

A systematic literature review on financial stock performance of sustainable investments: Bridging the gap between empirical evidence and recent theoretical models¹

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Abstract: Despite a growing body of literature, there is still no consensus on the effects of firm sustainable performance (assessed through the so-called Environmental Social and Governance (ESG) criteria) on their financial returns. Empirical research started in the late 1990s, while theoretical frameworks have been developed recently. This paper reconciles previous empirical evidence with recent theories and provides a classification of existing empirical work regarding these theories. We provide a guide for academics, practitioners, regulators and policy-makers to understand the financial impact of sustainable investing and the ways to enhance it.

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1. Introduction

Although it has received significant attention, empirical research on the link between firms' environmental, social and governance (ESG) fundamentals and stock returns remains limited in the finance literature. The question was largely under-investigated until the 2010s when the first ESG ratings were commercialized. Without a main theoretical framework, most of the studies have followed an inductive approach and present divergent results. Theoretical frameworks for studying stock returns have only been developed recently. The aim of this article is to provide a systematic review of empirical studies conducted at firm level and to reconcile this literature with recent theoretical frameworks.

Three main theories exist at the firm- or stock-level. First, the consideration of ESG-friendly policies might reduce company systematic risk and therefore lead to lower expected returns. (e.g., Hong and Kacperczyk, 2009; Albuquerque et al., 2019; Bolton and Kacperczyk, 2020). Second, investor preferences for sustainable products result in a (price) premium for “greenification” (Pastor et al., 2021; Gibson et al., 2020) which can also lead to lower returns. Third and finally, some research came to an opposite conclusion – arguing that some indicators, including for instance good governance (Gompers et al., 2003) or high employee engagement and hence their satisfaction (Edmans, 2010), might convey forward-looking information and create an alpha (i.e., abnormal return).

While the first and second claims correspond to an extension of the modern portfolio theory, the latter deviates from it by claiming the existence of an alpha related to ESG. Some authors tried to reconcile these results by theoretically extending the asset pricing models combining investor preferences with the possibility of generating an alpha (Pedersen et al., 2020) or by introducing a measure of disagreement between rating systems – as demonstrated

in Berg et al. (2020) and Chatterji et al. (2016) – (Avramov et al., 2020; Billio et al., 2020; Gibson et al., 2020). In particular, Avramov et al. (2020) demonstrate that disagreement distorts the equilibrium model of risk-return by rendering firms with good ESG ratings riskier when there is disagreement in the ratings.

This paper elaborates a classification of existing empirical work on the relationship between stock financial return and ESG fundamentals with regard to existing theories. Our analysis shows that three recently developed theories can explain previous empirical evidence. We found that articles mobilizing theories linked to demand or risk are more likely to document a negative relationship between sustainability and financial performance, while when articles mobilize the theory of predictability, the relationship is most of the time positive. Articles whose results are consistent with one of the three main theories receive more citations on average. These results are even more pronounced for articles published in top journals.

The remainder of the article is structured as follows. Section 2 presents the three theoretical models. Section 3 presents the data collection following the RepOrting Standards for Systematic Evidence Syntheses (ROSES) procedure developed by Haddaway (2020) as well as the classification of the articles regarding the three theories. Section 4 discusses our results and Section 5 concludes.

2. ESG criteria and stock financial returns: Review of the theoretical framework

We identify three different theoretical frameworks to discuss the likely impact on financial performance: (i) stock excess return induced by the predictability of ESG fundamentals, (ii) investor segmentation in terms of ESG preferences, (iii) ESG as a source of systematic risk.

a. Predictability of ESG fundamentals

Firms' involvement in ESG activities is known to have costs and benefits. While some authors view ESG activities as a trade-off against financial performance, the literature has provided evidence that superior environmental and social performance can help to enhance firm's value. Relying on the "win-win" argument (i.e., doing well by doing good), Bénabou and Tirole (2010) explain that corporate social responsibility (CSR) practices should be seen as a long-term perspective for profit maximization and the creation of value over the long run rather than a short-term perspective where costs related to adverse impacts will be priced. Gregory et al. (2014) argue that firms with a strong ESG profile have a competitive advantage over their peers. This advantage can be linked to more efficient use of resources as well as an improvement of firms' intangible resources such as the better development of human capital, good corporate governance or the enhancement of their reputation. Most dimensions aggregated into the ESG score have been shown to contribute to the greater profitability associated with ESG criteria.

Focusing on the environmental pillar, Porter and Van der Linde (1995) declare that cost savings can be achieved through the implementation of environmental strategies. Better environmental management can contribute to greater productivity by reducing material and energy consumption and avoid costs associated with environmental liabilities. In addition to this cost savings argument, Klassen and McLaughlin (1996) suggest that strong environmental performance creates market share gains as consumers are showing growing preferences for environmentally friendly products. In the same way, activities focusing on the social dimension have been shown to provide a competitive advantage and thus to affect firm profitability. Firms dedicating resources to the implementation of ESG policies, such as providing better health

care and retirement benefits or meeting labor union demands, contribute to the improvement of employee productivity (Edmans, 2011). Likewise, Kramer and Porter (2011) speak about “shared value” by suggesting a connection between companies’ success and societal improvement. Investment in wellness programs is not only beneficial for society but also for firm’s productivity as it minimizes employee absences which represent an important cost in the firm’s value chain. Analyzing the relation between corporate governance and firm profitability, Gompers et al. (2003) show that firms with strong shareholder rights are more profitable.

In efficient markets, this information conveyed by ESG indicators should be incorporated into prices. An abnormal return might arise if most investors ignore the pricing attached to this information (Pedersen et al., 2021). The markets fail to fully incorporate information related to intangibles, which results in excess returns. The stock return predictability is also consistent with investors’ limited attention theory which suggests that investors process information with a delay, leading to a lag in the incorporation of such information into the prices (Green et al., 2019).

b. ESG and investor demand

Theoretical work integrating ESG criteria into investor utility provides an extension to the two-fund separation model from Markowitz (1952). Under the modern portfolio theory, investors are assumed to exhibit utility towards investment products based on their expected return and the risk to deviate from the promised return measured by the asset volatility. As a consequence, they maximize return per unit of risk (i.e., Sharpe ratio) and take holdings in the risk-free asset and the market portfolio in proportions that depend on their level of risk aversion.

Current theoretical works extend the two-fund separation model to integrate exposure to an ESG portfolio that captures the return spread between brown and green assets. The excess return on this last portfolio will depend on the investor demand for green assets.

b.1. From two-fund separation to four-fund separation

Pastor et al.'s extension to a three-fund separation. Pastor et al. (2021) extend traditional two-fund separation theorem by assuming that investors receive non-pecuniary benefits from holding green assets and display disutility from holding brown assets. Assuming investors have an exponential utility function with both risk and brown aversion, the model posits a three-fund separation theorem whereby investors hold in various proportions the risk-free asset, the market portfolio and an ESG portfolio. Investors with green (resp. brown) preferences will overweight green assets and underweight brown assets and have positive (resp. negative) exposure to this ESG portfolio.

At the limit, should most investors derive utility from holding green assets, those preferences would be reflected in market prices and the equilibrium of the market portfolio. Moving from two-fund to three-fund separation theorem depends on the investor segmentation in the market and could be a transitory phenomenon.

Pedersen et al.'s four-fund separation. Pedersen et al.'s (2021) model brings together the framework of investor demand with evidence on ESG indicator predictability. They extend the framework of Pastor et al. (2021) by considering – next to traditionally assumed motivated investors who collect non-pecuniary benefits from holding green assets – ESG-aware investors with no preferences for ESG but who are aware of their return predictability, as well as investors who are not aware of the predictive ability of ESG criteria on firm fundamentals. They also consider that investors are aware of the low volatility anomaly (Frazzini & Pedersen,

2014), i.e., the fact that low volatility assets exhibit higher Sharpe ratios than high volatility assets. They deliver a four-fund separation theorem where investors hold the risk-free asset, the market portfolio, the minimum variance portfolio and an ESG portfolio.

The equilibrium will depend on the investor segmentation between the three types of investors. ESG-motivated investors push prices of green assets up and to lower expected returns, but could induce short-term benefits in cases of large flow from those investors, while the ESG-unaware push for mispricing by underreacting to the predictability of fundamentals. As a consequence, the Sharpe ratio follows a hump curve with regard to ESG. ESG-aware investors will achieve the higher Sharpe ratio, while the other two will deviate from the maximum Sharpe ratio to the right and ESG-unaware will be below the curve.

The sign of alphas related to greenness will be determined as follows: the ESG portfolio will offer a scaled return should most investors be ESG-motivated or an extra return should they be unaware or short-term motivated (changes in market structure that create a shock in the factor). This framework reconciles conflicting empirical results.

b.2. Investor segmentation

Investor preferences regarding ESG have been shown to differ among retail versus institutional investors. Hong and Kacperczyk (2009) show that institutional investors are subject to social norms which in turn lowers their likelihood of holding sin stocks compared to private investors. In line with this assumption, Nofsinger et al. (2019) show that institutional investors tend to avoid controversial stocks rather than picking ESG ones in order to avoid the risks linked to controversies. Besides, according to Riedl and Smeets (2017), institutional investors focus on economic performance first, while retail investors are more likely to forego economic performance for their social performance. Similarly, Erhemjamts et al. (2019)

postulate that institutional investors are more short-term minded compared to retail investors, which could explain why they hold fewer ESG assets. Nofsinger et al. (2019) further show that institutional investors are “ESG-aware” meaning that they invest in ESG assets in order to protect themselves from ESG risk, while retail investors tend to be “ESG lovers” meaning that they are driven to ESG investments because of social norms.

These unequal preferences for ESG assets between institutional and retail investors support the investor segmentation pointed out by Pastor et al. (2021) and Pedersen et al. (2021).

The distinction between institutional and retail investors introduced by Hong and Kacperczyk (2009) also has consequences in terms of strategies used. In a study dating from 2018, Amel-Zadeh and Serafeim investigate how institutional investors integrate ESG information in their investment processes. In line with Riedl and Smeets (2017) assumption, the study reveals that the surveyed investors are motivated by financial reasons rather than ethical ones. As a consequence, active ownership and negative screening are among the most used strategies, while best-in-class strategy ranks last at the time of this study.

b.3. Uncertainty around ESG information

Deviations from the three-fund separation theorem: Uncertainty around ESG. The model of Avramov et al. (2021) builds on the model of Pastor et al. (2021) and also assumes that each investor holds three portfolios: (1) a riskless asset, (2) the maximum Sharpe ratio portfolio in the risk-return space, and (3) the maximum Sharpe ratio portfolio in the risk-ESG space. This is only possible if every agent has access to the same information to build these portfolios. If they do not have access to the same ESG information, and ESG uncertainty exists, the composition of the ESG portfolio will differ and be agent specific. This means that the three-fund model is rejected. In other words, the equilibrium alpha will also vary with the uncertainty

around the ESG scores: if the market is green and there is uncertainty, the alpha-ESG relationship is inconclusive. In the case of market green neutrality and uncertainty, a higher market premium is expected as the uncertainty decreases demand for stocks and investors ask for compensation.

c. ESG and risk

Lower cost of capital - Reduced investor base. In an equilibrium model considering the price implications of exclusionary ethical investing, Heinkel et al. (2001) show that sustainability reduces firm risk. The model assumes that the financial market is segmented between two types of investors who differ with respect to their preference for green assets. On one hand, “green” investors screen out irresponsible stocks from their investment universe, while on the other hand, “neutral” investors ignore ethical considerations. As a consequence, the return of green and controversial assets can be affected if the fraction of green investors is large enough. The exclusion of polluting firms by green investors leads to reduced risk-sharing opportunities among investors (Merton, 1987). This market segmentation, where firms exhibiting poor corporate social responsibility are held by only a fraction of investors, induces greater systematic risk for these firms. As a result, neutral investors will require a higher rate of return for investing in polluting firms thus increasing the cost of capital of such firms.

Luo and Balvers (2017) extend the Sharpe-Lintner capital asset pricing model (CAPM) by introducing an additional risk factor to compensate unrestricted investors for holding sin stocks “boycotted” by other investors. Similar to Heinkel et al. (2001), they consider a segmentation of the investor base depending on their non-pecuniary preferences. By excluding firms whose activities are morally objectionable from their investment universe, socially responsible investors limit their investment opportunities. As a result, the two groups of investors face

different investment opportunity sets and thus choose different portfolios, which violates the key assumption of identical investment opportunity from the CAPM. The reduction of the investor base for boycotted stocks causes unrestricted investors to hold these assets in excess compared to the efficient market weights. This extra risk is compensated by higher returns.

Lower cost of capital – Perceived risk. The lower cost of capital associated with more ESG-related policies can also be explained by the reduction of firms' perceived risk. Focusing on the environmental dimension, Sharfman and Fernando (2006) argue that the implementation of environmental strategy should be viewed as a risk mitigation tool. Firms with a strong ESG profile face fewer litigation risks, which lowers their systematic risk. Given this reduced risk exposure, investors require a lower rate of return resulting in a lower cost of capital and thereby a higher valuation.

Albuquerque et al. (2019) construct a theoretical model which demonstrates how investment in CSR affects firms' systematic risk. This relationship between ESG criteria and systematic risk has also been proven empirically (Kim et al., 2014; Oikonomou et al., 2012). Their theory suggests that firms can use ESG policies as a product differentiation strategy. As a consequence of this strategy, firms investing in CSR face less-elastic demand – a more loyal customer base – which gives them more pricing power. This ability to charge higher prices and to obtain higher profit margins reduces firms' systematic risk and increases their value.

3. ESG criteria and stock financial returns: Systematic review of the empirical literature

We conduct a systematic review of the literature following the ROSES approach. ROSES is a framework developed by Haddaway (2018) that builds a list of criteria and steps to perform a systematic literature review. We followed the checklist provided by the authors to ensure that

the performed search is rigorous and representative of the existing literature. Our purpose of analysis is the empirical relationship between issuer ESG scores and their stock financial performance over the period 1970-2022, although the first relevant study dates to 1996.

a. Article collection

We first extract articles from the Scopus database (<https://www.scopus.com>). We run a query based on abstract, title or keywords that include the terms “csr” or “esg” or “sri” but not “lanka”², or “corporate” and “social” and “responsibility” or “environment” and “social” and “governance” or “socially” and “responsible” and “investment”. We restrict the search to articles written in English that have been published in an academic journal. This search yield 7,754 results as of March 20, 2022. We limit our sample to articles that have been published in a top-10 journal in the Google Scholar citation ranking³ in the fields of Economics, Finance, Management, Business and Accounting. This additional screen leads to a sample of 685 articles. The remaining list of articles is screened based on their abstract. We require that the articles have an empirical analysis in the form of an econometrical approach and remove articles that do not investigate the specific link between ESG scores and stock performance, among which were articles related to bonds, funds or banks. Our final sample from the Scopus

² This step avoids collection of articles relative to Sri Lanka and reduces the noise in our search.

³ The top-10 journals in the Google Scholar citation ranking for which there is at least one paper in our sample: American Economic Review, Quarterly Journal of Economics, Review of Financial Studies, Journal of Finance, Review of Economic Studies, Economic Journal, Journal of Financial Economics, Journal of Banking & Finance, Journal of Corporate Finance, Finance Research Letters, Journal of Accounting and Economics, Journal of Financial and Quantitative Analysis, Journal of Business Research, Management Science, Journal of Business Ethics, Accounting Review, Journal of Accounting Research, Accounting, Auditing & Accountability Journal, Review of Accounting Studies, British Accounting Review, Accounting and Business Research.

search contains 164 articles. Figure 3.1 shows the most used words⁴ among the abstracts and verifies the quality of our selection.

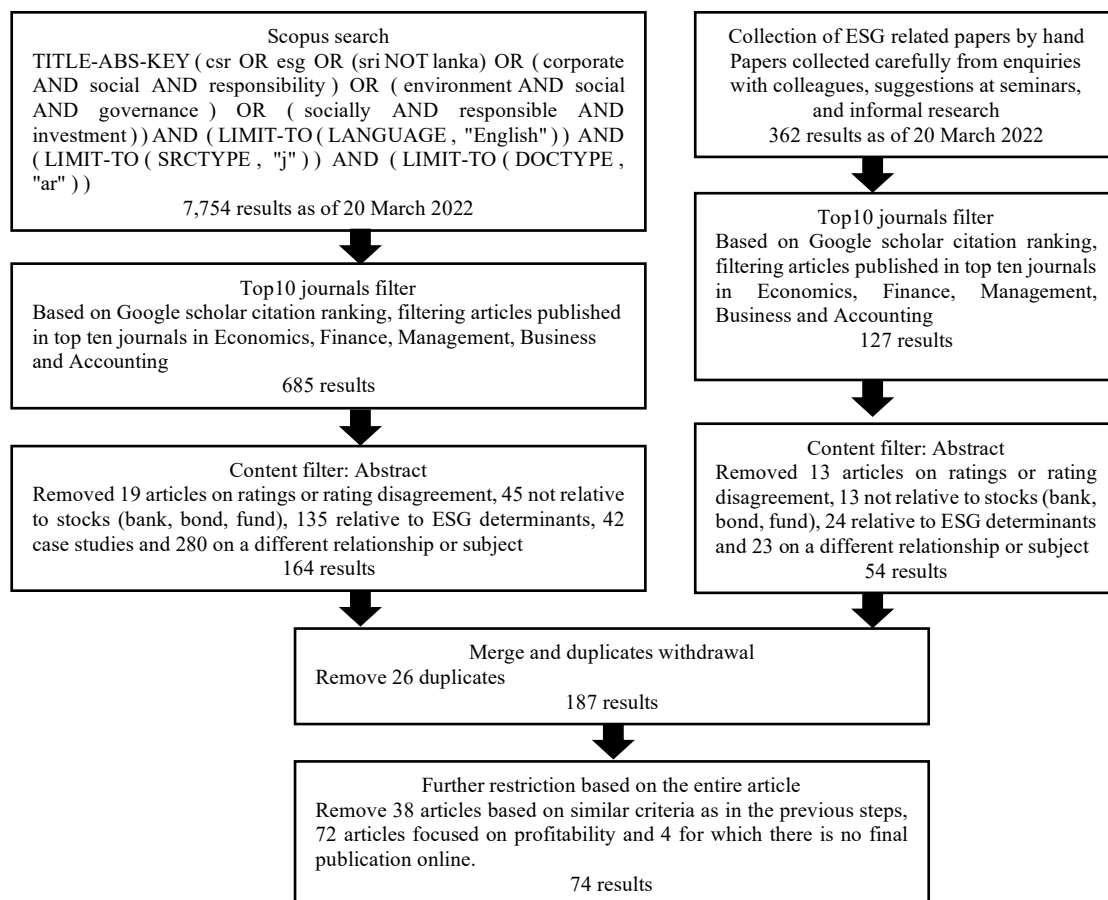
We complete this sample with articles manually collected. As of March 20, 2022, we collected 362 ESG-related papers thanks to enquiries with colleagues, suggestions at seminars, and informal research. Similar to the query carried out in Scopus, we focus on articles published in the top-10 ranking of Google Scholar, which lead to 127 articles. Of these articles, we retain 54 based on their abstract.

After merging these two samples and removing the duplicates, we reached a sample of 187 papers on the relation between ESG and performance. Finally, we focus our analysis on the financial performance of stocks and therefore eliminate the articles analyzing the relation between ESG and firm profitability. The resulting final sample contained 74 articles. The different steps of this search are detailed in Figure 3.2.



⁴ Stopwords and punctuation were removed using the "stopword" package for R available at <https://github.com/koheiw/stopwords>

Figure 3.1 - Most used words in the abstracts of the selected papers



d. Article classification **Figure 3.2 - Research methodology**

Of the 74 empirical works, we classify 68 papers into the three main theories described in Section 2. The 6 remaining papers do not directly relate to one theoretical framework. The classification is realized based on the specific statements that authors most often used in their

concluding remarks. Studies whose findings suggest that returns relate to better operating performance were considered to rely on the “predictability of ESG fundamentals” theory. Articles mentioning a heterogeneous pool of investors to support their results are classified under the “ESG and investor demand” category. Finally, the risk category includes all research proposing an extension of the traditional factor models with an additional risk factor. This classification has been cross-checked by the authors.

Table 1.1 provides the results of our classification. 68 studies out of the 74 included in our sample could be classified: 29 relate to the framework on predictability of ESG fundamentals, 24 to ESG affecting investor demand, 15 to systematic risk. For each study, we provide the main characteristics of the sample, the dependent variable used to assess stock performance and identify the sign of the relation between ESG and financial return. We document the sign as positive if the article concludes that ESG criteria are associated with higher returns, negative if the article concludes in the opposite direction, null if the article does not find any significant relationship between ESG criteria and stock performance, and conditional if the sign of the relation is conditional to other contextual information (e.g., country, firm characteristics) or if the relationship is non-linear (e.g., U-shape).

As illustrated in Figure 3.3, a large proportion of the empirical articles on the ESG-return relationship are contained within the financial research field. However, this relationship has also been the central focus of various articles in other fields, most of which have been published in top journals.

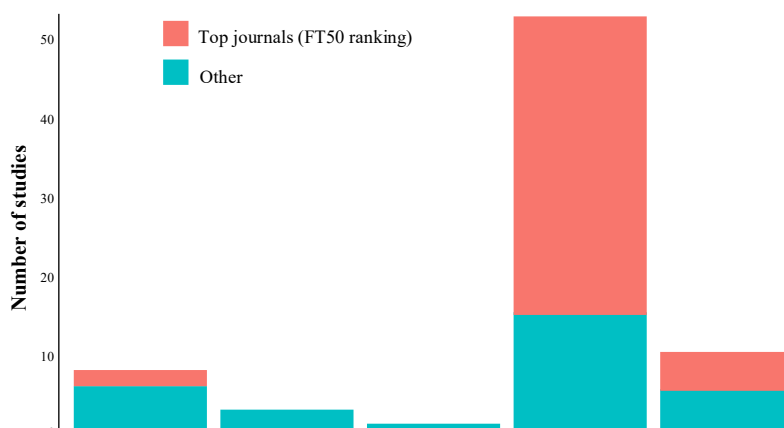


Figure 3.3 - Number of empirical studies by research fields

4. Discussion

Figure 4.1 provides a timeline illustrating the emergence of empirical studies on the relationship between firm ESG criteria and their financial performance, as well as the main theoretical references. We observed three phases.

The beginning of the sample (1996-2010) corresponds to the appearance of the first empirical studies. In 1996, consistent with the theory of predictability of ESG fundamentals, Klassen and McLaughlin (1996) argue that environmental management positively affects firm financial performance through two specific channels: market gains and cost saving. In addition, a study conducted by McGuire et al. (1998) gives evidence of significant risk reduction as a major benefit of social responsibility. Published about ten years later, a study by Hong and Kacperczyk (2009) pointed out that “sin” stocks are more likely to face litigation risk contributing to the higher return associated to this type of stock. Yet, it is not until 2008 that a study performed by Galema et al. (2008) provides evidence of pricing anomalies resulting from an excess in demand for socially responsible stocks and a shortage of demand for irresponsible stocks. As to the theoretical framework, only the risk theory was formalized during this period (Heinkel et al., 2001; Sharfman & Fernando, 2006).

The ESG-performance relationship remained under-investigated until the 2010s when the first ESG ratings were commercialized⁵. We observe a period of acceleration (2011-2020) with numerous empirical articles studying the ESG-performance relationship. Most of the empirical work in this period can be related to either the theory of predictability (Eccles et al., 2014; Flammer, 2015; Lins et al., 2017) or the implications of heterogeneous investor preferences for asset pricing (Derwall et al., 2011). Applications of the risk framework emerged around the 2010s, among which the research conducted by El Ghoul et al. (2011).

The theoretical models linked to ESG predictability and investor demand were only released between the end of this second period and the beginning of the third one – recent studies (2021-2022). In particular, Pedersen et al. (2021) built a model on the predictability of ESG fundamentals for firm profitability, describing the mechanism by which it influences stocks returns. Besides, the literature has extended the classical investor utility function to capture environmental and social aspects impacting the price formation of green or brown assets (Pastor et al., 2021; Pedersen et al., 2021). The number of empirical works supporting these two theories has largely expanded over the past two years. In the same period, empirical papers supporting the risk theory have shown a special attention to the reduction in perceived risk, presenting sustainability as an insurance mechanism against risk (Engle et al., 2020).

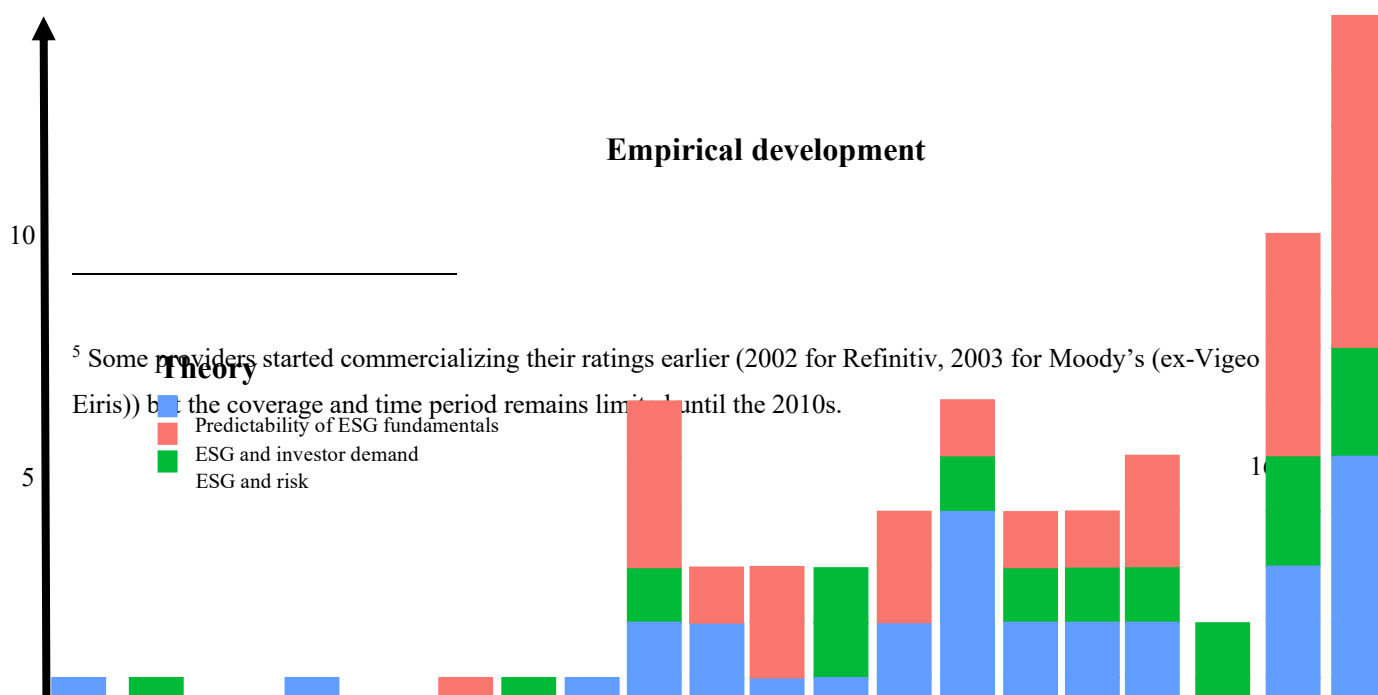


Figure 4.1 – Timeline of theoretical and empirical studies per theoretical framework

Table 4.1 provides descriptive statistics on the sample of empirical studies. Empirical research related to the predictability of ESG fundamentals mainly provides evidence of a positive relationship between ESG fundamentals and abnormal return. This positive effect shows that some ESG criteria such as employee satisfaction (Edmans, 2011; Green et al., 2019) have an impact on stock returns. The work establishing this positive relation has been widely cited in the literature, especially those published in the first part of the sample (1996-2010) and articles published in A+ journals⁶.

⁶ A+ journals are identified using the Financial Times ranking for academic journals (last update 2016): <https://www.ft.com/content/3405a512-5cbb-11e1-8f1f-00144feabdc0>

When looking at the ESG-financial performance relationship due to investor segmentation, the results are mixed. We observe about the same number of studies supporting respectively a positive or negative relation. Although no consensus can be drawn when considering the entire sample, evidence from studies published in A+ journals seems consistent with existing theories that command an ex-ante negative relation between ESG and stock return due to investor demand.

Among the empirical papers in our sample, two distinguish between institutional and retail investors. Hong and Kacperczyk (2009) show that since institutional investors are norm-constrained, “sin” stocks are neglected by a large part of the investors, which creates a premium for these stocks. Lee et al. (2022) also document an ESG premium during the Covid-19 crisis and explain it by the liquidation of brown stocks from institutional investors in order to reduce the risk of their portfolio. Erhemjamts et al. (2019) distinguish between institutional investors with long-term views and those with short-term views. They show that since ESG criteria have a long-term effect on stock return, the effect of ESG criteria on stock returns depends on the proportion of each type of investors. Consistent with Lee et al. (2022), Nofsinger et al. (2019) further discuss the difference between institutional and retail investors by showing that when institutional investors hold ESG assets, they do it in order to reduce the risk linked to a controversy rather than for their ESG impact.

Recent evidence provides an attempt to reconcile these a priori conflicting research results between empirical evidence and theory. Ardia et al. (2021) and Pastor et al. (2021) demonstrate that although the ex-ante relationship between sustainability and performance is negative, some events conveying climate-concerns might affect investors’ investing decisions and be responsible for temporary positive returns ex-post. Bansal et al. (2021) show that investor

demand for constituting a conscious portfolio increases in good economic times and is responsible for abnormal returns for high rated socially responsible stocks.

Finally, publications pointing out a negative relationship between ESG and stock performance are predominant among the studies based on the risk framework. These studies also received many more citations.

Table 4.2 shows the ten most cited articles in our sample. The three theoretical frameworks are represented in the subsample, with four articles linked to the risk theory, five articles related to predictability of ESG ratings theory and only one related to the recent investor demand theory. All ten articles display results that support the associated theories – i.e., a positive relationship between ESG and stock performance for the predictability theory and a negative effect for risk and demand theories. Most cited works are thus in line with the theories.

5. Concluding remarks

Research establishing a relationship between the performance of environmental, social or governance criteria of firm policies and their financial returns is recent. The first empirical work dates to 1996 and the number of empirical works started to increase after 2010. In the absence of a main theoretical framework, previous works have mostly followed an inductive approach and led to diverging results. Our paper reconciles the main conclusions brought by both the empirical and theoretical literature. We relied on a systematic approach to review the literature published in top academic journals in Economics, Finance, Management, Business and Accounting and provide a classification of 68 empirical works with regard to three main theoretical frameworks.

The first research providing a theoretical framework for the link between sustainability and stock performance was introduced in the 2000s and relies on the risk associated with green versus brown investment. This theory suggests a decrease in the cost of capital for sustainable firms that is either explained by the reduced investor base for “sin” stocks or the reduced perceived risk associated to firms with a strong ESG profile. Two other theoretical models emerged more recently; one is linked to the predictability of ESG fundamentals, while the second is based on the segmentation in investors’ preferences. The former supports the idea that ESG fundamentals have a predictability power for operating performance that further leads to stock excess return. The latter has also been developed over the past couple of years and relies on the hypothesis that a heterogeneous pool of investors in terms of preferences for green assets affects the stock performance. The two main theories that emerged recently (i.e., “predictability” and “investor demand”) might support different directions in the studied relationship. It has been shown that both could be reconciled in the case that investors present homogeneous preferences towards sustainability and capture the added-value of the ESG assessment of a firm. The ESG-return relationship might therefore be a relatively transitory phenomenon that is about to perish in the future.

These three theories therefore converge to the unique conclusion that ESG should not command any sub-performance or outperformance as the prices of financial assets should reflect the ESG performance of the issuer. Such long-term equilibrium is however conditional on the homogeneity of investor preferences towards sustainability and the availability of perfect information on the ESG of firms. However, the current short-term disequilibrium is associated to, on one hand, imperfect ESG information and, on the other hand, heterogeneous beliefs or preferences with regard to ESG.

As such, further research may enquire into the heterogeneous preferences of agents with regard to ESG with a particular attention to the distinction between institutional investors and private investors. In addition, the current academic evidence at stock level has direct implications on the performance of sustainable investment practices. The reduction of the investment base induced by the exclusion of “sin” stocks by investment funds may increase the risk of such assets and inflate the risks of such funds. Besides, the increase of the number of funds based on a best-in-class strategy may push ESG leading stocks’ prices up. This overpricing of ESG stocks would lead to abnormal returns in the short term but to scaled returns in the long term along the framework of Pastor et al. (2021). Indeed, there is a negative relationship between industry size and performance (Pastor et al., 2015). The increasing demand for ESG funds may also be explained by their good performance during crisis (Pastor and Vorsatz, 2020). However, the strategy consisting in active research of ESG characteristics not yet priced by the market may allow long-term abnormal returns and requires further research.

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Tables

Table 3.1 – Sample of empirical studies

Panel A: Predictability of ESG fundamentals			
Studies	Sample	Dependent variable	Sign of the ESG-return relation
Barko, T., Cremers, M., & Renneboog, L. (2021)	Geography: World Period: 2005-2014	Cumulative abnormal returns	+
Dimson, E., Karakaş, O., & Li, X. (2015)	Geography: US Period: 1999-2009	Abnormal returns	+
Ding, W., Levine, R., Lin, C., & Xie, W. (2021)	Geography: World Period: 2020	Stock return	+
Eccles, R. G., Ioannou, I., & Serafeim, G. (2014)	Geography: US Period: 1993-2010	Excess return	+
Flammer, C. (2015)	Geography: US Period: 1997-2012	Abnormal returns	+
Edmans, A. (2011)	Geography: US Period: 1984-2009	Excess return	+
Khan, M., Serafeim, G., & Yoon, A. (2016)	Geography: US Period: 1992-2013	Excess return	+
Green, T. C., Huang, R., Wen, Q., & Zhou, D. (2019)	Geography: World Period: 2008-2016	Excess return	+
Gompers, P., Ishii, J., & Metrick, A. (2003)	Geography: US Period: 1990-1998	Excess return	+
Klassen, R. D., & McLaughlin, C. P. (1996)	Geography: US Period: 1985-1991	Abnormal returns	+
Lins, K. V., Servaes, H., & Tamayo, A. (2017)	Geography: US Period: 2008-2009	Raw return, abnormal returns	+
Aktas, N., De Bodt, E., & Cousin, J. G. (2011)	Geography: Period: 1997-2007	Cumulative abnormal returns	+
Yoon, A., & Welch, K. (2020)	Geography: World Period: 2011-2018	Excess return	+
Boubaker, S., Liu, Z., & Zhan, Y. (2022)	Geography: China Period: 2020	Cumulative abnormal returns	+
Cellier, A., & Chollet, P. (2016)	Geography: Europe Period: 2004-2009	Cumulative abnormal return	Conditional

Christensen, D. M. (2016)	Geography: Period: 1999-2010	Cumulative abnormal returns	+
Deng, X., Kang, J. K., & Low, B. S. (2013)	Geography: US Period: 1992-2007	Cumulative abnormal returns	+
Humphrey, J. E., Lee, D. D., & Shen, Y. (2012)	Geography: UK Period: 2002-2010	Excess return	Null
Dhaliwal D., Radhakrishnan S., Tsang A., Yang Y. (2012)	Geography: World Period: 1994-2007	Earning Forecast Error	+
Hussaini, M., Hussain, N., Nguyen, D. K., & Rigoni, U. (2021)	Geography: US Period: 1992-2014	Takeover premium	+
Shackleton, M., Yan, J., & Yao, Y. (2022)	Geography: US Period: 1991-2015	Return	-
Zhang, J., Zhang, Y., & Sun, Y. (2022)	Geography: China Period: 2020	Raw return, abnormal returns	+
Alexandridis A, Hoepner G.F., Huang Z., Oikonomou I. (2022)	Geography: World Period: 2004-2011	Cumulative abnormal returns	-
Feng Z., Chen C., Tseng. (2018)	Geography: US Period: 1992-2012	Cumulative abnormal returns	+
Gomes M., Marsat S. (2018)	Geography: World Period: 2003-2014	Bid premium	+
Erragragui E., Lagoarde-Segot T. (2016)	Geography: World Period: 2008-2014	Excess return	Null
Jost S., Erben S., Ottenstein P., Zulch H. (2022)	Geography: Period: 2003-2018	Cumulative abnormal returns	Null
Erhemjamts O., Huang K. (2019)	Geography: US Period: 2003-2013	Lagged return	Conditional
Verwijmeren P., Derwall J. (2010)	Geography: US Period: 2001-2005	Credit rating	+

Panel B: Investor demand

Studies	Sample	Dependent variable	Sign of the relation ESG-return
Bansal, R., Wu, D., & Yaron, A. (2022)	Geography: World Period: 1993-2013	Abnormal returns	-
Bebchuk, L. A., Cohen, A., & Wang, C. C. (2013)	Geography: US Period: 1990-2008	Excess return	Conditional
Capelle-Blancard, G., & Petit, A. (2019)	Geography: World Period: 2002-2010	Abnormal returns	-
Derwall, J., Koedijk, K., & Ter Horst, J. (2011)	Geography: US Period: 1992-2008	Excess return	-

Galema, R., Plantinga, A., & Scholtens, B. (2008)	Geography: US Period: 1992-2006	Excess return	Null
Serafeim, G., & Yoon, A. (2022)	Geography: US Period: 2010-2018	Excess return	+
Trinks, P. J., & Scholtens, B. (2017)	Geography: World Period: 1991-2012	Excess return	-
Becchetti, L., Ciciretti, R., Hasan, I., & Kobeissi, N. (2012)	Geography: Period: 1990-2004	Excess return	-
Bose, S., Minnick, K., & Shams, S. (2021)	Geography: World Period: 2006-2018	Acquirer's five-day cumulative abnormal stock returns	-
Bofinger, Y., Heyden, K. J., & Rock, B. (2022)	Geography: US Period: 2004-2017	Misvaluation measure (i.e., market cap/true value)	+
Bae, K. H., El Ghouli, S., Gong, Z. J., & Guedhami, O. (2021)	Geography: US Period: 2020	Raw return, market-adjusted return	Null
Naughton, J. P., Wang, C., & Yeung, I. (2019)	Geography: US Period: 2002-2010	Abnormal returns	+
Krüger, P. (2015)	Geography: US Period: 2001-2007	Cumulative abnormal returns	-
Díaz, V., Ibrushi, D., & Zhao, J. (2021)	Geography: US Period: 2020	Excess return	Conditional
Dutordoir, M., Strong, N. C., & Sun, P. (2018)	Geography: US Period: 2004-2013	Cumulative abnormal return	+
Fuenzalida, D., Mongrut, S., Arteaga, J. R., & Erasquin, A. (2013)	Geography: Peru Period: 2007-2010	Excess return	+
Wong, J. B., & Zhang, Q. (2022)	Geography: US Period: 2007-2018	Excess return	+
Monfort, A., Villagra, N., & Sánchez, J. (2021)	Geography: World Period: 1995-2012	Cumulative abnormal returns	Conditional
Dhaliwal D., Radhakrishnan S., Tsang A., Yang Y. (2012)	Geography: World Period: 1994-2007	Earning Forecast Error	+
Lee, S., Lee, D., Hong, C., & Park, M. H. (2022)	Geography: Korea Period: 2020-2021	Excess return	+
Lam S., Zhang W., Jacob G. (2015)	Geography: US Period: 1992-2011	Stock return	-
Naffa H., Fain M. (2022)	Geography: Period: 2015-2019	Excess return	-

Zou P., Li G. (2016)	Geography: China Period: 2001-2011	Excess return	-
Avramov D., Cheng S., Lioui A., Tarelli A. (2021)	Geography: US Period: 2002-2019	Excess return	Null

Panel C: Risk

Studies	Sample	Dependent variable	Sign of the relation ESG-return
El Ghouli S., Guedhami O., Kwok C., Mishra D. (2011)	Geography: US Period: 1992-2007	Cost of Equity	-
Bolton, P., & Kacperczyk, M. T. (2020)	Geography: World Period: 2005-2018	Stock return	-
Chan, P. T., & Walter, T. (2014)	Geography: US Period: 1990-2012	Excess return	+
Chava, S. (2014)	Geography: US Period: 2000-2007	Implied cost of capital	-
Hong, H., & Kacperczyk, M. (2009)	Geography: US Period: 1962-2006	Excess return	-
Nofsinger, J. R., Sulaeman, J., & Varma, A. (2019)	Geography: US Period: 2001-2013	Excess return	+
McGuire, J. B., Sundgren, A., & Schneeweis, T. (1988)	Geography: Period: 1982-1984	Risk-adjusted return, alpha, total return	-
Nguyen, P. A., Kecskés, A., & Mansi, S. (2020)	Geography: US Period: 1991-2009	Excess return	-
Huang, Y., Yang, S., & Zhu, Q. (2021)	Geography: US Period: 2020	Raw return, abnormal returns	-
Löf, H., Sahamkhadam, M., & Stephan, A. (2021)	Geography: World Period: 2018-2020	Value-of-return, conditional Value-of-Return	-
Engle R., Giglio S., Lee., Stroebe J. (2020)	Geography: US Period: 1995-2016	Excess return	+
Ben Hmiden O., Rjiba H., Saadi S. (2022)	Geography: US Period: 1998-2015	Cost of Equity	-
Brzeszczynski J., Gajdka J., Schabek T. (2021)	Geography: Eastern Europe Period: 2009-2018	Excess return	+
Breuer W., Muller T., Rosenbach D., Salzmann A. (2018)	Geography: World Period: 2002-2015	Cost of Equity	-
Luo H., Balvers R. (2017)	Geography: US Period: 1963-2012	Excess return	-

Panel D: Not classified

Studies	Sample	Dependent variable	Sign of the relation ESG-return
Masulis, R. W., & Reza, S. W. (2015)	Geography: US Period: 1963-2012	Excess return	-
Erragraguy, E., & Revelli, C. (2015)	Geography: US Period: 2008-2011	Excess return	Null
Shanaev, S., & Ghimire, B. (2022)	Geography: US Period: 2016-2021	Risk-adjusted excess return	+
Broadstock D., Chan K., Cheng L., Wang X. (2021)	Geography: China Period: 2015-2020	Excess return	+
Crifo P., Forget V., Teyssier S. (2015)	Geography: US Period:	Firm valuation	+
Ng A., Rezaee Z. (2015)	Geography: US Period: 1991-2013	Cost of Equity	-

Table 4.1 - Descriptive statistics of the sample of empirical studies

			Predictability of ESG fundamentals				ESG and investor demand				ESG and risk				Not classified				Total	
			Pos	Neg	Null	Conditional	Pos	Neg	Null	Conditional	Pos	Neg	Null	Conditional	Pos	Neg	Null	Conditional		
Entire sample 1996-2022	A+	Number of articles	15	0	0	0	2	5	1	1	1	4	0	0	0	1	0	0	0	30
		Average number of citations	668	-	-	-	12	361	2	111	49	1,410	-	-	-	220	-	-	-	596
	Other	Number of articles	6	2	3	3	6	5	2	2	3	6	1	0	3	1	1	0	0	44
		Average number of citations	41	0	34	12	26	40	178	12	23	536	84	-	-	108	16	-	-	108
Beginning of the sample 1996-2010	A+	Number of articles	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	4
		Average number of citations	2,547	-	-	-	-	-	-	-	-	2,686	-	-	-	-	-	-	-	-
	Other	Number of articles	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2
		Average number of citations	112	-	-	-	-	-	309	-	-	-	-	-	-	-	-	-	-	-
Period of acceleration: 2011-2020	A+	Number of articles	11	0	0	0	1	4	0	1	1	2	0	0	0	1	0	0	0	21
		Average number of citations	440	-	-	-	23	451	-	111	49	134	-	-	-	220	-	-	-	348
	Other	Number of articles	3	0	2	2	3	3	0	0	2	3	1	0	1	1	1	0	0	22
		Average number of citations	61	-	51	18	49	65	-	-	32	1,068	84	-	42	108	16	-	-	184
Recent studies 2021-2022	A+	Number of articles	2	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	5
		Average number of citations	41	-	-	-	1	1	2	-	-	-	-	-	-	-	-	-	-	17
	Other	Number of articles	2	2	1	1	3	2	1	2	1	3	0	0	2	0	0	0	0	20
		Average number of citations	1	0	1	1	2	3	48	12	3	4	-	-	41	-	-	-	-	9
Total number of studies			21	2	3	3	8	10	3	3	4	10	1	0	3	2	1	0	74	

Caption: Number of studies published and average number of citations (as of May 13, 2022) relative to the relationship between ESG criteria and stock returns by category. The articles are classified as “A+” following the Financial Times ranking for academic journals (last update 2016): <https://www.ft.com/content/3405a512-5cbb-11e1-8f1f-00144feabdc0>. The articles classified as “Pos” are the ones for which the relationship between ESG and stock returns is positive, “Neg” when the relationship is negative, “Null” when the relationship is non-significant and “conditional” when the sign of the relationship is conditional to other parameters. The average number of citations corresponds to the sum of citations of the articles in a specific category over the number of articles in the same category.

Table 4.2 - Top ten articles by number of citations

Reference	Journal	Theory	Sign of ESG-return relation	Field	Number of citations
Eccles, R. G., Ioannou, I., & Serafeim, G. (2014)	Management Science	Predictability of ESG fundamentals	Positive	Management	664
Gompers, P., Ishii, J., & Metrick, A. (2003)	Quarterly Journal of Economics	Predictability of ESG fundamentals	Positive	Economics	3,568
Klassen, R. D., & McLaughlin, C. P. (1996)	Management Science	Predictability of ESG fundamentals	Positive	Management	1,527
Lins, K. V., Servaes, H., & Tamayo, A. (2017)	Journal of Finance	Predictability of ESG fundamentals	Positive	Accounting	660
Dhaliwal D., Radhakrishnan S., tsang A., Yang Y. (2012)	Accounting Review	Predictability of ESG fundamentals	Positive	Finance	690
Dhaliwal D., Li O., Tsang A., Yang Y. (2011)	Accounting Review	ESG and investor demand	Negative	Accounting	1,360
El Ghoul S., Guedhami O., Kwok C., Mishra D. (2011)	Journal of Banking and Finance	ESG and risk	Negative	Finance	2,443
Breuer W., Muller T., Rosenbach D., Salzmann A. (2018)	Journal of Banking and Finance	ESG and risk	Negative	Finance	703
Hong, H., & Kacperczyk, M. (2009)	Journal of Financial Economics	ESG and risk	Negative	Finance	725
McGuire, J. B., Sundgren, A., & Schneeweis, T. (1988)	Academy of Management Journal	ESG and risk	Negative	Management	4,648

Caption: Top ten articles with the highest number of citations (as of May 13, 2022). The sign of ESG-return relation is defined as “Positive” when the article displays a positive relationship between ESG and stock returns and “Negative” when the article displays a negative relationship. “Field” corresponds to the field of research and is defined based on the journal classification used by Google scholar.