



When green isn't enough: How AI and compliance reframe energy efficiency for sustainable investment

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ABSTRACT

As technological advancements, artificial intelligence (AI), and climate change become increasingly intertwined, energy efficiency has emerged as a crucial issue for organizations and public authorities. This research examines how firms can align financial and environmental goals to attract diverse investor groups, focusing on AI-driven energy efficiency strategies. To do so, we use the Economies of Worth framework and explore how investors respond to energy strategies framed by financial or environmental motivations (i.e., market or green worlds), depending on the type of AI adopted and the nature of compliance. Across four experimental studies with 1,500 investors, we find that environmental motivations can reduce investor willingness to invest, mediated by perceived energy efficiency. However, AI implementation and certification mechanisms act as critical boundary conditions that can legitimize environmental strategies and enable compromise between market and green logics. Specifically, coupling environmental motivations with AI for energy efficiency and third-party certification leads to higher investor willingness to invest. This study contributes to sustainable investment research by highlighting the critical role of AI and compliance in building hybrid justifications that can facilitate alignment between environmental and financial priorities in investor decision-making.

1. Introduction

In an era where technological advancements marked by the rise of Artificial Intelligence (AI), energy crises and the mounting threats of climate change are increasingly interconnected, the debate around the Grand Challenges and how to address them has emerged as a critical focal point for both academics and practitioners (Ferraro et al., 2015; Grodal and O'Mahony, 2017; Cloutier et al., 2024). Energy efficiency has taken a central place in this debate as an operable strategy to mitigate these issues. It has become a key concern in addressing Grand Challenges due to its complex social, environmental, and economic implications (Máté et al., 2020), with growing regulatory frameworks and public scrutiny pushing organizations to justify their strategies amid competing expectations. In this regard, firms are increasingly opting for compliance to internationally recognized standards such as the ISO 50001 energy management system as a way to leverage their energy efficiency strategies while signaling a tangible commitment towards a continuous improvement of their energy performance and a significant reduction of their environmental impact (AFNOR Energies, 2024). The

environmental implications of energy efficiency are profound, with the Intergovernmental Panel on Climate Change (IPCC) estimating that enhancing energy efficiency could reduce global greenhouse gas emissions by up to 40 % by 2050 (IPCC, 2021). This has prompted many countries to adopt ambitious policies aimed at promoting energy savings, such as the European Union's Energy Efficiency Directive, which targets a 32.5 % improvement by 2030, alongside initiatives like the UK's Energy Savings Opportunity Scheme (ESOS) and the Streamlined Energy and Carbon Reporting (SECR) frameworks (European Union, 2018). Beyond the environmental benefits, the economic advantages of energy efficiency are also significant. The International Energy Agency (IEA) reports a steady increase in global investments in energy efficiency, with an annual growth rate of 4 % from 2016 to 2020, as companies and consumers alike seek to reduce costs and improve operational efficiency (IEA, 2023).

As market conditions and the energy landscape evolve rapidly, firms are increasingly exploring innovative strategies to enhance both their sustainability profiles and their financial attractiveness. A key trend in this space is the integration of AI into energy management systems, with

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the rise of Industry 4.0 driving investment in AI technologies to optimize energy use (Ahmad et al., 2022). Approximately 64 % of industrial companies have begun adopting AI-driven solutions to enhance energy efficiency, leveraging advanced analytics, automation, and connectivity to gain a competitive edge (Ahmad et al., 2022). In recent decades, the electrical energy field has witnessed a massive implementation of AI strategies (Ahmad et al., 2021; Talaat et al., 2024), which provided effective and innovative solutions for various previous hurdles that used to make the efficient operation of electrical networks very difficult. In their latest global study, conducted among 2,342 IT professionals at enterprises across 20 countries, IBM revealed that 74 % of Energy and Utility companies have already implemented or are considering the integration of AI in their operations (IBM, 2024). Another study conducted with 420 Energy and Resources CEOs showcased that 63 % of the surveyed CEOs are more likely to expect to realize value in the next three years from AI and automation, than their global peers (IBM Institute for Business Value, 2023). Recent studies also show that in the face of heightened threat of climate change and energy scarcity, the adoption of AI-driven solutions could be the next step in implementing truly efficient energy management systems for companies, allowing them to remain financially competitive while operating in a more sustainable way (Agarwal et al., 2022; Ahmad et al., 2022; Kar et al., 2022; Yussuf and Asfour, 2024; Slama, 2025).

Despite the clear environmental and economic incentives, navigating the complexities of energy efficiency strategies presents a considerable challenge for business organizations, particularly when it comes to aligning these initiatives with investor preferences. Firms face a delicate balancing act: they must remain financially competitive and continue to attract investors while also responding to growing pressures from environmentally conscious stakeholders and regulation agencies. This complexity is further exacerbated by the unpredictable behavior of investors, who may shift between sustainable and conventional assets depending on market conditions. While impact investing—an investment approach that seeks measurable environmental and social returns alongside financial gains—has gained momentum, with global assets under management reaching USD 35.3 trillion by 2020 (Global Sustainable Investment Alliance, 2020), not all investors prioritize environmental, social, and governance (ESG) criteria. Recent studies have shown that during periods of economic instability or high inflation, investors often revert to traditional, higher-yield investments, thereby dampening the appeal of ESG-focused assets (Masters and Temple-West, 2023). This uncertainty presents a dilemma for companies: how much emphasis should they place on sustainability initiatives, such as energy efficiency, when communicating with actual and potential investors?

The intersection of sustainable investments and energy efficiency strategies forms the core of our research, with a focus on understanding investors' behaviors. Sustainable investments, which have grown rapidly over the past fifteen years, emphasize the integration of ESG factors into investment decisions (De Angelis et al., 2023). While a growing body of literature explores corporate efforts to reduce environmental impact, much of this research focuses on internal organizational initiatives, such as decarbonization efforts and the adoption of science-based emission reduction targets (Bendig et al., 2023). However, the implication of investors—those who deliberately consider financial, environmental and social factors when making investment decisions—and the impact of such initiatives on their perceptions remains underexplored. Previous studies have shown that investor behavior is influenced by both financial and environmental considerations, with green investors applying pressure on companies to reduce carbon emissions, while traditional investors may prioritize higher financial yields (De Angelis et al., 2023). Moreover, research by Bendig et al. (2023) supports the idea that environmentally conscious strategies can enhance both corporate sustainability and profitability, suggesting a potential alignment of interests between green and market logics. However, tensions remain, as evidenced by studies showing that during periods of market volatility, investor support for green assets may wane (Masters and Temple-West,

2023). By exploring how companies can strategically present their energy efficiency initiatives to address these competing rationalities, we aim to provide new insights into the evolving relationship between sustainability and financial performance.

Understanding investor perceptions of energy efficiency strategies and the underlying behaviors is crucial given that they can significantly influence organizational decisions and strategic orientations by choosing to invest or not. The financial support they bring to companies is crucial to implement these strategies and make the required technological investments, which constitutes an additional pressure for decision makers to frame their strategies in alignment with investors' preferences. Studies such as that by Carlsson Hauff (2022) highlight the importance of transparency in sustainability labeling, demonstrating that investors with greater financial literacy tend to prefer objective sustainability labels over subjective claims. This underscores the critical role of communication and certifications in aligning corporate energy efficiency efforts with investor expectations.

Building on this literature, our research investigates how firms can justify their motivations for implementing energy efficiency strategies by strategically combining different compliance measures and types of AI implementation to align with the value systems and expectations of different investor groups. We draw on the Economies of Worth (EW) framework developed by Boltanski and Thévenot ([1991], 2006), which is founded on the idea of the coexistence of different orders of worth, also referred to as worlds, that organizational actors mobilize to justify their actions and decisions and evaluate the legitimacy of other actors or objects, according to the principles guiding these worlds. In our work we focus on the *industrial world*, where efficiency and technology are highly valued, the *market world* centered on financial profits and market competitiveness and the *green world* focused on environmental sustainability and nature harmony (Patriotta et al., 2011). These worlds can come into tension in the context of energy efficiency strategies where financial motivations stemming from the market world view are confronted with environmental motivations stemming from the green world, for firms aiming to justify their strategies and investors assessing the value of these strategies before making an investment decision. We explore how the industrial world, through AI implementation, could shift the usual equilibrium between market and green worlds and enable investors to find a compromise between their market and green valuations.

Our research seeks to answer the question: how do AI-driven energy efficiency strategies, framed by financial versus environmental motives and coupled with varying compliance measures, shape external investor willingness to invest? Using the Economies of Worth (EW) framework, the research examines how firms invoke different worlds to legitimize their strategic choices and shape investor perceptions in terms of energy efficiency. The objective of this study is to gain insight into which optimal combination between compliance measures and type of AI-driven energy management technology—as objects embedded respectively in the green and industrial worlds—aligns best with a company's motivation for implementing an energy efficiency strategy, from an external investor's perspective.

In four studies, we investigated the relationship between a firm's energy management strategy, perceived energy efficiency, and investors' willingness to invest, with varying moderators like AI implementation and compliance. Study 1 (n = 300 investors) explores a mediation model and found that environmental motivations decreased investor willingness to invest, fully mediated by perceived energy efficiency. Study 2 (n = 300 investors) introduced AI as a moderator, showing that perceived energy efficiency mediated the relationship between environmental motivations and willingness to invest only when energy-efficient AI was implemented. Study 3 (n = 300 investors) added compliance (internal vs. external) and found that self-claimed energy management increased the effect of financial motivations on perceived energy efficiency, which mediated investment decisions. Finally, Study 4 (n = 600 investors), combined AI implementation and compliance, showing that both significantly moderated the relationship between

energy strategy and investment willingness, with externally certified energy management system coupled with the implementation of AI for energy efficiency, resulting in a positive relationship between environmental motivations and investors willingness to invest.

Our study makes several important contributions to the literature on sustainable investments and energy efficiency strategies. First, it offers new insights into the interaction between a company’s energy management motivations—whether financial or environmental—and investor perceptions, highlighting that investors may not always favor firms with strong environmental motivations, challenging existing findings in the field (De Angelis et al., 2023; Chi et al., 2023). We draw on the economies of worth framework to show that the worlds invoked by organizations to justify their energy efficiency strategies don’t systematically align with those mobilized by investors to evaluate these strategies. Second, we expand on the role of technological innovation, particularly AI, in energy efficiency strategies and show how AI implementation influences investor decisions through perceived energy efficiency, building on the work of Chi et al. (2023) and Bendig et al. (2023). Third, we contribute to the literature on the Economies of Worth (Boltanski and Thévenot, 2006), by offering empirical evidence supporting the idea that the industrial world can tip the usual balance between market and green worlds and enable investors to build a compromise between market and green valuations. Our study shows that under certain boundary conditions, such as the implementation of technologies like AI and the presence of certification mechanisms, investors can reconcile competing evaluative frameworks. In these cases, the industrial world serves as a bridge that legitimizes green objectives without undermining market-driven expectations of profitability and performance. This contributes to a more nuanced understanding of how organizations and stakeholders can navigate value pluralism, not merely by choosing between competing logics but by crafting hybrid justifications that allow for coexistence and mutual reinforcement. Our work offers insights into the conditions under which value alignments are possible, thus advancing the theoretical applicability of the EW in complex organizational settings such as sustainable investing.

2. Background

2.1. Sustainable investment

Over the past fifteen years, sustainable investments, also referred to as green, responsible, or impact investments, have gained significant momentum. The establishment of the Global Sustainable Investment Alliance (GSIA) in 2016 further strengthened the shift toward integrating environmental, social, and governance (ESG) factors into investment decisions (GSIA, 2020). While traditional investments can have both positive and negative effects on environmental and social sustainability, impact investing specifically aims to generate measurable social or environmental benefits alongside financial returns (GIIN, 2016). Despite much of the financial sector’s focus on short-term profits, sustainable investments are gaining traction, particularly in the U.S., where their share of assets under management increased from 18 % to 26 % between 2014 and 2018 (De Angelis et al., 2023). Globally, sustainable investments now represent 35.9 % of assets under management (GSIA, 2020). Previous research on sustainable investments includes corporate initiatives aimed at making businesses more environmentally friendly (Schaltenbrand et al., 2018). This paper, however, focuses on external investors—both individuals and institutions—who deliberately incorporate environmental and social criteria into their investment decisions.

Table 1 provides an overview of key studies that highlight the evolving landscape of sustainable and impact investing, showing how investor behavior and corporate practices align with ESG goals. For instance, Carlsson Hauff (2022) found that retail investors with greater financial knowledge prefer objective sustainability labels over subjective ones. This emphasizes the importance of transparency in sustainable

Table 1
Prior work.

Authors	Focus	Data and methods	Findings
Carlsson Hauff (2022)	Outlining retail investors’ reactions, in terms of willingness to invest, to sustainability-oriented investment labels.	A combination of scale development techniques and regression-based analysis. To pretest the scales, a sample of 400 respondents was randomly selected from a major European web panel, Norstat. Norstat was again used in order to obtain a sample of 413 respondents who went through the experiment, which involved two (objective vs. evaluative label) between-subjects conditions.	Objective labels are perceived more favorably by financially knowledgeable individuals. This evaluation is domain contingent, with only knowledge that aligns with choice domain interacting significantly with label format. The importance of the choice domain prevails with regard to the interaction between knowledge and the perceived effectiveness of an investment.
Bendig et al. (2023)	Empirically examining the relationship between corporate carbon emission performance (CCP) and corporate financial performance (CFP) of firms with science-based emission-reduction targets (SBTs) from 2015 to 2020.	The cross-country panel comprises 2014 observations of 465 firms. Financial and company data are collected from Refinitiv Eikon and CO2 emission data from Refinitiv environmental, social, and governance. A fixed-effects regression model was used to account for the firm-specific impact of CCP on CFP.	Findings indicate a positive association between CCP and CFP for firms engaging in SBTs, implying a positive relation between decarbonization efforts and financial results.
Yu et al. (2021)	Exploring whether a greater amount of environmental disclosure can reduce a firm’s ex ante cost of equity. This could occur because the quantity of environmental information changes investors’ risk perception of the company, thereby influencing its ex ante cost of equity.	A cross-country analysis of 1481 multinational corporations across 43 countries and territories from 2013 to 2019.	Investors price the amount of environmental disclosure. More environmental disclosure decreases a firm’s ex ante cost of equity because it lessens investors’ information asymmetry, until it reaches a certain threshold level, which once exceeded, a firm’s ex ante cost of equity will rise again.
Schaltenbrand et al. (2018)	Studying the effects of managerial experiences in making green investment decisions that are to be considered under stakeholder pressure.	Data are gathered from 247 managers about their past experience and their employer’s performance data. These data are combined with managerial responses to a vignette-based	Managers’ years of experience, their employers’ financial performance, and their employers’ market performance influence green investment decisions even

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Table 1 (continued)

Authors	Focus	Data and methods	Findings
		experiment, which required managers to make green investments based on a decision scenario where they are exposed to different types and strength of stakeholder pressure (from consumers and the community).	when making decisions under new and different set of circumstances. Compared to less-experienced managers, experienced managers invest more in response to consumer pressure but less in response to community pressure. GIF significantly improves corporate green innovation. The positive effect is more evident in state-owned enterprises, companies with a higher proportion of long-term GIF, and after the green financial system is introduced. GIF boosts stock returns, reduces stock risks, and achieves positive social valuation by lowering resource consumption and improving efficiency. GIF alleviates corporate financing constraints, while its industry experience enhances corporate green innovation. Green investing spurs companies to mitigate their carbon emissions by raising the cost of capital of the most carbon-intensive companies. Companies' emissions decrease when the wealth share of green investors and their sensitivity to climate externalities increase. However, heightened uncertainty regarding future climate risks alleviates green investors' pressure on the cost of capital of companies and pushes them to increase their emissions. The impact of green investors primarily
Chi et al. (2023)	Under the background of how the green financial system contributes to the goal of carbon peaking and neutrality, this study explores the relationship between green investment funds (GIFs) and corporate green innovation in Chinese listed firms. Authors propose social value logic to explain the green investment of GIF in addition to its commercial value logic.	A sample of 6119 firm-year observations from polluting companies listed in the A-share market between 2009 and 2019. The model used is a DID model to investigate the effect of GIF on corporate green innovation.	
De Angelis et al. (2023)	Exploring whether green investing pushes companies to reduce their greenhouse gas emissions, and if that's the case, what factors lead these companies to address and reduce their emissions and how these factors impact the dynamics of companies' emissions.	A dynamic equilibrium model populated by heterogeneous investors and companies. Authors model two different groups of investors (green investors and regular investors) with constant absolute risk aversion (CARA investors). Both groups determine their optimal allocation by maximizing their expected wealth at a given terminal date, but they differ in their climate beliefs.	

Table 1 (continued)

Authors	Focus	Data and methods	Findings
De Amicis et al. (2020)	Exploring the socio-demographic characteristics of investors who choose impact investment options over traditional investments, and on the drivers promoting such choices.	Experiment-based research in which 602 participants (non-experts and experts in the financial sector) took part in a multiple-choice game involving different investment scenarios and incentive conditions	governs companies' long-run emissions. Both expert investors and female participants are more likely to choose impact investment options. The tendency to invest in social funds increases with age. Neither external and centrally planned incentives, such as fiscal incentives, nor the educational level of participants show a significant influence on investment choices. Information about the actual social impact achieved by funds plays a role in promoting socially oriented decisions. With the firm's financial performance held constant, results showed that nonprofessional investors perceive the firm to be more valuable when it primarily uses an operational change strategy versus an offsets strategy. However, this only occurs when the firm's prior sustainability performance is below the industry average. These results are mediated by investors' perception that an operational change strategy is more socially and environmentally responsible than an offsets strategy.
Johnson et al. (2020)	Investigating whether investors value firms differently based on the strategies firms use to mitigate greenhouse gas emissions. These strategies consist of either making operational changes or purchasing offsets.	A sample of 674 participants was recruited from Amazon's Mechanical Turk platform to proxy for nonprofessional investors in the experiment. The authors used a 2 × 2 + 2 between-participants design, to create an investing scenario for prospective, nonprofessional investors in which they evaluate a firm's environmental performance and then assess its stock value before and after examining disclosures about its GHG emissions management strategy.	Decision-makers invest more in energy efficiency when evaluating from the energy bill perspective and derive important implications for environmentally friendly energy policymaking.
Rockstuhl et al. (2021)	Investigating the dichotomy in risk perception between the investment perspective and the energy bill perspective and analyzing how the contrary perspectives influence expected utility.	A case study based on real-world data of the German retrofitting market.	
Malshe et al. (2023)	Developing a conceptual framework that highlights: -the asymmetric	A six-step empirical strategy analyzing 10,248 firm-quarter observations from	CBBE and IIO indeed mediate the associations between E, S, and G performances and

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Table 1 (continued)

Authors	Focus	Data and methods	Findings
	relationships between individual E, S, and G performances and customer-based brand equity (CBBE) and institutional investor ownership (IIO). -the mediating roles of CBBE and IIO in the relationships between E, S, and G performances and firms' idiosyncratic risk.	416 unique firms from Q4 2012 to Q3 2020, collected from six different data sources.	idiosyncratic risk. While E performance has a positive and G performance a negative association with CBBE, E and S performances have a negative and G performance a positive association with IIO.

investment products to align with investor values and knowledge. De Angelis et al. (2023) expand on this by exploring how green investors—those prioritizing climate concerns—pressure companies to reduce greenhouse gas (GHG) emissions by increasing the cost of capital for carbon-intensive firms. However, when future climate risks appear uncertain, these investors may shift away from green assets, reducing their influence and allowing emissions to rise. This dynamic between investor preferences, financial structures, and corporate responses highlights the complexity of driving sustainable change. While the influence of green investors is growing, they remain outnumbered by traditional investors, whose wealth can dilute the impact of green investment strategies on corporate capital costs.

On the financial front, Bendig et al. (2023) investigate the link between corporate carbon emission performance and financial performance among firms committed to science-based emission reduction targets. Their analysis of 465 firms shows a positive correlation between decarbonization efforts and financial success, supporting the idea that environmentally conscious strategies can enhance both corporate sustainability and profitability. Similarly, Chi et al. (2023) examine how green investment funds (GIFs) promote corporate green innovation in Chinese firms. Their research, involving over 6,000 firm-year observations, demonstrates that GIFs significantly foster green innovation, particularly in state-owned enterprises and long-term GIF participants. Additionally, GIFs improve stock performance, reduce risk, and contribute to social value by reducing resource consumption and improving operational efficiency. These findings highlight the broader benefits of green investments as drivers of both innovation and financial stability. De Amicis et al. (2020) explore the socio-demographic factors that influence impact investing, finding that expert investors and women are more likely to choose socially responsible funds, with this tendency increasing with age. External incentives, such as fiscal policies, had little effect, underscoring that personal values and preferences, rather than external drivers, shape socially responsible investment decisions. The availability of information on the actual social impact of funds plays a critical role in influencing these decisions. Johnson et al. (2020) offer another perspective by examining how non-professional investors perceive corporate strategies to reduce GHG emissions. Their findings suggest that investors prefer firms that implement operational changes over those relying on carbon offsets, especially when sustainability performance is below industry averages. This reflects a broader preference for substantive actions over more superficial strategies.

Collectively, these studies paint a comprehensive picture of how impact investing, corporate behavior, and financial performance intersect. Impact investing emerges as both a viable financial strategy and a powerful tool for driving corporate responsibility, particularly in addressing environmental concerns and reducing carbon emissions. As

sustainable investment strategies continue to evolve, institutional and retail investors alike will play a crucial role in shaping corporate practices. However, it's important to acknowledge that concerns about climate risks and greenwashing can dissuade investors from choosing green assets. Despite the potential for growth, impact investing remains a niche market. Studies of diverse investor populations reveal mixed attitudes toward environmental and social performance (Malshe et al., 2023). Therefore, exploring how organizations can present their strategies—by emphasizing either financial or environmental aspects—will help gauge investor perceptions and preferences.

Organizations can pursue numerous sustainability strategies, with energy efficiency being just one example. We have chosen to focus on energy efficiency due to its relevance in today's context, particularly for tech companies, and its dual role as both a cost-reduction strategy and an environmental initiative. While Rockstuhl et al. (2021) examined decision-makers' risk perceptions of energy efficiency investments, this paper will explore external investors' views. Our goal is to compare financial and environmental approaches to energy efficiency and assess how factors such as technology (AI for energy efficiency vs. energy-efficient AI) and compliance (third-party certification vs. self-claimed standards) affect investor attitudes toward the strategy.

2.2. Economies of worth

For a long time, the utilitarian or means-end approach dominated the concept of rationality, as it was assumed that the primary goal of organizations was to generate profit and maximize utility and growth (Cloutier and Langley, 2007). However, scholars such as Friedland and Alford (1991), Townley (2002), and Thornton (2002) challenged this perspective, arguing that organizations operate at the intersection of multiple normative orders and that both individuals and organizations are guided by various forms of rationality, each rooted in competing institutional norms. Cloutier and Langley (2007) explored alternative views on rationality, comparing the frameworks developed by scholars to provide more realistic accounts of how actors form and justify opinions, actions, and decisions—both individual and collective. One such framework is the Economies of Worth (EW).

The EW framework, developed by Boltanski and Thévenot (2006 [1991]), is a key contribution to the French pragmatic "sociology of critique." Due to its valuable insights into social change and individual actions when facing controversies or conflicts, organizational scholars adopted this framework to examine actor behavior in organizations and complex institutional settings. Chiapello and Boltanski (1999) also used this lens to critique neocapitalism, addressing issues such as changing labor conditions, environmental degradation, and the relentless pursuit of profit (Richards et al., 2016). The EW framework is particularly notable for its recognition of the intricate dynamics between distinct normative orders within and between organizations (Cloutier et al., 2017). This makes it a pragmatic tool for understanding how social actors navigate compromises and agreements to maintain justice and address perceived unfairness (Boltanski and Thévenot, 2006).

The framework introduces the concept of "orders of worth," or "common worlds," which represent moral principles that actors use to justify their evaluations of objects, individuals, or practices, thereby legitimizing their positions in specific situations (Patriotta et al., 2011; Cloutier et al., 2017). These orders of worth, described as "higher common principles" (Patriotta et al., 2011, p. 1805), define appropriate forms of conduct in society and include seven categories: the industrial world, market world, civic world, inspired world, world of fame, and green world. Each world represents a distinct form of rationality that individuals can invoke in their judgments. For example, the green world values nature and ecological balance, while the market world prioritizes financial gain, competition, and self-interest. The industrial world, by contrast, emphasizes efficiency, technological advancement, and standardization, with a focus on science.

Although these moral orders are inherently distinct, scholars agree

that they are equally valid, with no universal hierarchy among them (Boltanski and Thévenot, 1991; Cloutier and Langley, 2007; Naccache and Leca, 2008). Organizations, existing in pluralistic institutional environments, are themselves composite structures that bring together different actors who, depending on the situation, may invoke different moral orders. Furthermore, organizations interact with a variety of stakeholders, each with their own priorities and interests. This internal and external plurality can lead to tensions, conflicts, and contradictions between competing rationalities, which individuals must resolve through compromises or agreements (Mesny and Mailhot, 2007; Oldenhof et al., 2014; Kozica and Brandl, 2015; Annisette et al., 2017; Lafaye and Thévenot, 2017; Stephanie and Moerman, 2018).

The EW framework has been widely used in studies on sustainability initiatives and ESG strategies, given the complexity and plurality of values involved, as well as the range of organizational actors engaged in these efforts (Gond et al., 2016; Demers and Gond, 2020; Shin et al., 2022; Olofsson, 2025), as well as understanding the complexity of resolving modern urgent issues known as the Grand Challenges (Cloutier et al., 2024) and navigating the evolving discourses and policies around energy regimes (Beamish and Biggart, 2017; Wallace et al., 2025). Implementing sustainability strategies often requires balancing conflicting principles and values, leading to tensions and disagreements among stakeholders, which necessitates collective efforts to find compromises or align perspectives (Nyberg and Wright, 2012, 2013; Levy et al., 2016; Reinecke et al., 2017; Wright and Nyberg, 2022). Scholars employing this framework focus not on which moral or institutional order prevails, but rather on how different logics coexist, interact, and compete within the same context and timeframe (Mesny and Mailhot, 2007; Nyberg and Wright, 2013; Oldenhof et al., 2014; Annisette et al., 2017; Arda et al., 2023).

This framework is particularly well-suited to our study, as we seek to understand the organizational conditions under which investors align financial interests with environmental values, thus drawing on different rationalities to evaluate a firm's energy efficiency efforts. The notion of "effectiveness," as identified by Cloutier and Langley (2007), is one of several key concepts that offer valuable data through the analysis of contentious interpretations, along with concepts like "performance," "success," and "quality."

When investors with diverse profiles and levels of investment experience are presented with the choice of supporting a company pursuing energy efficiency for financial gain versus one aiming to reduce its environmental impact, a tension arises between market and green values. This tension is becoming increasingly common with the rise of sustainable investment strategies, which attempt to integrate both financial and non-financial goals. As noted by Agrawal and Jespersen (2024), organizational objectives with social and environmental dimensions often compete with financial goals, resulting in a potential dilution of efficiency in one domain when emphasis is placed on the other. Traditional investors, typically representing the for-profit sector, are primarily guided by market world principles, focusing exclusively on profitability. In contrast, impact investors seek to balance environmental and social outcomes with financial returns, attempting to reconcile the green and market orders of worth. However, because impact investors still constitute a minority within the broader investment landscape, their influence tends to be diluted when analyzing a heterogeneous population of investors—as is the case in our study. This imbalance reinforces the dominance of market-based logics in shaping investment decisions, even in contexts where environmental considerations are increasingly salient.

Beamish and Biggart (2017) further emphasize that different social actors interpret energy through the lens of distinct orders of worth. While their study examines societal interpretations more broadly, our focus is narrower: we explore how industrial rationality, as it relates to energy efficiency, interacts with green and market logics in investor evaluations. Depending on the normative framework investors apply, they will prioritize different dimensions of value—financial or

environmental—which in turn shapes their perception of a firm's energy efficiency strategy and ultimately influences their willingness to invest.

Supporting this perspective, Malshe et al. (2023) found a negative relationship between a company's environmental performance and institutional investor ownership. We believe that in the context of energy efficiency, how a company presents and justifies its strategy, as well as the technology it uses, can significantly impact this relationship.

3. Hypotheses development

3.1. Energy management strategy

Energy management is defined as "the process of monitoring, planning, optimizing, and saving energy to create an energy-efficient system" (Sharma et al., 2022). It represents a strategic approach within an organization to effectively meet energy demands across its various systems. This can be achieved through procedural adjustments, operational improvements, reducing energy consumption in certain areas, or optimizing processes (Abdelaziz et al., 2011). At the level of a country or a territory, energy management systems are witnessing a great shift, with hybrid renewable energy systems (HRES) gaining traction as they hold great promise for sustainable electrification and offer countries support to reach their energy access goals (Elkadeem et al., 2021). With imminent problems such as the depletion of fossil fuels, climate change, air pollution and an ever-increasing population, the proportion of new energy has been steadily increasing. However, these systems have limitations due to the intermittent nature of renewable energy sources such as solar and wind sources and their spatial diversity, which calls for the integration of energy storage technologies to guarantee designs cost-effectiveness and reliability. This is where HRES prove to be useful, securing an access to modern energy services through the combined integration of several renewable energy systems. HRES are especially relevant and useful for isolated systems and rural areas or communities located in islands given that these solutions are most profitable for these areas and can avoid tons of greenhouse gas emissions (Cano et al., 2021).

At the internal organizational level, firms that implement energy management systems (EnMS) often pursue varying objectives, which are shaped by distinct value logics. Some companies are primarily driven by market world principles, focusing on reducing operational costs to enhance profitability (de Macedo et al., 2020), while others are motivated by green world values, aiming to lower overall energy consumption and reduce CO₂ emissions to minimize environmental impact (Mahmood et al., 2022). Depending on their resources, capacity, and organizational culture, companies may see these worlds as conflictual and contradictory relative to their objectives, or succeed at aligning them by achieving a balance that satisfies both economic performance and sustainability imperatives. In our study, we define this orientation—whether focused on financial savings or environmental sustainability—as the company's "energy management strategy."

Energy management initiatives are frequently driven by efforts to enhance both environmental, social, and governance (ESG) performance and overall profitability. Effective ESG policies have a notable influence on a company's reputation among clients and investors. Numerous studies emphasize the importance of strong ESG performance for maintaining customer engagement and presenting an attractive image to investors. However, research on the link between ESG performance and investors' perception of firm risk presents mixed results. Drawing on the EW framework, the findings introduced by Malshe et al. (2023) showed that a high performance according to the green world principles does not align with investors' market world focus. When exploring investor attitudes towards ESG performance, they found that high environmental performance was negatively associated with institutional investor ownership, while strong governance performance showed positive associations. This suggests that investors may perceive a focus on environmental performance as a potential financial risk, fearing increased costs and reduced profitability. Institutional investors, therefore, tend to

prioritize financial returns over sustainability efforts when evaluating investment opportunities. This shows that the green and market worlds can be in conflict in the context of investor decision-making. Similarly, [Rotzek et al. \(2018\)](#) identified common investor behaviors, such as risk aversion, bounded rationality, short-term profitability concerns, and myopia, as barriers to energy efficiency measures, further emphasizing the challenges faced by companies that pursue sustainability-driven strategies.

Given the increasing importance of energy management strategies in the industrial sector, it is critical to explore how companies call upon different orders of worth to justify their strategies and how they influence investors' perceptions. Understanding whether a company's energy management strategy—framed either as a financial initiative from a market world perspective or as an environmental action from a green world standpoint—aligns or comes into conflict with investors' valuations, affecting their perceptions and consequently their behaviors, is highly relevant in today's context.

The literature further indicates that impact investors consider not only a company's early sales and profitability, but also its social mission when making investment decisions ([Agrawal and Jespersen, 2024](#)). In contrast, traditional investors tend to focus primarily on financial metrics, such as profitability and early market performance. In alignment with the market world principles, where performance, competition and profitability are the primary evaluation standards, key decision variables influencing investor behavior include the market and industry potential, growth trajectory, degree of innovation, the nature of the product or service, and the scalability of the business model ([Paul et al., 2007](#); [Maxwell et al., 2011](#); [Agrawal and Jespersen, 2024](#)).

Building on this evidence, we hypothesize that an energy management strategy primarily framed around CO₂ emissions reduction will be less appealing to investors than one centered on financial savings. Strategies justified through green world principles—emphasizing environmental responsibility—may not align with the market-based logics that investors typically apply in evaluating the legitimacy and attractiveness of corporate initiatives. In particular, investors with short-term financial objectives may perceive environmentally driven strategies as costly and potentially less profitable, whereas a strategy emphasizing cost savings is more likely to be viewed as low-risk and directly aligned with their economic goals. Thus, the framing of the justification—whether environmental (i.e. green world) or financial (i.e. market world)—plays a key role in shaping investor perceptions of strategic legitimacy and effectiveness.

H1. When it comes to energy management strategies, environmental motivations (as opposed to financial motivations) reduce investors' willingness to invest.

3.2. Perceived energy efficiency

In their study on sustainable investing, [Carlsson Hauff \(2022\)](#) found that for sustainable investment funds to perform at their full potential, they must demonstrate genuine effectiveness in their sustainable investment strategies and their ability to meet the associated challenges. The willingness of retail investors to engage with such funds depends heavily on the perceived effectiveness of their approach. Drawing a parallel with a company presenting its energy efficiency strategy, we believe a similar psychological mechanism applies. For investors to be willing to invest in a company based on its energy performance, the company must convincingly demonstrate that it is truly efficient—both in achieving tangible results and in making a meaningful impact on its energy use, we refer to this concept as perceived energy efficiency.

Energy efficiency investments have consistently been shown to be highly cost-effective compared to other saving options, offering significant economic benefits to the investor ([de Macedo et al., 2020](#)). In the way these investments are typically communicated, their value is often framed through the industrial and market orders of worth, emphasizing

enhanced competitiveness, reduced operational costs, and profit maximization ([Laskurain et al., 2017](#)). In contrast, benefits highly valued in the green world, such as reducing CO₂ emissions and minimizing environmental impact are often framed as secondary, or they may be omitted altogether in the communication. Consequently, we expect that the emphasis on financial savings through energy efficiency would align better with investors' usual market world evaluation and perception of competency and effectiveness in this context compared to an emphasis on reducing CO₂ emissions. Investors are likely to see financial savings as a clearer indicator of a firm's ability to manage energy effectively, which could influence their perception of the company's overall energy efficiency.

This investor preference aligns with the market world logic and broader evidence suggesting that financial motivations, which highlight measurable, profit-oriented outcomes, are more readily associated with successful energy management. Environmental motivations rooted in the green world logic, on the other hand, may be perceived as riskier or less immediately profitable. Therefore, we hypothesize that the perceived energy efficiency of a firm serves as a key mediating factor in shaping investor responses. Specifically, investors are more likely to view companies focused on financial savings as having a more effective energy strategy, thereby mediating the negative impact that environmental motivations might have on their willingness to invest.

H2. Investors' perceptions of a firm's energy efficiency mediate the negative impact of environmental motivations (as opposed to financial motivations) on their willingness to invest.

3.3. AI implementation

In their study, [Zechiel et al. \(2024\)](#) developed an innovative AI × Sustainability framework that explores how customers perceive different strategic approaches to AI implementation. The framework contrasts two types of AI: "AI for sustainability", where AI is employed to achieve sustainability goals, and "sustainable AI", where the AI technology itself is designed to be energy efficient, combined with two types of sustainability: ecological and social. Their findings show that by understanding which combinations of types of AI and sustainability are most appreciated, companies can refine their corporate communication. The goal is to understand which type of AI aligns best with which justification for the company's approach to sustainability. Drawing from this framework, we operationalize energy efficiency as a specific strategy in the context of sustainability, as we take two types of AI: AI for energy efficiency and energy efficient AI.

Recognizing that investors are key stakeholders who increasingly expect companies to adopt sustainable technologies, we employed a similar analytical framework to assess how investors perceive a company's strategic positioning in AI implementation, particularly with regard to energy efficiency. The application of AI in energy-related domains has gained significant traction in both academic and business contexts ([Nishant et al., 2020](#)). Core areas of focus in AI-driven energy research include energy distribution, operations and maintenance, building energy consumption, energy production, and public sentiment toward renewable energy ([Nishant et al., 2020](#)). In addition to this perspective, [Al-Othman et al. \(2022\)](#) provided further insights into common AI applications in energy systems, such as the development of smart electric grids, optimization of demand response mechanisms, enhancement of computing efficiency, and improvements in manufacturing processes. Based on these studies, we can observe the growing strategic relevance of AI for achieving energy efficiency and sustainability goals.

In an effort to stimulate impactful research and explore the practical applications of artificial intelligence (AI) in the context of environmental sustainability, [Nishant et al. \(2020\)](#) conducted a comprehensive literature review to examine the role of AI in addressing environmental challenges, while also evaluating its limitations from social, ethical, and

technical perspectives. Their review identified over 250 empirical, theoretical, and review-based studies published between 2015 and 2019 that applied AI techniques to areas such as energy conservation and renewable energy. These studies utilized a range of AI components—including machine learning—and technical approaches such as artificial neural networks, support vector machines, and regression models. The applications spanned various domains, including energy use in buildings, energy production and distribution, and operations and maintenance, highlighting the breadth and growing significance of AI in supporting sustainable energy transitions.

A firm can choose to use AI as a tool to optimize its energy consumption and improve energy efficiency—what we refer to as AI for energy efficiency—in applications such as data center optimization, smart building management, supply chain optimization, and manufacturing process improvements (Farghali et al., 2023; Zhang et al., 2017; Govindan and Cheng, 2015). OptiPower AI algorithm represents an example of a commercial solution (Slama, 2025), offering a system that efficiently manages Renewable Energy Sources and Electric Vehicles and resulting in an energy costs reduction by 19.8 % and a 50.2 % decrease in average energy prices across two scenarios: Peer-to-Peer energy trading and Vehicle-to-Everything technology.

Alternatively, a firm may highlight that it is using energy-efficient AI meaning that the AI technology itself has been designed to minimize energy consumption and reduce energy waste (Uddin and Rahman, 2012; Roy et al., 2019; Schwartz et al., 2020). This includes energy-efficient hardware, efficient algorithms, and green cloud computing. Energy-efficient AI is specific type of Green AI, emphasizing that this version of AI not only reduces energy consumption but also lowers CO₂ emissions (Schwartz et al., 2020).

Firms can adopt different energy management strategies, with some focusing on market world goals by reducing operational costs without significant attention to environmental impact, while others prioritize green world objectives by reducing emissions as their primary energy efficiency goal, even if it results in suboptimal financial savings. In our framework, we integrate these two dimensions—AI implementation and energy management strategy—to examine which combination investors find most appealing. Specifically, we aim to explore whether the type of AI technology adopted influences investor evaluations based on the perceived alignment between the technology's function and the justificatory principles underpinning the strategy.

We hypothesize that when companies use energy-efficient AI their perceived energy efficiency will be higher when their strategy is oriented towards reducing CO₂ emissions rather than cutting financial costs. Energy-efficient AI is understood as a greener form of technological innovation, an industrial world object that aligns with green world principles. Its legitimacy arises from its dual relevance to both industrial efficiency and environmental responsibility, bridging the logics of performance optimization and ecological impact mitigation. We expect that this value coherence—between the company's goal (emissions reduction) and the means employed (energy-efficient AI)—will enhance investor perceptions of the firm's strategic credibility and operational efficiency. In this scenario, the perceived alignment between the company's goals (emissions reduction) and the means used to achieve them (energy-efficient AI) will enhance investors' perception of the firm's overall efficiency.

H3a. When companies implement energy-efficient AI, perceived energy efficiency is higher under environmental motivations (versus financial motivations).

In contrast, we predict that companies using AI as a tool to enhance energy performance—AI for energy efficiency—will have a higher perceived energy efficiency when their strategy is oriented towards reducing costs rather than CO₂ emissions. AI technologies are generally programmed to optimize processes and reduce inefficiencies, focusing primarily on operational improvements rather than emissions reduction. This means that while AI can reduce energy waste, it does not inherently

address which processes emit the most carbon, what type of energy is being used, or whether the AI itself contributes to emissions, making it a solely industrial world object. Without a deliberate focus on the environmental impact of both AI and energy consumption, the company's energy efficiency efforts may be perceived through a market-oriented lens. In this case, investors are likely to assess the firm's energy efficiency based on financial savings rather than environmental outcomes. Given that the principles invoked in this approach align more with industrial and market logics, investors may view financial motivations as a more straightforward and measurable indicator of energy efficiency.

H3b. When companies implement AI for energy efficiency, perceived energy efficiency is higher under financial motivations (versus environmental motivations).

3.4. Certification-driven strategy

Obtaining a certification signals to an organization's stakeholders that it complies with well-recognized standards, thereby granting legitimacy in the specific area covered by the certification (King et al., 2005; Eberhart and Armanios, 2022). Certification can be defined as “a process in which a central institutional actor with authority or status formally acknowledges that a venture meets a particular standard” (Sine et al., 2007a,b, p. 578). This formal acknowledgment not only provides legitimacy but also serves as a key motivation for companies to seek certification. Other incentives include regulatory compliance, enhancing corporate image, improving competitiveness, adapting to industry-specific requirements, and responding to external pressures (King et al., 2005; Bowler et al., 2017; Robinson et al., 2021).

In the field of energy management, the ISO 50001 certification, established in 2011, is the most prominent standard. It has quickly become one of the fastest-growing ISO management standards (Yuriev and Boiral, 2018). Organizations pursue ISO certifications not only because they are internationally recognized but also to gain a competitive edge and demonstrate excellence in their operations (Mkhaimer et al., 2017). With rising energy costs and growing climate concerns, managing energy performance has become a priority for many firms. ISO 50001 provides a structured framework for systematically improving energy performance, engaging top management and employees, and ensuring continuous improvement. This certification requires firms to establish clear goals, track progress, and report outcomes to third-party accreditation bodies (Trubetskaya et al., 2023). While ISO 50001 is not directly designed to reduce CO₂ emissions, its implementation is expected to significantly contribute to lower environmental impacts and reduced climate costs (Laskurain et al., 2017).

A study conducted in 2024 by the French Standardization Association (AFNOR) involving 486 organizations currently or previously certified under ISO 50001 found that the standard is widely recognized as a structuring tool for supporting the energy transition, with a growing emphasis on decarbonization (AFNOR Energies, 2024). A majority of respondents identified “engaging the company in the energy transition” (p.5), with a strong decarbonization focus, as their primary motivation for implementing an energy management system. Additionally, the need to reduce greenhouse gas (GHG) emissions ranked among the top three initial reasons for adopting ISO 50001. These findings reflect a strengthening association between ISO 50001 certification and CO₂ emissions reduction, as well as a desire among organizations to align industrial, civic, and green logics by complying with increasingly stringent regulations while improving energy efficiency and reducing their environmental impact.

By obtaining ISO 50001 certification, firms can legitimize their energy efficiency strategies and provide external proof of their commitment. This certification holds firms accountable to both accreditation bodies and their stakeholders, signaling that the organization is considering the interests of external actors rather than operating in a purely self-serving manner. In the context of our study, this external

compliance lends greater legitimacy to energy efficiency strategies aimed at reducing emissions. Supporting this view, Richards et al. (2016) found that firms seeking to enhance legitimacy by appealing to civic and environmental principles are more likely to adopt sustainability certifications. Thus, we hypothesize that when a firm's energy performance strategy focuses on reducing emissions, ISO 50001 certification will result in higher perceived energy efficiency compared to when the firm's goal is to reduce financial costs. In this case, investors who can align their market rationality with green principles are likely to recognize and appreciate the firm's commitment to sustainability, reinforcing the legitimacy of the firm's efforts.

H4a. When companies rely on externally certified energy management, perceived energy efficiency is higher with environmental motivations (vs. financial motivations).

In contrast, a company may opt to follow its own self-imposed standards and set its own energy efficiency policies, relying on self-claimed energy management. This approach can be seen as more self-centered, often indicating that the firm is primarily focused on market performance and financial outcomes. In this scenario, the company's strategy is justified primarily by market world logic, with less emphasis on external validation or civic responsibility. Investors, therefore, are more likely to evaluate the firm's strategy based on its potential for financial gains. We predict that when a firm's energy efficiency strategy is framed around reducing costs, relying on self-imposed standards will result in higher perceived energy efficiency compared to when the firm's goal is to reduce emissions. This reflects the alignment of self-claimed energy management with market and industrial principles, where financial savings are the key performance metric.

H4b. When companies rely on self-claimed energy management, perceived energy efficiency is higher with financial motivations (vs. environmental motivations).

3.5. AI implementation \times compliance

Without external validation, firms must rely on their internal resources and strategies to convince investors of their effectiveness. As Sine et al. (2007a,b) and King et al. (2005) suggest, certification lends legitimacy by providing an external stamp of approval. Without certification, companies are more vulnerable to investor skepticism, as there is no third-party validation to reinforce the company's claims of energy efficiency. Investors are likely to be more cautious in evaluating the firm's performance when it lacks an external compliance mechanism (Bowler et al., 2017). In the absence of certification, the specific alignment between the type of AI implementation and the firm's energy management strategy becomes even more critical.

When companies implement energy-efficient AI, they are deploying an industrial world object that aligns with the goals of the green world, as it emphasizes minimizing energy waste and reducing carbon emissions (Schwartz et al., 2020). In the absence of external certification—which would otherwise reinforce the green world justification—investors may turn to the internal alignment between the firm's technological choices and its stated environmental objectives as a proxy for credibility. In such cases, investors are likely to expect that the company applies self-claimed standards to ensure that the technology genuinely supports its energy efficiency goals. A strong alignment between the green-oriented AI technology and the firm's environmental mission may thus enhance the perceived legitimacy and efficiency of the strategy, signaling to investors a genuine commitment to sustainability—even in the absence of formal third-party validation.

H5a. When companies rely on self-claimed energy management and implement energy-efficient AI, perceived energy efficiency is higher when the strategy emphasizes environmental motivations rather than financial motivations.

Without certification, companies using AI for energy efficiency will be seen as more efficient when their strategy is geared toward financial savings rather than emissions reduction. This is because AI for energy efficiency is best understood as a purely industrial world object, designed primarily to optimize operational performance—such as reducing energy costs or improving system reliability—rather than purposefully targeting environmental outcomes (Govindan and Cheng, 2015). In this context, the firm doesn't invoke the green world principles, neither in its compliance approach nor in the nature of the AI technology it employs. As a result, investors are more likely to evaluate the firm's energy strategy from a market world perspective, prioritizing financial performance as the most concrete and credible indicator of efficiency.

Previous research supports this rationale, showing that financial motivations tend to align more closely with investor decision-making frameworks, particularly when companies rely on self-claimed standards rather than external validation (Agrawal and Jespersen, 2024; Malshe et al., 2023). In such cases, the absence of third-party certification shifts investor attention toward clear, quantifiable outcomes, with cost savings serving as the most straightforward performance metric. Thus, when firms adopt AI to optimize energy use without external verification, financial gains are likely to carry greater weight in shaping investor perceptions of the strategy's legitimacy and effectiveness.

H5b. When companies rely on self-claimed energy management and implement AI for energy efficiency, perceived energy efficiency is higher when the strategy emphasizes financial motivations rather than environmental motivations.

Certification provides external legitimacy, signaling that a company's energy strategy meets recognized standards, which enhances its credibility (Eberhart and Armanios, 2022). The ISO 50001 certification, for example, ensures that firms are systematically improving their energy performance (Yuriev and Boiral, 2018), but is also perceived as a structuring tool for supporting the energy transition, with a growing emphasis on decarbonization (AFNOR Energies, 2024), which not only reassures stakeholders but also bolsters perceptions of energy efficiency, particularly when linked to broader sustainability goals (Richards et al., 2016). The company thus follows a compliance measure that puts an emphasis on the green world principles to justify its legitimacy.

When this certification is coupled with the implementation of energy-efficient AI—a technological object grounded in the industrial world but serving green world objectives—an additional layer of justification is introduced, reinforcing the firm's commitment to environmental responsibility. As previously discussed, energy-efficient AI helps reduce energy waste and carbon emissions, functioning at the intersection of industrial and green worlds. In this scenario, the coherence between the compliance measure and the implemented technology, both aligned with green world values, strengthens the firm's credibility when it comes to its commitment to sustainability. We argue that the assurance of operational efficiency and good governance provided by certification (Mkhaimer et al., 2017) serves to mitigate investor skepticism, especially around the perceived risks associated with environmentally motivated strategies (Rotzek et al., 2018). This alignment clearly communicates that the company's environmental goals are achievable and managed within a structured framework. However, in the absence of any explicit justification linked to market world principles, most investors, given their inherent on profitability, may still prefer companies that frame their energy strategy in financial terms, as a signal that economic performance remains a priority (Agrawal and Jespersen, 2024). Thus, while green-aligned justifications and technologies enhance legitimacy among sustainability-conscious investors, companies may still need to reassure more traditional investors by integrating market-oriented framing to avoid perceptions of neglecting financial performance.

H6a. When companies rely on an externally certified energy management and implement energy-efficient AI, perceived energy efficiency

is higher when the strategy emphasizes financial motivations rather than environmental motivations.

When companies implement AI for energy efficiency in combination with certification, investors might be more likely to perceive higher levels of energy efficiency—particularly when the firm emphasizes CO₂ emissions reduction rather than purely financial savings. While AI for energy efficiency is fundamentally an industrial world object, designed to enhance operational performance, optimize processes, and reduce energy-related costs, certification adds a complementary green world justification (Richards et al., 2016). In this scenario, certification serves to validate the firm's sustainability efforts, signaling that the AI-driven optimizations are not only cost-effective but also aligned with environmental objectives. As Carlsson Hauff (2022) highlights, certification plays a critical role in demonstrating the credibility and effectiveness of sustainability initiatives, thereby helping to reframe AI for energy efficiency within a broader environmental narrative.

This combination of technological optimization and external validation can shift investor perceptions, suggesting that the cost savings achieved through AI tools could be reinvested into the company's decarbonization efforts, given that the certification proves the company's true commitment towards sustainability. Unilever is a prime contemporary example of a corporation that has quantified energy-efficiency savings and explicitly reinvested them into sustainability capital projects. The company has saved over €1 billion since 2008 through energy efficiency projects, and is investing €150 million in its manufacturing decarbonization program among other sustainability related projects (Unilever, 2024; Jessen, 2025). This case illustrates how operational savings can serve as a financial lever for advancing environmental goals, helping to counter concerns that sustainability strategies may undermine profitability. Certification, in this context, acts as a bridge between industrial efficiency and environmental responsibility, reinforcing the idea that the firm's strategy contributes meaningfully to sustainability. Prior research supports this view, showing that environmentally conscious strategies can enhance both corporate sustainability and financial performance, indicating a potential alignment of investor interests across green and market logics (Bendig et al., 2023).

H6b. When companies rely on an externally certified energy management and implement AI for energy efficiency, perceived energy efficiency is higher when the strategy emphasizes environmental motivations rather than financial motivations.

3.6. Control variables

We include gender, age, years of investment experience and Green value as control variables to make sure that our dependent variable is indeed explained by the psychological mechanism we are studying (perceived efficiency) instead of other individual-level differences that may influence investment behavior independently of our experimental manipulations. Gender, age and years of investment experience are controlled given that prior research showcased that expert investors and female participants are more likely to choose socially or environmentally responsible investment options and that the tendency to invest in social funds increases with age (De Amicis et al., 2020).

Green value, defined as the degree to which individuals prioritize and confer value to environmental sustainability and environmentally friendly products (Haws, Winterich and Naylor, 2014), is controlled for because it can directly influence the appeal of environmentally focused investment strategies and products. As shown by De Amicis et al. (2020), external incentives, such as fiscal policies, had little effect on responsible investment decisions, underscoring that personal values and preferences, rather than external drivers, shape socially responsible investment decisions. Consequently, investors with strong green values may be predisposed to favor strategies framed around environmental benefits, regardless of their assessment of those strategies' operational efficiency or financial rationale. Controlling for green value thus allows us

to better isolate the effect of our experimental manipulations on investor perceptions.

Fig. 1 represents the research model.

4. Overview of studies

The overarching aim of these studies is to examine how investors evaluate organizations' energy management strategies, focusing on the justifications provided for these strategies, the compliance measures adopted, and the technologies implemented. Drawing on the Economies of Worth (EW) framework, the research investigates how companies call upon different orders of worth to justify their strategies and how they influence investors' perceptions and behavior.

Study 1 explores investor judgments of strategic legitimacy across two justification scenarios. The first scenario presents an energy efficiency strategy justified through market world principles (i.e., financial motivations such as cost reduction), while the second scenario draws on green world principles (i.e., environmental motivations such as CO₂ emissions reduction). The goal is to assess which orders of worth, when mobilized by the organization to justify its strategy, resonate with those typically used by investors in their evaluation processes. More specifically, the study asks whether justifications rooted in environmental values align—or conflict—with the market-based logics that investors often apply when making investment decisions.

Study 2 builds on these scenarios by introducing a second layer: the type of AI technology implemented: energy-efficient AI vs AI for energy efficiency. These two approaches reflect different value logics: AI comes as an industrial world object, that bridges a link with the green world in the case of energy efficient AI, and a link with the market logic in the case of AI for energy efficiency as explained in the hypotheses. This study investigates whether the type of AI technology adopted influences investors' judgments based on the perceived alignment between the technology's purpose and the justificatory principles underlying the strategy.

In Study 3, we swap the type of AI implemented with compliance measures, to test each boundary condition separately. Here, investors are presented with the same strategic justifications as in Study 1, but now the organization either adopts self-claimed standards or an externally certified energy system to support its claims. These measures reflect different justificatory logics: self-claimed standards represent a market/industrial rationale, emphasizing internal control and efficiency, whereas external certification (e.g., ISO 50001) signals social and environmental responsibility, resonating with the green world. ISO 50001 is chosen for its widespread recognition among managers as a robust, structured framework for decarbonization and energy transition. The study examines whether the perceived legitimacy of a strategy depends on the coherence between the justification provided (market vs. green) and the type of compliance measure employed.

Study 4 combines both boundary conditions—compliance measures and types of AI implementation—to explore how these two dimensions interact in shaping investors' perceptions of a strategy's efficiency. The objective is to identify the optimal combination of compliance mechanism (self-claimed standards vs. external certification) and AI technology (energy-efficient AI vs. AI for energy efficiency) that best aligns with the justificatory principles underlying an energy efficiency strategy. By presenting investors with integrated scenarios, this study examines whether coherence across all three elements—the strategy's justification (market vs. green), the chosen compliance measure, and the AI implementation—enhances perceived efficiency. Ultimately, this study seeks to uncover which configurations are most persuasive to investors when evaluating a company's commitment to sustainable and technologically advanced energy practices.

To evaluate investor behavior, we structure our research design by drawing on prior studies in consumer behavior (Li et al., 2025; van der Sluis et al., 2025; Weiss and Tanner, 2025; Wu and Morwitz, 2025) as well as in organizational behavior (Carnevale et al., 2022; Ogunfowora

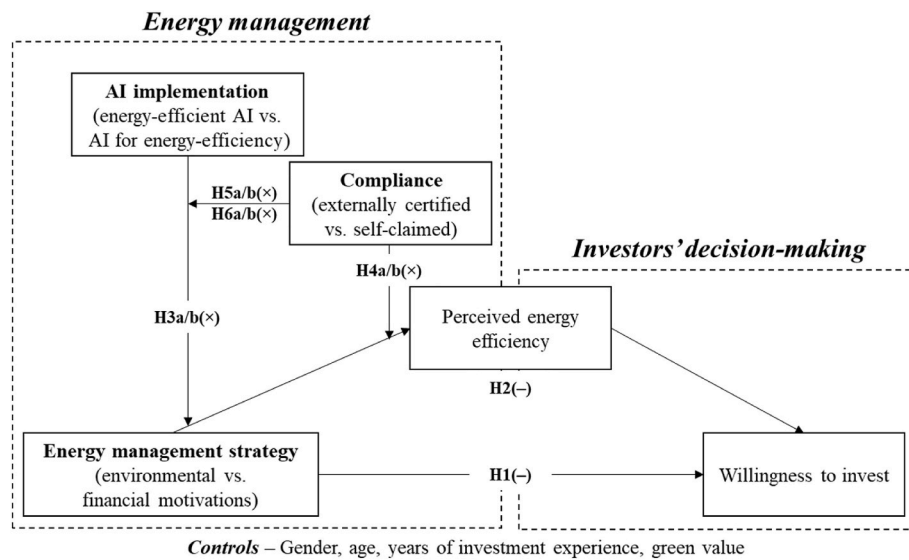


Fig. 1. Research model.

et al., 2023; Hamrick et al., 2024). These studies commonly follow a structured approach to presenting methods, beginning with a general overview of the research design, followed by separate sections for each study, where specific details regarding measures, manipulation checks, and results are presented. Each study investigates either one or several mediating psychological mechanisms or a moderating boundary condition. We adopt a similar format in this paper to ensure clarity and coherence across the multiple studies conducted. The first study aims to explore the psychological mechanism underlying investment decisions. Subsequent studies are designed to investigate the conditions under which this mechanism is activated or influenced. To do so, we conduct a separate study for each proposed boundary condition, allowing for a more nuanced understanding of the factors that shape investor decision-making in sustainability-oriented contexts.

5. Study 1 – Mediation model

5.1. Research design

Study 1 aimed to provide insight into the proposed mediation model by checking the direct relationship between the company's energy management strategy and investors' willingness to invest as well as the indirect impact of perceived energy efficiency. The respondents were shown a scenario where the company decided to enhance its performance by focusing on energy efficiency and technological advancement (Appendix 1).

Regarding the company's strategy, respondents were presented with one of two scenarios. In the first scenario, the focus was on financial motivations, where the company highlighted that its efforts to reduce energy consumption had led to substantial cost savings within a year, with plans to achieve further reductions by the following year. In the second scenario, the focus was on environmental motivations, where the company emphasized that its energy consumption reduction efforts had significantly decreased CO₂ emissions over the year, with ongoing goals to achieve additional reductions by the next year.

As manipulation checks, participants were asked to recall the strategy ("1 = financial motivations, 7 = environmental motivations").

5.2. Sample

Three hundred U.S.-based participants from Prolific ($M_{\text{age}} = 38.4$, $SD = 11.45$, 60.67% men) took part in this experiment in exchange for £9 per hour (median completion time = 4'01") in 2024. To ensure that

the effect was not limited to individuals unfamiliar with investments, we recruited only participants with relevant experience. All potential participants were asked two screening questions—only those with investment experience ($M_{\text{years of investment}} = 8.57$, $SD = 7.92$) and who frequently evaluate a company's stock as a potential investment were eligible to participate (i.e., those who responded "Sometimes," "Most of the time," or "Always"). Participants who answered "0" to the first question or "Never" or "Rarely" to the second question were screened out at the beginning and did not proceed with the study.

5.3. Measures

Perceived energy efficiency was assessed with a three-item 7-point Likert scale (e.g., "The way the company approaches energy efficiency generates results"; "1 = strongly disagree, 7 = strongly agree"; adapted from Carlsson Hauff (2022); $\alpha = .88$). Willingness to invest was evaluated with a three-item 7-point scale ("1 = extremely unwilling/unlikely/improbable, 7 = extremely willing/likely/probable", adapted from Carlsson Hauff (2022), $\alpha = .93$). Green value was measured with a six-item 7-point Likert scale (e.g., "I consider the potential environmental impact of my actions when making many of my decisions."; "1 = strongly disagree, 7 = strongly agree"; adapted from Haws et al. (2014); $\alpha = .93$). The complete psychometric properties—including reliability, convergent validity, and discriminant validity—as well as the assessment of common method bias are presented in Appendices 2–4.

5.4. Results

5.4.1. Manipulation check

The manipulations of strategy were successful. Participants in the environmental motivations condition rated significantly higher ($M = 5.94$, $SD = 1.42$) than were participants in the financial motivations condition ($M = 2.72$, $SD = 1.79$, $t(298) = -17.33$, $p < .001$, $d = -2.00$).

5.4.2. Willingness to invest

To test H1, we analyzed whether an energy management strategy focused on environmental motivations (compared to financial motivations) decreased investors' willingness to invest. In line with H1, the regression analysis showed that environmental motivations had a significant negative impact on investors' willingness to invest ($b = -.24$, $p = .031$).

5.4.3. Perceived energy efficiency

To test whether perceived energy efficiency mediates the decrease in willingness to invest under environmental motivations, we conducted a mediation analysis using PROCESS (Model 4; Appendix 5) with 5,000 bootstrapped samples (Hayes, 2021). The results indicated that the direct effect of strategy on willingness to invest was no longer significant ($b = -.12$, 95 % CI = $[-.3173, .0690]$), as perceived energy efficiency fully mediated the relationship between environmental motivations and the decrease in willingness to invest ($b = -.12$, 95 % CI = $[-.2462, -.0140]$), supporting H2.

6. Study 2 – AI implementation

6.1. Research design

Study 2 aimed to provide initial support for the proposed mediation model. Study 2 used a 2 (energy management strategy: environmental vs. financial motivations) \times 2 (AI implementation: energy-efficient AI vs. AI for energy efficiency) between-subjects design. The respondents were shown a scenario where the company decided to enhance its performance by focusing on energy efficiency and technological advancement through the use of high-end artificial intelligence by the end of the year (Appendix 1).

Regarding the company's strategy, respondents were presented with one of two scenarios. In the first scenario, the focus was on financial motivations, where the company highlighted that its efforts to reduce energy consumption had led to substantial cost savings within a year, with plans to achieve further reductions by the following year. In the second scenario, the focus was on environmental motivations, where the company emphasized that its energy consumption reduction efforts had significantly decreased CO2 emissions over the year, with ongoing goals to achieve additional reductions by the next year.

Regarding the company's AI implementation, respondents were randomly presented with one of two scenarios. In the first scenario, the focus was on energy-efficient AI, where the company optimized AI usage through sustainable software development, efficient algorithms, and data center optimization to reduce computational resources and energy waste. In the second scenario, the focus was on AI for energy efficiency, where AI was employed to enhance the overall energy performance of the company's processes, including sustainable product design and smart office management, to reduce energy consumption and environmental impact.

As manipulation checks, participants were asked to recall the strategy ("1 = financial motivations, 7 = environmental motivations") and the AI implementation ("1 = energy-efficient AI, 7 = AI for energy efficiency") they read about the company.

6.2. Sample

Three hundred U.S.-based participants from Prolific ($M_{\text{age}} = 41.76$, $SD = 13.36$, 61 % men) took part in this experiment in exchange for £9 per hour (median completion time = 5'57") in 2024. To ensure that the effect was not limited to individuals unfamiliar with investments, we recruited only participants with relevant experience. All potential participants were asked two screening questions—only those with investment experience ($M_{\text{years of investment}} = 11.91$, $SD = 10.23$) and who frequently evaluate a company's stock as a potential investment were eligible to participate (i.e., those who responded "Sometimes," "Most of the time," or "Always"). Participants who answered "0" to the first question or "Never" or "Rarely" to the second question were screened out at the beginning and did not proceed with the study.

6.3. Measures

Perceived energy efficiency was assessed with a three-item 7-point Likert scale (e.g., "The way the company approaches energy efficiency

generates results"; "1 = strongly disagree, 7 = strongly agree"; adapted from Carlsson Hauff (2022); $\alpha = .88$). Willingness to invest was evaluated with a three-item 7-point scale ("1 = extremely unwilling/unlikely/improbable, 7 = extremely willing/likely/probable", adapted from Carlsson Hauff (2022), $\alpha = .93$). Green value was measured with a six-item 7-point Likert scale (e.g., "I consider the potential environmental impact of my actions when making many of my decisions."; "1 = strongly disagree, 7 = strongly agree"; adapted from Haws et al. (2014); $\alpha = .93$). The complete psychometric properties—including reliability, convergent validity, and discriminant validity—as well as the assessment of common method bias are presented in Appendices 2–4.

6.4. Results

6.4.1. Manipulation checks

The manipulations of strategy and AI implementations were successful. Participants in the environmental motivations condition rated significantly higher ($M = 6.37$, $SD = 1.01$) than were participants in the financial motivations condition ($M = 2.90$, $SD = 2.02$, $t(298) = -18.61$, $p < .001$, $d = -2.15$). Similarly, participants in the AI for energy efficiency condition rated significantly higher ($M = 6.04$, $SD = 1.61$) than were participants in the energy-efficient AI condition ($M = 3.03$, $SD = 2.39$, $t(298) = -12.76$, $p < .001$, $d = -1.47$).

6.4.2. Perceived energy efficiency

To examine evidence for H3, we examined whether strategy affected perceived energy efficiency depending on AI implementation. A two-way ANCOVA (i.e., with covariates) revealed two nonsignificant main effects of strategy ($F(1, 292) = .04$, $p = .84$, $\eta^2 = .00$) and AI implementation ($F(1, 292) = .50$, $p = .48$, $\eta^2 = .00$). This was qualified by a significant interaction effect ($F(1, 292) = 7.91$, $p = .005$, $\eta^2 = .03$). When companies implement energy-efficient AI, perceived energy efficiency is higher under environmental motivations ($M = 5.93$, $SD = 1.58$) strategy than under financial motivations ($M = 5.59$, $SD = 1.55$; $F(1, 292) = -2.72$, $p = .007$; $d = -.45$), supporting H3a. When companies implement AI for energy efficiency, perceived energy efficiency is not significantly higher under financial motivations ($M = 5.96$, $SD = 1.54$) than under environmental motivations ($M = 5.79$, $SD = 1.63$; $F(1, 292) = 1.27$, $p = .206$; $d = .21$), rejecting H3b.

6.4.3. Willingness to invest

To test whether perceived energy efficiency mediates the decrease in willingness to invest when with environmental motivations, the data were subjected to a standard mediation analysis (PROCESS model 4; Appendix 5) with 5,000 bootstrapped samples (Hayes, 2021). Results showed that the perceived energy efficiency did not mediate the CO2 reductions strategy on the decrease in willingness to invest ($b = .08$, 95 % CI = $[-.0661, .2237]$).

6.4.4. Moderated mediation

Bootstrapping analyses were conducted using PROCESS model 7, with the energy management strategy as the independent variable, perceived energy efficiency as the mediator, willingness to invest as the dependent variable, and AI implementation as the moderator. As anticipated, the moderated mediation was supported, with AI implementation serving as the moderator (index = $-.42$, $SE = .16$, 95 % CI = $[-.7424, -.1090]$). Specifically, perceived energy efficiency mediated the relationship between environmental motivations and willingness to invest when the AI implementation involved energy-efficient AI ($b = .29$, $SE = .11$, 95 % CI = $[.0785, .5117]$), but not when AI was used for energy efficiency ($b = -.13$, $SE = .11$, 95 % CI = $[-.3531, .0750]$).

7. Study 3 – Compliance

7.1. Research design

Study 3 aimed to provide initial support for the proposed mediation model. Study 3 used a 2 (energy management strategy: environmental vs. financial motivations) x 2 (compliance: external vs. internal) between-subjects design. The respondents were shown a scenario where the company decided to enhance its performance by focusing on energy efficiency and technological advancement through the use of high-end artificial intelligence by the end of the year (Appendix 1).

Regarding the company's strategy, respondents were presented with one of two scenarios. In the first scenario, the focus was on financial motivations, where the company highlighted that its efforts to reduce energy consumption had led to substantial cost savings within a year, with plans to achieve further reductions by the following year. In the second scenario, the focus was on environmental motivations, where the company emphasized that its energy consumption reduction efforts had significantly decreased CO2 emissions over the year, with ongoing goals to achieve additional reductions by the next year.

Regarding the company's compliance measures, respondents were randomly presented with one of two scenarios. In the first scenario, the focus was on externally certified energy management, specifically the ISO 50001 standard, where the company implemented an Energy Management System that complied with the requirements set by this standard in order to continuously improve its energy performance. In the second scenario, the focus was on self-claimed energy management as it followed its own energy efficiency strategy to implement an Energy Management System that satisfied the requirements set internally by its own energy policy.

As manipulation checks, participants were asked to recall the energy management strategy ("1 = financial motivations, 7 = environmental motivations") and the compliance measure ("1 = self-imposed standards, 7 = Third-party standards") they read about the company.

7.2. Sample

Three hundred U.S.-based participants from Prolific ($M_{\text{age}} = 42.09$, $SD = 12.75$, 60.67 % men) took part in this experiment in exchange for £9 per hour (median completion time = 6'30") in 2024. To ensure that the effect was not limited to individuals unfamiliar with investments, we recruited only participants with relevant experience. All potential participants were asked two screening questions—only those with investment experience ($M_{\text{years of investment}} = 11.1$, $SD = 9.68$) and who frequently evaluate a company's stock as a potential investment were eligible to participate (i.e., those who responded "Sometimes," "Most of the time," or "Always"). Participants who answered "0" to the first question or "Never" or "Rarely" to the second question were screened out at the beginning and did not proceed with the study.

7.3. Measures

Perceived energy efficiency was assessed with a three-item 7-point Likert scale (e.g., "The way the company approaches energy efficiency generates results"; "1 = strongly disagree, 7 = strongly agree"; adapted from Carlsson Hauff (2022); $\alpha = .88$). Willingness to invest was evaluated with a three-item 7-point scale ("1 = extremely unwilling/unlikely/improbable, 7 = extremely willing/likely/probable", adapted from Carlsson Hauff (2022), $\alpha = .93$). Green value was measured with a six-item 7-point Likert scale (e.g., "I consider the potential environmental impact of my actions when making many of my decisions."; "1 = strongly disagree, 7 = strongly agree"; adapted from Haws et al. (2014); $\alpha = .93$). The complete psychometric properties—including reliability, convergent validity, and discriminant validity—as well as the assessment of common method bias are presented in Appendices 2–4.

7.4. Results

7.4.1. Manipulation checks

The manipulations of strategy and certification-driven strategy were successful. Participants in the environmental motivations condition rated significantly higher ($M = 6.05$, $SD = 1.31$) than were participants in the financial motivations condition ($M = 2.89$, $SD = 1.97$, $t(298) = -16.41$, $p < .001$, $d = -1.89$). Similarly, participants in the externally certified energy management condition rated significantly higher ($M = 5.79$, $SD = 1.63$) than were participants in the self-claimed energy management condition ($M = 2.13$, $SD = 1.62$, $t(298) = -19.56$, $p < .001$, $d = -2.26$).

7.4.2. Perceived energy efficiency

To examine evidence for H4, we examined whether energy management strategy affected perceived energy efficiency depending on the type of compliance. A two-way ANCOVA (i.e., with covariates) revealed a nonsignificant main effect of compliance ($F(1, 292) = 1.7$, $p = .08$, $\eta^2 = .01$) and a significant effect of strategy ($F(1, 292) = 4.11$, $p = .005$, $\eta^2 = .02$). This was qualified by a significant interaction effect ($F(1, 292) = 7.22$, $p = .0002$, $\eta^2 = .04$). When companies rely on externally certified energy management, perceived energy efficiency is not significantly higher under environmental motivations ($M = 5.88$, $SD = 1.51$) than under a financial motivations ($M = 5.82$, $SD = 1.47$; $F(1, 292) = -0.55$, $p = .59$), rejecting H4a. When companies rely on self-claimed energy management, perceived energy efficiency is significantly higher under financial motivations ($M = 6.06$, $SD = 1.54$) than under environmental motivations ($M = 5.50$, $SD = 1.41$; $F(1, 292) = 4.65$, $p < .001$), supporting H4b.

7.4.3. Willingness to invest

To test whether perceived energy efficiency mediates the decrease in willingness to invest when with environmental motivations, the data were subjected to a standard mediation analysis (PROCESS model 4; Appendix 5) with 5,000 bootstrapped samples (Hayes, 2021). Results showed that the perceived energy efficiency mediated the environmental motivations on the decrease in willingness to invest ($b = -.1449$, 95 % CI = $[-.2645, -.0442]$).

7.4.4. Moderated mediation

Bootstrapping analyses were conducted using PROCESS model 7, with the energy management strategy as the independent variable, perceived energy efficiency as the mediator, willingness to invest as the dependent variable, and compliance as the moderator. As anticipated, the moderated mediation was supported, with compliance serving as the moderator (index = .37, SE = .11, 95 % CI = $[.1648, .5928]$). Specifically, perceived energy efficiency mediated the relationship between environmental motivations and willingness to invest when the energy management was self-claimed ($b = -.33$, SE = .09, 95 % CI = $[-.5074, -.1725]$), but not when it was externally certified ($b = .04$, SE = .07, 95 % CI = $[-.0939, .1662]$).

8. Study 4 – AI implementation x Compliance

8.1. Research design

Study 4 aimed to build upon the findings of Studies 2 and 3 by incorporating a more complex experimental design to further explore the interactions between corporate strategy, AI implementation, and certification standards. Study 4 employed a 2 (energy management strategy: environmental vs. financial motivations) x 2 (AI implementation: energy-efficient AI vs. AI for energy efficiency) x 2 (compliance: external vs. internal) between-subjects design. Respondents were randomly assigned to one of the eight scenarios, where they were asked to read about a company that decided to improve its performance through energy efficiency and AI-driven technological advancements

(Appendix 1).

In the energy management strategy manipulation, respondents were either exposed to a financial motivations scenario, where the company emphasized that its energy efficiency efforts led to significant cost reductions, or to environmental motivations scenario, where the company focused on decreasing its carbon footprint. For the AI implementation, participants read about either a company utilizing energy-efficient AI, which optimized computational processes to reduce energy use, or AI for energy efficiency, where AI was applied to streamline and improve energy consumption across various operations. Finally, in the compliance manipulation, respondents were shown either a scenario in which the company adopted the ISO 50001 standard for energy management, or one where the company followed its own internally developed energy efficiency strategy.

As manipulation checks, participants were asked to recall the strategy (“1 = financial motivations, 7 = environmental motivations”), the AI implementation (“1 = energy-efficient AI, 7 = AI for energy efficiency”), and the compliance measure (“1 = self-imposed standards, 7 = Third-party standards”) described in their scenario.

8.2. Sample

Six hundred U.S.-based participants from Prolific ($M_{\text{age}} = 41.5$, $SD = 13.00$, 54.70 % men) took part in this experiment in exchange for £9 per hour (median completion time = 6'53") in 2024. To ensure that the effect was not limited to individuals unfamiliar with investments, we recruited only participants with relevant experience. All potential participants were asked two screening questions—only those with investment experience ($M_{\text{years of investment}} = 11.10$, $SD = 10.1$) and who frequently evaluate a company's stock as a potential investment were eligible to participate (i.e., those who responded “Sometimes,” “Most of the time,” or “Always”). Participants who answered “0” to the first question or “Never” or “Rarely” to the second question were screened out at the beginning and did not proceed with the study.

8.3. Measures

Perceived energy efficiency was assessed with a three-item 7-point Likert scale (e.g., “The way the company approaches energy efficiency generates results”; “1 = strongly disagree, 7 = strongly agree”; adapted from Carlsson Hauff (2022); $\alpha = .86$). Willingness to invest was evaluated with a three-item 7-point scale (“1 = extremely unwilling/unlikely/improbable, 7 = extremely willing/likely/probable”, adapted from Carlsson Hauff (2022), $\alpha = .93$). Green value was measured with a six-item 7-point Likert scale (e.g., “I consider the potential environmental impact of my actions when making many of my decisions.”; “1 = strongly disagree, 7 = strongly agree”; adapted from Haws et al. (2014); $\alpha = .93$). The complete psychometric properties—including reliability, convergent validity, and discriminant validity—as well as the assessment of common method bias are presented in Appendices 2–4.

8.4. Results

8.4.1. Manipulation checks

The manipulations of energy management strategy, AI implementation, and compliance were successful. Participants in the environmental motivations condition rated significantly higher ($M = 6.03$, $SD = 1.43$) than were participants in the financial motivations condition ($M = 3.21$, $SD = 2.04$, $t(598) = -19.63$, $p < .001$, $d = -1.60$). Similarly, participants in the AI for energy efficiency condition rated significantly higher ($M = 6.20$, $SD = 1.51$) than were participants in the energy-efficient AI condition ($M = 3.59$, $SD = 2.49$, $t(598) = -15.56$, $p < .001$, $d = -1.27$). Also, participants in the externally certified energy management condition rated significantly higher ($M = 5.82$, $SD = 1.76$) than were participants in the self-claimed energy management condition

($M = 1.96$, $SD = 1.6$, $t(598) = -28.1$, $p < .001$, $d = -2.29$).

8.4.2. Perceived energy efficiency

To examine evidence for H5, we examined whether strategy affected perceived energy efficiency depending on the certification-driven strategy (Fig. 2). A three-way ANCOVA (i.e., with covariates) revealed nonsignificant main effects of certification-driven strategy ($F(1, 588) = 3.40$, $p = .07$, $\eta^2 = .01$), AI implementation ($F(1, 588) = .03$, $p = .87$, $\eta^2 = .00$), and strategy ($F(1, 588) = 1.39$, $p = .005$, $\eta^2 = .00$). This was qualified by a significant interaction effect ($F(1, 588) = 25.34$, $p < .001$, $\eta^2 = .04$).

When companies rely on self-claimed energy management and implement energy-efficient AI, perceived energy efficiency is slightly higher under a CO2 reduction ($M = 5.70$, $SD = 1.05$) strategy than under a financial savings strategy ($M = 5.50$, $SD = .80$; $F(1, 588) = -1.93$, $p = .054$; $d = -.32$) but not significantly, rejecting H5a. When companies rely on self-claimed energy management and implement AI for energy efficiency, perceived energy efficiency is slightly higher under a financial savings strategy ($M = 5.68$, $SD = .78$) than under a CO2 reductions strategy ($M = 5.54$, $SD = .99$; $F(1, 588) = 1.73$, $p = .084$; $d = .28$) but not significantly, rejecting H5b.

When companies rely on external certification and implement energy-efficient AI, perceived energy efficiency is higher under a financial savings ($M = 5.89$, $SD = .78$) strategy than under a CO2 reduction strategy ($M = 5.61$, $SD = 1.01$; $F(1, 588) = 1.86$, $p = .064$; $d = .31$) but not significantly, rejecting H6a. When companies rely on external certification and implement AI for energy efficiency, perceived energy efficiency is significantly higher under a CO2 reductions strategy ($M = 6.00$, $SD = .94$) than under a financial savings strategy ($M = 5.45$, $SD = .62$; $F(1, 588) = -4.56$, $p < .001$; $d = -.75$), supporting H6b.

8.4.3. Willingness to invest

To test whether perceived energy efficiency mediates the decrease in willingness to invest when with environmental motivations, the data were subjected to a standard mediation analysis (PROCESS model 4; Appendix 5) with 5,000 bootstrapped samples (Hayes, 2021). Results showed that the perceived energy efficiency did not mediate the environmental motivations on the decrease in willingness to invest ($b = .07$, 95 % CI = [-.0268, -.1693]).

8.4.4. Conditional moderated mediation

Bootstrapping analyses were conducted using PROCESS model 11, with the energy management strategy as the independent variable, perceived energy efficiency as the mediator, willingness to invest as the dependent variable, AI implementation as the moderator, and compliance as the conditional moderator. The index of moderated moderated mediation was significant (index = .99, SE = .21, 95 % CI = [.5895, 1.4235]). Furthermore, the index of conditional moderated mediation was significant with a self-claimed energy management (index = -.36, SE = .15, 95 % CI = [-.6490, -.0729]) and with an externally certified energy management (index = .64, SE = .15, 95 % CI = [.3556, .9327]). Specifically, with a self-claimed energy management, perceived energy efficiency slightly mediated, at the 90 % CI level, the relationship between the environmental motivations and willingness to invest when the AI implementation involved energy-efficient AI ($b = .19$, SE = .10, 95 % CI = [-.0075, .3936], 90 % CI = [.0213, .3692]) and when AI was used for energy efficiency ($b = -.16$, SE = .10, 95 % CI = [-.3660, .0242], 90 % CI = [-.3338, -.0113]). Also, with an externally certified energy management, perceived energy efficiency mediated the relationship between the environmental motivations and willingness to invest when the AI implementation involved AI for energy-efficient ($b = .45$, SE = .10, 95 % CI = [.2599, .6649], 90 % CI = [.2892, .6281]) and slightly mediated, at the 90 % CI level, when energy-efficient AI was used ($b = -.18$, SE = .10, 95 % CI = [-.3828, .0037], 90 % CI = [-.3451, -.0301]).

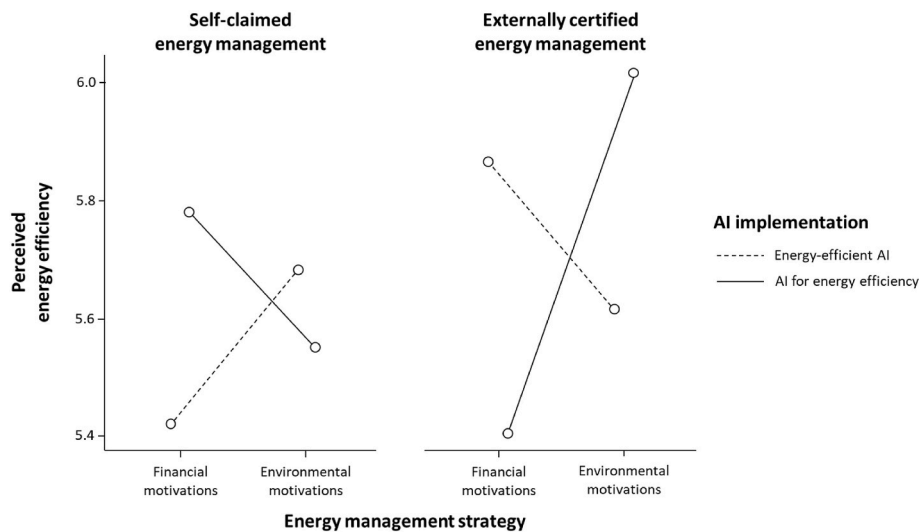


Fig. 2. Perceived energy efficiency as a function of energy management strategy (environmental vs. financial motivations), AI implementation (AI for energy efficiency vs. energy-efficient AI), and compliance (self-claimed vs. externally certified energy management).

9. Discussion

9.1. Theoretical contributions

Our results make significant contributions to the existing literature on sustainable investments and investor behavior, particularly in the context of energy efficiency strategies and their intersection with technological innovation and compliance measures. While previous studies have explored the effects of green investment on corporate environmental practices (De Angelis et al., 2023; Chi et al., 2023), our findings highlight a nuanced aspect: the interplay between a company's energy management motivations (financial vs. environmental) and investor perceptions. Specifically, we show that when companies emphasize environmental motivations, investors' willingness to invest decreases. This finding suggests that, despite prior research showing positive associations between environmental and financial performance (Johnson et al., 2020; Bendig et al., 2023; Chi et al., 2023) and the recent surge in sustainable investing (Global Sustainable Investment Alliance, 2020; De Angelis et al., 2023), investors do not consistently assign greater value to environmental credentials over financial performance. This complements the existing literature that identifies the complexity of investor responses to ESG factors, as seen in works by Malshe et al. (2023) and Johnson et al. (2020). Building on the Economies of Worth framework, we show that the justificatory worlds mobilized by a company aiming to put forward its energy efficiency strategy, don't systematically align with the worlds invoked by investors evaluating this strategy before making an investment decision.

Furthermore, our study extends the literature on the role of technological implementation in shaping investor perceptions. Studies such as Chi et al. (2023) and Bendig et al. (2023) have shown that green innovations positively impact financial and environmental performance. Our research builds on this by examining how the use of AI in energy efficiency strategies influences perceived energy efficiency and investment decisions. The findings demonstrate that AI implementation (whether energy-efficient AI or AI for energy efficiency) moderates the relationship between environmental motivations and perceived efficiency, particularly when combined with specific compliance measures. This introduces a new layer of complexity to the understanding of how investors evaluate the effectiveness of green technologies in corporate sustainability efforts.

Our results also contribute to the literature on the economies of worth (Boltanski and Thévenot, 2006), which provides a framework for understanding how different rationalities (market, green, industrial)

coexist and interact within organizational contexts. However, this framework has not been previously mobilized to understand how investors, call upon different logics when evaluating a company's strategy before making an investment decision, depending on the way a company frames its justification for its strategy and which compliance measures and technology it puts in place to support its justification. We offer empirical evidence supporting the idea that the industrial world can tip the usual tension between market and green worlds and enable investors to build a compromise between market and green valuations. Our findings show that under certain boundary conditions, investors can reconcile competing evaluative frameworks. Our results demonstrate that, under certain boundary conditions, investors are capable of reconciling competing evaluative frameworks. This contributes to a more nuanced understanding of how organizations and stakeholders navigate value pluralism, not by selecting one logic over another, but by constructing hybrid justifications that promote coexistence and alignment among orders of worth. By identifying the conditions under which such value alignments are possible, our work advances the theoretical applicability of the Economies of Worth framework in complex decision-making contexts such as sustainable investing, where organizations must simultaneously appeal to diverse and often conflicting stakeholder expectations.

9.2. Managerial recommendations

The findings from the four studies collectively offer valuable insights that could benefit several key stakeholders, including corporate decision-makers, investors, policymakers, and environmental advocates. For corporate leaders, particularly those involved in sustainability and technological innovation, the studies highlight how different strategies in energy management—whether focused on financial or environmental motivations—interact with AI implementation and compliance frameworks. Understanding how perceived energy efficiency impacts investors' willingness to invest based on these factors can help companies fine-tune their energy strategies to align with stakeholder expectations. For example, firms aiming for an externally certified energy management system with a focus on AI for energy efficiency may increase perceived energy efficiency and attract more investment, especially when emphasizing their environmental goals. On the other hand, when no compliance measure is involved, firms that want to implement an energy efficiency strategy motivated by a desire to reduce their environmental impact, would benefit from implementing energy efficient AI which is a greener, less resource-intensive type of AI, to

appeal to investors.

Investors are another primary stakeholder group that can benefit from these findings. The studies reveal that while environmental motivations in energy management may sometimes reduce willingness to invest, perceived energy efficiency plays a crucial role in mediating this effect. Investors can use these insights to assess the risks and opportunities associated with companies that prioritize sustainability. Furthermore, the studies highlight that the type of AI implementation—whether optimizing energy efficiency or enhancing overall company processes—can influence perceived efficiency differently depending on compliance measures. This knowledge equips investors to make more informed decisions based on how a company's energy strategy aligns with broader technological and environmental trends.

Policymakers and environmental advocates can also draw important conclusions from these studies, especially regarding how corporate compliance and regulatory standards like ISO 50001 influence corporate behavior and investment patterns. An externally certified energy management tends to enhance perceived energy efficiency and can help ensure that companies remain transparent in their sustainability efforts. Environmental advocates may use these findings to promote stronger regulatory frameworks that encourage companies to adopt both financial and environmental motivations for energy management. By pushing for policies that incentivize self-claimed and externally certified energy management, they can help drive broader adoption of sustainable practices across industries.

9.3. Limitations and future research

One key limitation across the four studies is the limited generalizability due to the sample composition. All participants were U.S.-based investors, which may not reflect the perspectives of investors from different cultural, regulatory, and economic environments. Investor preferences and reactions to energy management strategies might vary significantly across regions where environmental regulations or market incentives for energy efficiency differ. Future research could address this by replicating these studies in various geographic regions to better understand how diverse cultural and economic contexts influence investment behavior regarding corporate energy strategies. Conducting similar future studies in regions facing complex energy challenges, such as energy access in politically fragile contexts or the deployment of hybrid systems in isolated areas, could provide valuable additional insights and offer a useful contrast to our findings.

Another limitation is the simplified binary distinction between financial and environmental motivations in the energy management strategies presented to participants. Real-world corporate strategies often involve a blend of financial and environmental objectives, and companies may prioritize both simultaneously. By focusing only on these two contrasting motivations, the studies may have overlooked more complex strategic considerations that influence investor decisions.

Appendix 1. Scenarios

By the end of 2022, our company decided to take its performance to another level in two critical dimensions for any tech company: energy efficiency and technological advancement through the use of high-end Artificial Intelligence.

1 Financial Motivation x Energy efficient AI x Externally certified energy management

We have implemented **an energy-efficient approach to our use of AI**, through sustainable software development and data center optimization. By developing optimized and efficient algorithms and utilizing techniques like model pruning, we reduce the size and complexity of AI models thus lowering the computational resources required. Additionally, we optimize data centers by employing energy-efficient hardware, implementing intelligent cooling systems and using AI to dynamically allocate workloads across servers to ensure optimal utilization and reducing energy waste.

By achieving ISO 50001 certification, we have implemented a robust Energy Management System that aligns with a clearly defined set of requirements. This certification has enabled us to effectively monitor our energy performance, identify necessary actions and investments, and drive continuous improvement over time. Additionally, it has ensured **compliance with industry standards through third party verification**.

Future studies should consider more nuanced scenarios, including regulatory pressures or hybrid strategies, to reflect the intricate reality of corporate energy management and its influence on investor perceptions.

While we selected ISO 50001 certification as our focal form of external compliance due to its global recognition as an international standard, we acknowledge that other forms of external compliance—such as NGO partnerships, third-party audits, or alternative certifications like the B Corp label—can also be perceived as credible and valued by external stakeholders, including investors. Future research could also expand this perspective by exploring the long-term strategic implications of certification for organizational energy planning. ISO 50001, by encouraging a continuous improvement process, offers a structural foundation for firms to develop sustained energy management practices over time. The standard has also been increasingly regarded as a structuring tool for supporting the energy transition. However, its effectiveness in guiding long-term investment in emerging technologies, such as sustainable hybrid systems that combine renewable energy sources, energy storage, and AI-driven control systems, remains under-explored. Comparing ISO 50001 with more technology-specific or system-level strategies could shed light on how different forms of governance and standardization influence both immediate operational gains and longer-term transitions toward decarbonization. In addition, although our study focuses on investor perceptions of AI-driven energy strategies through the lens of justificatory logics, future research could greatly benefit from examining how these strategies are implemented in practice within hybrid energy systems. Crossing perceptual insights with practical, system-level analysis would provide a more comprehensive understanding of AI's role in energy efficiency and energy transition and its reception among diverse investor profiles.

Finally, the studies focused heavily on perceived energy efficiency as the primary mediator influencing investment decisions, potentially overlooking other important factors such as corporate social responsibility (CSR), brand reputation, or trust. While perceived energy efficiency plays a significant role, these additional factors may also contribute to how investors assess a company's overall value and commitment to sustainability. Future research could expand the scope of mediating variables, exploring a broader range of perceptions and actual company performance metrics to gain a more comprehensive understanding of the factors that drive investment decisions in sustainable companies.

CRedit authorship contribution statement

Yosr Ammar: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Conceptualization. **Julien Cloarec:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Bertrand Valiorgue:** Writing – review & editing, Writing – original draft, Conceptualization.

This allowed us to reduce our energy consumption, and **make substantial cost savings** in one year. We will continue our efforts to achieve significant reductions by 2025.

2 Environmental Motivation x Energy efficient AI x Externally certified energy management

We have implemented **an energy-efficient approach to our use of AI**, through sustainable software development and data center optimization. By developing optimized and efficient algorithms and utilizing techniques like model pruning, we reduce the size and complexity of AI models thus lowering the computational resources required. Additionally, we optimize data centers by employing energy-efficient hardware, implementing intelligent cooling systems and using AI to dynamically allocate workloads across servers to ensure optimal utilization and reducing energy waste.

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This allowed us to reduce our energy consumption, and **reduce our CO2 emissions** in one year. We will continue our efforts to achieve significant reductions by 2025.

3 Financial Motivation x AI for Energy Efficiency x Externally certified energy management

We started utilizing **AI to improve the overall energy performance** of our different processes and reduce our energy consumption through sustainable product design and smart office management. By employing AI we can identify and source sustainable materials for product manufacturing as well as conduct lifecycle assessments of products to minimize environmental impact from production to disposal. Additionally, AI-driven smart office management enables us to automate energy controls and monitor usage patterns, allowing us to analyze consumption and identify opportunities for energy savings.

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4 Environmental Motivation x AI for Energy Efficiency x Externally certified energy management

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This allowed us to reduce our energy consumption, and **reduce our CO2 emissions** in one year. We will continue our efforts to achieve significant reductions by 2025.

5 Financial Motivation x Energy efficient AI x Self -claimed energy management

We have implemented **an energy-efficient approach to our use of AI**, through sustainable software development and data center optimization. By developing optimized and efficient algorithms and utilizing techniques like model pruning, we reduce the size and complexity of AI models thus lowering the computational resources required. Additionally, we optimize data centers by employing energy-efficient hardware, implementing intelligent cooling systems and using AI to dynamically allocate workloads across servers to ensure optimal utilization and reducing energy waste.

In line with our energy efficiency strategy, we have implemented a robust Energy Management System that aligns with our internal standards and requirements. This system enabled us to effectively monitor our energy performance, identify necessary actions and investments, and drive continuous improvement over time. Additionally, it has ensured **adherence to the performance standards we established in our energy policy**.

This allowed us to reduce our energy consumption, and **make substantial cost savings** in one year. We will continue our efforts to achieve significant reductions by 2025.

6 Environmental Motivation x Energy efficient AI x Self -claimed energy management

We have implemented **an energy-efficient approach to our use of AI**, through sustainable software development and data center optimization. By developing optimized and efficient algorithms and utilizing techniques like model pruning, we reduce the size and complexity of AI models thus lowering the computational resources required. Additionally, we optimize data centers by employing energy-efficient hardware, implementing intelligent cooling systems and using AI to dynamically allocate workloads across servers to ensure optimal utilization and reducing energy waste.

In line with our energy efficiency strategy, we have implemented a robust Energy Management System that aligns with our internal standards and requirements. This system enabled us to effectively monitor our energy performance, identify necessary actions and investments, and drive continuous improvement over time. Additionally, it has ensured **adherence to the performance standards we established in our energy policy**.

This allowed us to reduce our energy consumption, and **reduce our CO2 emissions** in one year. We will continue our efforts to achieve significant reductions by 2025.

7 Financial Motivation x AI for Energy Efficiency x Self -claimed energy management

We started utilizing AI to improve the overall energy performance of our different processes and reduce our energy consumption through sustainable product design and smart office management. By employing AI we can identify and source sustainable materials for product manufacturing as well as conduct lifecycle assessments of products to minimize environmental impact from production to disposal. Additionally, AI-driven smart office management enables us to automate energy controls and monitor usage patterns, allowing us to analyze consumption and identify opportunities for energy savings.

In line with our energy efficiency strategy, we have implemented a robust Energy Management System that aligns with our internal standards and requirements. This system enabled us to effectively monitor our energy performance, identify necessary actions and investments, and drive continuous improvement over time. Additionally, it has ensured adherence to the performance standards we established in our energy policy.

This allowed us to reduce our energy consumption, and make substantial cost savings in one year. We will continue our efforts to achieve significant reductions by 2025.

8 Environmental Motivation x AI for Energy Efficiency x Self -claimed energy management

We started utilizing AI to improve the overall energy performance of our different processes and reduce our energy consumption through sustainable product design and smart office management. By employing AI we can identify and source sustainable materials for product manufacturing as well as conduct lifecycle assessments of products to minimize environmental impact from production to disposal. Additionally, AI-driven smart office management enables us to automate energy controls and monitor usage patterns, allowing us to analyze consumption and identify opportunities for energy savings.

In line with our energy efficiency strategy, we have implemented a robust Energy Management System that aligns with our internal standards and requirements. This system enabled us to effectively monitor our energy performance, identify necessary actions and investments, and drive continuous improvement over time. Additionally, it has ensured adherence to the performance standards we established in our energy policy.

This allowed us to reduce our energy consumption, and reduce our CO2 emissions in one year. We will continue our efforts to achieve significant reductions by 2025.

Appendix 2. Measurement instruments and psychometric properties

Constructs	Study 1		Study 2		Study 3		Study 4	
	α	AVE	α	AVE	α	AVE	α	AVE
Perceived efficiency (Carlsson Hauff, 2022)								
The way the company accepts the challenge inherent in energy use is efficient	.87	.69	.88	.72	.87	.70	.86	.68
The company has a good possibility of making a difference as regards energy efficiency								
The way the company approaches energy efficiency generates results								
Willingness to invest (Carlsson Hauff, 2022)								
How willing are you to invest in the company?	.92	.84	.93	.86	.93	.85	.93	.86
How likely are you to invest in the company?								
How probable is it that you would invest in the company?								
Green value (Haws et al., 2014)								
It is important to me that the products I use do not harm the environment.	.92	.68	.93	.71	.92	.69	.93	.70
I consider the potential environmental impact of my actions when making many of my decisions.								
My purchase habits are affected by my concern for our environment.								
I am concerned about wasting the resources of our planet.								
I would describe myself as environmentally responsible.								
I am willing to be inconvenienced to take actions that are more environmentally friendly.								
Energy management strategy (manipulation check)	-	-	-	-	-	-	-	-
Based on the text above, what is the company’s goal in implementing AI? (“1 = financial motivations, 7 = environmental motivations”)								
AI implementation (manipulation check)	-	-	-	-	-	-	-	-
Based on the text above, what type of AI is the company implementing? (“1 = energy-efficient AI, 7 = AI for energy efficiency”)								
Compliance (manipulation check)	-	-	-	-	-	-	-	-
Based on the text above, which type of standards does this company follow for its energy management system? (“1 = self-imposed standards, 7 = third-party standards”)								

Appendix 3. HTMT coefficients

		PE	WTI	GREEN
Study1	PE	-		
	WTI	.65	-	
	GREEN	.46	.53	-
Study 2	PE	-		
	WTI	.73	-	
	GREEN	.52	.49	-
Study 3	PE	-		
	WTI	.60	-	
	GREEN	.46	.41	-
Study 4	PE	-		
	WTI	.67	-	
	GREEN	.42	.41	-

Notes. PE: perceived efficiency; WTI: willingness to invest; GREEN: green value.

Appendix 4. Common method bias estimation

	df	Study 1		Study 2		Study 3		Study 4	
		χ^2	$\Delta\chi^2$	χ^2	$\Delta\chi^2$	χ^2	$\Delta\chi^2$	χ^2	$\Delta\chi^2$
Proposed model	51	106.952	301.251***	123.609		108.654		133.395	
PE and WTI	53	408.203	546.842***	384.016	260.407***	450.099	341.445***	720.218	586.823***
PE and GREEN	53	653.794	839.631***	717.694	594.085***	656.111	547.457***	1319.991	1186.596***
WTI and GREEN	53	946.582	1254.93***	1053.291	929.682***	997.377	888.723***	2050.126	1916.731***
Harman's Factor	54	1361.881	48.306***	1601.505	1477.895***	1428.056	1319.402***	3267.858	3134.462***

Notes. PE: perceived efficiency; WTI: willingness to invest; GREEN: green value.

Appendix 5. PROCESS model estimations (Studies 1–4)

	Study 1		Study 2		Study 3		Study 4	
	PE	WTI	PE	WTI	PE	WTI	PE	WTI
Focal variables								
EMS	-.20*	-.12 ^{ns}	.35**	.09 ^{ns}	-.56***	-.08 ^{ns}	.26 ^{ns}	.05 ^{ns}
AI			.37**				.36**	
COMP					-.25*		.44**	
EMS x AI			-.51**				-.49*	
EMS x COMP					.63***		-.51**	
AI x COMP							-.82***	
EMS x AI x COMP							1.34***	
PE		.59***		.83***		.59***		.74***
Control variables								
Gender	-.03 ^{ns}	-.07 ^{ns}	-.40***	.32**	-.09 ^{ns}	.28**	.03 ^{ns}	.22*
Age	.00 ^{ns}	-.01**	-.00 ^{ns}	-.01 ^{ns}	.01 ^{ns}	.01 ^{ns}	-.01 ^{ns}	-.00 ^{ns}
Investment years	.00 ^{ns}	-.00 ^{ns}	-.00 ^{ns}	.00 ^{ns}	-.01 ^{ns}	-.02**	.01 ^{ns}	-.01*
Green value	.32***	.18***	.36***	.22***	.30***	.20***	.30***	.21***
R ²	.19	.45	.29	.51	.24	.37	.19	.42

Notes. EMS: energy management systems (1 = environmental motivations, 0 = financial motivations), AI: AI implementation (1 = AI for energy efficiency, 0 = energy-efficient AI), COMP: compliance (1 = externally certified, 0 = self-claimed), PE: perceived efficiency, WTI: willingness to invest.

***p < .001, **p < .01, *p < .05, ns: not significant.

Data availability

Data will be made available on request.

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