show that the green revenues measure used in our study provides new information and has a low correlation with both environmental scores issued by ESG rating agencies and firm-level Scope 1 and 2 carbon emissions that have been the focus of previous literature (e.g. Bolton and Kacperczyk (2021); Pastor et al. (2022)).[3]

We start by sizing up the "green economy". Although the majority of public com-

[2]Wall Street Journal, "Is Tesla or Exxon More Sustainable? It Depends Whom You Ask" (Sept. 17, 2018).

[3]Sustainability assessments by ESG rating agencies (Pastor et al., 2022) have received criticism from both academics (Berg et al., 2022b) and policy makers (`https://bit.ly/49J9bfU`). The focus has also often been on Scope 1 carbon emissions arising from business operations (Bolton and Kacperczyk, 2021, 2023; Aswani et al., 2024), which usually does not capture the environmental impact of the firms' products and services.

panies around the world still primarily engage in non-green business activities, we show that there is an accelerated shift to green in the period after the Paris Agreement. The global percentage of green revenues was basically flat at approximately 4% from 2008 until 2015 but then grew to approximately 6% by 2023. Although the share of green revenues might seem modest at first sight, there are actually more than 3,000 companies generating green revenues (a fifth of all global public firms in the sample). Translating the share of green revenues into US dollar revenues, we find that the aggregate corporate green revenues at the end of the sample totaled approximately USD $4 trillion. This positions the green economy at about the same size as the oil and gas sector, to which it is often compared.[4] Green economic activities are diversified across several industries with manufacturing being the largest (e.g., electric vehicles, rail transportation, or renewable energy equipment), followed by utilities (e.g., renewable energy generation), and also technology firms exhibit relatively high green revenue shares (e.g., IT processes such as cloud computing). Although the US, China, and Japan have the largest aggregate dollar green revenues, the highest green revenue exposure is observed in Europe, where the green share exceeded 10% of total company revenues in markets such as France. This suggests that European companies are aligning faster with their countries' net-zero targets and broader sustainability goals.

In the second part of the paper, we examine possible channels that facilitate the generation of green revenues at the corporate level. For this purpose, we follow Seltzer et al. (2022), among others, and use the unexpected passage of the Paris Agreement as a regime shift to the global commitment to address environmental challenges. Before the treaty, media outlets and policy-makers expressed skepticism about the conference's outcome, given the unsuccessful track record of previous climate negotiations. The Paris Agreement not only made climate change more salient, but also raised expectations that more stringent environmental regulations could be imposed in the future. We validate this approach by documenting a ramp up of green revenues in European companies with the post-Paris rollout of the "European Green Deal" and the announcement of the EUTSF.

[4]IBISWorld, "Global Oil and Gas Exploration - Production Market Size 2005–2028".

Furthermore, countries with more stringent environmental regulation, as measured by the Environmental Performance Index (EPI), also generate on average more green revenues after the Paris Agreement.

We then turn to the drivers of the corporate green transition. In the absence of first-best environmental policies, Acemoglu et al. (2016); Aghion et al. (2016) and others have shown the importance of corporate innovation to help the transition from dirty to clean technologies. Therefore, as a first channel, we examine the role of technological innovation, which we capture by firms patenting green inventions pre-Paris and then successfully taking these solutions to market generating more green revenues in the period after the Paris Agreement. We estimate that firms with at least one green patent pre-Paris experienced an average increase of 2.3 percentage points in green revenue shares after the Paris Agreement came into effect, compared to firms that did not have a single green patent pre-Paris. The effect is economically meaningful and represents about one-sixth of a standard deviation in green revenues. This relation seems specific to green patents as we do not find an association between green revenues and non-green patents. Exploring regional variation, we find that the conversion of green patents into marketable environmental solutions is stronger for US companies, where there was actually less of a regulatory push.[5] In fact, when limiting the sample to European firms, we observe a statistically significant relation between green patents and green revenues, but do not find any strengthening of this relation post Paris. We perform a number of robustness checks on the measure of "greenness" and alternative regression specifications.

A second channel we explore is the external support provided by investors in assuming the equity risk of the green transition and driving real change. Again, in the absence of first-best environmental policies, models such as Oehmke and Opp (2024) highlight the importance of sustainability-conscious investors in addressing environmental challenges. These ESG-focused investors can collectively take the role of a large socially responsible fund that reduces negative externalities arising from dirty production and relaxes financ-

[5]Our study does not measure the impact of the subsequent government support programs such as the landmark 2022 US Inflation Reduction Act which may produce effects only after the end of our sample period.

ing restrictions for green investments. We focus on institutional ownership that might be more aligned with the environmental goals outlined in the Paris Agreement based on previous research on ESG-oriented investment (Dimson et al., 2015; Dyck et al., 2019; Krueger et al., 2020; Dimson et al., 2021; Pastor et al., 2024). We first examine whether firms with higher institutional ownership prior to the passage of the Agreement have higher green revenues post-Paris. Our focus on the predetermined level of institutional ownership pre Paris is intended to rule out that results are driven by institutional investors' portfolio adjustments as a reaction to the Paris Agreement. We estimate that a one standard deviation higher level of pre-Paris institutional ownership is associated with an about 0.3 percentage points higher green revenue share post Paris. Next, we focus on the particular role of sustainability-conscious investors, which we measure by the extent to which a firm is held by signatories of the most prominent ESG investor coalitions such as the Principles for Responsible Investment (PRI) (Gibson Brandon et al., 2022) and the CDP (Atta-Darkua et al., 2023). We find evidence that a stronger presence of these sustainability-focused institutions is associated with more green revenues post Paris. In a last test, we look at the investment horizon of institutional investors using average portfolio churn measures at the firm level (see Gaspar et al. (2005); Starks et al. (2024)). We find that companies owned by more long-term institutions pre Paris generated higher green revenues post Paris. This evidence suggests that there might be a trade-off between short-term (financial) goals of companies and possibly costly longer-term societal objectives of the green transition.[6]

In the final part of the paper, we examine the financial returns of the corporate shift to green business activities thus far. Successfully commercializing green products and services does not necessarily imply higher profits or a good return on the invested capital required to carry out the transition. Green business activities could be profit-enhancing if these create new market opportunities for firms or if a markup on green products can be passed on to customers with green preferences. This would be consistent with

[6]Our findings speak more broadly to the larger debate around the impact of engagement and exit strategies by institutional investors (Berk and Van Binsbergen, 2021; Edmans et al., 2022; Heath et al., 2023; Hartzmark and Shue, 2022; Becht et al., 2023; Atta-Darkua et al., 2023).

our evidence above that institutional ownership plays a role in the promotion of green revenues for financial "value"-oriented reasons (see Starks (2023)). However, investors could be motivated by their "values", that is non-pecuniary preferences such as reducing their portfolio environmental impact. Therefore, it could also be the case that green revenues entail lower profit margins or higher capital investments, resulting in net costs associated with shifting to green solutions, at least in the short term. This presents a potential trade-off between positive environmental impact and stock performance.

To better understand the financial consequences of shifting green, we analyze the stock market performance of firms with green revenues. When we form portfolios of firms with green revenues, these appear to exhibit higher returns than the overall market, consistent with some of the outperformance of the FTSE Russell green revenues index series.[7] However, our tests show no overall "green alpha" once we account for exposures to common sources of return co-variation such as market beta, size, value, momentum, profitability, or investment factors. Nonetheless, there is some evidence of alpha for portfolios of firms with high shares of green revenues adjusting for systematic asset pricing factors. This result is concentrated in the post-Paris sub-period–when attention to environmental issues is heightened–and mostly concentrated in US stocks, with green patents and high levels of institutional ownership pre Paris. We conclude that the market favorably received the green transition from US companies that had the internal resources and external support to develop green business models. In additional tests, we examine possible explanations for the outperformance of portfolios consisting of stocks with high green revenues. Our analysis suggests that the outperformance is likely driven by a combination of discount rate effects—manifested as a lower cost of capital for green firms— and unexpected shifts in climate-related concerns rather than by underreaction to earnings news.

Our paper contributes to the finance literature that examines the implications of climate change and environmental concerns. Previous studies have examined carbon emissions (Bolton and Kacperczyk, 2021, 2023; Ilhan et al., 2021; Aswani et al., 2024), industrial pollution (Hsu et al., 2023), or measures of environmental performance from

[7]LSEG FTSE Russell (July 2024), "Investing in the Green Economy 2024".

ESG ratings (Pastor et al., 2022; Karolyi et al., 2023; Alves et al., 2023; Eskildsen et al., 2024; Berg et al., 2022a). Most of these studies either use the "E" component of ESG ratings or carbon footprints based on Scope 1 and 2 emissions, which mostly reflect the sustainability of the operations or the conduct of firms. In contrast, the green revenues measure captures the extent to which a firm's output contributes to addressing environmental conservation and how a firm can benefit commercially from a shift to a greener economy.

A second stream of literature to which our paper contributes is studies on green patents and R&D (Cohen et al., 2023; Hege et al., 2022; Bolton et al., 2022). In our study, we take the extra step to examine whether green innovation translates into actual market adoption of those technologies and whether firms achieve higher commercial revenues as a result. Interestingly, we find that incumbent energy companies, despite having green patents (Cohen et al., 2023), do not seem to generate more green revenues, which indicates a disconnect in the green transition of this important sector. The green shift appears to be driven by companies outside the traditional energy sector.

A third research stream related to our paper is that on the existence of a green alpha in stock returns. Our tests suggest that the outperformance is concentrated in a subset of US firms. Additional tests show no average earnings surprises for firms with green revenues, suggesting that the observed alpha might come from a discount rate, rather than an excess cash flow effect. These findings are related to the literature that examines whether investors are willing to pay more for holding green securities.[8]

Finally, we also provide novel evidence on the impact of public policies that establish taxonomies for firms' sustainable activities in order to direct private capital to support the green transition. More recently, several papers have looked at EU policy frameworks, for instance Hoepner et al. (2023), Sautner et al. (2022), Bassen et al. (2023), Dai et al. (2023), Lambillon and Chesney (2023), Scheitza and Busch (2024), Sautner et al. (2024)

[8]Pastor et al. (2021) and Zerbib (2022) shed light on mechanisms by which environmental preferences create a taste premium for green stocks. Heeb et al. (2023) present experimental evidence that investors are willing to pay to align their portfolios with their sustainable preferences. Other studies show significant variability in "greenium" estimates (Baker et al., 2018; Zerbib, 2019; Colombage and Nanayakkara, 2020; Larcker and Watts, 2020; Caramichael and Rapp, 2022). Karpf and Mandel (2018) and Flammer (2021) suggest that factors beyond environmental preferences may influence the greenium estimates.

or Bassen et al. (2025). While the EU taxonomy is only starting to be implemented, in our study, we are able to test whether–in the past–firms started to shift towards green taxonomy-aligned business activities, what drives such shifts, and whether and how stock markets started to price these green revenues.

2 Sizing the Green Transition

Our sample comprises publicly listed firms in FactSet Fundamentals with a minimum market capitalization of USD $100 million and domiciled in one of the 48 countries that are classified as developed or emerging markets by FTSE Russell. We obtain annual company financial information and monthly stock prices from FactSet Fundamentals. The sample period spans from 2008 to 2023. The companies in our sample represent more than 90% of the global total market capitalization. Table 1 shows the descriptive statistics of the sample.

2.1 Green Revenues

Our main variable of interest is *Green Revenues %* – i.e., the percentage of revenues a company derives from "green" products and services. The data source is FTSE Russell (now an LSEG Business), a leading global index provider.[9] The Green Revenues Classification System (GRCS) provides firm-level revenue exposure to environmentally sustainable business activities for more than 16,000 publicly listed companies. The GRCS taxonomy comprises 10 green sectors and 64 subsectors classified based on their impact on climate change mitigation and adaptation, water, resource use, pollution, and agricultural efficiency (see Table A-1.1 in Appendix 1 for details). In the main analysis, the sample includes 36,725 firm-year observations where green revenues are larger than 0. In total, 3,306 unique firms show green revenues at some point during the sample period from 2008 to 2023.

[9]More details can be found in LSEG FTSE Russell (2024) "Green Revenues Data Model - Methodology". A few recent papers have used this novel dataset on firm green revenues - Kruse et al. (2020); Bassen et al. (2023); Lel (2024); Bassen et al. (2025).

This classification system was originally launched by FTSE Russell with Impax Asset Management in 2008 in response to investor demand to track the performance of the green economy. Its purpose was to construct financial products that sought exposure to the green economy. Examples of such products include the FTSE Russell Environmental Markets Index Series where a stock's inclusion is based on green revenue thresholds. GRSC 1.0 was created by FTSE Russell in 2013 and the latest iteration of the classification system, GRCS 2.0 (which we use in this study), was launched in 2020. More recently, investors have also started using these data for regulatory reporting requirements, such as determining the eligibility of their portfolio companies' sustainable activities under the EUTSF. In fact, the GRCS was used by the European Commission's Joint Research Center in its EUTSF Impact Assessment Report and has shaped the proposal of the EU's High-Level Expert Group on Sustainable Finance. It is therefore no surprise that there is an alignment between the GRCS and the EU taxonomies (in subsequent sections, we show how our main results are robust using green revenues based on the EUTSF instead).[10] FTSE Russell uses three methods to calculate green revenues:

1. **Disclosed**: Approximately a quarter of the GRCS data come directly from detailed publicly disclosed information (company websites, annual reports, CSR or sustainability reports, etc.) where company-reported business segments are mapped into the GRCS classifications of business activities.[11] This is followed by semantic screening of keywords (for example: 'biofuel' or 'electric vehicles') and then FTSE Russell analysts verify a company's involvement in green products or services.

2. **Company-specific estimates**: This is the case for around three-quarters of the firm-year observations where FTSE Russell analysts start with other available non-revenue data (e.g. production volumes, market shares of a product, etc.) and then engage directly with companies to confirm the estimates on the breakdown of revenues by green activity.

[10] The mapping of green revenues into the EUTSF is available here: LSEG FTSE Russell (2020) "Sizing the Green Economy - Green Revenues and the EU taxonomy".

[11] We do not observe a significant trend in the disclosure percentage post Paris.

3. **Sector-specific estimates**: This occurs for only a few companies with known green revenues, but no available public disclosures. FTSE Russell then uses a quantitative model that takes reported data from sector peers to estimate a firm's revenues from each GRCS green sector.[12]

The GRCS Green Revenues 2.0 data model was launched in 2020 and provides point estimate data for *Green Revenues %* since 2016. It builds on earlier versions going back to 2008 that provided only upper and lower bounds of estimated green revenues. We consulted with FTSE Russell on how to backfill estimates from 2016 going back to 2008 and adopted the approach taken in their research reports.[13] Starting in 2016, FTSE Russell provides both point estimates and a confidence interval of green revenues for each firm, corresponding to a conservative and a more optimistic estimate. We then compute a factor that allows us to backfill the point estimates using the minimum and maximum green revenues in the data. The factor is obtained by calculating:

$$Factor_{i,2016} = \frac{GR_{i,2016} - GR_{i,min,2016}}{GR_{i,max,2016} - GR_{i,min,2016}} \tag{1}$$

where $Factor_{i,2016}$ is the factor of firm i in 2016, $GR_{i,2016}$ is the point estimate, $GR_{i,min,2016}$ the lower limit and $GR_{i,max,2016}$ the upper limit. We backfill this factor for the years 2008 to 2015 and then obtain the point estimate for these years by applying the formula:

$$GR_{i,t} = GR_{i,min,t} + Factor_{i,2016} \times (GR_{i,max,t} - GR_{i,min,t}) \tag{2}$$

where $GR_{i,t}$ is the new point estimate, $GR_{i,min,t}$ the lower bound in a given year between 2008 and 2015 and $GR_{i,max,t}$ the upper bound, respectively. Companies without any green revenue are categorized as having zero contribution. This classification aligns with the methodology adopted by FTSE Russell in their research reports, wherein missing green revenue data is interpreted as zero. In later analysis, we conduct several robustness checks based on the treatment of the zeros and the backfilling.

[12] This approach is akin to the estimated carbon emissions data from providers such as S&P Trucost and used frequently in the literature (e.g., Bolton and Kacperczyk (2021) and many other papers).

[13] LSEG FTSE Russell (July 2024),"Investing in the Green Economy 2024".

Table A-1.2 in Appendix 1 provides the top-ranked companies by green revenues in USD for each of the top countries in different regions. The table shows many global leaders in energy generation from renewable and non-fossil fuel sources (nuclear: Electricité de France; wind: EnBW; hydro: Electrobras; solar: Canadian Solar), as well as firms producing the equipment (Hanwha) and enabling efficiencies via IT processes (e.g., Amazon and Microsoft with cloud computing) or building management and power storage. A second main category is transportation that minimizes environmental impacts, such as electric road vehicles (Tesla, BYD, or Toyota Motor) as well as railway manufacturers (Alstom), or operators (China Railway). Finally, the table provides examples of firms that are active in environmental resources such as key raw minerals and metals for the energy transition (SQM for lithium), sustainable forestry, waste management, or water infrastructure.

In our subsequent analyses, we tackle the active debate on the ''greenness" of several business activities. The coloring in Table A-1.1 shows the GRCS tiering system that classifies green products and services with significant and clear environmental benefits (Tier 1), those with more limited but net positive environmental benefits (Tier 2), or those with some environmental benefits but being overall net neutral or negative (Tier 3). A prominent example of Tier 3 is nuclear energy, which is free of CO2 emissions but produces radioactive waste.[14] Another such case is cloud computing, which falls under the GRCS sector "IT Processes" and is labeled Tier 2. In the next sections, we therefore run robustness tests focusing on the more strict GRCS Tier 1 green revenues to alleviate concerns that the results might be driven by these controversial green activities.

To assess whether these new data offer new information on a firm's contributions to the green transition, we explore the correlations of green revenues with other measures of environmental sustainability used in prior literature (carbon emissions and environmental scores). There are several reasons why green revenues differ from those other measures. First, the greenness of products and services is not necessarily related to the sustainability of a company's production and business operations. For example, the environmental

[14] The EUTSF also labeled nuclear energy as green despite some controversy (Reuters, ''EU Parliament Backs Labeling Gas and Nuclear Investments as Green", July 6, 2022)

efficiency in the production of cars is different from the environmental footprint of cars once they are used. Second, environmental scores mostly measure how firms implement or manage environmental issues, which is more related to their conduct rather than firms' contributions to the green transition through their output. It is easy to envision firms that have good best-in-class operations but sell products and services with a negative environmental impact (e.g., oil companies). Third, we computed the correlations between *Green Revenues %* and *Ad. MSCI ESG Score* (ESG ratings from from MSCI), *E-Score PST* (a modified version proposed by Pastor et al. (2022)) as well as corporate carbon emission intensities (see, e.g. Bolton and Kacperczyk (2021) or Bolton and Kacperczyk (2023)).

Table 2 shows that these commonly used measures have low correlations with the share of green revenues of a company. However, the correlation matrix further reveals that the main variable *Green Revenues %* is highly correlated with alternative definitions of greenness (*Tier 1 Green Revenues %*, *EUTSF Green Revenues %*). We also find similar patterns with Spearman rank-order correlations and for the intensive margin shown in Table I.A.1 of the Internet Appendix where we focus only on firms with non-zero green revenues.

2.2 The Growth of the Green Economy

Panel A of Figure 1 illustrates aggregate global green revenues in USD $ trillions on the left axis, alongside the percentage of green revenues relative to total revenues on the right axis. Both absolute and relative measures of green revenues show an upward trend that accelerates post-2016 after the Paris Agreement, exceeding USD $4 trillion and 6% of total revenues by 2023. Panel B of Figure 1 offers a breakdown of green revenues by the 10 GRCS sectors, showing that the highest proportions come from green energy (management, generation, and equipment) and transportation (solutions and equipment). Finally, panel C of Figure 1 uses the GRCS tiering system and illustrates that the acceleration after 2015 covers all tiers, including Tier 1 green revenues with clear environmental benefits, which we focus on in some of the tests in the next sections. For more details, Figures A-1.1 and A-1.2 in Appendix 1 display treemaps showing the distribution of green revenues across the 64 GRCS sub-sectors and by tier of ‘’greeness”.

Figure 2 illustrates that no single industry dominates the green economy. Naturally, certain sectors, such as Health Services, exhibit small to negligible green revenue contributions. In contrast, the Manufacturing and Utilities sectors collectively contribute approximately USD $1.4 trillion in aggregate green revenues, while the Consumer Durables sector (mainly comprising electric vehicles), adds another USD $0.5 trillion in green revenues. Within these top 3 industries, the green revenue share ranges from around 14% for Consumer Durables to up to 22% in Utilities. Interestingly, traditional Energy firms exhibit low green revenues, and we will analyze this sector in greater detail in the following sections.

Figure 3 shows that the United States is the leading economy with USD $1 trillion dollars in terms of aggregate green revenues. It is not surprising that in the Asia-Pacific region green revenues are also concentrated in large economies such as China and Japan. The bottom panel of Figure 3 shows that Europe has a higher percentage share of green revenues compared to other regions of the world. At the end of our sample, there were already multiple European markets in which the green economy made up more than 10% of total revenues, while the US only had a green share of approximately 5%.

Table 1 shows that the pooled equal-weighted average firm has about 3.4% of green revenues. This is lower than the revenue-weighted averages shown in Figure 1. The divergence between equal- and revenue-weighted average green revenues suggests that green revenues tend to be higher among larger firms. Table I.A.2 in the Internet Appendix examines firm-level variables that correlate with green revenues. We document a positive association with a firm’s scale (as measured by sales) and higher Tobin’s Q ratio, suggesting that growth firms exhibit higher green revenue shares. The coefficients for ROA (lower profitability), CAPEX, and R&D (more investment) point to potential short-term costs associated with the green transition. In a similar spirit, firms with lower cash balances also exhibit higher green revenue shares. Compared to the rest of the world, European firms stand out as having higher green revenue shares on average, consistent with Figure 3.

3 The Paris Agreement as a Regime Shift

As the main empirical strategy for our analysis, we take advantage of the unexpected success of the 2015 United Nations Climate Change Conference. This led to the Paris Agreement, a commitment of 196 nations to reduce greenhouse gas emissions and enhance resilience to climate change. The conference took place in December 2015 and the Agreement entered into force on November 4, 2016. The primary pledge is to limit the increase in the global average temperature to 1.5 degrees Celsius compared to preindustrial levels. We argue that the Paris Agreement marks a regime shift in that it elevated environmental concerns for many economic agents (e.g., firms, investors, regulators, and consumers).

Importantly, for our empirical design, this regime shift was far from anticipated. In fact, media articles prior to the treaty were pessimistic about the outcome of the conference given the unsuccessful track record of prior climate negotiations.[15] The uncertain outcome of the conference provides us with a quasi-exogenous shock to expected beliefs about climate and environmental action. In fact, Ramadorai and Zeni (2024) show in a survey that managers believe that the Paris Agreement increased the likelihood of more stringent environmental regulations worldwide. Seltzer et al. (2022) exploit the same shock in their study and show that the Paris Agreement had a significant impact on bond prices and risk. In addition, Engle et al. (2020) also show that their climate attention index spiked during the Paris meeting.

Beyond regulation, the Paris Agreement heightened expectations for investments in more efficient resource use and green technologies. Hence, we further motivate our setting with prior economic theory on green innovation. Acemoglu et al. (2016) propose a dynamic general equilibrium model that emphasizes how environmental policies can steer innovation towards clean technologies that align with regulatory requirements. The model

[15] Examples of article headlines before the meeting included Forbes ”The Paris Climate Summit Will Fail, For A Pretty Simple Reason” (Nov 30, 2015) or BBC ”Paris Climate Summit: Don’t Mention Copenhagen” (Sep 16, 2015).

highlights that clean innovation can become self-sustaining over time if early investments are maintained. Our hypothesis aligns with this: on the one hand, stricter legislation could amplify the path dependency of green innovation by ensuring that firms investing in clean technologies capture higher green revenues. On the other hand, by introducing stricter green legislation, firms face stronger disincentives to rely on dirty technologies. The green shift around the Paris Agreement likely increased the marketability and profitability of green innovations, directly tying stricter regulation to green revenue growth.

In sum, the Paris regime shift is an interesting setting to use in a cross-sectional difference-in-differences research design to explore potential channels that can accelerate the corporate green transition. This econometric research design uses the Paris Agreement as a "regime shift" and we take predetermined firm characteristics to capture differential exogenous exposures to the common shock. We employ several predetermined variables to estimate the effect of (1) firms' internal green innovative capacities measured by green patents held before the Paris Agreement and (2) the level and sustainability-orientation of institutional ownership measured pre-Paris. Instead of using time-varying exposure variables for the full sample period, our difference-in-differences regressions keep the exposure before the common shock constant over time to estimate how the common shock affects firms' green revenues conditional on pre-shock differences. We employ both traditional difference-in-differences regressions with a binary treatment definition (for dummy variables) and continuous treatment models (for ratio or level variables), as proposed by Callaway et al. (2024). The continuous treatment approach is especially appealing as it extends beyond a binary grouping, which allows us to capture the nuanced variation in treatment intensity around the Paris Agreement. In our subsequent tests, we run OLS regressions of the following type:

$$
\begin{aligned}
GR_{i,t} = \alpha + \beta_1 PostParis_t + \beta_2 Treatment_{i,preParis} + \beta_3 \\
PostParis_t \times\ Treatment_{i,preParis} + \beta_n X_{i,t} + \mu_j + \theta_r + \tau_t + \epsilon_{i,t},
\end{aligned}
\tag{3}
$$

where $GR_{i,t}$ is the percentage green revenue share of company i in year t. $PostParis_t$ is an indicator variable equal to 1 if the year is larger or equal to 2016. $Treatment_{i,preParis}$ is the conditioning variable measured before the Paris shock in 2015 and kept constant in the post-Paris period. Our regressions additionally include sector, country, and year-fixed effects in the form of μ_j, θ_r, and τ_t, respectively. Standard errors are clustered at the country-year level. We also estimate equations using firm-fixed effects.

In Appendix 2, we detail how we validate the Paris Agreement as a regime shift that raised expectations of a regulatory shift by presenting evidence from the multistage process that led to the introduction of the EUTSF. For example, Table A-2.1 shows that firms headquartered in European countries, on average, increased their green revenue shares during taxonomy roll-out process compared to firms located elsewhere. Overall, we conclude that the prospect of more stringent regulation post-Paris is associated with an acceleration in the transition towards a green economy. In Table A-2.2 we also provide evidence that supply factors related to a countries' environmental policies are more important than consumer demand aspects in the post-Paris green push (see also the discussion in Appendix 2).

4 Drivers of the Green Economy

Our main tests focus on two key drivers for a firm's successful green transition: (1) a firm's internal capabilities (which we proxy by having the technological knowledge to enable the green transition) and (2) the external support of its shareholder base (we look at the role played by institutional investors, in particular in terms of their sustainability-alignment and investment horizon).

4.1 The Role of Green Innovation

The first economic channel we examine is whether a firm's innovation capacity prior to the Paris Agreement is associated with stronger green revenues afterward. For this purpose, we collect data from the Global Corporate Patent Dataset (GCPD) developed by Bena et al. (2017).[16] We measure green patents based on the technology classes that are classified by the OECD as related to the environment based on the mapping outlined in Haščič and Migotto (2015) and also used in Cohen et al. (2023), Hege et al. (2022) and Atta-Darkua et al. (2023). We then construct the variables *GP Indicator* and *GP Ratio*, calculated as a dummy variable if the firm had at least a green patent pre-Paris and also the ratio of green patents to total patents granted between 2008 and 2013. In cases of missing firm data, we impute zeros. The data on granted patents are available until the end of 2013, so we stop there.[17]

We follow the methodology outlined in Section 3. The results in Table 3 show that companies that were more successful in developing green technologies pre Paris generated higher green revenues post Paris. Our first and main proxy for a firm's green innovativeness is *GP Indicator*, an indicator variable equal to 1 when a firm created at least one green patent in any year between 2008 and 2013.[18] This measure addresses the possibility that a single or a few green patents are highly influential. The positive coefficients of the interaction terms $GP\ Indicator \times\ PostParis$ in columns (1), (3), and (5) of Table 3 indicate that companies that had at least one green patent pre-Paris were more apt to respond to the Paris regime shift and transition to green at a faster pace. Since firms in some sectors can be more predisposed to patenting their inventions, we also include sector fixed effects in the regressions and use the ratio of green to total patents *GP Ratio* as a second measure for green innovation. We find that companies with higher green patent ratios exhibit significantly higher green revenue shares post-Paris (see columns (2), (4) and (6)). The specification using the *GP Indicator* variable is useful in evaluating the economic magnitude of the effect. Looking at the coefficient for the interaction effect $Post\ Paris \times GP\ Indicator$, we estimate that firms with at least one green patent before

[16]This data is available at https://patents.darden.virginia.edu/. Although we consider green patents granted as a measure of successful technological innovation, we acknowledge its limitations as firms can strategically choose not to patent all inventions and the propensity to patent with the USPTO varies across industries or geographies.

[17]We take the five years from 2008 to 2013 due to a time lag until filed patents are approved and incorporated into the last update of the GCPD database which took place in 2017. In future work, we will try to update the patent data set.

[18]In unreported results, we also find that results are consistent if we use the count of green patents without adjusting for total patents generated by a firm.

the Paris Agreement experienced on average an increase in green revenues that is 2.3 percentage points higher than for firms without any green patents after the Agreement came into effect. The effect is economically meaningful and represents about one-sixth of the standard deviation of the green revenue share. To alleviate concerns related to unobserved firm heterogeneity and also other shocks beyond the Paris Agreement that could correlate with the shift to green in different countries and industries, we employ an alternative regression specification using Firm, Country × Year, and Sector × Year fixed effects. Panel B of Table 3 shows that the results are robust to using firm-fixed effects to control for time-invariant company unobservables.

We also split the sample by geographical regions. The differences between the United States, Asia-Pacific, and Europe are striking (see Table 4). In all regions, green innovation is positively correlated with more green revenues. However, only in the United States and the Asia-Pacific region the Paris regime shift led to an accelerated increase in green revenues post Paris for firms holding relatively more green patents prior to the Paris Agreement (as shown by the coefficient on $GP\ Indicator \times\ PostParis$). One possible interpretation is that the shift to green is primarily driven by firms with the technology know-how responding to market opportunities in the follow-up to Paris, rather than just a response to a regulatory push as in Europe. We will examine these explanations in more depth in Section 5 when we investigate how global markets valued these revenues.

We also focus on the energy sector to understand its role in the green transition. Previous findings by Cohen et al. (2023) suggest that firms in the energy sector have a lot of green patents, but the question remains open whether these translate into tangible outcomes. Our tests in columns (7) and (8) of Table 4 show that energy companies with more green patents actually do not accelerate their green revenues post Paris, differently from firms in other sectors. There are several possible explanations for this result. First, the transition for "brown" energy firms (which are more dependent on fossil fuels) could be slow, as it requires a fundamental change in their business models. They might prefer to license their patents to firms that have the facilities and equipment to bring these green technologies to market. Second, energy firms could also use patents to preempt new "greener" competitors from entering the market.

Columns (3) - (6) in Panels A and B of Table 3 repeat the previous regression analysis using Tier 1 and EUTSF-eligible green revenues as dependent variables. We observe that the results tend to be similar, both statistically and economically, for Tier 1 green revenues with clear environmental benefits (columns (3) and (4)) and green revenues that qualify under the EU Taxonomy (columns (5) and (6)). Firms that held at least one green patent before the Paris Agreement had on average 2.1 (2.5) percentage points higher Tier 1 (EUTSF-eligible) green revenue shares post-Paris. We also assess whether our findings could be explained by firms that are generally more innovative by replacing green patents with any type of patent. However, Table I.A.3 in the Internet Appendix does not support this notion. The positive relation with green revenues appears to be specific to the greenness of patents, while general patenting activity is not associated with higher green revenues post-Paris.

4.2 The Role of Institutional Investors

The second channel we test is the willingness of a firm's investor base to support the green transition. Institutional investors play an increasingly important role in capital markets around the world. Survey evidence by Krueger et al. (2020) finds that institutional investors are concerned about climate risk. Among others, Dyck et al. (2019) and Hoepner et al. (2024) suggest that institutional investors can push firms to improve their environmental profiles. Apart from institutional investors' direct preferences for ESG, institutions might also care about firms' green revenues for financial "value"-oriented reasons (Starks, 2023) if there are profitable opportunities in the green transition. Rather than examining the innovativeness as well as the industry or geographic location of the firm, as in Section 4.1, here we focus on the sustainability alignment and the investment horizon of investors.

We access data on institutional ownership from the FactSet/LionShares database (Ferreira and Matos (2008)). We capture the environmental concerns of an investor by evaluating if the investor has signed the United Nations' sponsored Principles for

Responsible Investment (PRI, the world's largest initiative on ESG investing) or joined the CDP (formerly the Climate Disclosure Project and now focused on tackling also other environmental goals such as water, forests or plastics). We use data from Gibson Brandon et al. (2022) and Atta-Darkua et al. (2023) that matched the institution names in FactSet with the list of PRI and CDP signatories, respectively. Those papers find that PRI signatories who incorporate ESG into their active equity holdings have better portfolio ESG scores than non-PRI signatories (but less so for US-domiciled institutions) and that CDP signatories decarbonize their portfolios faster, particularly European-based institutions. A related paper by Pastor et al. (2023) also finds that after institutions become PRI signatories, their ESG portfolio tilts tend to become "greener" (and that this is more the case for European institutions than US-based ones). Another dimension we consider is investor patience for the transition, which we proxy by their investment horizon as in (Starks et al., 2024).

It is challenging to establish a causal link between sustainability-conscious institutional ownership and green revenues. On the one hand, investors can engage with companies to encourage more investment in green activities. On the other hand, investors with green mandates can pick stocks to "green their portfolios". To better isolate selection versus influence effects, we follow Ilhan et al. (2023) and our methodology described in Section 3. We estimate a regression model where sustainability-conscious institutional ownership is predetermined, that is, we consider a firm's pre-Paris institutional ownership and keep it constant in the post-Paris period. This approach allows us to rule out that the results are driven by institutional investors changing their holdings after the Paris Agreement.

In Table 5, we find that firms with higher institutional ownership pre-Paris indeed exhibit higher green revenue shares post-Paris. The three panels use different definitions of green revenues as the dependent variable (e.g., Tier 1). Panel A uses the baseline green revenue share as the dependent variable, and column (1) shows that firms with higher institutional ownership pre-Paris generate higher green revenues shares afterwards. We estimate that a one standard deviation higher level of pre-Paris institutional ownership is associated with an about 0.3 percentage points higher green revenue share post Paris. We find a stronger effect in column (2) with *IO High Pre Paris*. Then in columns (3) and (4) we observe that firms with higher ownership by PRI signatory institutions and CDP members tend to exhibit a stronger acceleration in green revenues after Paris. Finally, in column (5), we find that firms held by "patient" investors (as proxied by lower portfolio turnover) exhibit higher green revenue shares, however, the effect does not increase in strength after the Paris Agreement. Although the estimated coefficient is negative, it is not significant at conventional levels.

In Panel B, restricting ourselves to revenues from Tier 1 green business activities, we again find a significant association between the presence of PRI and CDP (but not long-term) institutions and green revenue shares with clear environmental benefits. The results are economically and statistically similar. In Panel C, we use EUTSF-eligible green revenues. The associations between EUTSF-eligible green revenues and our institutional ownership variables are stronger compared to the results in Panels A and B. For instance, we now also find a robust link between the green revenue share and long-term oriented institutional ownership (see column (5), Panel C).

4.3 Robustness and Additional Tests

As an alternative to our main regression tests, we implemented additional difference-in-difference tests for the two channels driving the green transition, the objective being to isolate the effect of the Paris regime shift from other concurrent changes. For instance, we use a balanced panel of firms and again keep green innovativeness and institutional ownership pre-Paris constant over time to test whether better initial conditions in these two dimensions allowed firms to generate more green revenues after the Paris Agreement. The results of these difference-in-differences regressions are presented in Figure 4, which shows that there is no pre-trend before Paris and there is an acceleration post-Paris. We find that a firm with at least one green patent pre-Paris experienced an increase of more than 1 percentage point in green revenues (Panel A). Firms that are above the sample median of institutional ownership pre-Paris, exhibit about 1.5 percentage points higher green revenue shares after the Agreement (Panel B). These results confirm the role of internal technological capabilities and also of external shareholder pressure in driving firms' green transition.

To investigate whether an increase in green dollar revenues reflects a substitution for brown revenues, we rerun our regression models across the two channels, this time focusing on "brown" US dollar revenues (which we define as total revenues minus green revenues). Our analysis in Tables I.A.5 and I.A.6 in the Internet Appendix yields interesting findings. We show that green revenues do not seem to replace brown revenues; the relation between green innovation and institutional ownership with brown dollar revenues is often insignificant after the Paris Agreement.

Lastly, we determine whether more firms began generating green revenues after the Paris Agreement. To do so, we look into the extensive margin and conduct the same regression analysis but replace the green revenue point estimates with a binary indicator variable set to 1 if the firm has any green revenues and 0 otherwise. In Tables I.A.7 and I.A.8 we find that firms with green patents and higher institutional ownership are indeed more likely to generate green revenues post-Paris. Overall, our main results seem to be driven by new entrants (extensive margin) rather than by firms with existing green revenues that are expanding their green businesses (intensive margin). In addition, we also examine the sensitivity of our results to the backfilling methodology applied to the 2008–2015 data. We conduct a subsample analysis focusing only on the post-Paris Agreement period, and an alternative approach that uses the midpoint between the minimum and maximum FTSE green revenue estimates. Overall, the results remain robust in these additional tests.

5 Do Investors Value Green Revenues?

Corporate environmental sustainability may be a desirable goal in itself. However, it remains an open question whether the stock market rewards firms with more green revenues and whether it is possible to generate profitable trading strategies from investing in green firms. As a reference, Figure 5 plots the cumulative returns for all stocks and compares them to portfolios of firms with different levels of green revenue. For these different "shades of green" we choose a portfolio consisting of firms with non-zero green revenues (solid green line), as well as two portfolios based on a 20% (short-dashed line) and 50% (long-dashed line) revenue cutoff (similar to those commonly used by FTSE Russell in their published indices). We observe that the 'All Green Revenues' portfolio does not outperform the all stocks portfolio (black line), but portfolios with higher green revenue shares appear to be associated with higher realized returns over the sample period (2008-2023). Do these seemingly higher returns reflect a green alpha, or might these be spanned by asset pricing factors commonly used in the finance literature?

In Panel A of Table 6, we test the *Green Revenues* $> 20\%$ portfolio against several benchmark portfolios and standard asset pricing models from Jensen et al. (2023). Column (1) shows the significant excess returns of the portfolio over the risk-free rate, consistent with the graphical evidence in Figure 5. In column (2) we use the portfolio's industry-hedged returns by benchmarking stock returns against sector returns based on the 10 GICS sectors. We find that portfolio outperformance is no longer significant, suggesting that excess returns based on green revenues reflect return differences across and not within industries. Using the CAPM model and switching back to value-weighted portfolio returns in excess of the risk-free rate, column (3) reports a statistically insignificant one factor alpha. This non-alpha result holds for all the other factor models that we employ in columns (4)-(8). The *Green Revenues* $> 20\%$ portfolio significantly loads on the market portfolio. The negative loading on the value factor indicates that stocks with high green revenues tend to be growth stocks (consistent with the analysis shown in Table I.A.2). Column (8) shows, as expected, that the portfolio does not load on the GMB factor proposed by Pastor et al. (2022) (we use the global GMB factor from Karolyi et al. (2023) given our international sample). This is consistent with the low correlations between green revenue shares and the ESG scores presented in Table 2 and supports the notion that green revenues capture aspects different from standard E(SG) scores.

In Panel B, we construct a factor portfolio GML that goes long firms with at least

20 % green revenues and short firms without green revenues. We refer to the short leg as the *Legacy* portfolio, hence the acronym GML. In Panel B, we rerun the analysis from Panel A using the factor returns and find insignificant alphas in each of the estimated factor models.

In Table 7, we construct GML portfolios with different green revenue % cutoffs for the long leg of the GML factor. We also use different types of green revenues across panels (Panel A: standard green revenues; Panel B: Tier 1 green revenues; Panel C: EUTSF-eligible green revenues). Overall, the results in this table are very similar to the findings in Table 6. The estimated alphas[19] are largely insignificant. If anything, there is weak positive alpha in the most extreme GML variants (i.e., those that go long in firms with at least 80 percent green revenues), and when using Tier 1 (Panel B) or EUTSF-eligible (Panel C) green revenues. Overall, we conclude that there is no strong evidence of positive alpha from investing in green revenue stocks in our 2008-2023 sample period, apart from the more extreme green portfolios.

We know from the previous sections that green revenues were relatively flat until the Paris Agreement and accelerated strongly afterward as the Paris Agreement elevated the importance of environmental issues to many stakeholders.[20] Thus, in Table 7, we extend the analysis and divide the sample into two periods, one for the period prior to the Paris Agreement and one for the period afterward. We estimate the 6-factor alphas for different variants of the GML factor, which we construct based on the three blends of green revenues (i.e., regular, Tier 1 and EUTSF-eligible) and different cut-off levels. In the last column of Table 7, we consider a portfolio of "pure-play" green firms that have more than 80% green revenues. The idea is to examine the financial implications of companies that were created with the primary purpose of selling predominantly green products and services. The results are striking: while there does not appear to be much evidence of alpha in the period prior to the Paris Agreement, positive 6-factor alpha

[19]We use a 6 factor model, i.e., Fama-French 5 factors augmented with a momentum factor.

[20]Our focus is on portfolio returns but, in contemporaneous studies, Battiston et al. (2024) present panel regression evidence that the stock returns of utility firms with green revenues are higher following the Paris Agreement and Bassen et al. (2025) show that EUTSF-aligned green stocks outperformed as investor attention increased with the publication of the taxonomy.

materializes in the Post-Paris period for the GML factor, in particular when the long leg is constructed based on "pure-play" firms (Column 4).

Table 7 shows a positive alpha after the Paris Agreement for stocks with higher green revenues. We now further investigate where this alpha originates from by conducting a subsample analysis in Table 8. In Panels A-C, we split the sample by geographic regions. The positive green alpha appears to be driven primarily by US stocks. We do not find any strong positive alpha outside the United States. If anything, European firms with high green revenues experienced negative alpha in the years leading to the Paris Agreement. In Panel D, we focus on a sample comprising global energy stocks. In the energy sector, there were no firms with more than 50% in green revenues and there is no evidence of outperformance of green portfolios in the energy sector. In a final step, we construct double-sorted portfolios based on the insights from our prior analysis that firms with more green patents and higher institutional ownership were able to increase their green revenues more strongly after the Paris Agreement. In line with the previous analysis, we find that the alpha is strongest among firms with the highest green revenues holding green patents (columns (3) and (4) of Panel E) as well as high institutional ownership (columns (3) and (4) of Panel F).

In a nutshell, before the implementation of the Paris Agreement, profitable trading strategies based on green revenues seemed unattainable. After 2016, this seemed to have changed, but not everywhere in the world. Outperformance is strongest among firms that were well positioned for the green transition, that is, firms with green patents and shareholders open to investing in the green transition. The results on the financial profitability of investing in firms with (high) green revenues remain mixed, but portfolios of US firms with extreme green revenues shares appear to be most promising.

We perform a series of robustness checks. The first concern is the potential influence of a few firms on the returns of green portfolios. Theory models such as Acemoglu et al. (2016) highlight the role of winner-take-all breakthrough technologies that have low probability, but may become highly influential if successful. Empirical asset pricing studies, such as Bessembinder (2018), also have shown that a handful of highly impactful stocks often account for the majority of the equity premium. Specifically, large firms with substantial green revenues can significantly drive the observed green alpha in our value-weighted portfolios. Looking at Table I.A.9 in the Internet Appendix, it becomes apparent that Tesla comprises up to approximately 50% of the green US portfolio considering stocks with more than 50% in green revenues. This raises questions regarding the robustness of our results when Tesla's influence is omitted. Indeed, Figure I.A.1 shows that a significant portion of the initially observed green outperformance can be attributed to Tesla's returns. However, notably in the US post-Paris period (see lower sub-figure in Figure I.A.1), we continue to observe higher cumulative stock returns for portfolios consisting of stocks with higher green revenues. In particular, the portfolio containing stocks with more than 50% green revenues seems to perform much better than the all-stocks portfolio. This finding is further substantiated in Table I.A.10, where we estimate factor models. In Panels A and B, Tesla is excluded from the value-weighted global and US portfolios, respectively. Panels C and D present equally weighted portfolios, effectively mitigating the influence of outlier firms with high market capitalization. Despite these adjustments, the results consistently indicate a positive and significant green alpha post-Paris in the U.S. for stocks with at least 80% green revenues. The other portfolios neither under- nor outperform, suggesting, in turn, that investors do not need to sacrifice returns to invest in firms generating green revenues.

Finally, we explore possible explanations for the outperformance of some of the green revenue portfolios. Any observed alpha could be due to investors' under-reaction to positive earnings news, differences in discount rates, or perhaps both. Another possible explanation could be that unexpected shifts in climate concerns in the spirit of Pastor et al. (2022) and Ardia et al. (2023) drive outperformance. We do not believe that these explanations are mutually exclusive and possibly all contribute to the outperformance of the GML factor.

In Table 9 we examine the possibility of underreaction to earnings news and differences in discount rates (Atilgan et al., 2024; Eskildsen et al., 2024). Columns (1) and (2) suggest a lower implied cost of capital for firms with higher discount rates. The results for earnings surprises are less conclusive (columns 3 and 4). Although the estimated relation between earnings surprises and green revenue shares is positive in the Post 2016 sub-sample (column 4), the relation seems estimated with noise and not significant at conventional levels.

In Table 10, we explore whether unexpected shocks to climate concerns (using the Media Climate Change Concerns (MCCC) index of Ardia et al. (2023)) drive the returns of green revenue portfolios. Panel A focuses on returns in excess of the risk-free rate of portfolios formed on the basis of percentage green revenues. Panel B employs the GML factors. We find strong evidence that unexpected climate concerns and the ensuing shifts in investor and consumer demand positively impact the returns of green revenue portfolios. We conclude that a mix of discount rate effects and unexpected shifts in climate concerns drives the outperformance. One caveat is the limited time series used in our study as green technologies may take time to develop and be better understood. Next, we acknowledge that some sectors such as Healthcare cannot generate green revenues, which does not mean that their revenues are brown, but they simply do not play a key role in the green transition. Hence, we exclude industries with either no green revenues, or in an alternative specification, green revenue shares below 5% from the short legacy portfolio to test the robustness of our results. The estimated alphas are not significantly different from our baseline specification.[21] Lastly, we address the concern that GML portfolio returns might be driven by green measures previously examined in the finance literature. To investigate this, we test across various specifications whether the global green-minus-brown (GMB) factor based on MSCI environmental pillar scores proposed by Karolyi et al. (2023) explains our GML portfolio returns. Our results in Table I.A.11 show no evidence of such a relationship in any of the tested specifications.

6 Conclusions

In this paper, we use novel data on corporate green revenues to provide evidence of the green transition. This measure is not spanned by prior sustainability metrics used in the

[21]Detailed results are available upon request.

sustainability finance literature. We start by sizing the green economy and show that the green transition has accelerated after the Paris Agreement and has grown to about $4tn in total revenues. In absolute dollar terms, firms in large economies such as the US, China, and Japan generate the most green revenues, while European firms exhibit higher green revenue shares and appear to be more advanced in the green transition.

Next, we isolate two channels driving green revenues: technological innovation and institutional investor support. The analysis suggests that firms with (more) green patents held before the Paris Agreement were better positioned to increase their green revenue shares after the Paris Agreement, especially in the US, where regulatory pressure was less intense. We conclude that innovation is a critical driver of the green transition, allowing firms to overcome technological barriers and bring green products to market. Institutional investors have also played a role in supporting the green transition. We find that firms with higher levels of sustainability-focused institutional ownership before the Paris Agreement were more likely to see an increase in green revenues afterward.

Finally, we examine the stock market returns of firms undergoing the green transition. Although firms with higher green revenues tend to outperform the broader market, our tests reveal no overall green "alpha" once systematic asset pricing factors are accounted for. However, there is evidence of positive alpha for green firms in the United States post-Paris, suggesting that investors may have rewarded companies for voluntarily adopting greener business models. Interestingly, we do not observe similar returns for European firms, where regulatory pressure may have played a more significant role in driving the green transition. In a last step, we examine the drivers of the outperformance of firms with high green revenues post-Paris and find evidence that a mix of lower discount rates and unexpected shocks to climate concerns likely explain the higher realized returns of firms with the highest green revenue shares.

Since we are still in the early stages of the green transition, there are a lot of open questions that can be addressed by future work. For example, one question our paper leaves open is how much the shift to green revenues actually contributes to reducing corporate emissions and helps achieve broader environmental goals. One other aspect is that sustainability goals may be dynamic, while our study uses a static green classification. It would be interesting to examine how green technologies develop and better understand how markets price in their economic and environmental impacts.

References

Acemoglu, D., Akcigit, U., Hanley, D., and Kerr, W. (2016). Transition to clean technology. *Journal of political economy*, 124(1):52–104. 5, 15, 26

Aghion, P., Dechezleprêtre, A., Hemous, D., Martin, R., and Van Reenen, J. (2016). Carbon taxes, path dependency, and directed technical change: Evidence from the auto industry. *Journal of Political Economy*, 124(1):1–51. 5

Alves, R., Krüger, P., and van Dijk, M. A. (2023). Drawing up the bill: Is esg related to stock returns around the world? *Available at SSRN 4674146*. 8

Ardia, D., Bluteau, K., Boudt, K., and Inghelbrecht, K. (2023). Climate change concerns and the performance of green vs. brown stocks. *Management Science*, 69(12):7607–7632. 27, 28, 54, 63

Aswani, J., Raghunandan, A., and Rajgopal, S. (2024). Are carbon emissions associated with stock returns? *Review of Finance*, 28(1):75–106. 3, 7

Atilgan, Y., Demirtas, K. O., Edmans, A., and Gunaydin, A. D. (2024). Does the carbon premium reflect risk or mispricing? *FEB-RN Research Paper*, (03). 27

Atta-Darkua, V., Glossner, S., Krueger, P., and Matos, P. (2023). Decarbonizing institutional investor portfolios. *Available at SSRN*. 6, 18, 21

Baker, M., Bergstresser, D., Serafeim, G., and Wurgler, J. (2018). Financing the response to climate change: The pricing and ownership of U.S. green bonds. Working Paper 25194, National Bureau of Economic Research. 8

Bassen, A., Kordsachia, O., Lopatta, K., and Tan, W. (2025). Revenue alignment with the eu taxonomy regulation in developed markets. *Journal of Banking & Finance*, 170:107339. 9, 25

Bassen, A., Shu, H., and Tan, W. (2023). Green revenues and stock returns: Cross-market evidence. *Finance Research Letters*, 52:103550. 8, 9

Battiston, S., Monasterolo, I., and Montone, M. (2024). Technological greenness and long-run performance. 25

Becht, M., Pajuste, A., and Toniolo, A. (2023). Voice through divestment. *European Corporate Governance Institute–Finance Working Paper*, (900). 6

Bena, J., Ferreira, M. A., Matos, P., and Pires, P. (2017). Are foreign investors locusts? the long-term effects of foreign institutional ownership. *Journal of Financial Economics*, 126(1):122–146. 18

Berg, F., Koelbel, J. F., Pavlova, A., and Rigobon, R. (2022a). ESG confusion and stock returns: Tackling the problem of noise. *Unpublished working paper*, National Bureau of Economic Research. 8

Berg, F., Koelbel, J. F., and Rigobon, R. (2022b). Aggregate confusion: The divergence of ESG ratings. *Review of Finance*, 26(6):1315–1344. 3

Berk, J. and Van Binsbergen, J. H. (2021). The impact of impact investing. 6

Bessembinder, H. (2018). Do stocks outperform treasury bills? *Journal of financial economics*, 129(3):440–457. 26

Bolton, P. and Kacperczyk, M. (2021). Do investors care about carbon risk? *Journal of Financial Economics*. 3, 7, 11, 13

Bolton, P. and Kacperczyk, M. (2023). Global pricing of carbon-transition risk. *The Journal of Finance*, 78(6):3677–3754. 3, 7, 13

Bolton, P., Kacperczyk, M. T., and Wiedemann, M. (2022). The co2 question: Technical progress and the climate crisis. *Available at SSRN*. 8

Callaway, B., Goodman-Bacon, A., and Sant'Anna, P. H. (2024). Difference-in-differences with a continuous treatment. Technical report, National Bureau of Economic Research. 16

Caramichael, J. and Rapp, A. C. (2022). The green corporate bond issuance premium. *International Finance Discussion Paper*, (1346). 8

Carhart, M. M. (1997). On persistence in mutual fund performance. *The Journal of finance*, 52(1):57–82. 50

Cohen, L., Gurun, U. G., and Nguyen, Q. (2023). The ESG - Innovation Disconnect: Evidence from Green Patenting. 8, 18, 19

Colombage, S. and Nanayakkara, K. (2020). Impact of credit quality on credit spread of green bonds: a global evidence. *Review of Development Finance*, 10(1):31–42. 8

Dai, J., Ormazabal, G., Penalva, F., and Raney, R. A. (2023). Can mandatory disclosure curb greenwashing? First evidence from the eu sfdr. *EU SFDR (September 7, 2023)*. 8

Dimson, E., Karakaş, O., and Li, X. (2015). Active ownership. *The Review of Financial Studies*, 28(12):3225–3268. 6

Dimson, E., Karakaş, O., and Li, X. (2021). Coordinated engagements. *European Corporate Governance Institute–Finance Working Paper*, 721. 6

Downar, B., Ernstberger, J., Reichelstein, S., Schwenen, S., and Zaklan, A. (2021). The impact of carbon disclosure mandates on emissions and financial operating performance. *Review of Accounting Studies*, 26(3):1137–1175. 64

Dyck, A., Lins, K. V., Roth, L., and Wagner, H. F. (2019). Do institutional investors drive corporate social responsibility? International evidence. *Journal of Financial Economics*, 131(3):693–714. 6, 20, 67

Edmans, A., Levit, D., and Schneemeier, J. (2022). *Socially responsible divestment*. Centre for Economic Policy Research. 6

Engle, R. F., Giglio, S., Kelly, B., Lee, H., and Stroebel, J. (2020). Hedging climate change news. *The Review of Financial Studies*, 33(3):1184–1216. 15

Eskildsen, M., Ibert, M., Jensen, T. I., and Pedersen, L. H. (2024). In search of the true greenium. *Available at SSRN*. 8, 27

Fama, E. F. and French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of financial economics*, 33(1):3–56. 50

Fama, E. F. and French, K. R. (2015). A five-factor asset pricing model. *Journal of financial economics*, 116(1):1–22. 50

Ferreira, M. A. and Matos, P. (2008). The colors of investors' money: The role of institutional investors around the world. *Journal of financial economics*, 88(3):499–533. 20

Flammer, C. (2021). Corporate green bonds. *Journal of Financial Economics*, 142(2):499–516. 8

Gaspar, J.-M., Massa, M., and Matos, P. (2005). Shareholder investment horizons and the market for corporate control. *Journal of financial economics*, 76(1):135–165. 6

Gibson Brandon, R., Glossner, S., Krueger, P., Matos, P., and Steffen, T. (2022). Do responsible investors invest responsibly? *Review of Finance*, 26(6):1389–1432. 6, 21, 61

Hartzmark, S. M. and Shue, K. (2022). Counterproductive sustainable investing: The impact elasticity of brown and green firms. *Available at SSRN 4359282*. 6

Haščič, I. and Migotto, M. (2015). Measuring environmental innovation using patent data. 18

Heath, D., Macciocchi, D., Michaely, R., and C. Ringgenberg, M. (2023). Does socially responsible investing change firm behavior? *Review of Finance*, 27(6):2057–2083. 6

Heeb, F., Koelbel, J. F., Paetzold, F., and Zeisberger, S. (2023). Do investors care about impact? *The Review of Financial Studies*, 36(5):1737–1787. 8

Hege, U., Pouget, S., and Zhang, Y. (2022). The impact of corporate climate action on financial markets: Evidence from climate-related patents. *Available at SSRN 4170774*. 8, 18

Hoepner, A., Klausmann, J., Leippold, M., and Rillaerts, J. (2023). Beyond climate:'eu taxonomy' criteria, materiality, and cds term structure. *Swiss Finance Institute Research Paper*, (23-10). 8

Hoepner, A. G., Oikonomou, I., Sautner, Z., Starks, L. T., and Zhou, X. Y. (2024). Esg shareholder engagement and downside risk. *Review of Finance*, 28(2):483–510. 20

Hsu, P.-h., Li, K., and Tsou, C.-y. (2023). The pollution premium. *The Journal of Finance*, 78(3):1343–1392. 7

Ilhan, E., Krueger, P., Sautner, Z., and Starks, L. T. (2023). Climate risk disclosure and institutional investors. *The Review of Financial Studies*, 36(7):2617–2650. 21, 64, 67

Ilhan, E., Sautner, Z., and Vilkov, G. (2021). Carbon tail risk. *The Review of Financial Studies*, 34(3):1540–1571. 7

Inderst, R. and Opp, M. M. (2025). Sustainable finance versus environmental policy: Does greenwashing justify a taxonomy for sustainable investments? *Journal of financial economics*, 163:103954. 2

Jensen, T. I., Kelly, B., and Pedersen, L. H. (2023). Is there a replication crisis in finance? *The Journal of Finance*, 78(5):2465–2518. 24, 62, 63

Jouvenot, V. and Krueger, P. (2019). Mandatory corporate carbon disclosure: Evidence from a natural experiment. *Available at SSRN 3434490*. 64

Karolyi, G. A., Wu, Y., and Xiong, W. W. (2023). Understanding the global equity greenium. *Available at SSRN 4391189*. 8, 24, 28, 50, 63, 83

Karpf, A. and Mandel, A. (2018). The changing value of the green label on the us municipal bond market. *Nature Climate Change*, 8(2):161–165. 8

Krueger, P., Sautner, Z., and Starks, L. T. (2020). The importance of climate risks for institutional investors. *The Review of Financial Studies*, 33(3):1067–1111. 6, 20

Krueger, P., Sautner, Z., Tang, D. Y., and Zhong, R. (2024). The effects of mandatory esg disclosure around the world. *Journal of Accounting Research*, 62(5):1795–1847. 67

Kruse, T., Mohnen, M., Pope, P. F., and Sato, M. (2020). Green revenues, profitability and market valuation: Evidence from a global firm level dataset. 9

Lambillon, A.-P. and Chesney, M. (2023). How green is 'dark green'? An analysis of sfdr article 9 funds. *An analysis of SFDR Article*, 9. 8

Larcker, D. F. and Watts, E. M. (2020). Where's the greenium? *Journal of Accounting and Economics*, 69(2-3):101312. 8

Lel, U. (2024). In the pursuit of greenness: Drivers and consequences of green corporate revenues. *Available at SSRN 4823664*. 9

Oehmke, M. and Opp, M. M. (2024). A theory of socially responsible investment. *Review of Economic Studies*, page rdae048. 5

Pastor, L., Stambaugh, R. F., and Taylor, L. A. (2021). Sustainable investing in equilibrium. *Journal of financial economics*, 142(2):550–571. 8

Pastor, L., Stambaugh, R. F., and Taylor, L. A. (2022). Dissecting green returns. *Journal of Financial Economics*, 146(2):403–424. 3, 8, 13, 24, 27, 45, 72

Pastor, L., Stambaugh, R. F., and Taylor, L. A. (2023). Green tilts. Technical report, National Bureau of Economic Research. 21

Pastor, L., Stambaugh, R. F., and Taylor, L. A. (2024). Sustainable investing. Technical report, National Bureau of Economic Research. 6

Ramadorai, T. and Zeni, F. (2024). Climate regulation and emissions abatement: Theory and evidence from firms' disclosures. *Management Science*. 15

Sautner, Z., Yu, J., Zhong, R., and Zhou, X. (2022). The EU taxonomy and the syndicated loan market. *Available at SSRN 4058961*. 8

Sautner, Z., Yu, J., Zhong, R., and Zhou, X. (2024). The eu taxonomy and the syndicated loan market. *Available at SSRN 4058961*. 8

Scheitza, L. and Busch, T. (2024). SFDR Article 9: Is it all about impact? *Finance Research Letters*, page 105179. 8

Seltzer, L. H., Starks, L., and Zhu, Q. (2022). Climate regulatory risk and corporate bonds. Technical report, National Bureau of Economic Research. 4, 15

Starks, L. T. (2023). Presidential address: Sustainable finance and esg issues—value versus values. *The Journal of Finance*, 78(4):1837–1872. 7, 20

Starks, L. T., Venkat, P., and Zhu, Q. (2024). Corporate ESG profiles and investor horizons. *Journal of Finance*, forthcoming. 6, 21

Tirole, J. (2008). Some economics of global warming. *Rivista di Politica Economica*, 98(6):9–42. 2

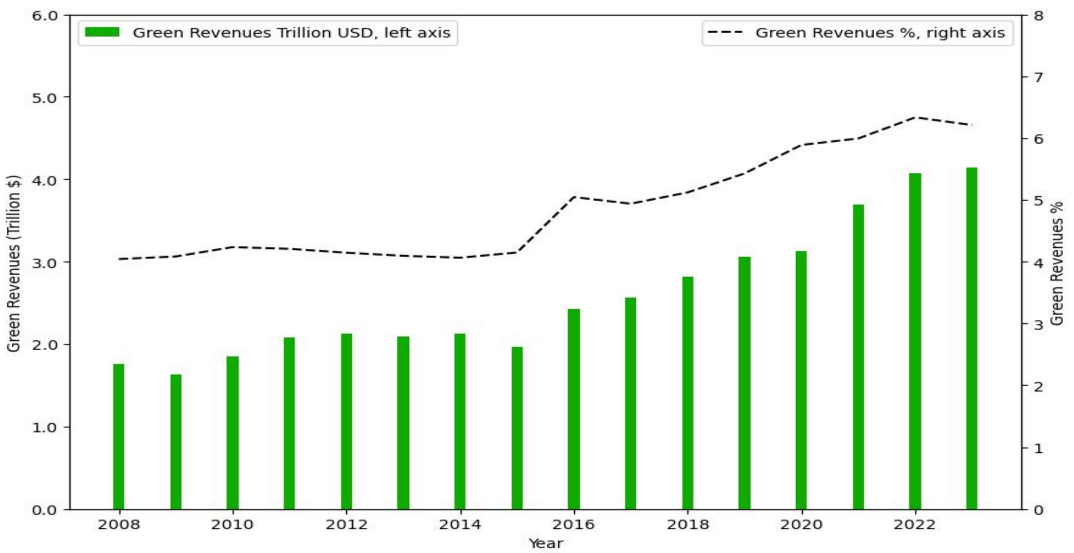
Zerbib, O. D. (2019). The effect of pro-environmental preferences on bond prices: Evidence from green bonds. *Journal of Banking and Finance*, 98:39–60. 8

Zerbib, O. D. (2022). A sustainable capital asset pricing model (S-CAPM): Evidence from environmental integration and sin stock exclusion. *Review of Finance*, 26(6):1345–1388. 8

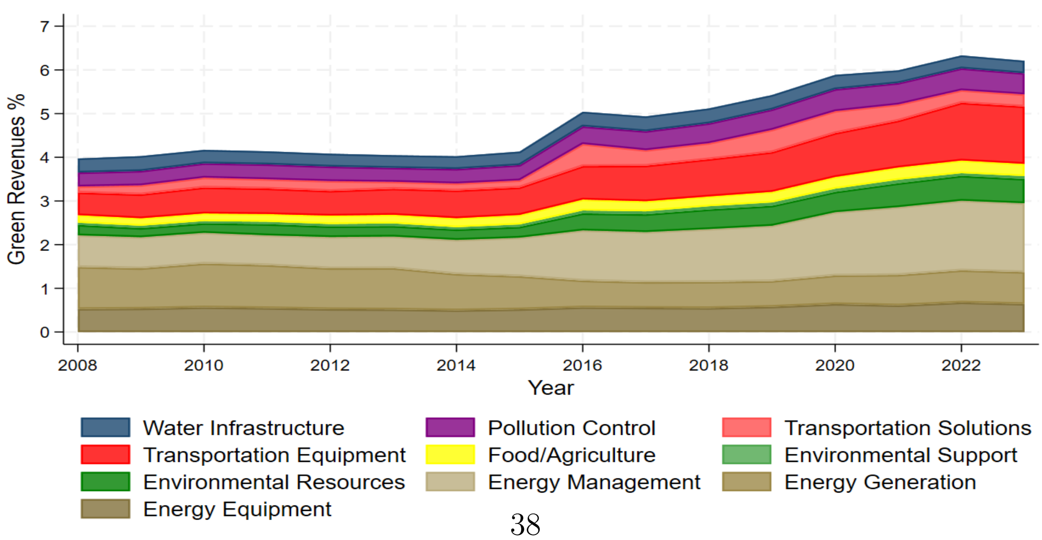
Figures

Figure 1. Sizing the Green Economy
Panel A illustrates the growth of corporate green revenues. The left axis shows total annual revenues derived from green products and services for publicly-listed companies worldwide (in USD $ trillions). The right axis shows the percentage of green revenues relative to total company revenues. Panel B shows the growth of revenues by type of green business activity based on FTSE Russell's Green Revenue Classification System (GRCS). The graph plots the percentage of green revenues by each of the 10 GRCS green business activities relative to total revenues per year. The green coloring of Panel C is based on FTSE Russell's GRCS tiering system that ranks green products and services with significant and clear environmental benefits (Tier 1), those with more limited but net-positive environmental benefits (Tier 2), or those with some environmental benefits but overall net-neutral or negative environmental impact (Tier 3). More details on the GRCS taxonomy system are provided in Table A-1.1.

Panel A: The Growth of Green Corporate Revenues



Panel B: Green Revenues by GRCS Business Activity



Panel C: Green Revenues by GRCS Tier of "Greenness"

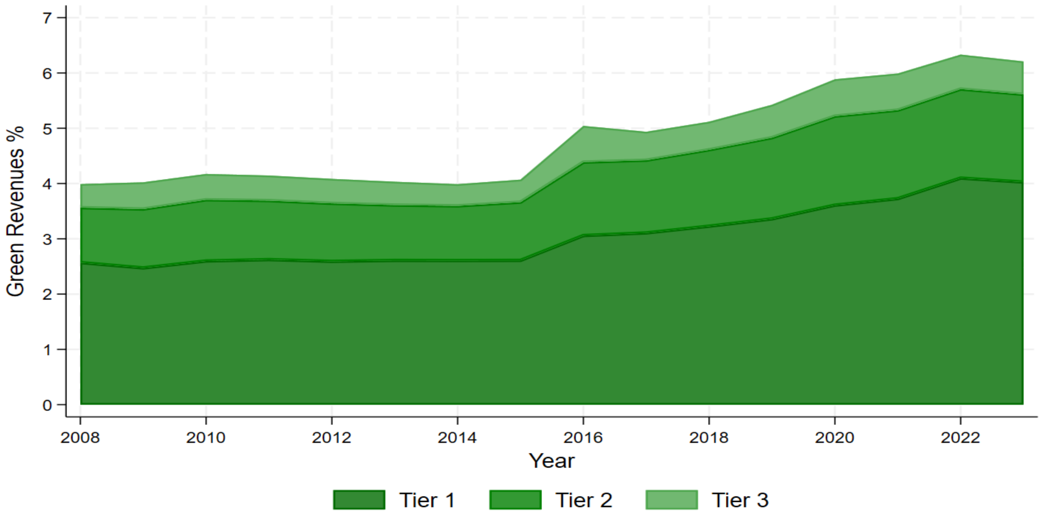


Figure 2. Green Revenues by Industry

The figure maps green revenues into different traditional industries based on a company's FactSet sector classification in 2022. The green bar chart shows total annual green revenues (in USD $ trillions) and the black dashed line plots green revenues relative to total revenues for companies in each FactSet sector.

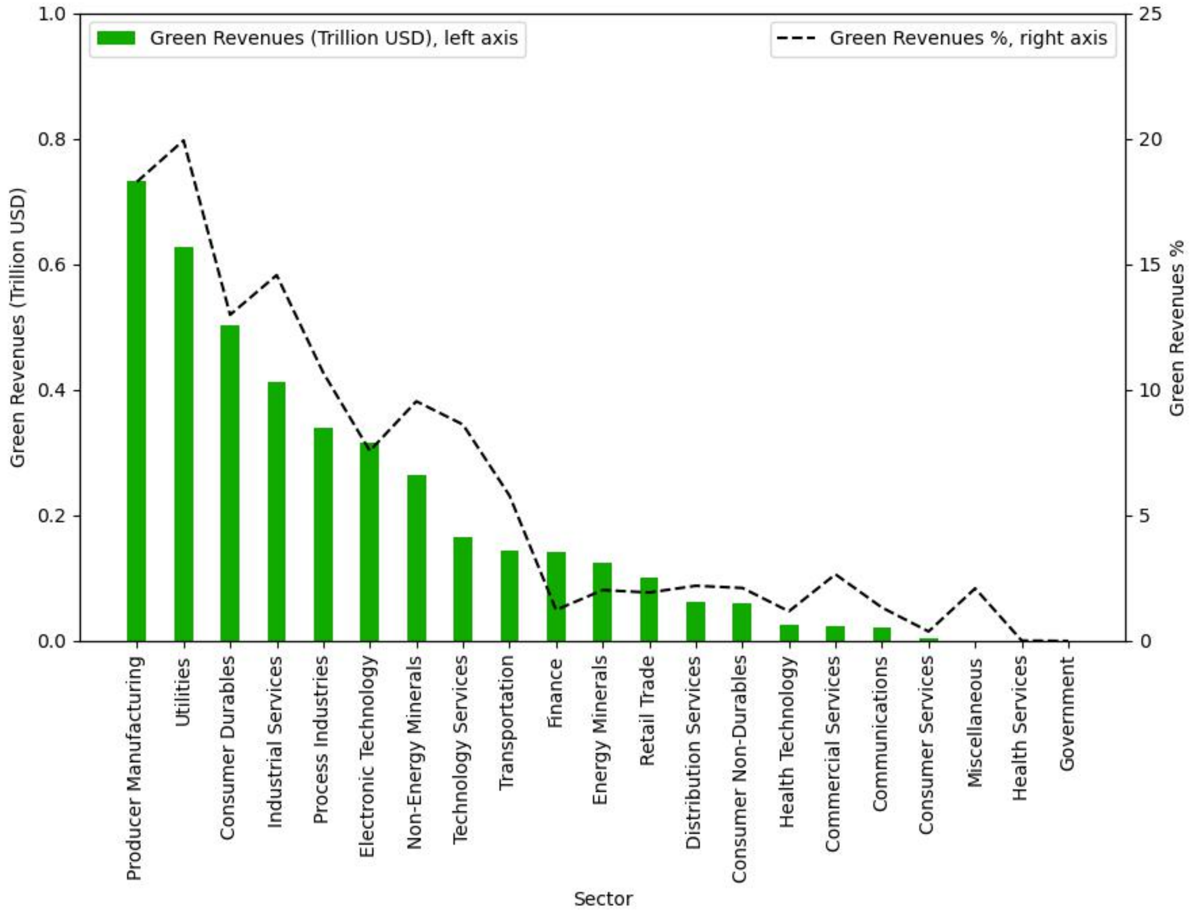
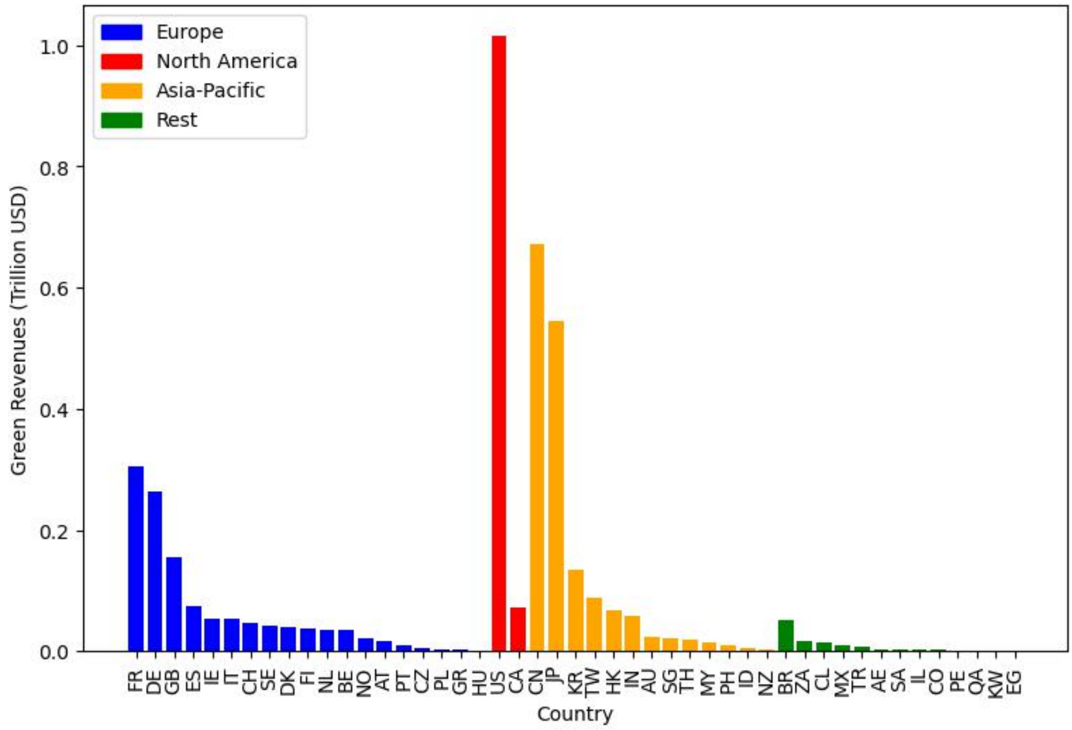


Figure 3. Green Revenues by Country

The figure shows annual revenues from green products and services by geographical regions based on each company's country of incorporation in 2022. The top graph shows total annual green revenues (in USD $ trillions) while the bottom graph shows the percentage share of green revenues relative to total revenues for companies in each country.



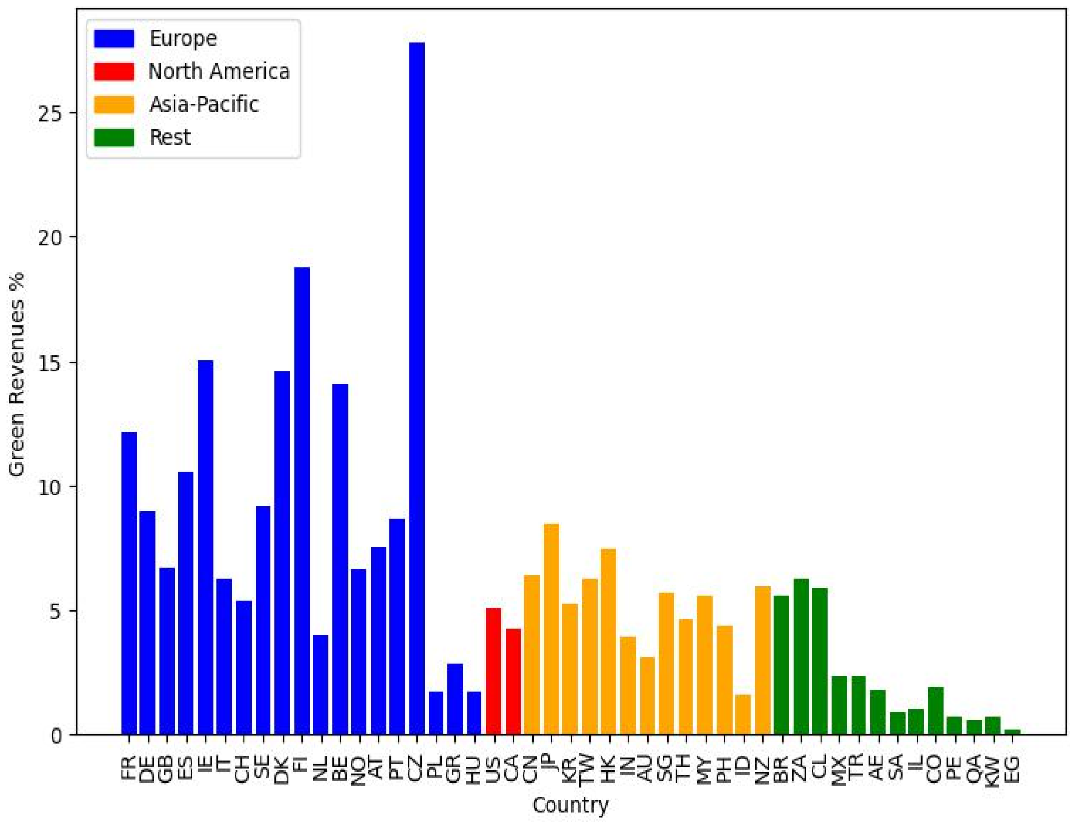
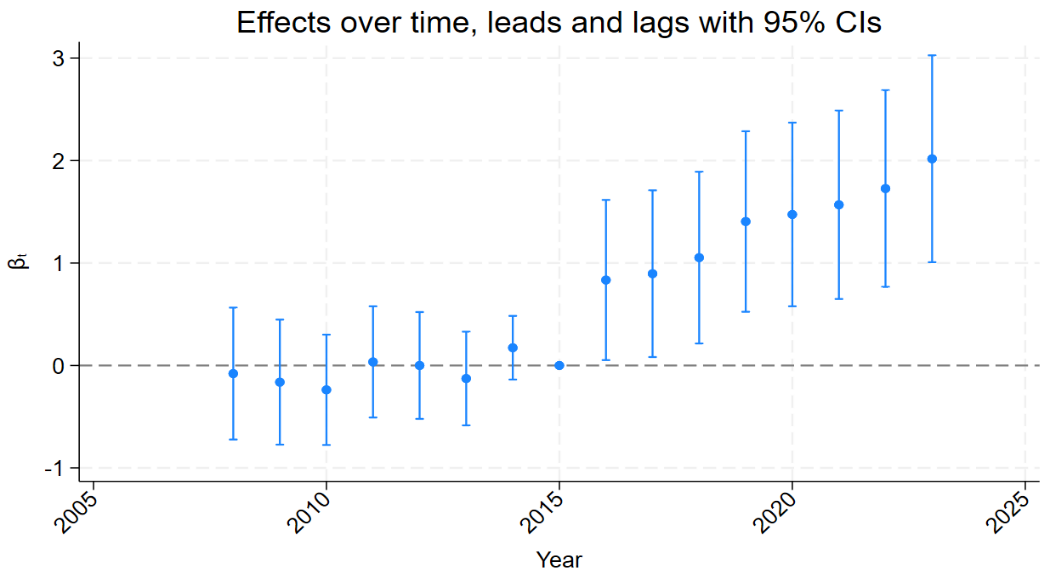


Figure 4. Difference-in-differences Tests on the Drivers of Green Revenues
The plots illustrate the annual regression coefficients for a balanced panel dataset, covering the years 2008 to 2023, both before and after the Paris Agreement. Blue dots represent the coefficient estimates, while the lines indicate 95% confidence intervals (CIs). The graph in Panel A displays the yearly regression coefficient estimates for an indicator variable equal to 1 if a firm held at least one green patent before the Paris Agreement, and 0 otherwise. The graph in Panel B presents a dynamic coefficient plot for an indicator variable equal to 1 if the firm's institutional ownership share is above the sample median, and 0 otherwise.

Panel A: Green Innovation



Panel B: Institutional Ownership

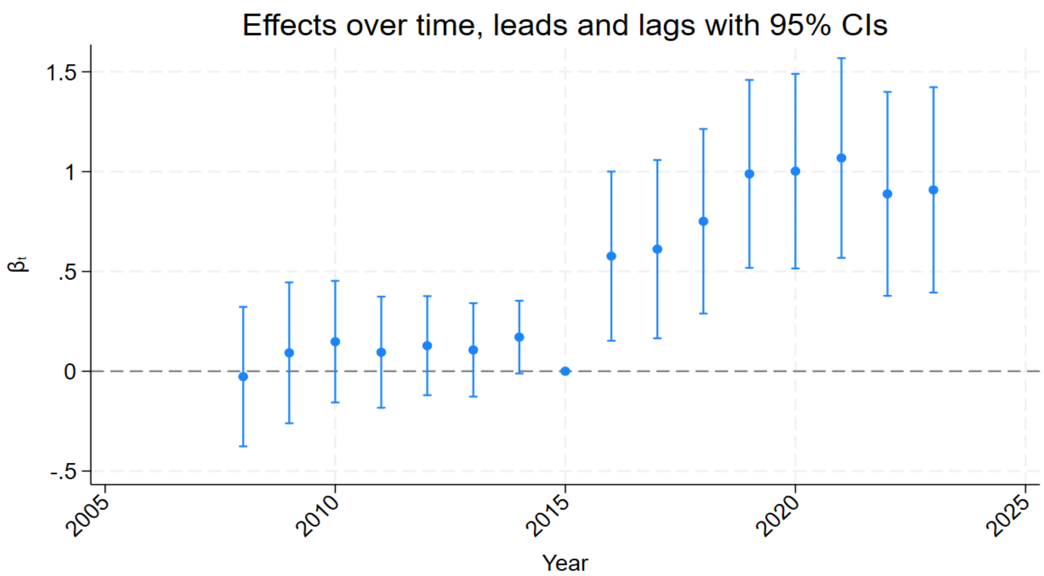
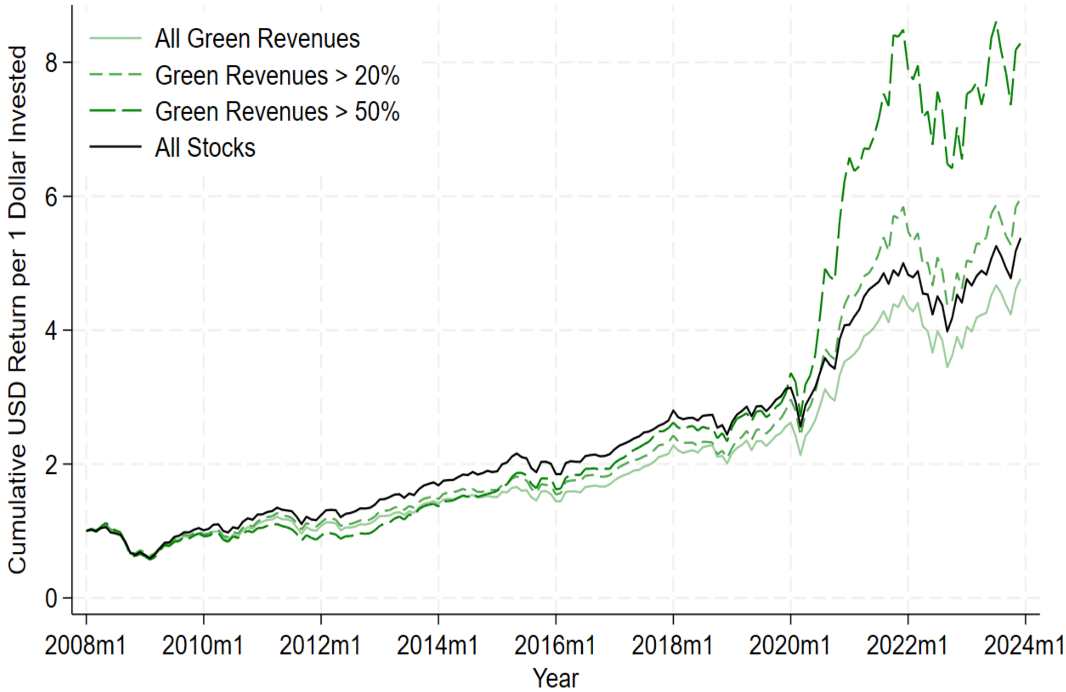


Figure 5. Green Revenues Portfolio Returns

The figure plots cumulative returns per 1 USD invested for the value-weighted green stocks portfolio (light green) and we contrast it with portfolios containing stocks with at least 20% (dashed green) and 50% (dashed darker green) green revenues, respectively. The black line plots cumulative returns for the portfolio including all stocks in our sample and serves as a benchmark.



Tables

Table 1. Summary Statistics

This table provides summary statistics for the main variables used in the regression analysis. The sample period is from 2008 to 2023. Detailed definitions of the variables are provided in Table A-1.3. Accounting ratio variables are winsorized at the 1% and 99% levels.

Variable	N	Mean	SD	Min	Median	Max
Green Revenues %	267,576	3.3666	13.8646	0.0000	0.0000	100.0000
Green Revenues Indicator	267,576	0.1373	0.3441	0.0000	0.0000	1.0000
Tier 1 Green Revenues %	267,576	2.1078	10.4023	0.0000	0.0000	100.0000
Tier 2 Green Revenues %	267,576	0.9828	7.0425	0.0000	0.0000	100.0000
Tier 3 Green Revenues %	267,576	0.2362	3.4485	0.0000	0.0000	100.0000
EUTSF Green Revenues %	267,576	2.5576	11.7089	0.0000	0.0000	100.0000
Post Paris	267,576	0.5306	0.4991	0.0000	1.0000	1.0000
Post TEG	267,576	0.3923	0.4883	0.0000	0.0000	1.0000
Post EUTSF	267,576	0.2570	0.4370	0.0000	0.0000	1.0000
All Patents	267,576	1.9515	9.5517	0.0000	0.0000	65.5000
Green Patents	267,576	0.0948	0.5176	0.0000	0.0000	3.6667
GP Ratio	267,576	0.0056	0.0302	0.0000	0.0000	0.2222
GP Indicator	267,576	0.0554	0.2287	0.0000	0.0000	1.0000
Total Assets USD	267,576	12.4658	109.2394	0.0000	0.8245	12822.25
Total Sales USD	267,576	3.1190	13.4602	0.0000	0.4323	592.46
Green Revenues USD	267,576	0.1550	1.4778	0.0000	0.0000	102.55
Market Value USD	267,576	3.7128	21.7784	0.1000	0.6045	2490.54
Tobin's Q	267,576	1.8913	1.7600	0.5450	1.2903	17.0187
Leverage	267,576	0.2278	0.1937	0.0000	0.1972	0.8445
ROA	267,576	0.0627	0.0956	-0.4682	0.0596	0.4022
Cash	267,576	0.1750	0.1730	0.0003	0.1203	0.8717
CAPEX	267,576	0.0396	0.0478	0.0000	0.0241	0.3426
R&D	267,576	0.0143	0.0378	0.0000	0.0000	0.2825
Europe	267,576	0.1670	0.3730	0.0000	0.0000	1.0000
North America	267,576	0.2125	0.4091	0.0000	0.0000	1.0000
Asia-Pacific	267,576	0.5345	0.4988	0.0000	1.0000	1.0000
Rest of the World	267,576	0.0860	0.2803	0.0000	0.0000	1.0000
IO Pre Paris	220,241	0.2180	0.2834	0.0000	0.0909	1.0000
IO CDP Pre Paris	220,241	0.0787	0.1077	0.0000	0.0281	0.5774
IO PRI Pre Paris	220,241	0.1031	0.1402	0.0000	0.0405	0.7584
Turnover Pre Paris	209,056	0.2740	0.1673	0.0202	0.2089	1.4532

Table 2. Correlation of Green Revenues with other Environmental Measures

This table shows pairwise Pearson correlation coefficients for % company green revenues, % tier 1 green revenues, % EUTSF eligible green revenues, and various environmental measures used in prior literature. These include scope 1, 2, and 3 carbon intensities from Trucost and environmental (ESG) scores from MSCI. *E-Score PST* is the modified environmental score proposed in Pastor et al. (2022), and *Ad. MSCI ESG Score* is the industry-adjusted ESG score from MSCI. By *, **, and *** we denote *p*-levels below 10%, 5%, and 1%, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Green Revenues %	1							
(2) Tier 1 Green Revenues %	0.814***	1						
(3) EUTFS Green Revenues %	0.889***	0.819***	1					
(4) CO2 Int. Scope 1	0.042***	0.011***	0.032***	1				
(5) CO2 Int. Scope 2	0.013***	0.003	0.004	0.067***	1			
(6) CO2 Int. Scope 3	0.066***	0.085***	0.050***	0.245***	0.067***	1		
(7) E-Score PST	-0.119***	-0.075***	-0.085***	-0.360***	-0.171***	-0.505***	1	
(8) Adj. ESG Score	0.085***	0.092***	0.090***	-0.101***	-0.015*	-0.01	0.272***	1

Table 3. The Role of Green Innovation

This table examines the relation between corporate green patent innovation and green revenues. In Panel A, we test whether green innovation measured by *GP Indicator* (which equals one if a company had at least one green patent between 2008 and 2013) is associated with the sales of green products and services captured by *Green Revenues %*. Alternatively, we use *GP Ratio* which measures average annual green patents relative to all patents created by a company between 2008 and 2013. *Post Paris* is a dummy equal to 1 if the year $\geq$ 2016. In columns (3) & (4), we only consider Tier 1 green revenues (green products and services with significant and clear environmental benefits) as the dependent variable. In columns (5) & (6), we consider green revenues that are eligible under the EUTSF taxonomy. Panel A shows the results for our baseline model and Panel B employs an alternative regression specification using firm, country x year, and sector x year fixed effects. By *, **, and *** we denote p-levels below 10%, 5%, and 1%, respectively. Standard errors clustered on the country-year level are in parentheses.

Panel A: Baseline Results

Regressions	(1)	(2)	(3)	(4)	(5)	(6)
	Green Revenues %		Tier 1 Green Revenues %		EUTSF Green Revenues %	
GP Indicator	4.524***		2.999***		2.947***	
	(0.418)		(0.258)		(0.259)	
GP Indicator × Post Paris	2.310***		2.095***		2.473***	
	(0.472)		(0.280)		(0.294)	
GP Ratio		51.34***		35.00***		32.76***
		(4.326)		(3.054)		(2.637)
GP Ratio × Post Paris		16.61***		13.61***		17.76***
		(5.446)		(3.662)		(3.421)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	267,576	267,576	267,576	267,576	267,576	267,576
Adjusted R^2	0.079	0.087	0.051	0.057	0.072	0.077

Panel B: Alternative Specification

Regressions	(1)	(2)	(3)	(4)	(5)	(6)
	Green Revenues %		Tier 1 Green Revenues %		EUTSF Green Revenues %	
GP Indicator × Post Paris	1.294***		1.022***		1.208***	
	(0.104)		(0.124)		(0.104)	
GP Ratio × Post Paris		5.823***		4.496***		6.116***
		(1.024)		(0.963)		(0.905)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	264,658	264,658	264,658	264,658	264,658	264,658
Adjusted R^2	0.856	0.856	0.852	0.851	0.847	0.847

Table 4. The Role of Green Innovation: Regions and the Energy Sector

This table examines the relation between corporate green innovation and green revenues for different geographical regions and the energy sector. We test whether corporate green innovation measured by the variable *GP Indicator* (which equals one if a company had at least one green patent between 2008 and 2013) is associated with the sales of green products and services captured by *Green Revenues %*. Alternatively, we use *GP Ratio* which measures average annual green patents relative to all patents created by a company between 2008 and 2013. *Post Paris* is a dummy equal to 1 if the year $\geq$ 2016. In columns (1) to (6), we conduct the analysis separately for firms headquartered in three regions: United States, Europe, and Asia-Pacific. In columns (7) and (8), we show results for firms in the energy sector, given its potential role in the energy transition. By *, **, and *** we denote p-levels below 10%, 5%, and 1%, respectively. Standard errors are clustered at the country-year level, except for columns (1) and (2), where robust standard errors are applied. Standard errors are reported in parentheses.

	Dependent variable: Green Revenues %							
	US		Europe		Asia-Pacific		Energy	
Regressions	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GP Indicator	6.876***		4.312***		1.143***		1.962***	
	(0.374)		(0.550)		(0.347)		(0.598)	
GP Indicator × Post Paris	2.450***		0.869		2.756***		-0.818	
	(0.554)		(0.845)		(0.463)		(0.614)	
GP Ratio		69.44***		49.88***		13.96***		7.143***
		(3.705)		(4.616)		(2.687)		(2.604)
GP Ratio × Post Paris		18.21***		5.461		20.50***		-1.868
		(5.551)		(6.930)		(3.283)		(3.071)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Country FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	48,460	48,460	44,689	44,689	143,014	143,014	7,648	7,648
Adjusted R^2	0.099	0.129	0.097	0.102	0.065	0.065	0.269	0.263

Table 5. The Role of Institutional Ownership

The table examines the relation between institutional ownership and corporate green revenues. In Panel A, the dependent variable is *Green Revenues %*. The key explanatory variables of interest include the total share of institutional ownership (*IO Pre Paris*), institutional ownership above the sample median (*IO High Pre Paris*), the share of responsible institutional ownership (*IO PRI Pre Paris*), and climate-focused institutional ownership (*IO CDP Pre Paris*). *IO Turnover Pre Paris* represents the holdings-weighted churn ratio of institutional owners by firm. These explanatory variables are all measured as of 2015 and held constant over the sample period to analyze how pre-Paris institutional ownership and turnover impacted firms' green revenues post Paris. *Post Paris* is a dummy variable equal to 1 for years $\geq$ 2016. In Panel B, we restrict the analysis to GRCS Tier 1 green revenues as the dependent variable. Panel C focuses on green revenues that are eligible under the EUTSF taxonomy. By *, **, and *** we denote p-levels below 10%, 5%, and 1%, respectively. Standard errors clustered on the country-year level are in parentheses.

Panel A: Green Revenues %

Regressions	(1)	(2)	(3)	(4)	(5)
IO Pre Paris	2.669***				
	(0.323)				
IO Pre Paris × Post Paris	1.103***				
	(0.318)				
IO High Pre Paris		1.549***			
		(0.117)			
IO High Pre Paris × Post Paris		0.650***			
		(0.152)			
IO PRI Pre Paris			5.344***		
			(0.458)		
IO PRI Pre Paris × Post Paris			2.234***		
			(0.723)		
IO CDP Pre Paris				7.297***	
				(0.799)	
IO CDP Pre Paris × Post Paris				3.202***	
				(1.085)	
Turnover Pre Paris					-2.908***
					(0.672)
Turnover Pre Paris × Post Paris					-0.341
					(0.466)
Controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Observations	220,241	220,241	220,241	220,241	209,056
Adjusted R^2	0.076	0.078	0.077	0.077	0.079

Panel B: Tier 1 Green Revenues %

Regressions	(1)	(2)	(3)	(4)	(5)
IO Pre Paris	2.061***				
	(0.209)				
IO Pre Paris × Post Paris	0.927***				
	(0.208)				
IO High Pre Paris		0.932***			
		(0.0751)			
IO High Pre Paris × Post Paris		0.502***			
		(0.114)			
IO PRI Pre Paris			3.176***		
			(0.391)		
IO PRI Pre Paris × Post Paris			1.801***		
			(0.534)		
IO CDP Pre Paris				4.409***	
				(0.544)	
IO CDP Pre Paris × Post Paris				2.616***	
				(0.762)	
Turnover Pre Paris					-1.550***
					(0.595)
Turnover Pre Paris × Post Paris					0.236
					(0.383)
Controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Observations	220,241	220,241	220,241	220,241	209,056
Adjusted R^2	0.046	0.047	0.046	0.046	0.047

Panel C: EUTSF Green Revenues %

Regressions	(1)	(2)	(3)	(4)	(5)
IO Pre Paris	1.640***				
	(0.223)				
IO Pre Paris × Post Paris	1.359***				
	(0.254)				
IO High Pre Paris		1.072***			
		(0.100)			
IO High Pre Paris × Post Paris		0.686***			
		(0.116)			
IO PRI Pre Paris			3.624***		
			(0.354)		
IO PRI Pre Paris × Post Paris			2.850***		
			(0.579)		
IO CDP Pre Paris				4.843***	
				(0.600)	
IO CDP Pre Paris × Post Paris				4.095***	
				(0.886)	
Turnover Pre Paris					-2.331***
					(0.535)
Turnover Pre Paris × Post Paris					-0.710*
					(0.388)
Controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Observations	220,241	220,241	220,241	220,241	209,056
Adjusted R^2	0.071	0.072	0.071	0.072	0.071

Table 6. Green Revenues Portfolio Tests

This table presents the results of calendar-time portfolio regressions for monthly green stock portfolios from January 2008 to December 2023. In Panel A, the green testing portfolio is a long-only, value-weighted portfolio composed of firms with *Green Revenues* > 20%. In Panel B, we analyze the returns of a long-short portfolio, where the long position includes firms with *Green Revenues* ≥ 20%, and the short position consists of firms with *Green Revenues* = 0% (legacy portfolio). Column (1) reports monthly value-weighted excess returns (*Alpha*), while column (2) presents sector-adjusted excess returns. Column (3) provides results for the CAPM model, and column (4) implements the Fama-French 3-factor model (Fama and French (1993)). Column (5) uses the Carhart 4-factor model (Carhart (1997)), column (6) applies the Fama-French 5-factor model (Fama and French (2015)), and column (7) combines both the Carhart and Fama-French factors. Lastly, in column (8), we add the GMB factor proposed by Karolyi et al. (2023) that covers the 2012 to 2021 period. By *, **, and *** we denote p-levels below 10%, 5%, and 1%, respectively. Robust standard errors are in parentheses.

Panel A: Long Green Revenues Portfolio

Portfolio	Green Revenues ≥ 20%							
Regressions	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Market - Rf			1.038***	1.084***	1.075***	1.046***	1.044***	1.095***
			(0.0207)	(0.0199)	(0.0202)	(0.0219)	(0.0213)	(0.0310)
Size				-0.0134	-0.0208	-0.0915	-0.0928	-0.0585
				(0.0616)	(0.0615)	(0.0803)	(0.0805)	(0.119)
Value				-0.207***	-0.260***	-0.113*	-0.157**	-0.108
				(0.0387)	(0.0485)	(0.0587)	(0.0768)	(0.118)
Momentum					-0.0714*		-0.0419	-0.0521
					(0.0374)		(0.0406)	(0.0733)
Profitability						-0.0765	-0.0824	-0.0392
						(0.0970)	(0.0980)	(0.125)
Investment						-0.230**	-0.204**	-0.230
						(0.0956)	(0.102)	(0.163)
GMB								-0.0657
								(0.0643)
Alpha	0.952**	-0.0422	0.0323	-0.00736	0.0136	0.0714	0.0809	0.164
	(0.369)	(0.0680)	(0.0935)	(0.0853)	(0.0845)	(0.0983)	(0.0992)	(0.125)
Observations	192	192	192	192	192	192	192	109
Adjusted R^2	0.000	0.000	0.931	0.942	0.943	0.944	0.944	0.924

Panel B: Long-Short Green Revenues Minus Legacy (GML) Portfolio

Portfolio	Green Revenues ≥ 20% Minus Legacy (GML)							
Regressions	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Market - Rf			0.0596**	0.120***	0.108***	0.0756***	0.0733***	0.126***
			(0.0253)	(0.0243)	(0.0242)	(0.0252)	(0.0246)	(0.0368)
Size				-0.0444	-0.0538	-0.118	-0.119	-0.0810
				(0.0737)	(0.0737)	(0.0961)	(0.0963)	(0.143)
Value				-0.254***	-0.322***	-0.128*	-0.183**	-0.113
				(0.0453)	(0.0570)	(0.0690)	(0.0882)	(0.140)
Momentum					-0.0909**		-0.0524	-0.0573
					(0.0440)		(0.0472)	(0.0877)
Profitability						-0.0337	-0.0411	0.0204
						(0.113)	(0.113)	(0.145)
Investment						-0.290**	-0.257**	-0.292
						(0.114)	(0.120)	(0.197)
GMB								-0.0797
								(0.0793)
Alpha	-0.0041	-0.0426	-0.0568	-0.106	-0.0797	-0.0337	-0.0219	0.113
	(0.119)	(0.0681)	(0.114)	(0.103)	(0.102)	(0.119)	(0.120)	(0.145)
Observations	192	192	192	192	192	192	192	109
Adjusted R^2	0.000	0.000	0.024	0.202	0.212	0.231	0.231	0.167

Table 7. GML Portfolios: Shades of Green

This table presents calendar-time portfolio regressions for the long-short green revenues minus legacy (GML) portfolio, categorized by different levels of "greenness" based on the percentage of green revenues. In Panel A, we report results for monthly value-weighted long-short portfolio returns, where the long portfolio consists of "green" stocks (stocks generating green revenues above a specified percentage threshold) and the short portfolio includes stocks that do not generate any green revenues (legacy firms). These GML portfolios are regressed on the 6-factor model proposed in column (7) of Table 6, but we display only the *Alpha* coefficient estimates. In column (1), the green portfolio includes all stocks with *Green Revenues* > 0%. Column (2) focuses on green stocks with *Green Revenues* > 20%, column (3) considers green stocks with *Green Revenues* > 50%, and column (4) examines a portfolio of "pure-play" green stocks with *Green Revenues* > 80%. In Panel A, we report the *Alpha* estimates for the full global sample as well as two sub-periods: *Pre Paris* (2008–2015) and *Post Paris* (2016–2023). Below, we present the number of firms and combined market value of the stocks in the long green (G) portfolio for both 2008 and 2022. In Panel B, we apply a stricter definition of green revenues based on the GRCS tiering system, considering only Tier 1 green revenues. In Panel C, revenues are classified as green if they are eligible under the EUTSF taxonomy. By *, **, and *** we denote p-levels below 10%, 5%, and 1%, respectively. Robust standard errors are in parentheses.

Regression	(1)	(2)	(3)	(4)
Panel A: Green Minus Legacy (GML)				
Portfolio	> 0%	> 20%	> 50%	> 80%
Alpha	-0.199**	-0.0219	0.135	0.595*
	(0.0941)	(0.120)	(0.191)	(0.302)
Pre Paris	-0.409***	-0.292*	-0.286	-0.0426
	(0.129)	(0.151)	(0.192)	(0.283)
Post Paris	0.00602	0.242	0.546*	1.218***
	(0.120)	(0.169)	(0.297)	(0.463)
2008: Nr firms	1,462	493	221	129
Total USD trln	$7.79	$2.00	$0.70	$0.25
2022: Nr firms	2,736	1,014	516	302
Total USD trln	$29.20	$9.57	$3.87	$2.07
Panel B: Tier 1 Green Minus Legacy (GML)				
Portfolio	> 0%	> 20%	> 50%	> 80%
Alpha	-0.266**	0.0844	0.446	1.082**
	(0.103)	(0.182)	(0.277)	(0.482)
Pre Paris	-0.503***	-0.279	-0.0204	0.202
	(0.142)	(0.199)	(0.259)	(0.457)
Post Paris	-0.0355	0.439	0.901**	1.942***
	(0.133)	(0.275)	(0.445)	(0.743)
Panel C: EUTSF Green Minus Legacy (GML)				
Portfolio	> 0%	> 20%	> 50%	> 80%
Alpha	-0.186*	0.0665	0.260	0.753**
	(0.105)	(0.139)	(0.210)	(0.365)
Pre Paris	-0.414***	-0.220	-0.138	-0.0138
	(0.142)	(0.170)	(0.196)	(0.354)
Post Paris	0.0358	0.346*	0.648*	1.501***
	(0.136)	(0.199)	(0.334)	(0.555)

Table 8. GML Portfolios: Subsample Analysis

This table reports the *Alpha* of the long-short green revenues minus legacy (GML) portfolio across different shades of "greenness", as in Table 7. We provide results for various subsamples: Panels A–C categorize firms by their country of incorporation; Panel D focuses on energy sector firms (note that there are no energy companies with > 50% green revenues); and Panels E and F condition the analysis on whether the firm had at least one green patent prior to the Paris Agreement (*GP Indicator = 1*) or high institutional ownership pre-Paris (*IO High Pre-Paris = 1*). For more details on the specifications, refer to Tables 6 and 7. By *, **, and *** we denote p-levels below 10%, 5%, and 1%, respectively. Robust standard errors are in parentheses.

Variable	Green Revenues %			
Regression	(1)	(2)	(3)	(4)
Portfolio	> 0%	> 20%	> 50%	> 80%
Sample	Panel A: United States			
Pre Paris	-0.308*	-0.380**	-0.331	0.0575
	(0.159)	(0.173)	(0.318)	(0.417)
Post Paris	0.126	0.394	1.319**	1.859**
	(0.183)	(0.252)	(0.538)	(0.716)
Sample	Panel B: Europe			
Pre Paris	-0.575***	-0.589***	-0.821***	-0.251
	(0.158)	(0.180)	(0.276)	(0.334)
Post Paris	-0.130	-0.0152	0.117	0.0518
	(0.124)	(0.171)	(0.210)	(0.268)
Sample	Panel C: Asia-Pacific			
Pre Paris	-0.423**	-0.0586	0.0589	0.347
	(0.187)	(0.215)	(0.214)	(0.389)
Post Paris	-0.0870	0.0950	0.0913	0.555
	(0.167)	(0.248)	(0.309)	(0.339)
Sample	Panel D: Energy			
Pre Paris	-0.220	-0.0574	-	-
	(0.306)	(0.630)	-	-
Post Paris	-0.443	0.429	-	-
	(0.278)	(0.876)	-	-
Sample	Panel E: Green Patents			
Pre Paris	-0.404**	-0.296	-0.191	0.129
	(0.181)	(0.204)	(0.330)	(0.530)
Post Paris	0.113	0.408*	1.105**	2.254***
	(0.173)	(0.241)	(0.544)	(0.813)
Sample	Panel F: Institutional Ownership			
Pre Paris	-0.396***	-0.271*	-0.175	-0.0722
	(0.129)	(0.156)	(0.206)	(0.323)
Post Paris	0.0124	0.254	0.656*	1.471**
	(0.130)	(0.187)	(0.362)	(0.567)

Table 9. Green Revenues, Implied Cost of Capital and Earnings Surprises

In this table, we present OLS regression results using the stock-level *Implied Cost of Capital* as the dependent variable in columns (1) and (2). In columns (3) and (4) we regress the median analyst *Earnings Surprise* on lagged company *Green Revenues %* and firm controls. The earnings surprise variable is defined as the difference between the actual earnings and the analyst consensus forecast 9 months prior to the end of the forecast period, scaled by the stock price at the end of the fiscal year at time t. Forecast errors are winsorized at the 1st and 99th percentiles, respectively. The coefficients for Green Revenues % are multiplied by 100. By *, **, and *** we denote p-levels below 10%, 5%, and 1%, respectively. Standard errors clustered on the country-year level, are in parentheses.

Dep. Variable	Implied Cost of Capital		Earnings Surprise t+1	
Regressions	(1)	(2)	(3)	(4)
Green Revenues %	-0.622***	-0.516***	-0.272	0.161
	(0.168)	(0.121)	(0.173)	(0.175)
Sample	Full	Post 2016	Full	Post 2016
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Observations	63,319	24,473	116,872	64,491
Adjusted R^2	0.028	0.240	0.029	0.023

Table 10. Unexpected Changes in Climate Concerns

We estimate monthly time-series regressions using data from January 2008 to December 2023. In Panel A, the dependent variable is the monthly return on value-weighted portfolios for different thresholds of *Green Revenues %* as in Tables 6 and 7. In Panel B, the dependent variable is a long-short portfolio of each value-weighted green portfolio return minus the legacy portfolio return (GML). The independent variable is the prediction error from an AR(1) model applied to the monthly MCCC index proposed by Ardia et al. (2023) Robust standard errors are in parentheses.

Panel A: Long Green Revenues Portfolio

Variable	Green Revenues %			
Portfolio	> 0%	> 20%	> 50%	> 80%
Prediction Error	2.405**	2.718**	3.803***	4.500***
	(1.093)	(1.129)	(1.298)	(1.508)
Observations	192	192	192	192
Adjusted R^2	0.019	0.025	0.041	0.044

Panel B: Long-Short Green Revenues Minus Legacy (GML) Portfolio

Variable	Green Minus Legacy %			
Portfolio	> 0%	> 20%	> 50%	> 80%
Prediction Error	0.708**	1.020***	2.105***	2.803***
	(0.318)	(0.384)	(0.576)	(0.856)
Observations	192	192	192	192
Adjusted R^2	0.029	0.038	0.074	0.063

Appendix 1

Figure A-1.1. Decomposition of Green Revenues by GRCS Business Activities

The tree map breaks down total green revenues based on the 10 GRCS green sectors (and into the 64 GRCS subsectors) of FTSE Russell's Green Revenue Classification System (GRCS) as of 2022. Total green revenues sum to approximately USD $4 trillion. More details on the GRCS taxonomy are provided in Table A-1.1.

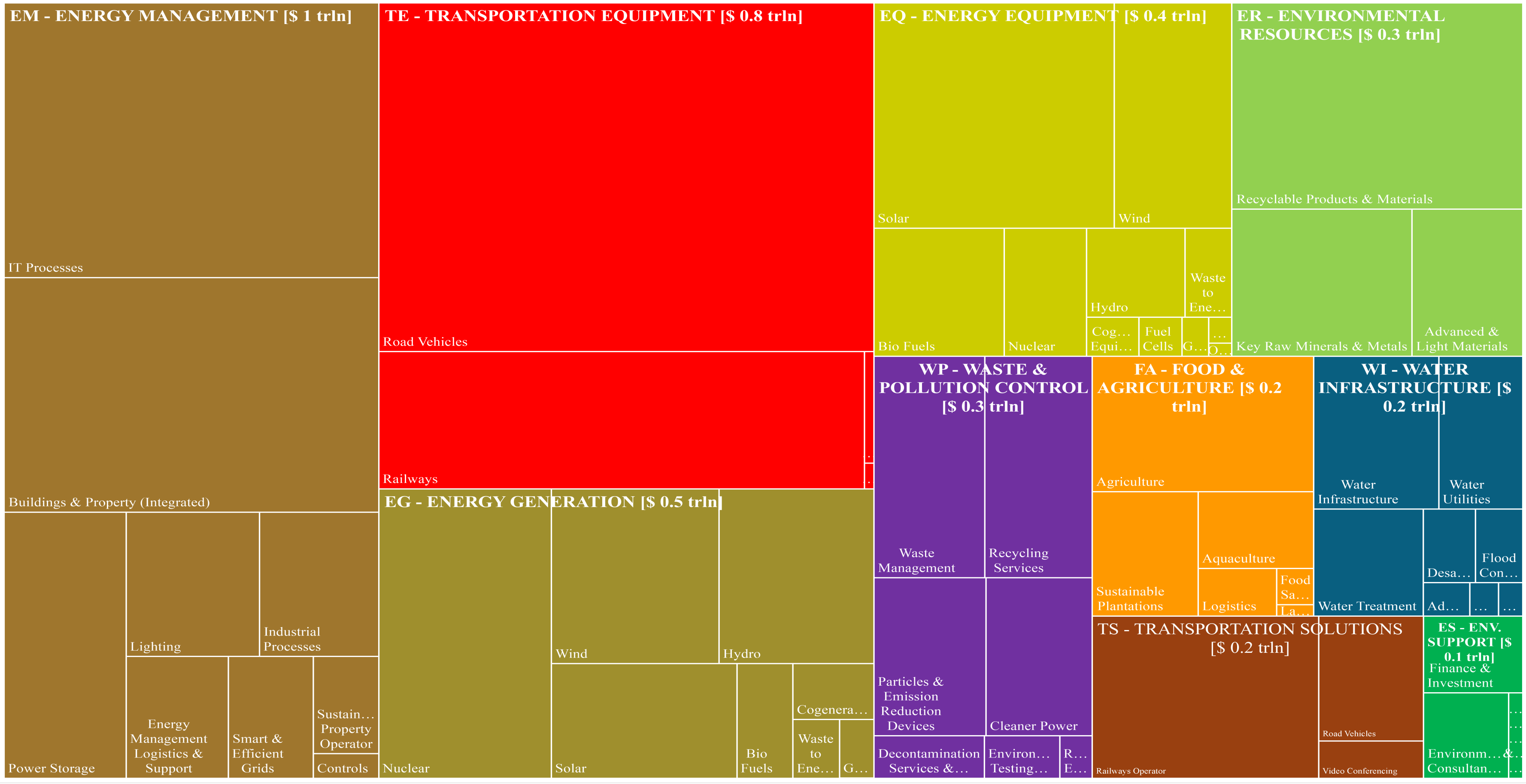


Figure A-1.2. Decomposition of Green Revenues by Tiers of "Greenness" of GRCS Business Activities

The tree map breaks down total green revenues based on the 10 GRCS green sectors (and into the 64 GRCS subsectors) of FTSE Russell's Green Revenue Classification System (GRCS) as of 2022. The green coloring is based on FTSE Russell's GRCS tiering system: **Tier 1** covers green products and services with significant and clear environmental benefits; **Tier 2** covers green products and services with more limited but net-positive environmental benefits; **Tier 3** covers green products and services which have some environmental benefits but are overall net-neutral or negative. More details on the GRCS taxonomy are provided in Table A-1.1.

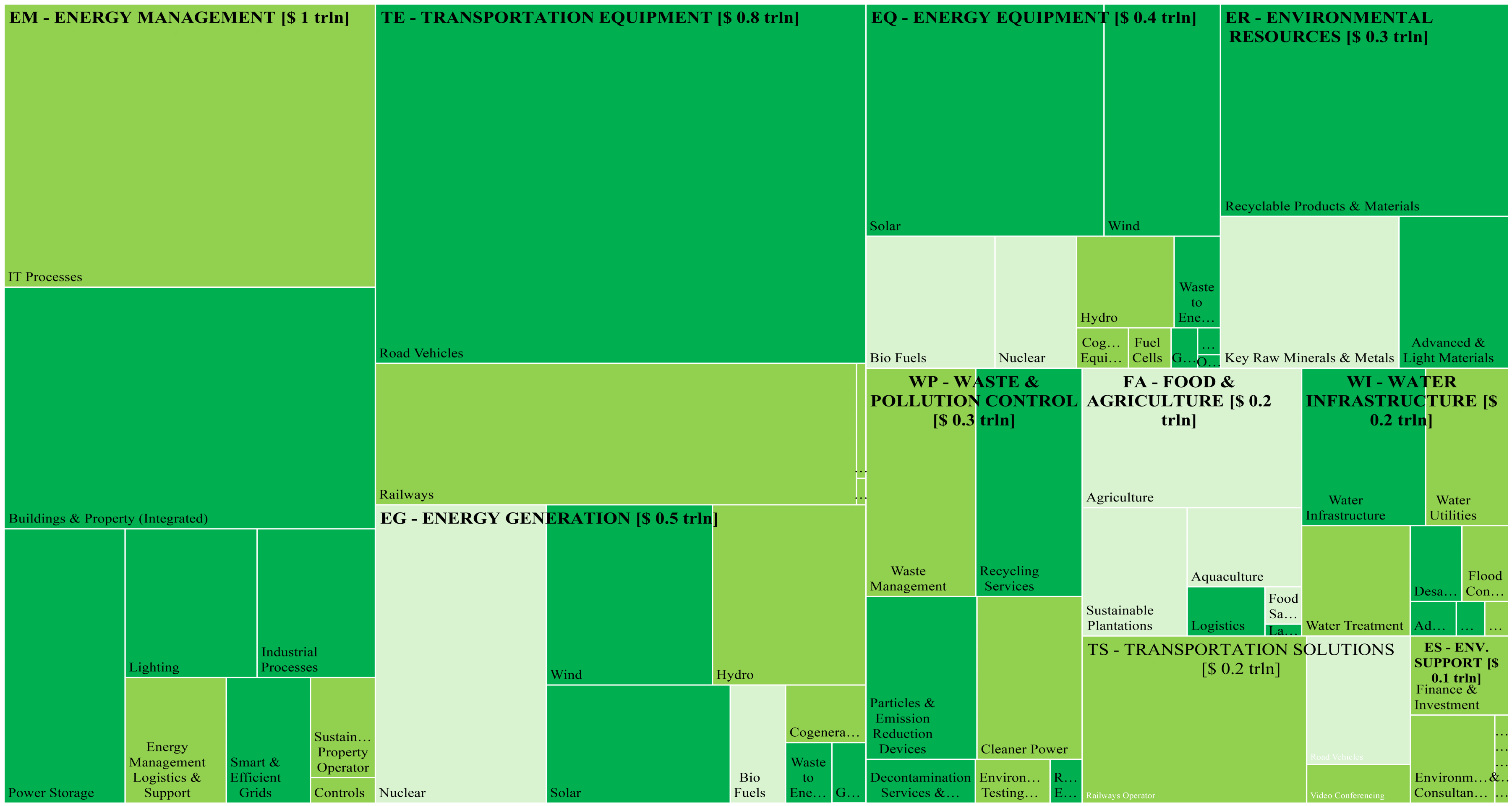


Table A-1.1. FTSE Russell's Green Revenue Classification System

This table provides details on FTSE Russell's Green Revenue Classification System (GRCS), which identifies green products and services covering 10 sectors and 64 subsectors. Source: LSEG FTSE Russell *"Green Revenues Data Model - Methodology" (2024)* - `https://www.lseg.com/content/dam/ftse-russell/en_us/documents/policy-documents/ftse-green-revenues-classification-system.pdf`. The green coloring is based on FTSE Russell's GRCS tiering system: subsectors are colored in dark green if these are only classified as **Tier 1** covering green products and services with significant and clear environmental benefits; green if the subsectors include also activities with any **Tier 2** green products and services with more limited but net-positive environmental benefits; and light green if the sub-sector encompasses any **Tier 3** green products and services which have some environmental benefits but are overall net-neutral or negative.

EG - ENERGY GENERATION	EQ - ENERGY EQUIPMENT	EM - ENERGY MANAGEMENT	ER - ENVIRONMENTAL RESOURCES	ES - ENVIRONMENTAL SUPPORT
Revenue generating activities from the generation of power from renewable and alternative energy sources.	*Revenue generating activities from the renewable and alternative energy value chain, excluding power generation activities.*	*Revenue generating activities from products and services enabling more efficient methods of energy usage and management.*	*Revenue generating activities from production, processing and sale of key and advanced materials which specifically enable the minimisation of negative environmental impacts and improve the efficiency of natural resource use*	*Revenue generating activities from environmental support services relating to consulting, investment or urban design that enable or indirectly contribute to green activities resulting in a large breadth of environmental utility*
Bio Fuels (Tier 2/3)	Bio Fuels Equipment (Tier 2/3)	Buildings & Property (Integrated) (Tier 1)	Advanced & Light Materials (Tier 1)	Environmental Consultancies (Tier 2)
Cogeneration (Tier 1/2)	Cogeneration Equipment (Tier 1/2)	Controls (Tier 2)	Key Raw Minerals & Metals (Tier 3)	Finance & Investment (Tier 2)
Clean Fossil Fuels (Tier 1)	Clean Fossil Fuels (Tier 1)	Industrial Processes (Tier 1)	Recyclable Products & Materials (Tier 1)	Smart City Design & Engineering (Tier 2)
Geothermal (Tier 1)	Fuel Cells (Tier 2)	IT Processes (Tier1/2)		
Hydro (Tier 1/2)	Geothermal (Tier 1)	Lighting (Tier 1)		
Nuclear (Tier 3)	Hydro (Tier 1/2)	Power Storage (Tier 1)		
Ocean & Tidal (Tier 1)	Nuclear (Tier 3)	Smart & Efficient Grids (Tier 1)		
Solar (Tier 1)	Ocean & Tidal (Tier 1)	Sustainable Property Operator (Tier 2)		
Waste to Energy (Tier 1)	Solar (Tier 1)	Energy Management Logistics & Support (Tier 2)		
Wind (Tier 1)	Waste to Energy (Tier 1)			
	Wind (Tier 1)			

FA - FOOD & AGRICULTURE	TE - TRANSPORTATION EQUIPMENT	TS - TRANSPORTATION SOLUTIONS	WP - WASTE & POLLUTION CONTROL	WI - WATER INFRASTRUCTURE
Revenue generating activities from products that improve yield, productivity and sustainability in agriculture, silviculture, aquaculture and food production or distribution, whilst minimising negative environmental impacts	*Revenue generating activities from the provision of technologies, systems and services which minimise the environmental impacts and improve the efficiency of natural resource use associated with the transportation industry*	*Revenue generating activities from the operation of transportation solutions and services which minimise the environmental impacts and improve the efficiency of natural resource use associated with the transportation industry*	*Revenue generating activities from products and services which reduce, monitor, or prevent the contamination of air, water and soil to address global, regional and local environmental issue and technologies, systems and services for waste management, reuse and recycling*	*Revenue generating activities from technologies, infrastructure, products and services for the supply, management and treatment of water*
Agriculture (Tier 1/2/3)	Aviation (Tier 2)	Railways Operator (Tier 1/2)	Cleaner Power (Tier 2)	Meteorological Solutions (Tier 1)
Aquaculture (Tier 1/3)	Railways (Tier 1/2)	Road Vehicles (Tier 1/2/3)	Decontamination Services & Devices (Tier 1)	Desalination (Tier 1)
Land Erosion (Tier 1)	Road Vehicles (Tier 1)	Video Conferencing (Tier 2)	Environmental Testing & Gas Sensing (Tier 2)	Flood Control (Tier 2)
Food Safety, Efficient Processing & Sustainable Packaging (Tier 1/3)	Shipping (Tier 2)		Particles & Emission Reduction Devices (Tier 1)	Advanced Irrigation Systems & Devices (Tier 1)
Logistics (Tier 1)			Recycling Equipment (Tier 1)	Natural Disaster Response (Tier 2)
Sustainable Plantations (Tier 2)			Recycling Services (Tier 1)	Water Infrastructure (Tier 1)
			Waste Management (Tier 1/2)	Water Treatment (Tier 1/2)
				Water Utilities (Tier 2)

Table A-1.2. Top Green Revenue Firms by Region

This table provides green revenues for the companies with the highest USD green revenues incorporated in selected top countries for each geographical region. More details on the FTSE Russell's Green Revenue Classification System (GRCS) taxonomy are provided in Table A-1.1.

Region	Country	Nr of Firms in 2008	2008 Green Revenues (in US$ trlns)	2008 Green Revenues (in %)	Nr of Firms in 2022	2022 Green Revenues (in US$ trlns)	2022 Green Revenues (in %)	TOP 1 - 5 by country COMPANY NAME Green Revenues (in US$ bln) % of Green Revenues (of which % in top FTSE GRCS sector & micro-sector)				
Europe	France	313	$ 0.280	10.0	283	$ 0.291	12.2	ELECTRICITE DE FRANCE $ 97 bln 64% (52% in EG - Nuclear)	VEOLIA ENVIRONNEMENT $ 42 bln 93% (33 % in WI - Water Utilities)	SCHNEIDER ELECTRIC $ 26 bln 72% (23% in EM - Industial Processes)	ENGIE $ 19 bln 19% (3% in EG - Solar)	ALSTOM $ 14 bln 85% (85% in TE - Trains Electric)
	Germany	289	$ 0.150	5.1	285	$ 0.274	9.8	MERCEDES-BENZ $ 30 bln 19% (15% in TE - Electrified Road Vehicles & Devices)	UNIPER $ 29 bln 10% (5% in EM - Power Storage)	E.ON $ 28 bln 23% (22% in EM - Energy Management Logistics)	EnBW $ 20 bln 35% (7% in EG - Wind)	BASF $ 20bln 22% (7% in ER - Recyclable Materials)
	U.K.	655	$ 0.112	4.8	596	$ 0.150	6.8	SHELL $ 34 bln 9% (7% in TE - Electrified Road Vehicles & Devices)	JOHNSON MATTHEY $ 21 bln 94% (76% in ER - Platinum)	BP $ 9 bln 4% (4% in TE - Electrified Road Vehicles & Devices)	ANGLO AMERICAN $ 9 bln 26% (26% in ER - Platinum)	BARRATT $ 6 bln 97% (97% in EM - Buildings & Property (Integrated))
North America	U.S.	2,848	$ 0.303	2.4	2,515	$ 1.034	5.2	AMAZON $ 104 bln 20% (15% in EM - Cloud Computing)	TESLA $ 81 bln 100% (93% in TE - Electrified Road Vehicles & Devices)	MICROSOFT $ 57 bln 29% (29 % in EM - Cloud Computing)	BERKSHIRE HATHAWAY $ 28 bln 10% (7% in TS - Railways Operator)	FORD MOTOR $ 21 bln 13% (13 % in TE - Electrified Road Vehicles & Devices)
	Canada	450	$ 0.026	2.3	457	$ 0.073	4.7	CN RAILWAY $ 12 bln 91 % (91 % in TS - General Railways)	WEST FRASER TIMBER $ 9 bln 92% (92% in FA - Sustainable Forestry)	CANADIAN SOLAR $ 7 bln 100% (83% in EQ - Solar)	WASTE CONNECTIONS $ 7 bln 100% (50% in WP - Waste Management & Recycling)	CANFOR $ 5 bln 85% (85% in FA - Sustainable Forestry)
Asia Pacific	China	1,409	$ 0.047	2.7	3,383	$ 0.648	6.2	CHINA RAILWAY $ 60 bln 35% (35% in TE - Railway)	CHINA RAILWAY CONSTRUCTION $ 34 bln 21% (20% in TE - Railway)	POWER CHINA $ 25 bln 30% (8% in EQ - Hydro)	BYD $ 24 bln 38% (14% in TE - Electrified Road Vehicles & Devices)	ENERGY CHINA $ 23 bln 43% (5% in EQ - Solar)
	Japan	1,808	$ 0.370	5.7	1,956	$ 0.526	8.4	TOYOTA MOTOR $ 71 bln 30% (30% in TE - Electrified Road Vehicles & Devices)	ENEOS $ 25 bln 30% (20% in EG - Solar)	BRIDGESTONE $ 24 bln 76% (75% in TE - Energy Use Reduction Devices)	DAIKIN $ 21 bln 91% (91% in EM - Buildings & Property)	TEL $ 14 bln 94% (94% in EM - Industrial Processes)
	South Korea	345	$ 0.049	3.4	892	$ 0.123	4.9	KIA $ 17 bln 25% (25% in TE - Electrified Road Vehicles & Devices)	HYUNDAI MOTOR $ 12 bln 11% (11% in TE - Electrified Road Vehicles & Devices)	SK HYNIX $ 10 bln 28% (28% in EM - Efficient IT)	HANWHA $ 7 bln 15% (7% in EQ - Solar)	SK INNOVATION $ 8 bln 10% (5% in EM - Power Storage)
Rest of the World	Brazil	169	$ 0.047	6.4	138	$ 0.052	6.2	MARFRIG $ 15 bln 58% (58% in FA - Meat & Dairy Alternatives)	GERDAU $ 14 bln 85% (85% in ER - Recyclable Materials)	SABESP $ 4 bln 88% (66% in WI - Water Utilities)	ELECTROBRAS $ 4 bln 56% (53% in EG - Hydro)	METALURGICA GERDAU $ 3 bln 20% (20% in WP - Recycling Services)
	Chile	165	$ 0.011	6.8	160	$ 0.020	9.2	SQM $ 4 bln 41% (33% in ER - Lithium)	EMPRESAS COPEC $ 4 bln 12% (12% in EA - Sustainable Forestry)	ENEL AMERICAS $ 3 bln 17% (10% in EG - Hydro)	ENEL CHILE $ 2 bln 48% (36% in EG - Hydro)	CMPC $ 2 bln 25% (15% in ER - Recyclable & Reusable Products)

Table A-1.3. Variable Definitions and Data Sources

Variable	Definition
Green Revenues %	Percentage of green revenues relative to total annual company revenues, with missing values filled in as zeros (source: FTSE Russell GRCS). The data identifies products and services that positively impact climate change mitigation and adaptation, water management, resource use, pollution reduction, and agricultural efficiency.
Tier 1 Green Revenues %	Percentage of green revenues relative to total annual company revenues according to the tiering definition of the FTSE Russell classification system[22], with missing values filled in as zeros (source: FTSE Russell GRCS). Tier 1 covers business activities with significant and clear environmental benefits.
Tier 2 Green Revenues %	Tier 2 covers business activities with more limited but net positive environmental benefits.
Tier 3 Green Revenues %	Tier 3 covers business activities which have some environmental benefits but are overall net neutral or negative (e.g. nuclear).
EUTSF Green Revenues %	Percentage of green revenues relative to total annual company revenues that are eligible under the EUTSF. Eligibility means that an economic activity falls within the scope of the EUTSF, which is determined by whether it has a set of corresponding criteria in the EUTSF to be evaluated against. This is not the same as EUTSF alignment.[23] Missing values are filled in as zeros (source: FTSE Russell GRCS).

[22] LSEG FTSE Russell (2024) "Green Revenues Data Model - Methodology".
[23] LSEG FTSE Russell (2020) "Sizing the Green Economy - Green Revenues and the EU taxonomy".

Table A-1.3 (continued): Variable Definitions

Variable	**Definition**
Post Paris	Dummy = 1 if the year $\geq$ 2016, which captures the period after the Paris Agreement.
Post TEG	Dummy = 1 if the year $\geq$ 2018, which captures the creation of the Technical Expert Group commissioned to create a taxonomy for green investing (TEG).
Post EUTSF	Dummy = 1 if the year $\geq$ 2020, which captures the roll out of the EU Taxonomy on Sustainable Finance (EUTSF).
Europe	Dummy = 1 if the company is headquartered in Europe (source: FactSet).
North America	Dummy = 1 if the company is headquartered in North America (source: FactSet).
Asia Pacific	Dummy = 1 if the company is headquartered in the Asia-Pacific region (source: FactSet).
Rest of World	Dummy = 1 if the company is headquartered in another region (source: FactSet).
GP Ratio	Average annual ratio of green patents to total patents between 2008 and 2015. Patent data is from the Global Corporate Patent Dataset[24] and green patents are classified using the OECD Environmental-related technology mapping developed by Hascic and Migotto (2015) and updated in 2020[25].
GP Indicator	Dummy = 1 if the company had at least one green patent between 2008 and 2015.
IO Pre-Paris	Holdings by institutional investors as a fraction of market capitalization at the end of 2015 (source: FactSet Ownership).

[24] UVA Darden Global Corporate Patent Dataset.
[25] OECD Green Patents Classification.

Table A-1.3 (continued): Variable Definitions

Variable	**Definition**
IO PRI Pre Paris	Holdings by institutional investors that are signatories of the Principles for Responsible Investment (PRI) as a fraction of market capitalization at the end of 2015 (sources: FactSet Ownership and Gibson Brandon et al. (2022)).
IO CDP Pre Paris	Holdings by institutional investors that are participants of the Carbon Disclosure Project (CDP) as a fraction of market capitalization at the end of 2015 (sources: FactSet Ownership and CDP).
Turnover Pre Paris	Firm-level turnover measure of institutional owners equal to the holdings-weighted Churn ratio of each institutional owner at the end of 2015 (source: FactSet Ownership).
Total Assets	Total assets in millions of US dollars (FactSet item FF_ASSETS).
Total Sales	Total sales in millions of US dollars (FactSet item FF_SALES).
Domestic Sales	Total revenues generated by a company from selling goods or services within the borders of the country where the company is headquartered (100 minus the FactSet item $FF\_FOR\_SALES\_PCT$).
Market Value	Market capitalization in millions of U.S. dollars (FactSet item FF_MKT_VAL).
Tobin's Q	Total assets (FactSet item FF_ASSETS) plus market value of equity (Factstet item FF_MKT_VAL) minus book value of equity (Factstet item FF_COM_EQ) divided by total assets.
Leverage	Total debt (FactSet item FF_DEBT) divided by total assets (FactSet item FF_ASSETS).

Table A-1.3 (continued): Variable Definitions

Variable	**Definition**
ROA	Operating income (FactSet item *FF_OPER_INC*) plus interest expenses (FactSet item *FF_INT_EXP_DEBT*) divided by total assets (FactSet item *FF_ASSETS*).
Cash	Cash and short-term investments (FactSet item *FF_CASH_ST*) divided by total assets (FactSet item *FF_ASSETS*).
Capex	Capital expenditures (FactSet item *FF_CAPEX_FIX*) divided by total assets (FactSet item *FF_ASSETS*).
R&D	Research and development expenditures (FactSet item *FF_RD_EXP*) divided by total assets (FactSet item *FF_ASSETS*).
Returns	Monthly gross returns are calculated using stock prices from Factset (item *ADJ_PRICE*). This variable is right-winsorized at the 99.95% level.
Market - Rf	Value-weighted returns of all firms in our sample using prices from Factset (item *ADJ_PRICE*) minus the one-month Treasury bill rate from Kenneth French's website.
Size	Global size factor from Jensen et al. (2023) (source: https://jkpfactors.com/) and regional factors from Kenneth French's website.
Value	Global value factor from Jensen et al. (2023) (source: https://jkpfactors.com/) and regional factors from Kenneth French's website.
Momentum	Global momentum factor from Jensen et al. (2023) (source: https://jkpfactors.com/) and regional factors from Kenneth French's website.

Table A-1.3 (continued): Variable Definitions

Variable	**Definition**
Profitability	Global profitability factor from Jensen et al. (2023) (source: https://jkpfactors.com/) and regional factors from Kenneth French's website.
Investment	Global investment factor from Jensen et al. (2023) (source: https://jkpfactors.com/) and regional factors from Kenneth French's website.
GMB	Global green-minus-brown factor provided by the authors of the study Karolyi et al. (2023).
Earnings surprises	The difference between actual earnings and the analyst consensus forecast 9 months prior to the end of the forecast period, scaled by the stock price at the end of the fiscal year.
MCCC	Media Climate Change Concerns Index provided by the authors of Ardia et al. (2023).
EPI	The Environmental Performance Index (EPI) provides a country-year summary of the state of sustainability around the world using 58 performance indicators.
IVS	IVS E-Norms is a survey-based index of the environmental awareness in a country-year.

Appendix 2

Validating the Paris Agreement Regime Shift: Evidence from the EUTSF Rollout

As a validation for using the Paris Agreement as a regime shift that raised expectations of a regulatory shift, we present evidence from the multi-stage process that led to the introduction of the EUTSF. This was the first framework in the world to establish benchmark criteria for "green" investments and positioned Europe as having the most stringent green regulations compared to other regions of the world.[26] Under the EUTSF, a green activity is defined as one that contributes positively to at least one of the six environmental objectives of the EU without causing harm to any of the others.[27]

We examine the effects of three milestones in the progression towards the implementation of the EUTSF. Phase 1 started after the Paris Agreement, where the EU launched a call for applications in 2016 to establish an expert group commissioned to develop the first large-scale taxonomy on sustainable investing. In 2018, the Technical Expert Group (TEG) convened for the first time. In 2020, the EUTSF was formally enacted.[28] We study the impact of each phase independently and in combination by employing the following regression model:

[26]This regulatory push stands out prominently among other European initiatives aimed at promoting green investing, such as Article 173 (Ilhan et al., 2023) in France or mandatory disclosures of greenhouse gases (GHG) in the UK (Downar et al., 2021; Jouvenot and Krueger, 2019).

[27]The EU Taxonomy on Sustainable Finance (Regulation (EU) 2020/852 - see `https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en`). At the core of the EUTSF are six climate and environmental goals: (1) climate change mitigation, (2) climate change adaptation, (3) sustainable use and protection of water and marine resources, (4) transition to a circular economy, (5) pollution prevention and control, and (6) protection and restoration of biodiversity and ecosystems. The EUTSF considers a business activity as "green" if it positively contributes to one of the goals without harming any of the other environmental objectives.

[28]The actual roll out of the EU taxonomy occurs after our sample period ends. Starting in 2022, financial institutions that offer investment products in the EU were required to report to what extent their portfolios were taxonomy-aligned. In 2023, EU banks started to disclose lending indicators directly related to the taxonomy. In the coming years, large EU firms will be required to disclose information about their taxonomy-aligned activities. The EU has also established the International Platform on Sustainable Finance to map common agendas and promote consistency across the emerging national taxonomies.

$$Green\ Revenues\ \%_{i,t} = \alpha + \beta_1 Post_t + \beta_2 Europe_i + \beta_3 Post_t \times\ Europe_i \\ + \beta_n X_{i,t} + \mu_j + \tau_t + \epsilon_{i,t}, \tag{4}$$

where the dependent variable is $Green\ Revenues\ \%_{i,t}$, the green revenue share of company i in year t, $Post_t$ is the *Post Paris* indicator equal to 1 if the year is $\geq$ 2016,*Post TEG* is an indicator equal to 1 for years $\geq$ 2018, and *Post EUTSF* is an indicator equal to 1 for years $\geq$ 2020 following the rollout of the EUTSF. The variable $Europe_i$ is a dummy indicator variable equal to 1 if a firm is headquartered in Europe. We account for unobserved differences across sectors and years, where μ_j are sector fixed effects and τ_t year fixed effects. We also control for several firm characteristics contained in the vector $X_{i,t}$.

Table A-2.1 shows that European firms, on average, increased their green revenue shares more in the post-Paris era compared to firms located elsewhere. The uptick we observe post-Paris (column 1) becomes even more pronounced following the creation of the TEG (column 2), and later upon the official enactment of the taxonomy (column 3). Furthermore, the findings indicate that the acceleration already occurred before 2020 (column 4), suggesting that firms anticipated the roll-out of the EUTSF. The economic magnitude is significant, as European firms exhibit on average 1% higher green revenues, which is equivalent to 7% of a standard deviation change in green revenues.

We perform several robustness checks. First, we excluded firms from European countries outside the EU (Norway, Switzerland, and the UK), which did not significantly alter our results. It is worth noting that the UK engaged in the green taxonomy post-Brexit. The results are also robust if we focus only on Tier 1 green revenues (Panel B, thus excluding controversial technologies such as nuclear power generation), or if we use EUTSF-eligible green revenues (Panel C). Additionally, we observe in Table I.A.4 that firms in Europe generate more USD green revenues post Paris, however, the results tend to be slightly less significant. Finally, we employed a propensity score matching approach for the European firms but the policy findings remain unchanged.

Table A-2.1. Evidence on the Regulatory Push

In this table, we estimate the effect of increased green regulation on firm *Green Revenues %*. We split the sample into firms incorporated in *Europe*, where a strong regulatory push occurred after the Paris Agreement, and the rest of the sample. *Post Paris* is a dummy equal to 1 if the year ≥ 2016. *Post TEG* is equal to 1 if the year ≥ 2018, where *TEG* indicates the creation of the Technical Expert Group commissioned to create the EU green taxonomy. *Post EUTSF* is equal to 1 if the year ≥ 2020, where *EUTSF* stands for the EU Taxonomy on Sustainable Finance that was rolled out in 2020. In Panel A, the dependent variable is corporate % green revenues as defined by the FTSE Russell GRCS. In Panel B, we alternatively use the GRCS Tier 1 green revenues as the dependent variable. Panel C focuses on green revenues that are eligible under the EUTSF taxonomy. By *, **, and *** we denote *p*-levels below 10%, 5%, and 1%, respectively. Standard errors clustered on the country-year level are in parentheses.

Panel A: Green Revenues %

Regressions	(1)	(2)	(3)	(4)
		Green Revenues %		
Europe × Post Paris	0.983***			0.477***
	(0.128)			(0.138)
Europe × Post TEG		1.063***		0.459***
		(0.141)		(0.154)
Europe × Post EUTSF			1.042***	0.355*
			(0.184)	(0.201)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Observations	267,576	267,576	267,576	267,576
Adjusted R^2	0.072	0.072	0.072	0.072

Panel B: Tier 1 Green Revenues %

Regressions	(1)	(2)	(3)	(4)
		Tier 1 Green Revenues %		
Europe × Post Paris	0.674***			0.326***
	(0.0763)			(0.0922)
Europe × Post TEG		0.730***		0.262***
		(0.0855)		(0.0979)
Europe × Post EUTSF			0.755***	0.328***
			(0.109)	(0.116)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Observations	267,576	267,576	267,576	267,576
Adjusted R^2	0.044	0.044	0.044	0.044

Panel C: EUTSF Green Revenues %

Regressions	(1)	(2)	(3)	(4)
		EUTSF Green Revenues %		
Europe × Post Paris	0.810***			0.411***
	(0.0973)			(0.108)
Europe × Post TEG		0.866***		0.334***
		(0.108)		(0.115)
Europe × Post EUTSF			0.864***	0.323**
			(0.139)	(0.148)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Observations	267,576	267,576	267,576	267,576
Adjusted R^2	0.066	0.066	0.066	0.066

Evidence on Supply and Demand Factors behind the post-Paris Green Push

An important question is whether the increase in green revenues post-Paris is driven by demand or supply factors. Separating demand from supply is difficult, mainly because we do not observe separate price and quantity data, but only equilibrium green revenues in dollar or percentage terms. To indirectly address the issue, we use country-level data capturing (i) the quality of a country's environmental policies and institutions and (ii) a country's consumer preferences with respect to environmental issues.

To capture the first aspect, namely the stringency of a country's environmental policies, we use Yale's Environmental Performance Index (EPI) (e.g. Dyck et al. (2019); Ilhan et al. (2023); Krueger et al. (2024)). The EPI relies on national regulatory frameworks, institutional capacities, and policy-based performance metrics, which directly shape corporate environmental decisions. Since the EPI emphasizes the impact of government enforcement and compliance requirements, it reflects the constraints and incentives that influence environmental policies of firms more than individual consumer choices. In other words, we believe that the EPI captures the external pressure that firms face to supply green products and services.

On the other hand, to capture the second aspect, that is, the environmental preferences of consumers, we obtain data from the Integrated Values Survey (IVS), which constructs an environmental awareness index at the country-year level. To do so, the Integrated Values Survey captures citizens' values and attitudes toward environmental stewardship, focusing on personal norms and beliefs. By emphasizing individual-level perspectives, rather than policy-based metrics, the IVS environmental index more directly captures consumer preferences and priorities with respect to environmental challenges. Therefore, we argue that this measure captures the demand pressure for green products and services.

In Table A-2.2 we estimate difference-in-differences regressions in which we use these country-level variables. In column (1) we provide evidence that firms in countries with more stringent environmental regulations generate higher green revenues, and more so after the Paris Agreement (column 2). These regressions include country fixed effects, which implies that the results are identified from within-country changes in environmental regulations, which aligns with the previously presented evidence on the European regulatory push.

In Column (3), the Integrated Values Survey (IVS) does not have a significant association with the share of green revenues, potentially reflecting that consumer-level environmental values (captured by IVS) do not automatically translate into higher green revenues. Prima facie, this could mean that our effects are primarily supply-driven. However, it is important to consider that not all company revenues are generated in the domestic market. IVS - which captures consumer-level environmental values in a company's country of headquarters - should matter more for domestic sales. In column (4) we find that firms that face stronger local demand in countries with more environmentally conscious consumers (higher values of IVS) exhibit higher green revenues, and even more so in the post-Paris period (column 5). Overall, this implies that consumer demand and global policy momentum together can drive higher green revenues for domestically oriented firms.

Table A-2.2. Green Revenues: Supply or Demand-Driven?

In this table, we examine whether the growth in green revenues is driven by supply and/or demand factors. *EPI* stands for the Environmental Performance Index, which provides a summary of the state of sustainability for each country-year. *Post Paris* is a binary variable equal to 1 if the year is $\geq$ 2016. *IVS* is a survey-based index measuring environmental awareness in a given country-year. *Domestic Sales* represents the percentage of a firm's revenues generated within its country of incorporation. By *, **, and ***, we denote p-levels below 10%, 5%, and 1%, respectively. Standard errors clustered on the country-year level are in parentheses.

Regressions	(1)	(2)	(3)	(4)	(5)
			Green Revenues %		
EPI	0.0352***	0.0672***			
	(0.0135)	(0.0145)			
EPI × Post Paris		0.0186***			
		(0.00288)			
IVS			-0.0277	-3.814**	-1.660
			(0.970)	(1.553)	(1.531)
Domestic Sales				-0.0423***	-0.0285***
				(0.00677)	(0.00671)
IVS × Domestic Sales				0.0493***	0.0263*
				(0.0152)	(0.0148)
IVS × Post Paris					-7.511***
					(2.301)
Domestic Sales × Post Paris					-0.0441***
					(0.0124)
IVS × Dom. Sales × Post Paris					0.0777***
					(0.0274)
Controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Observations	216,232	216,232	233,171	227,420	227,420
Adjusted R^2	0.069	0.069	0.069	0.070	0.070

Internet Appendix

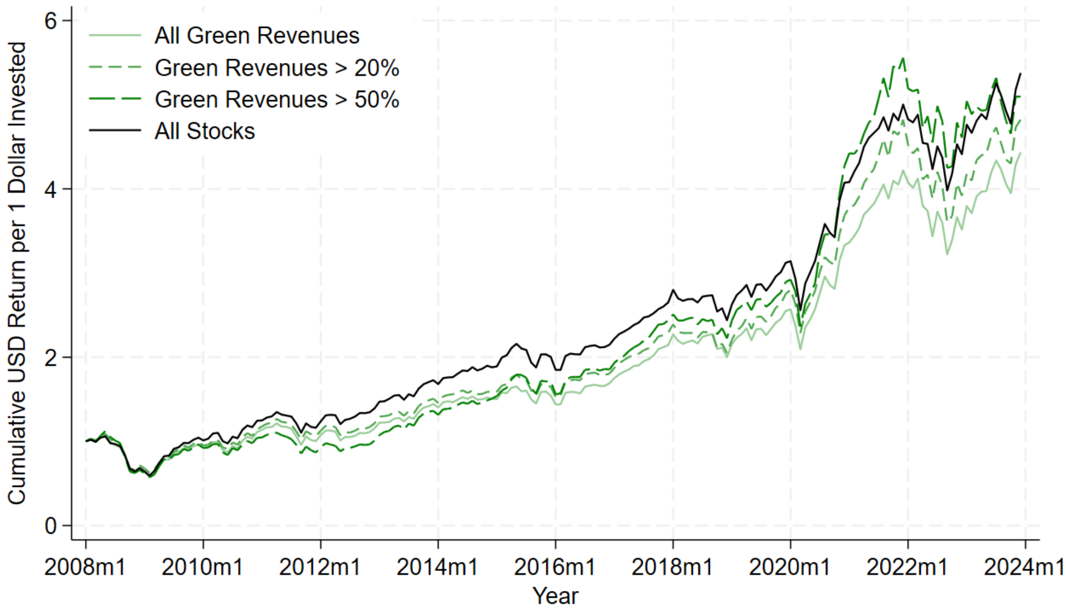
The Green Transition:

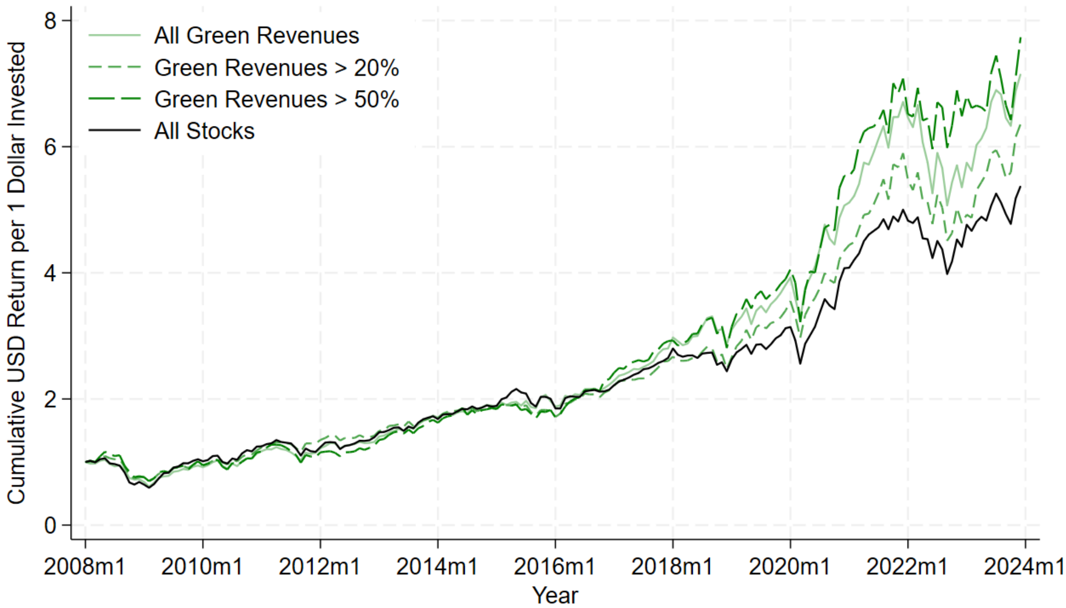
Evidence from Corporate Green Revenues

Figures

Figure I.A.1. Green Revenues Portfolio - Excluding Tesla

We analyze the impact of excluding Tesla on the green revenues portfolio return series in Figure 5. In the top graph, we plot the cumulative returns for 1 USD invested in the value-weighted green stocks portfolio (light green) and compare it with portfolios containing stocks with at least 20% (dashed green) and 50% (dashed darker green) green revenues, all excluding Tesla. The black line represents cumulative returns for the portfolio containing all stocks in our sample, serving as a benchmark. The bottom graph repeats this analysis while restricting the sample to firms incorporated in the United States.





Tables

Table I.A.1. Correlation of Green Revenues with other Environmental Measures (for firms with non-zero Green Revenues)
We re-run the correlations in Table 2 but restrict the sample to firms with Green Revenues % > 0. This table shows pairwise Pearson correlation coefficients for % company green revenues, % tier 1 green revenues, % EUTSF eligible green revenues, and various environmental measures used in prior literature. These include scope 1, 2, and 3 carbon intensities from Trucost and environmental (ESG) scores from MSCI. *E-Score PST* is the modified environmental score proposed in Pastor et al. (2022), and *Ad. MSCI ESG Score* is the industry-adjusted ESG score from MSCI. By *, **, and *** we denote *p*-levels below 10%, 5%, and 1%, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Green Revenues %	1							
(2) Tier 1 Green Revenues %	0.739***	1						
(3) EUTSF Green Revenues %	0.837***	0.750***	1					
(4) CO2 Int. Scope 1	-0.045***	-0.072***	-0.048***	1				
(5) CO2 Int. Scope 2	0.001	-0.021***	-0.021***	0.059***	1			
(6) CO2 Int. Scope 3	-0.101***	-0.002	-0.112***	0.317***	0.096***	1		
(7) E-Score PST	0.001	0.056***	0.051***	-0.416***	-0.117***	-0.439***	1	
(8) Adj. ESG Score	0.021*	0.065***	0.050***	-0.179***	-0.036**	-0.154***	0.409***	1

Table I.A.2. Determinants of Green Revenues

This table shows firm-level determinants of green revenues that are defined in Table A-1.3. We further add geographic regions in columns (6) and (7). By *, **, and *** we denote p-levels below 10%, 5%, and 1%, respectively. Standard errors clustered on the country-year level are in parentheses.

Regressions	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ln(Sales)	0.820***	0.818***	0.816***	0.787***	0.736***	0.794***	0.744***
	(0.0324)	(0.0311)	(0.0313)	(0.0330)	(0.0375)	(0.0315)	(0.0359)
Tobin's Q		0.176***	0.131***	0.167***	0.196***	0.118***	0.142***
		(0.0241)	(0.0250)	(0.0258)	(0.0227)	(0.0239)	(0.0235)
Leverage		2.214***	2.044***	0.933***	0.975***	2.070***	0.894***
		(0.216)	(0.212)	(0.158)	(0.167)	(0.221)	(0.161)
ROA		-2.542***	-2.592***	-2.644***	-2.882***	-2.462***	-2.574***
		(0.331)	(0.341)	(0.376)	(0.367)	(0.346)	(0.360)
Cash		-1.737***	-1.737***	-1.252***	-1.009***	-1.518***	-0.846***
		(0.186)	(0.189)	(0.173)	(0.220)	(0.194)	(0.188)
CAPEX			9.786***	9.826***	11.37***	10.17***	10.48***
			(1.153)	(1.064)	(1.093)	(1.144)	(1.099)
R&D			4.660***	6.481***	1.091	3.089***	3.121**
			(0.966)	(1.159)	(1.226)	(1.042)	(1.239)
Europe						2.160***	2.414***
						(0.193)	(0.138)
Asia-Pacific						1.211***	1.078***
						(0.150)	(0.104)
North America						1.500***	2.018***
						(0.227)	(0.0940)
Constant	-1.676***	-2.036***	-2.352***	-2.098***	-1.857***	-3.560***	-3.238***
	(0.191)	(0.233)	(0.239)	(0.260)	(0.261)	(0.257)	(0.252)
Year FE	No	No	No	Yes	Yes	No	Yes
Sector FE	No	No	No	Yes	Yes	No	Yes
Country FE	No	No	No	No	Yes	No	No
Observations	267,576	267,576	267,576	267,576	267,576	267,576	267,576
Adjusted R^2	0.013	0.015	0.016	0.065	0.072	0.018	0.068

Table I.A.3. The Role of Green Innovation: Placebo Test

In this table, we examine whether our results in Table 3 could be driven by the general innovativeness of a firm and not specifically green innovation. Corporate green innovation is measured by the variable *GP Indicator*, which is equal to one if a company had at least one green patent between 2008 and 2013. The variable *Patent Indicator* is equal to one if a company had at least one patent between 2008 and 2013. For the latter variable, we consider all patents (green and non-green). By *, **, and *** we denote p-levels below 10%, 5%, and 1%, respectively. Standard errors clustered on the country-year level are in parentheses.

Regressions	(1)	(2)	(3)
	Green Revenues %	Tier 1 Green Revenues %	EUTSF Green Revenues %
GP Indicator × Post Paris	1.286***	1.040***	1.263***
	(0.238)	(0.346)	(0.212)
Patent Indicator × Post Paris	0.0099	-0.0233	-0.0691
	(0.251)	(0.255)	(0.206)
Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Observations	264,658	264,658	264,658
Adjusted R^2	0.856	0.852	0.847

Table I.A.4. The Role of Regulatory Push: US Dollar Revenues

In this table, we estimate the effect of increased green regulation in Europe on firm *USD Green Revenues*. We follow the regression specifications of Table A-2.1 in Appendix 2. In Panel A, the dependent variable is *USD Green Revenues* = (*Green Revenues %*/100) x *USD Total Sales*. In Panel B, we conduct the same analysis using *USD Brown Revenues* = (100 - *Green Revenues %*)/100 x *USD Total Sales*, which represents all US dollar revenues of a firm not classified as green by the FTSE Russell GRCS. By *, **, and *** we denote *p*-levels below 10%, 5%, and 1%, respectively. Standard errors clustered on the country-year level are in parentheses.

Panel A: USD Green Revenues				
Regression	(1)	(2)	(3)	(4)
Europe × Post Paris	-11.71			-54.36***
	(12.97)			(14.47)
Europe × Post TEG		15.80		29.68**
		(14.22)		(14.32)
Europe × Post EUTSF			33.33*	43.87**
			(18.58)	(19.09)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes
Observations	267,576	267,576	267,576	267,576
Adjusted R^2	0.058	0.058	0.058	0.058
Panel B: USD Brown Revenues				
Regression	(1)	(2)	(3)	(4)
Europe × Post Paris	-471.1***			-404.5***
	(101.1)			(118.8)
Europe × Post TEG		-406.9***		-77.64
		(108.0)		(112.6)
Europe × Post EUTSF			-345.6**	-20.53
			(138.7)	(139.3)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes
Observations	267,576	267,576	267,576	267,576
Adjusted R^2	0.234	0.234	0.234	0.234

Table I.A.5. The Role of Green Innovation: US Dollar Revenues

This table examines the relation between corporate green patent innovation and firm *USD Green Revenues*. We follow the regression specifications of Table 3. In columns (1) and (2), the dependent variable is *USD Green Revenues* = (*Green Revenues %*/100) x *USD Total Sales*. In columns (3) and (4), we conduct the same analysis using *USD Brown Revenues* = (100 - *Green Revenues %*)/100 x *USD Total Sales*, which represents all US dollar revenues of a firm not classified as green by the FTSE Russell GRCS. By *, **, and ***, we denote p-levels below 10%, 5%, and 1%, respectively. Standard errors clustered on the country level (except in column (3)) are in parentheses.

Dep. Variable	USD Green Revenues		USD Brown Revenues	
Regression	(1)	(2)	(3)	(4)
GP Indicator	551.3***		6600.2***	
	(71.71)		(736.7)	
GP Indicator × Post Paris	506.9***		1830.9*	
	(106.8)		(981.4)	
GP Ratio		5538.0***		53132.9***
		(792.2)		(7855.8)
GP Ratio × Post Paris		3022.1***		5687.6
		(1109.8)		(11044.6)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Observations	267,576	267,576	267,576	267,576
Adjusted R^2	0.072	0.077	0.248	0.249

Table I.A.6. The Role of Institutional Investors: US Dollar Revenues

This table examines the relation between institutional ownership and firm *USD Green Revenues*. We follow the regression specifications of Table 5. In Panel A, the dependent variable is *USD Green Revenues* = (*Green Revenues %*/100) x *USD Total Sales*. In Panel B, we conduct the same analysis using *USD Brown Revenues* = (100 - *Green Revenues %*)/100 x *USD Total Sales* which represents all US dollar revenues of a firm not classified as green by the FTSE Russell GRCS. By *, **, and ***, we denote p-levels below 10%, 5%, and 1%, respectively. Standard errors clustered on the country-year level are in parentheses.

Panel A: USD Green Revenues					
Regression	(1)	(2)	(3)	(4)	(5)
IO Pre Paris	-300.9*** (38.89)				
IO Pre Paris × Post Paris	150.6*** (24.61)				
IO High Pre Paris		-84.21*** (14.19)			
IO High Pre Paris × Post Paris		54.52*** (13.16)			
IO PRI Pre Paris			-434.6*** (59.16)		
IO PRI Pre Paris × Post Paris			420.8*** (59.38)		
IO CDP Pre Paris				-397.0*** (93.67)	
IO CDP Pre Paris × Post Paris				556.7*** (99.17)	
Turnover Pre Paris					14.92 (48.15)
Turnover Pre Paris × Post Paris					-238.0*** (49.28)
Observations	220,241	220,241	220,241	220,241	209,056
Adjusted R^2	0.066	0.066	0.066	0.066	0.068
Controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes

Panel B: USD Brown Revenues					
Regression	(1)	(2)	(3)	(4)	(5)
IO Pre Paris	-7680.4*** (679.5)				
IO Pre Paris × Post Paris	618.1* (343.7)				
IO High Pre Paris		-1558.9*** (247.7)			
IO High Pre Paris × Post Paris		138.6 (198.0)			
IO PRI Pre Paris			-9986.3*** (893.8)		
IO PRI Pre Paris × Post Paris			2118.2** (862.3)		
IO CDP Pre Paris				-9101.1*** (1327.7)	
IO CDP Pre Paris × Post Paris				2721.5** (1148.1)	
Turnover Pre Paris					-136.3 (694.5)
Turnover Pre Paris × Post Paris					-2850.5*** (824.6)
Observations	220,241	220,241	220,241	220,241	209,056
Adjusted R^2	0.260	0.256	0.257	0.256	0.259
Controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes

Table I.A.7. The Role of Green Innovation: Backfilling Robustness Checks
This table assesses the sensitivity of the results in Table 3 to the backfilling of FTSE Russell GRCS green revenue point estimates. In Panel A, the independent variable is *GP Indicator* while in Panel B we use *GP Ratio*. In column (1), we use the FTSE Russell GRCS green revenue point estimates post-Paris (when the green revenue data is not backfilled) as the dependent variable. In column (2), the dependent variable *Green Revenues Indicator* is an indicator for whether a firm reports any green revenues in a given year. Finally, in column (3), we apply an alternative measure *Green Revenues % Midpoint* of green revenues, where missing values between 2008 and 2015 are backfilled with the midpoint between the minimum and maximum FTSE Russell GRCS estimates. In columns (2)–(3), we interact *GP Ratio/Indicator* with *Post Paris* to explore how firms with varying levels of green innovation are differently positioned for a green transition following the Paris Agreement. By *, **, and *** we denote p-levels below 10%, 5%, and 1%, respectively. Standard errors clustered on the country-year level are in parentheses.

Panel A: Green Patent Indicator

Regressions	(1)	(2)	(3)
	Green Revenues %	Green Revenues Indicator	Green Revenues % Midpoint
GP Indicator	6.291***	0.198***	7.567***
	(0.484)	(0.00717)	(0.367)
GP Indicator × Post Paris		0.0712***	4.113***
		(0.00987)	(0.427)
Sample	Post Paris	Full	Full
Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes
Country	Yes	Yes	Yes
Observations	141,977	267,576	267,576
Adjusted R^2	0.089	0.189	0.132

Panel B: Green Patent Ratio

Regressions	(1)	(2)	(3)
	Green Revenues %	Green Revenues Indicator	Green Revenues % Midpoint
GP Ratio	63.51***	1.747***	75.81***
	(4.533)	(0.0504)	(3.137)
GP Ratio × Post Paris		0.417***	28.11***
		(0.0716)	(3.376)
Sample	Post Paris	Full	Full
Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes
Country	Yes	Yes	Yes
Observations	141,977	267,576	267,576
Adjusted R^2	0.095	0.196	0.141

Table I.A.8. The Role of Institutional Ownership: Backfilling Robustness Checks

This table assesses the sensitivity of the results in Table 5 to the backfilling of FTSE Russell GRCS green revenue point estimates. In Panel A, the dependent variable is *Green Revenues %*, and the sample is restricted to the post-Paris period. Panel B considers the full sample period, using a binary dependent variable equal to 1 if a firm exhibits FTSE Russell GRCS green revenues in a given year and 0 otherwise. Panel C employs an alternative measure of green revenues, using point estimates where missing values from 2008 to 2015 are backfilled with the midpoint between the minimum and maximum FTSE Russell GRCS green revenue estimates. In Panels B and C, *Post Paris* is a binary variable equal to 1 for years $\geq$ 2016. By *, **, and *** we denote *p*-levels below 10%, 5%, and 1%, respectively. Standard errors clustered on the country-year level are in parentheses.

Panel A: Green Revenues % Post Paris

Regressions	(1)	(2)	(3)	(4)	(5)
IO Pre Paris	3.911***				
	(0.525)				
IO High Pre Paris		2.124***			
		(0.193)			
IO PRI Pre Paris			6.775***		
			(0.949)		
IO CDP Pre Paris				9.329***	
				(1.378)	
Turnover Pre Paris					-4.267***
					(0.938)
Sample	Post Paris	Post Paris	Post Paris	Post Paris	Post Paris
Controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Observations	115,129	115,129	115,129	115,129	107,972
Adjusted R^2	0.085	0.087	0.085	0.086	0.086

Panel B: Green Revenues Indicator

Regressions	(1)	(2)	(3)	(4)	(5)
IO Pre Paris	0.0948***				
	(0.0106)				
IO Pre Paris × Post Paris	0.0173*				
	(0.00969)				
IO High Pre Paris		0.0612***			
		(0.00508)			
IO High Pre Paris × Post Paris		0.0200***			
		(0.00664)			
IO PRI Pre Paris			0.218***		
			(0.0193)		
IO PRI Pre Paris × Post Paris			0.0561**		
			(0.0259)		
IO CDP Pre Paris				0.258***	
				(0.0287)	
IO CDP Pre Paris × Post Paris				0.0634*	
				(0.0351)	
Turnover Pre Paris					-0.132***
					(0.0137)
Turnover Pre Paris × Post Paris					-0.0669***
					(0.0125)
Sample	Full	Full	Full	Full	Full
Controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Observations	220,241	220,241	220,241	220,241	209,056
Adjusted R^2	0.176	0.180	0.177	0.177	0.181

Panel C: Green Revenues % Midpoint Estimates

Regressions	(1)	(2)	(3)	(4)	(5)
IO Pre Paris	4.276***				
	(0.462)				
IO Pre Paris × Post Paris	1.361***				
	(0.429)				
IO High Pre Paris		2.523***			
		(0.158)			
IO High Pre Paris × Post Paris		1.036***			
		(0.223)			
IO PRI Pre Paris			8.418***		
			(0.790)		
IO PRI Pre Paris × Post Paris			3.355***		
			(1.085)		
IO CDP Pre Paris				10.76***	
				(1.201)	
IO CDP Pre Paris × Post Paris				4.297***	
				(1.515)	
Turnover Pre Paris					-4.112***
					(0.674)
Turnover Pre Paris × Post Paris					-2.315***
					(0.529)
Sample	Full	Full	Full	Full	Full
Controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Observations	220,241	220,241	220,241	220,241	209,056
Adjusted R^2	0.122	0.125	0.122	0.122	0.126

Table I.A.9. Tesla Portfolio Weight

This table presents annual weights of Tesla in the different green portfolios of Table 7, categorized by their percentage levels of green revenues. The weights are determined annually as of December.

Panel A: Tesla Weight in Global Green Revenues Portfolios (%)				
Year	> 0%	> 20%	> 50%	> 80%
2010	0.022	0.083	0.293	0.646
2011	0.030	0.116	0.421	1.066
2012	0.035	0.136	0.488	1.316
2013	0.141	0.572	1.858	4.837
2014	0.204	0.852	2.647	6.848
2015	0.225	0.931	2.698	6.315
2016	0.198	0.772	1.876	4.143
2017	0.236	0.909	2.118	4.826
2018	0.273	1.078	2.744	5.413
2019	0.308	1.010	2.853	5.378
2020	2.300	6.764	15.482	28.930
2021	3.067	8.520	19.660	34.221
2022	1.291	3.943	9.757	18.250
2023	2.332	7.107	17.560	32.386
Panel B: Tesla Weight in US Green Revenues Portfolios (%)				
Year	> 0%	> 20%	> 50%	> 80%
2010	0.072	0.312	1.378	2.374
2011	0.091	0.370	1.839	3.554
2012	0.099	0.417	2.013	4.028
2013	0.358	1.803	7.791	14.543
2014	0.509	2.488	9.351	19.680
2015	0.548	2.969	11.324	21.118
2016	0.456	2.023	5.516	10.573
2017	0.551	2.478	7.175	13.038
2018	0.601	2.928	8.581	13.362
2019	0.657	2.178	8.519	13.002
2020	4.409	13.118	39.798	54.164
2021	5.727	16.557	48.424	62.055
2022	2.448	7.991	28.609	41.245
2023	4.186	13.340	42.251	56.284

Table I.A.10. Green Revenues Portfolios: Robustness

As in Table 7, this table reports the *Alpha* of the long-short green revenues minus legacy (GML) portfolio across different shades of "greenness". Panel A shows value-weighted portfolio returns for the global sample, excluding Tesla. Panel B shows value-weighted portfolio returns for the US sample, excluding Tesla. Panel C considers equally-weighted global portfolio returns. Lastly, in Panel D, we investigate equally-weighted portfolio returns for US firms. By *, **, and ***, we denote p-levels below 10%, 5%, and 1%, respectively. Robust standard errors are in parentheses.

Regression	(1)	(2)	(3)	(4)
Variable	Green Minus Legacy (GML)			
Portfolio	$> 0\%$	$> 20\%$	$> 50\%$	$> 80\%$
Panel A: All Firms without Tesla Value-Weighted				
Alpha (Pre Paris)	-0.412***	-0.302**	-0.323**	-0.126
	(0.125)	(0.139)	(0.160)	(0.227)
Alpha (Post Paris)	-0.0746	0.00995	0.00794	0.289
	(0.108)	(0.126)	(0.172)	(0.209)
Panel B: US Firms without Tesla Value-Weighted				
Alpha (Pre Paris)	-0.302*	-0.385**	-0.422*	-0.171
	(0.155)	(0.162)	(0.252)	(0.291)
Alpha (Post Paris)	0.000520	0.0162	0.192	0.454*
	(0.169)	(0.192)	(0.205)	(0.268)
Panel C: All Firms Equally-Weighted				
Alpha (Pre Paris)	-0.234*	-0.102	-0.112	-0.0298
	(0.119)	(0.128)	(0.174)	(0.226)
Alpha (Post Paris)	-0.169*	-0.0406	0.0839	0.310
	(0.0977)	(0.125)	(0.162)	(0.205)
Panel D: US Firms Equally-Weighted				
Alpha (Pre Paris)	-0.280**	-0.282*	-0.260	-0.243
	(0.135)	(0.152)	(0.240)	(0.286)
Alpha (Post Paris)	-0.0650	0.0195	0.345	0.646**
	(0.137)	(0.164)	(0.216)	(0.274)

Table I.A.11. GML Loadings on GMB

This table investigates the relation between various GML (Green Minus Legacy) portfolios as defined in Table 7 and the GMB (Green Minus Brown) factor proposed by Karolyi et al. (2023). The regression analysis explores potential correlations between our GML factor and a GMB factor constructed using MSCI environmental scores. Panel A presents results from univariate regressions where different long-short GML portfolios are tested against the GMB factor. Panel B extends the analysis by controlling for the Fama-French 6-factor asset pricing model. By *, **, and *** we denote p-levels below 10%, 5%, and 1%, respectively. Robust standard errors are in parentheses.

Variable	Green Minus Legacy (GML)			
Regression	(1)	(2)	(3)	(4)
Portfolio	> 0%	> 20%	> 50%	> 80%
Panel A: Univariate GML Loadings on GMB				
GMB	0.0738	0.0445	-0.128	-0.0626
	(0.104)	(0.110)	(0.118)	(0.172)
Alpha	0.148	-0.0325	0.341*	0.718***
	(0.150)	(0.156)	(0.173)	(0.234)
Fama-French 6 Factors	No	No	No	No
Observations	109	109	109	109
Adjusted R^2	0.00	0.00	0.00	0.00
Panel B: GML Loadings on GMB in 6-Factor Model				
GMB	-0.113	-0.0964	-0.157	-0.111
	(0.0897)	(0.0948)	(0.120)	(0.175)
Alpha	-0.00470	-0.0314	0.285	0.665**
	(0.158)	(0.166)	(0.212)	(0.280)
Fama-French 6 Factors	Yes	Yes	Yes	Yes
Observations	109	109	109	109
Adjusted R^2	0.26	0.09	0.02	0.02