Exploring the role of ESG for the performance and risks of infrastructure investing: evidence from the international funds' market

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Exploring the Role of ESG for the Performance and Risks of Infrastructure Investing: Evidence from the International Funds' Market

Abstract

This study investigates the relation between ESG-driven investment strategies and the performance of infrastructure funds. More specifically, this study examines the impact of the different dimensions – environmental (E), social (S) and governance (G) – of the ESG profile of infrastructure funds on their performance. The results show that infrastructure funds with more solid environmental investment policies experience a lower performance, while those with a stronger social orientation yield a superior performance. Governance-related investment policies seem to be trivial in determining the performance of these funds. Further analysis shows that ESG Controversies have a negative impact on infrastructure funds' performance, whereas Emissions and Resource Use scores, both proxying for different elements under the environmental pillar, have opposite signs. Finally, the Community score has a positive impact on funds' performance consistent with the positive impact of the social pillar score. The study also provides a number of sub-sample analyses to shed light on the conditions under which each pillar has significant impact on funds' performance.

Keywords: ESG; Infrastructure Funds; Net Asset Value; Sharpe Ratio; CO2 emissions; ESG Controversies.

1. Introduction

ESG considerations are a growing force in the money management industry (Fama, 2021). Hence, a new variable, ESG, is added to the decision-making process of investors (Ammann et al., 2019). Indeed, 83% of active U.S. investment managers embed ESG criteria into their investment decision-making (Cerulli Associates, 2019). ESG investing can be defined as an investment process that involves allocating capital into assets (e.g., companies' stocks, infrastructures) with high corporate social responsibility (CSR) profiles where the latter are evaluated on the basis of environmental (E), social (S) and corporate governance (G) criteria (Renneboog et al., 2008a; Auer and Schuhmacher, 2016). It implies that not only investors hold portfolios to obtain financial returns but also to take advantage of personal and societal values (Auer and Schuhmacher, 2016).

Among various investment categories, infrastructure is a relatively new asset class with attractive attributes to institutional investors, such as low sensitivity to swings in the business cycle, low correlation with equity markets, and long-lasting cash flows generated by tangible and durable projects in highly regulated industries backed by prolonged concession agreements (Andonov at al., 2021). Infrastructure assets have the potential to offer environmental, social, and political/governance benefits. From transportation systems to energy generation and healthcare facilities, infrastructure plays an important role in advancing sustainable, inclusive development and enhancing societal resilience. The role of infrastructure as a catalyst for sustainable growth and as an enabler of the transition to a low-carbon economy has become increasingly clear in the wake of the COVID-19 pandemic as economies around the world strive to build back better (RBC Capital Markets Insights, 2022).[1] Stimulus packages issued by G20 governments over the last two years, including the Bipartisan Infrastructure Deal in the United States, the National Infrastructure Strategy in the UK, and the EU's NextGen program, have placed green and social infrastructure investment at the forefront of post-pandemic economic recovery plans.

At the same time, the global infrastructure financing gap – the difference between infrastructure needs and investment – is anticipated to reach US$15 trillion by 2040. This gap cannot be reconciled by public funding alone; mobilizing private capital will also be essential. As institutional investors increasingly seek to deepen their exposure to green assets and projects, as well as invest in projects which advance socio-economic inclusion, interest in sustainable infrastructure funds' market will continue to grow.

[1] The UN Environment Programme (UNEP) defines sustainable infrastructure as infrastructure that is planned, designed, constructed, operated, and decommissioned in a manner that ensures economic and financial, social, environmental, and institutional sustainability over the entire lifecycle.

In this context, it should be noted that 97% of infrastructure companies with core and non-core infrastructure assets are exposed to ESG risks that have some potential to impact their credit ratings if the risks are not actively and properly managed (Linklaters, 2020). At the same time, ESG is already being woven into financial regulation at EU level. According to the regulation on sustainability-related disclosures in the financial sector published in December 2019, the alternative investment fund managers (AIFMs) have been articulating their approach to ESG and its link to remuneration since March 2021. In this sense, most infrastructure funds see ESG as a value-driver to improve the resilience and sustainability of portfolio companies (Linklaters, 2020). In order to capitalize on the opportunities that ESG brings, ESG factors need to be considered at every stage of the investment lifecycle. ESG horizon scanning needs to be part of investment strategies and asset selection. To truly embrace ESG, it needs to be embedded in the fund's culture instead of being seen as a vague corporate responsibility option or even another compliance requirement. Hence, the decisions of asset managers should include rigorous assessments of ESG.

Sustainable investing assets exceeded $35 trillion globally at the start of 2020, a 15% increase in two years (Global Sustainable Investment Review, 2020). In the wake of the significant market surge, socially responsible investment has been investigated at both theoretical (Oehmke and Opp, 2020; Cornell, 2021; Pedersen et al., 2020; Pastor et al., 2021) and empirical level (Capelle-Blancard and Monjon, 2014; Ammann et al., 2019; Liang and Renneboog, 2020). In this regard, the key aspect under inquiry has been the impact of the ESG profile of such investments on expected returns offered to investors. However, while there has been a wide range of academic studies exploring the empirical relationship between performance and ESG profiles of the several asset classes such as stocks (Auer and Schuhmacher, 2016), corporate and sovereign bonds (Drut, 2010; Polbennikov et al., 2016; Tang and Zhang, 2020; Flammer, 2021) or asset management structures, such as mutual funds (Renneboog et al., 2008b; El Ghoul and Karoui, 2017) and sovereign wealth funds (SWFs) (Liang and Renneboog, 2020), ESG-related infrastructure investing is still under-researched. Indeed, in view of the long-term time horizon of infrastructure investments and the essential nature of services provided to communities and society in areas such as utilities, transport, energy and, most obviously, social infrastructures such as schools and hospitals, ESG is core to this sector.

To that end, our paper fits in the realm of studies aimed at investigating the empirical relation between ESG-driven investment strategies and the performance of mutual funds (Ielasi et al., 2018; Helliar et al., 2022b), the impact of the information content of sustainability ratings on the flows of mutual funds (Ammann et al., 2019), the comparison between the performances of socially responsible investing (SRI) funds and conventional ones (Helliar et al., 2022a; El Ghoul et al., 2023). More specifically, our article extends this literature by studying the impact of the adoption of ESG investment policies on the performance of the infrastructure funds and, to the best of our knowledge, it is the first to do so. In this regard, our study complements that by Andonov et al. (2021) which analyzes the risk and return characteristics of infrastructure funds compared to those of other private funds (e.g., VC funds, buyout funds).

More broadly, we make the following three contributions to literature. First, we study the ESG investment strategies of the infrastructure funds operating both at local and global level and their relationship with annual performance. More specifically, our claim is that the ESG investment strategy of a fund is rooted in the ESG features of its underlying assets selected by the fund manager. Second, we investigate the different dimensions – environmental (E), social (S) and governance (G) – of the ESG strategic profile of infrastructure funds by also measuring their impact on performance. Third, we shed light on some detailed but relevant aspects of this phenomenon by analyzing the breakdown of the ESG strategic profile of infrastructure funds into four sustainability sub-scores capturing their efforts to reduce CO2 emissions, the use of polluting materials and to influence local communities as well their exposure to the risk of litigation due to the occurrence of ESG controversies. Again, this is the first study to address the extent to which the adoption of ESG investment policies by the infrastructure funds have an impact on their performances in a comprehensive manner. Not only is the ESG space of such funds analyzed, but also the effects of its different dimensions on (Net Asset) value creation for investors are quantified.

The main findings of our econometric analysis can be summarized as follows. The pursuit of environmental investment strategies by infrastructure funds is inversely related with their performance, while investing into social infrastructures increases their performance. These opposite effects on performance are more pronounced for young, local and concentrated infrastructure funds. The importance of the social dimension for performance improvement also stretches out to funds operating globally. Instead, the attention to governance aspects has no impact on funds' performance. A further analysis suggests that: (a) a higher exposure of infrastructure funds' investments to ESG controversies lowers their performance; (b) the increased compliance with rules to emit less CO2 negatively impacts funds' performance; (c) the contraction of the use of materials harmful to the environment enhances funds' performance; (d) investing into social infrastructure with increasing impact on the wealth of local territories and communities leads to superior funds' performance.

Our article is organized as follows. Section 2 reviews the relevant literature. Section 3 presents the data, the methodology and our main empirical findings. Section 4 draws some key implications for infrastructure fund managers and policy-makers and concludes.

2. Literature Review

Most recently, there has been a growing literature on ESG-based investment strategies. The role of sustainability in investments has been mainly discussed by academic research linking stock and fund performance, as well as fund flows, to ESG criteria across various fund categories (e.g., mutual funds, sovereign wealth funds, infrastructure funds) and different geographic markets. Prior studies on ESG and sustainable investing have been of both conceptual and empirical nature.

From a conceptual standpoint, Cornell (2021) suggests that there are two primary factors affecting expected returns for companies with high ESG ratings: investor preferences and risk. Following Fama and French (2007), Cornell (2021) argues that the positive behavioral bias by which investors may prefer stocks of companies with high ESG ratings for their social impact in addition to their pecuniary return would raise market prices while causing a decline in the discount rate at which the companies' cash flows are discounted.[2] This would represent a double-edged sword for investors as two opposite effects will be determined at two distinct points in time. In the short run, highly rated ESG stocks will outperform low ESG stocks, with investors using lower (higher) discount rates to price the former (latter) and thus earning superior risk-adjusted returns. In the long run, when the above price adjustment is complete and prices have reached equilibrium, the value of highly rated ESG stocks will be greater but their expected returns will be lower having converged to discount rates. As a result, investors having a positive (nonpecuniary) preference for highly rated ESG stocks with an expected positive impact on society must not be compensated with a higher expected return. More interestingly, the performance of stocks as a function of their ESG rating will be dependent on the sample period. However, from the point of view of the company and society, there will be two intertwined benefits. The lower discount rate incentivizes firms to go green as greener firms have greater market value and can become further valuable as their new projects will generate more value than those undertaken by firms with lower ESG ratings. This would create more capital raising opportunities related to green investments for highly rated ESG companies.

The same conclusions reached by Cornell (2021)'s study are also obtained by Pastor et al. (2021). Through the lens of an equilibrium model, they show that investors' tastes for green holdings affect asset prices. Investors are willing to pay more for greener firms, thus lowering the costs of capital of such companies. Green assets then have negative CAPM alphas, whereas brown assets display positive alphas. Consequently, investors with stronger ESG preferences, whose portfolios tilt more

[2] Fama and French (2007) develop a model in which when investors also have tastes for assets as consumption goods prices deviate from the predictions of the conventional risk-return logic.

toward green assets (and away from brown assets), earn lower expected returns. Nevertheless, sustainable investing produces a positive social impact by making firms greener and by shifting real investments toward green firms.

Additionally, Cornell (2021) contends that to the extent that ESG is a risk factor to be included in a multifactor asset pricing model, investors' desire for a related exposure would require a negative risk premium, thus implying lower expected returns for highly rated ESG firms. This suggests that a high ESG rating can function as a hedge against climate/environmental sustainability shocks or any unexpected changes in regulation impacting the environmental, social or governance dimensions of society (Lioui, 2018; Engle et al., 2020; Pastor et al., 2021). However, West and Polychronopoulos (2020) doubt that ESG may be considered as a risk factor as there is no robust evidence about high ESG stocks yielding a positive performance to investors across various definitions of ESG ratings and markets (U.S., Europe).

Pedersen et al., 2021 develop and empirically validate an ESG-efficient frontier showing the costs and benefits of responsible investing. Equilibrium asset returns satisfy an ESG-adjusted capital asset pricing model (CAPM), showing when higher ESG assets have lower or higher equilibrium expected returns. They test their theoretical equilibrium predictions using four ESG proxies, providing a rationale for why certain ESG measures predict returns positively (some aspects of governance, G) and others negatively (non-sin stocks, a measure of S) or close to zero (low carbon emissions, an example of E, and commercial ESG measures).

From an empirical perspective, there is a wide range of studies that deserve to be mentioned. Auer and Schuhmacher (2016) construct and compare a series of ESG-based stock using a new dataset of international ESG scores provided by Sustainalytics. They show that – regardless of geographic region (Asia-Pacific, USA, Europe), industry or ESG criterion – active selection of high-ESG or low-ESG rated stocks does not offer superior risk-adjusted performance in comparison to passive investing.

On the front of mutual funds, Ammann et al. (2019) provide empirical evidence supporting a causal relationship between sustainability and funds' flows by exploiting an exogenous shock to the availability of sustainability information: the launch of Morningstar Sustainability Rating in March 2016.[3] By showing that retail investors invest in funds with the highest Sustainability Rating while withdrawing money from lower-rated funds being more sensitive to the publication of the rating than institutional investors, their research demonstrates retail investors' strong interest in

[3] Morningstar's Sustainability Rating measures a mutual fund's conformity to ESG criteria and assigns each fund share class to a rating category between 1 (low sustainability) and 5 (high sustainability).

sustainable investment strategies and the related importance of condensed and clearly displayed, albeit unsophisticated, sustainability information. In so doing, they support a model in which investors have multi-attribute utility functions beyond performance. Their findings document a substantial economic impact of the Morningstar Sustainability Rating on flows of actively managed domestic US equity mutual funds. An average high-rated retail fund receives between $4.1 million and $10.1 million higher inflows per year than expected for an average rating. A low-rated retail fund suffers from a $1.0 million to $5.0 million lower net flow per year compared to an average-related fund.

Based on a sample of 634 European mutual funds and using the Morningstar Sustainability Rating, Abate et al. (2021) provide evidence of the superior financial efficiency of funds investing in high ESG-rated securities, which enjoy a competitive advantage due to their inclusion of non-financial data. They also show that funds with high ESG ratings are subject to lower ongoing charges despite their more complex screening activities and related operating costs.

By combining administrative investor data, behavior in controlled experiments and survey data, Riedl and Smeets (2017) investigate why individuals hold socially responsible equity funds. They find that intrinsic social preferences play an important role in determining socially responsible investment (SRI) decisions, even when controlling for risk preferences, trading activity, realized Sharpe ratios, and other investor characteristics. Financial motivations also play a role in SRI decisions as investors who expect SRI equity funds to underperform relative to conventional equity funds are less likely to invest in a socially responsible manner. Even most interestingly, most socially responsible investors expect SRI funds to earn lower returns than conventional funds, to achieve worse Sharpe ratios, and to pay higher management fees, thus suggesting that on average investors with a strong social motivation are willing to forgo financial returns in order to invest in accordance with their social preferences.

Social preferences also play a key role in influencing pension plan participants when asked to vote on the sustainable investment strategy of their schemes. In this regard, Bauer at al. (2021) study sustainable investment behavior in a field survey in which a pension fund grants its members a real vote on its sustainable investment policy. They show that two-thirds of participants are willing to expand the fund's engagement with companies based on selected SDGs, even when they expect such engagement to hurt financial performance. A majority also support more sustainable investments when participants see how the pension fund implemented the increased focus on sustainable investments. A key reason is participants' strong social preferences.

Concerning the practice of ESG-washing, Candelon et al. (2021) use a sample of about 1500 European and U.S. domestic equity mutual funds to show that socially responsible mutual fund names are not related to their non-financial performance. Indeed, they find that some asset managers opportunistically make unsubstantiated or misleading claims about their funds' ESG commitments such as the choice of a name or a private third-party certification with a label assignment, thus portraying themselves as socially responsible but without making any tangible investment decision. This practice of ESG-washing amplifies the degree of information asymmetry in this market, which spurs investors interested in responsible investing not to trust ESG labels but only rely on the ex-post extra-financial performance of funds synthesized in an ESG score.

Given the non-exclusive focus of sovereign wealth funds (SWFs) (that are government-owned) on financial returns and their additional stakeholder orientation (e.g., Norwegian Oil Fund, SWFs of New Zealand and France), it is reasonable to expect that they may be in a prime position to concentrate on long-term corporate and societal sustainability. In this regard, Liang and Renneboog (2020) investigate whether and how SWFs incorporate ESG considerations in their investment decisions in publicly listed companies as well as the subsequent evolution of target firms' ESG performance. To this end, they distinguish between SWFs' selection (whether the ESG performance of potential target firms affects funds' investment decisions) and engagement (whether SWFs' activism in the course of their investments improves the ESG performance of target firms). Based on a sample of 24 SWFs (80% of total AUM by SWFs globally), their findings suggest that the ESG score of target firms is a strong predictor of its SWF ownership (both of the probability of being invested in and of the ownership stakes held). The ESG relation to SWF ownership is driven by SWFs originating from developed and civil law countries and by SWFs explicitly adopting an ESG investment policy. Furthermore, no evidence is found that SWF ownership increases the ESG performance of target firms, thus suggesting that SWFs seem to select companies with better ESG performance to invest.

Based on Preqin data, Andonov et al. (2021) analyze the risk-return profile of closed (private) infrastructure funds operating in various geographic regions and industries finding a lower risk-adjusted performance, similar volatility and cyclicality compared to other alternative asset class investments. More specifically, the performance of infrastructure funds is based on procyclical cash flows generated largely by quick exit deals. Such evidence shows that, even though infrastructure funds hold long-lived tangible assets frequently backed by concession agreements, the business model of closed funds seems incompatible with the investors' expectations of stable long-term income streams, thus leading to a failure to translate potential differences in the underlying assets into different risk-return properties. Furthermore, their findings imply that ESG considerations and a focus on sustainability and impact investing contribute to increased infrastructure investment overall, and in particular by public institutional investors, but also to the underperformance of public (compared to private) institutional investors. The adoption of United Nations Principles for Responsible Investment (UN PRI) and shocks imposing voluntary ESG regulations on public investors explain around 25%-40% of the higher number of infrastructure investments made by public investors. These types of investors with prevailing nonfinancial objectives may also be willing to accept lower performance in return for social externalities by concentrating their investments on infrastructure assets rather than on other less ESG-driven but more profitable assets. Hence, the underperformance of infrastructure investments reflects a price that must be paid to create their associated social benefits, with the transfers accruing either to the infrastructure assets or to the funds' general partners (GPs) through fees. An estimation of the annual dollar value of such transfers, provided by Andonov et al. (2021), is around $5 billion.

3. Data, Methodology and Empirical Findings

3.1 Data

To study the risk-return properties of infrastructure funds and the relationship with their ESG profiles, an empirical analysis is conducted.

The rising interest of investors for infrastructure assets has caused a remarkable increase in the investments of infrastructure funds worldwide. In the 2007-2019 period, infrastructure funds' investments grew at an average yearly rate of 40% (+ 478%; $ 101 billion in 2007 vs. $ 582 billion in 2019) (Preqin, 2020).[4] As a consequence of this soaring attention towards infrastructures as an asset class, the number of listed infrastructure funds operating globally has also increased exponentially. As of December 2020, 886 listed infrastructure funds operated in global markets managing assets worth € 72,9 billion (asset under management; AUM). Due to the strong ESG orientation of infrastructure investing, an important portion of such funds (378) adopted ESG investment policies with AUM amounting to € 29,6 billion (source: Refinitiv). It follows that ESG-oriented (listed) infrastructure funds now represent 42,7% of total industry. Indeed, given the major trend in sustainable investments across global markets, the number of ESG-oriented (listed) infrastructure funds has steadily increased over the past fourteen years as they were only 26 (out of 102; 25,5%) in 2007. The AUM of ESG-oriented infrastructure funds has also raised almost quadrupling (+377%) between 2007 (€ 6,2 billion) and 2020 (€ 29,6 billion) (Figure 1). At the end of 2020, the AUM of the 378 ESG-oriented (listed) infrastructure funds reached a market share of almost half (41%) of the global infrastructure fund industry.

[4] Preqin statistics refer to both listed and non-listed infrastructure funds.

[INSERT FIGURE 1 ABOUT HERE]

The population of listed infrastructure funds operating in the international capital markets between 2007 and 2020, as displayed in Figure 1, was identified through Refinitiv Eikon and key financial data - including net asset value (NAV), volatility and portfolio return - were retrieved. The population comprises 886 infrastructure funds still operating as of December 2020, of which 378 have adopted an ESG investment policy. For these 378 infrastructure funds, the relevant information is not always fully available, which thus forced us to restrict the sample of our study. Indeed, due to the lack of data concerning volatility and Sharpe Ratio, our econometric analysis is based on a subset of the above population, a sample of 180 ESG-oriented infrastructure funds, which represents about 47,6% of the population, with the share exceeding one-half (53,7%) as regards the assets under management (AUM). Table 1 reports the comparative statistics of the population vs the sample of ESG-oriented infrastructure funds used for the purpose of our empirical analysis.

[INSERT TABLE 1 ABOUT HERE]

3.2 Methodology

This study investigates the impact of the ESG investment policies adopted by infrastructure funds - whose assessment is synthesized in the three key ESG pillar scores, i.e., Environmental (E) (ENV_SC), Social (S) (SOC_SC) and Governance (G) (GOV_SC) - on their performance, after controlling for a battery of fund-specific control variables as per equation (1).

Performance = *f* (ENV_SC, SOC_SC, GOV_SC; *Vol_3Y, Sharpe_R, AGE, HHI, D_Assets, D_Global, D_INSTF*) (1)

Our performance variable is the fund performance measured based on the growth of the net asset value (NAV) of each infrastructure fund from the launch year to 2020. Thus, we focus on the long-life performance of the fund. The reason we utilize the long-term performance of infrastructure funds is because the purpose of the study is to investigate the impact of ESG-driven investment strategies (on the funds' performance) which could not be short-termism. *ENV_SC, SOC_SC, GOV_SC* are the Environmental, Social and Governance scores at fund level as provided by Refinitiv database. In particular, ESG scores are calculated by Refinitiv based on 630 company-level measures, of which 186 include the most material ones per industry in order to assess each firm's ESG performance, commitment and effectiveness relying on publicly-reported information (see Refinitiv, 2021; 2022). We use ESG scores measured at the end of our observation period, 2020, which are the most updated ones for each fund. The reason is that the ESG score reflects the output of the entire ESG-driven investment policy conducted by each fund across its life. Hence, the most recent and updated ESG score captures the long-term consequence of the sustainable investment policy decisions undertaken by each fund. Appendix 1 shows a diagram explaining the key empirical relationship we establish between the NAV, its growth and the ESG score of each fund. More specifically, our econometric approach aims to assess the relationship between the ESG-driven investment strategies and the performance of infrastructure funds, that is, to what extent the adoption of ESG criteria in the selection of investments in various infrastructure assets may have impacted the growth in the NAV in the long-medium run.

Our model also includes a number of control variables. Vol_3Y is the volatility, measured by the standard deviation of the net asset value (NAV) of the infrastructure funds over the three-year period 2018-2020. Sharpe_R is the Sharpe Ratio developed by Sharpe (1966) as a measure of the reward to volatility trade-off. It is calculated as the average excess return over the volatility of excess return over the three-year period 2018-2020. The excess return is the fund's portfolio return in excess of the risk-free rate (10-year bond benchmark per country). The volatility of the excess return is measured by the standard deviation of the excess return. The underlying assumption is that an infrastructure fund manager always has the possibility to invest in a risk-free asset; therefore, the return of the risk-free asset is deducted from the total return. This net return is then divided by the total risk. The higher the Sharpe Ratio, the better the infrastructure fund portfolio's risk adjusted performance. In other words, a higher Sharpe ratio means a better infrastructure fund performance relative to the risk-free rate on a risk-adjusted basis. AGE is the duration of each infrastructure fund, measured in number of years of operations since its inception. HHI is the Herfindahl-Hirschman index used as a measure of concentration of each infrastructure fund's portfolio investments into sectors such as energy, telecommunication services, healthcare, basic materials. All continuous variables are calculated in the period 2018-2020 to control for endogeneity effects on fund performance that attributed to these fund characteristics which are not related to ESG. More specifically, we focus on the 2018-2020 period as 2018 has been a turning year for global investors' interest in the ESG themes as Larry Fink, the CEO of BlackRock, the largest investment firm in the world, wrote in his letter to CEOs that "To prosper over time, every company must not only deliver financial performance, but also show how it makes a positive contribution to society. Companies must benefit all of their stakeholders, including shareholders, employees, customers, and the communities in which they operate … a company's ability to manage environmental, social, and governance matters demonstrates the leadership and good governance that is so essential to sustainable growth, which is why we are increasingly integrating these issues into our investment process." As a result, we believe that the 2018-2020 period has been crucial for the exponentially growing adoption of ESG criteria in the investment decision-making process by the investor community around the world. There was not such a high attention for sustainable finance in the early or mid-years of our sample period.

Lastly, we include three dummy variables in our model to control for the investment strategy, ownership nature and geographic location of the fund: D_Assets, D_Global and D_INSTF. More specifically, the variable denoted as D_Assets takes the value of 1 if the infrastructure fund is an equity fund and 0 if it is a bond or a mixed assets' fund. The variable denoted as D_Global takes the value of 1 if the infrastructure fund has a global geographic focus and 0 if it has a country-specific investment concentration. D_INSTF is a variable that takes the value of 1 if the infrastructure fund is an institutional fund, in which institutional investors invest on behalf of a large number of constituents (e.g., pension funds, insurance companies) and 0 if it is a retail fund, whose capital is primarily invested by individuals.

For robustness analysis we utilize four alternative sustainability sub-scores proxying for the occurrence of ESG Controversies (Controv), calculated based on 23 ESG controversy topics, the commitment and effectiveness towards reducing CO2 Emissions in the production/construction process (Emissions), the reduction of the use of Resources such as polluting materials, energy or water (Resource) and the impact of infrastructures on local Communities by protecting public health and respecting business ethics (Community) across all portfolio investments of each fund (Refinitiv, February 2021) as per equation (2):

$$\mathit{Performance} = f\,(\text{Controv, Emissions, Resource, Community};\ \mathit{Vol\_3Y, Sharpe\_R, AGE, HHI, D\_Assets, D\_Global, D\_INSTF}) \tag{2}$$

Table 2 shows summary statistics in Panel A and correlation coefficients in Panel B for all variables used in the study. The mean and median performance of all infrastructure funds of our sample is 1.747 and 3.23 respectively, implying that the performance is slightly skewed to the right. The mean score for ENV_SC, SOC_SC and GOV_SC is 57, 59, 61 respectively, whereas the mean score of ESG Controversies, Emissions, Resource Use and Community is 83, 71, 67 and 71 respectively. None of the sustainability scores exhibits high asymmetric characteristics (as compared with their median values).

The correlation matrix in Panel B of Table 2 shows at first glance that all sustainability scores have a positive (and significance) univariate relationship with performance. However, this finding is incomplete, as this analysis is missing the effects from a number of control variables as shown in the following multivariate analysis. All variables used in our econometric analysis are described in the Appendix 2.

[TABLE 2 ABOUT HERE]

In Table 3 we show the mean of the main variables used in the analysis by the launch year (or consequently the age) of the funds. The age is the number of years of each fund from its launch year to the end of 2020. First, the results in this table show that there is no any bias with regard to the launch period of the funds. The launch of the infrastructure funds used in this study is consistently allocated in all years from 2007 to 2017. The maximum number of funds (25) was launched in 2014 and, as expected, the minimum (4) during the financial crisis in 2009. More interestingly, the results herein confirm that the fund performance, even though its calculation depends on the age of the fund, is not biased or related to the age of the fund, as no certain pattern is evident in the mean performance of the funds as the age increases. We also observe a similar pattern unrelated with the age for any other variable used in our main analysis.

[TABLE 3 ABOUT HERE]

3.3. Empirical findings

In this sub-section we provide the empirical findings based on equations (1) and (2). Table 4 shows the main results based on the three ESG pillars as per eq. (1). The results based on Model 1, which includes only the three main sustainability scores: ENV_SC, SOC_SC and GOV_SC, show a significantly negative coefficient for ENV_SC and a significantly positive one for both SOC_SC and GOV_SC. This finding remains robust after the inclusion of a number of fund-specific control variables in Model 2. All control variables have been found relevant to the performance of investment funds in prior literature (e.g., Ielasi et al., 2018; Pedersen et al., 2021; Helliar et al., 2022a; Helliar et al., 2022b).

Model 3 includes other three additional controls designed to proxy for the asset specialization (D_Assets), the geographic focus (D_Global) and the institutional ownership (D_INSTF) of the infrastructure fund. More specifically, D_Assets is a dummy variable that takes the value of one for funds with their portfolios invested in equity instruments issued by the entities engaged in the management and financing of infrastructure constructions (so called Special Purpose

Vehicles, SPVs) and zero otherwise (bonds, mixed). D_Global is a dummy variable that takes the value of one for those funds operating globally and zero otherwise (operating at domestic or local level). D_INSTF is a dummy variable that takes the value of one for institutional funds - whose Limited Partners (LPs) are institutional investors - and zero otherwise, that is for funds with a different nature such as pension trusts, insurance funds, offshore funds or REITs. The results based on Model 3 show that only the environmental and social pillars are significant, whereas the government pillar becomes insignificant in explaining the performance of the infrastructure funds. The adjusted R-squared of Model 3, equal to 67.2%, is noteworthy, thus implying that such a specification adds explanatory power compared to the previous ones.

These results imply that infrastructure funds with more solid environmental investment policies based on the choice of E-driven infrastructural assets experience a lower performance, while those with a stronger social orientation driven by select S-driven infrastructural assets yield a superior performance. Governance-related investment policies seem to be trivial in determining the performance of these funds. These findings confirm those obtained by Helliar et al. (2022b) in the context of mutual funds, according to which the environmental logic of mutual funds competes with the conventional market logic (higher return for higher systematic risk) but this does not apply to funds focused on the social pillar. In particular, they find that socially-oriented funds with a higher systematic risk (higher beta) report higher ESG scores, while funds with an environmental investment policy, when characterized by higher systematic risk, tend to display lower ESG scores. Based on the notion that value is only driven by the risk profile reflecting a market logic (Statman, 2000), a higher rate of return for the latter types of funds can only be achieved at the cost of downplaying the ESG logic thus increasing the ESG risk exposure.

These findings are consistent with the nature of infrastructure funds as these are designed to finance the realization of assets with strong perceived social externalities due to the provision of mainly social benefits to local communities. In this sense, our results are in line with the idea put forward by Andonov et al. (2021) that the social externalities channel is especially relevant for infrastructure assets, because these assets are closely related to government spending and regulation. For this reason, infrastructures mainly involving the role of the national or local government are aimed at producing positive externalities. In contrast, the predominance of environmental investment policies followed by these funds seems to contrast with the social role played by the infrastructure assets at local level and consequently lead to the partial erosion of their positive effects. Indeed, the magnitude of the positive coefficient associated with the SOC_SC (0.314) is greater than that of the negative coefficient associated with the ENV_SC (-0.266), thus implying that the beneficial effects of the social dimension of the infrastructures are not completely nullified by the negative consequences resulting from the compliance with the environmental aspects.

This can be explained by some key features of infrastructure construction and maintenance. The construction of infrastructures in the transportation sector, such as bridges or highways, or in the telecommunications sector, such as transmission towers, or in the renewables sector, such as wind plants, requires the compliance with stringent environmental regulations to diminish the direct impact of such assets on the environment, which in turn forces investors to bear the related cost burden. These additional costs, which are not (or less) present in the context of social infrastructures (e.g., nursing homes, social housing), tend to erode the net cash flow-based return obtained by investors such as infrastructure funds.

Concerning the control variables, only the volatility (Vol_3Y) of the fund has a negative impact on the performance, while the age (AGE) and the sector concentration (HHI) of the fund have a positive impact. The Sharpe ratio is instead insignificant. Funds having global operations (D_Global) and an institutional nature (D_INSTF) experience higher performance than local and non-institutional funds. The asset specialization of the fund (D_Assets) is instead not significant and hence irrelevant to its performance.

[TABLE 4 ABOUT HERE]

In order to provide further evidence on the conditions under which the two pillars (Social and Environmental) affect the performance of infrastructure funds, in Table 5 we show a number of sub-sample analyses. The first model specification is derived by splitting the sample into low and high AUM (asset under management). AUM measures the size with funds being categorized into small vs large-sized ones using the median AUM of all funds, equal to € 20,9450,920 (ln = 19.16). The results show that the unfavorable impact of the environmental dimension and the beneficial effect of the social dimension of funds' infrastructure investing, documented by the significant negative coefficient associated with ENV_SC and the significant positive coefficient associated with SOC_SC respectively, mainly applies to small-sized funds (low AUM). Instead, larger funds (High AUM) exhibit insignificant environmental and social scores. These findings suggest that the impact of environmental and social investment policies on the performance of infrastructure funds is evident only in small-sized funds. These results are partially in line with those obtained by Helliar et al. (2022b), according to which smaller-size funds display less ESG social risk and thus higher social pillar scores. In contrast with these authors' findings, our empirical results imply that infrastructure funds pursuing environment-driven investment policies experience an inferior performance (relative to that of social infrastructure funds) as captured by the negative relationship with environmental pillar scores. Consistent with Helliar et al. (2022b), our findings show that governance aspects are irrelevant to infrastructure funds' performances.

The second split specification is based on the AGE of the funds, thus discriminating between young (low AGE) and old (high AGE) funds. Funds are classified into young (low AGE) and old (high AGE) funds using the median AGE of all funds, equal to 6.85 years. These results confirm the negative effect of the environmental dimension (ENV_SC) and the positive impact of the social dimension (SOC_SC) on the performance for young infrastructure funds (Low AGE). Older funds exhibit insignificant effects of such pillars on performance.

Next, following Bianchi et al. (2014) we split the sample into low and high HHI funds using the median HHI of all funds, equal to 3734. Our econometric analysis reveals that the main findings on the inverse relationship between the environmental pillar investment strategies and fund performance and the positive relationship between social pillar investing and fund performance also apply to infrastructure funds with more concentrated portfolios (High HHI). Interestingly, the results also show that the governance pillar score (GOV_SC) is positive and strongly significant for funds with lowly concentrated portfolios (low HHI). This finding is consistent with that of Helliar et al. (2022b), who demonstrate that, for the governance dimension, fund size dispersion attainable via low concentration of infrastructure investments across sectors implies less ESG risk exposure and thus higher ESG scores.

When splitting the sample into funds operating globally (Global_yes) and those locally (Global_no), we find that the negative impact of the environmental pillar (ENV_SC) and positive effect of the social pillar (SOC_SC) on performance documented in our main analysis is more pronounced for infrastructure funds operating locally. This may be explained by the informational advantage of institutional investors when they invest domestically (Ferreira et al., 2017). The positive impact of the social dimension (SOC_SC) on performance is also confirmed for funds investing in infrastructures at global level. This implies that the social dimension positively impacts performance of fund regardless of their geographic focus, being a comprehensive feature of all infrastructure funds. Furthermore, we find evidence that the complexity and the cost burden associated with the environmental sustainability of infrastructure investing are more conspicuous for funds operating at domestic level in their own regions of domicile. This is line with the results obtained by Ferreira et al. (2017) mentioned above.

[TABLE 5 ABOUT HERE]

In order to provide further evidence on the impact of sustainability on the performance of infrastructure funds, we examine the role of four alternative sustainability sub-scores as per eq. (2):

ESG Controversies, Emissions, Resource Use and Community scores. As defined in the Refinitiv methodology manual (February 2021), the ESG Controversies score is calculated based on 23 ESG controversy topics. During the year, if an ESG-related scandal occurs, the company involved is penalized and this affects their overall ESG Combined Score and grading. Therefore, the ESG Controversies score is expected to have a negative relationship with fund performance. The Emissions and Resource Use scores, which belong to the environmental pillar, are positively correlated with infrastructure fund performance. The Community score, which has a social pillar dimension, is also positively correlated with infrastructure fund performance.

The results reported in Table 6 are qualitatively consistent with our expectations and the main findings shown in Table 4, thus constituting robustness test to our findings as well. More specifically, the main Model 3 shows that, as expected, the ESG Controversies score has a negative and significant impact on infrastructure funds' performance. The higher the number of ESG-related controversies faced by the fund through its portfolio investments into infrastructure operations, the lower its overall annual performance. The Emissions and Resource Use scores, both proxying for different elements under the environmental pillar, have opposite signs. Model 3 of Table 6 reveals that, on one hand, the stronger the efforts made by a fund to comply with the environmental regulation and reduce CO2 emissions, the higher the related cost burden and the higher the erosion of the overall annual performance, thus leading to a lower return. On the other hand, the higher the contraction of the use of materials harmful to the environment, the higher the fund performance. The coefficient associated with the Emissions score is significantly negative with a magnitude of -0.309 while the coefficient of the Resource Use score is significantly positive with a magnitude of 0.194, suggesting that the overall negative ENV_SC in the Model 3 of Table 4 is mainly influenced by the negative impact of the Emissions score. Interestingly, the Community score has a positive and significant impact on funds' performance consistent with the positive impact of SOC_SC in the main findings of Table 4. This implies that the higher the impact of funds' investment policies on local communities through the financing of infrastructures aimed at improving e.g., public health and business ethics, the better their overall annual performance.

More interesting are the results of the sub-sample analysis in Table 7, as they provide some more details about the relation between the four sustainability sub-scores and infrastructure funds' performance. In particular, in the low and high AUM split our econometric analysis shows that the ESG Controversies score is negative and strongly significant only for small-sized funds (low AUM), thus confirming the idea that the performance of infrastructure funds is reduced by the increase in their ESG discredit caused by scandals concerning sustainability issues of realized projects.

The Emissions and Resource Use scores still have opposite effects on funds' performance. The Emissions score is significantly negative, whereas the Resource is (marginally) significantly positive. However, the Resource Use score is significantly negative for large-sized funds (high AUM). Therefore, it seems that the overall negative impact of ENV_SC on infrastructure funds' performance should be attributed to the costly efforts in reducing CO2 emissions by small-sized funds (negative Emissions score) and to the lower (or modest) capability of large-sized funds of minimizing the use of polluting materials (negative Resource Use score). Moreover, the Community score is significantly positive only in the high AUM sample, suggesting that the overall positive impact of SOC_SC on infrastructure funds' performance, documented across all models of Table 4, only exists for large-sized funds. This implies that the social dimension of an infrastructure fund can be amplified as its size, in terms of assets under management, gets larger.

When splitting the sample by AGE, we find that the ESG Controversies score is significantly negative for older funds, most likely because older infrastructure funds are more exposed to any reputational damage caused by a negative ESG event. It is plausible that younger infrastructure funds suffer less from ESG-related scandals as they have less to lose (e.g., a lower number of clients, smaller-sized operations, a not yet fully established reputation). The Emissions score is significantly negative and the Resource Use score is significantly positive for younger funds, implying again that the negative impact of the Emission score dominates the positive impact of the Resource Use score in explaining infrastructure funds' performance in the main model of Table 6. Instead, the Community score is never significant, implying that the age of the infrastructure funds plays no role in their social dimension.

The results in the low and high HHI are closely consistent with those of previous splits and the main findings shown in Table 6 and Table 4. More specifically, the ESG Controversies score is negative and strongly significant for highly-concentrated infrastructure funds More focused funds have a higher exposure to the reputational damage associated with negative ESG events. The Emissions and Resource Use scores have opposite signs for highly-concentrated funds, with the negative impact of CO2 emissions' reduction initiatives on funds' performance dominating the positive role of managerial actions to minimize the use of polluting resources: the net effect is a decrease in the annual NAV growth. The Community score is significantly positive only for highly-concentrated funds (high HHI sample). Funds with a more focused investment portfolio including mainly social infrastructure assets experience superior performance. Again, these results provide robustness to our main findings (related to the SOC_SC across all models of Table 4 and the Community score in Model 3 of Table 6).

Similar conclusions we get from the sub-sample analysis based on globally vs locally operating funds. The ESG Controversies score is negative and strongly significant only for funds operating locally, thus implying higher exposure to ESG scandals for this type of infrastructure funds with a heavier impact on their performances. The Emissions and Resource Use scores exert opposite effects on fund performance with the former being dominant over the latter. Hence, domestic infrastructure funds tend to experience a higher pressure on performance due to the complex and costly activity of complying with environmental regulations to diminish CO_2 emissions, more than what occurs for global funds. As suggested by the positive and strongly significant of the coefficient associated with the Community score, globally operating funds, if invested in social infrastructures, can have a better impact on the wealth of local territories compared to domestic ones. If this result is combined with the ones described above, we can conclude that larger-sized, more focused and more global (less local) infrastructure funds, if devoted to financing social pillar investment projects, can better exploit their social scope and achieve a bigger impact on the wealth of local communities.

[TABLES 6 AND 7 ABOUT HERE]

4. Implications and Conclusions

Some important implications can be drawn from our study that are relevant for infrastructure fund managers, and the fund industry more in general, for policy-makers and researchers.

First, there are three implications for fund managers as well as, more broadly, asset managers. The practical implication of the opposite signs associated with the environmental dimension (-) and the social dimension (+) of infrastructure investing, as shown by our baseline results (Models 1, 2 and 3 of Table 4), is that infrastructure funds should choose the composition of their portfolio holdings in a way that the total return is not penalized by the prevalence of the tricky E aspects (compliance with environmental regulations) over the main benefits of the S dimension. This should urge general partners (GPs) of infrastructure funds to mix infrastructures with a heavy environmental impact (e.g., transport, energy) with social infrastructures, while ignoring governance-related aspects, so as to be able to manage a well-balanced investment portfolio with low or negligible negative externalities across the territories, communities or regions affected by the presence of the new assets.

The second important implication for fund managers is that if they want to improve the performance of their infrastructure funds, they need to bet on infrastructures with an expected impact on the social pillar dimension such as those aimed at promoting the wealth of the local communities (e.g., hospitals, schools).

The third important implication for fund managers is that if an infrastructure fund manager is willing to strengthen the social dimension of its fund by investing into more infrastructures with a social impact on local territories such as hospitals, nursing homes, nursery schools or social housing, it must increase the dollar amount of the assets under management (i.e., the fund size) to be able to count on a higher firepower.

Our study also helps policy-makers. It is stated that good infrastructures promote investment by connecting firms to their customers and suppliers and helping them to take advantage of modern production techniques and organizational structures. Conversely, inadequacies in infrastructures create barriers to opportunities and increase *costs* for all firms. In this vein, the American Society of Civil Engineers in 2017 gave the U.S. infrastructures a grade of D+ and estimated that the country needs an additional $2.1 trillion in investments between 2016 and 2025 to meet its needs and reduce negative impacts on the economy.[5] Access to sustainable infrastructure is critical to enabling economic opportunities and meeting the Sustainable Development Goals (SDGs) by 2030.[6] However, developing countries around the world continue to face challenges in financing sufficient infrastructures – estimated at 4.5 percent of GDP for lower and middle-income countries – to meet the SDGs, increase economic growth, and reduce poverty and inequality. Climate change has exacerbated these infrastructure investment needs, and the incremental cost to supply climate-resilient and environmentally sustainable infrastructures ranges from 9 percent to 27 percent over and above total investment needs.

In this context, our findings herein may imply that green infrastructures are not as effectively operated as conventional infrastructures. This causes lower return for greener compared to conventional infrastructures. Moreover, green infrastructures may attract a different clientele group and/or lower-sized funds, which are more exposed to risks of litigation due to ESG controversies and suffer from a heavier cost burden to comply with environmental regulation. Overall, this explains why infrastructure funds with superior environmental score experience inferior performance.

Hence, the results of this study are important for government executives as climate change have brought the need to build infrastructures with greener specifications and raised concerns whether current infrastructure investment funds are adequately rewarded and valued. This has

[5] See https://www2.deloitte.com/content/dam/Deloitte/us/Documents/risk/us-risk-infrastructure-investment-funding.pdf
[6] See https://ppiaf.org/documents/5982/download

brought to the forefront the need to connect the sustainability property of infrastructure funds to their performance. In this regard, our study responds to the call by The Global Review of Public Infrastructure Funds[7] to provide public sector officials with further information to use when considering the investments in infrastructure funds.

Finally, researchers may derive interesting insights regarding the determinants of the performance and the related risks of the main investment strategies pursued by infrastructure funds.

The study is not without limitations, which, if properly addressed, can foster future research studies. Although the annual growth of the net asset value (NAV) of each infrastructure fund is the most trustworthy measure of performance, there are other metrics that can be examined such as the growth of the NAV from the fund's inception or even the Sharpe Ratio. Second, we have analyzed only the funds listed in the Refinitiv database, while in the future further research may be conducted on funds mapped in other databases and/or located in other geographic areas. Third, we have analyzed the role of the three main sustainability pillars - Environmental, Social and Governance - and of four alternative pillars' sub-scores aimed at proxying for ESG controversies, Emissions, Resource Use and Community. In the future, various sub-facets of ESG-driven activities, such as green investments for eco-innovation, technological development or greenwashing can be studied in relation with infrastructure funds.

Our hope is to have provided novel insights about the impact of ESG investing by infrastructure funds on returns and value generated by such key participants in the international capital markets to the benefit of institutional investors.

[7] The Global Review of Public Infrastructure Funds is a joint product of the World Bank Group's Infrastructure Finance, PPPs & Guarantees (IPG) Group and the Inter-American Development Bank (IADB).

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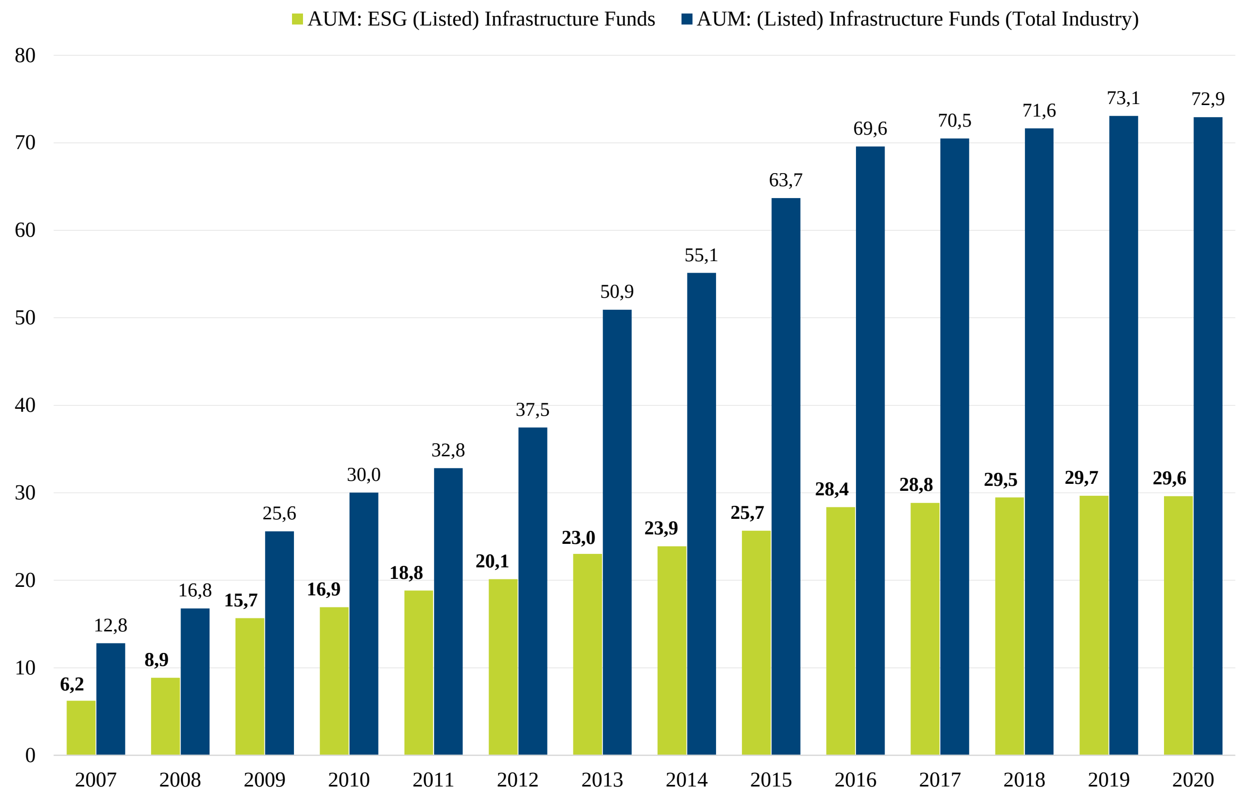
Figure 1 – Asset Under Management (AUM) of Listed Infrastructure Funds: ESG vs Total Industry (2007-2020)



Source: Authors' own creation

Table 1: Comparative Statistics of Population vs. Sample of ESG-Oriented Infrastructure Funds

	Population (378 Funds)	**Sample (180 Funds)**
Number of Funds (#):	378	180
Asset Under Management (aggregate share class amount in billions of euro):	€ 176,6	€ 94,8
Time Period of Operations	2007-2020	2007-2020
Average Time Period of Operations (in years; mean)	6,3	7,6

Source: Created by Authors based on Refinitiv data

Table 2: Descriptive statistics

This table shows descriptive statistics of the main variables. Panel A shows summary statistics and Panel B the correlation coefficient matrix. The performance variable is the annual growth of the net asset value (NAV) of each infrastructure fund calculated in the period commencing from the launch year to the end of 2020. *ENV_SC*, *SOC_SC*, *GOV_SC* are the Environmental, Social and Governance scores at fund level as provided by Refinitiv database. Controv proxies for ESG Controversies, calculated based on 23 ESG controversy topics; Emissions proxies for the commitment and effectiveness towards reducing CO2 Emissions in the production/construction process; Resource proxies for the reduction of the use of Resources such as polluting materials, energy or water, and Community proxies for the impact of infrastructures on local Communities by protecting public health and respecting business ethics. Vol_3Y is the volatility, measured by the standard deviation of the net asset value (NAV) of the infrastructure funds over the three-year period 2018-2020. Sharpe_R is the Sharpe Ratio developed by Sharpe (1966) as a measure of the reward to volatility trade-off. It is calculated as the average excess return over the volatility of excess return over the three-year period 2018-2020. The excess return is the fund's portfolio return in excess of the risk-free rate (10-year bond benchmark per country). The volatility of the excess return is measured by the standard deviation of the excess return. AGE is the duration of each infrastructure fund, measured in number of years of operations since its inception. HHI is the Herfindahl-Hirschman index used as a measure of concentration of each infrastructure fund's portfolio investments into sectors such as energy, telecommunication services, healthcare, basic materials. D_Assets takes the value of 1 if the infrastructure fund is an equity fund and 0 if it is a bond or a mixed assets' fund. D_Global takes the value of 1 if the infrastructure fund has a global geographic focus and 0 if it has a country-specific investment concentration. D_INSTF takes the value of 1 if the infrastructure fund is an institutional fund, in which institutional investors invest on behalf of a large number of constituents (e.g., pension funds, insurance companies) and 0 if it is a retail fund, whose capital is primarily invested by individuals.

Panel A: Summary statistics

	Mean	**Median**	**St. Dev**	**Min**	**Max**	**N**
Performance	1.747	3.230	4.813	-16.818	15.765	180
ENV_SC	57.778	58.613	7.008	39.562	67.337	180
SOC_SC	59.385	59.978	4.088	47.400	72.386	180
GOV_SC	61.717	63.168	6.125	38.607	68.930	180
Controv	83.118	86.553	7.824	51.685	99.213	179
Emissions	71.658	74.859	9.731	49.060	83.249	179
Resource	67.693	70.482	8.103	47.667	78.291	179
Community	71.007	72.564	8.363	47.262	81.114	179
Vol_3Y	17.511	15.197	6.120	10.079	40.597	180
Sharpe_R	0.633	-0.015	2.335	-1.047	14.772	180
AGE	7.642	6.850	3.092	3.100	13.800	180
HHI	4220.4	3734.5	1559.9	2705	9884	180
D_Assets	0.961	1.000	0.194	0.000	1.000	180
D_Global	0.711	1.000	0.455	0.000	1.000	180
D_INSTF	0.272	0.000	0.446	0.000	1.000	180

Source: Authors' own creation

Panel B: Correlations

	Performance	ENV_SC	SOC_SC	GOV_SC	Controv	Emissions	Resource	Community	Vol_3Y	SharpeR	AGE	HHI	D_Assets	D_Global	D_INSTF
ENV_SC	0.1683	1													
	0.024														
SOC_SC	0.210	0.7136	1												
	0.0047	0.00													
GOV_SC	0.4324	0.7238	0.3428	1											
	0.000	0.00	0.00												
Controv	0.0813	-0.2215	-0.3074	0.0663	1										
	0.2793	0.0029	0.00	0.3782											
Emissions	0.3523	0.7937	0.4757	0.8704	0.075	1									
	0.00	0.00	0.00	0.00	0.3183										
Resource	0.4411	0.7782	0.6016	0.8397	-0.0078	0.9359	1								
	0.00	0.00	0.00	0.00	0.9172	0.00									
Community	0.3171	0.7187	0.6788	0.6248	-0.2188	0.7954	0.7745	1							
	0.00	0.00	0.00	0.00	0.0033	0.00	0.00								
Vol_3Y	-0.7272	-0.0785	0.0008	-0.4405	-0.3493	-0.3318	-0.3641	-0.0977	1						
	0.00	0.2946	0.9915	0.00	0.00	0.00	0.00	0.1931							
Sharpe_R	-0.2173	0.1037	0.1114	-0.0204	-0.1561	-0.0013	0.014	0.0907	0.3592	1					
	0.0034	0.1658	0.1365	0.7854	0.0369	0.9858	0.8524	0.227	0.00						
AGE	-0.0245	-0.1543	-0.058	-0.1305	-0.12	-0.1917	-0.0997	-0.2496	0.0763	-0.0348	1				
	0.7442	0.0387	0.4392	0.0808	0.1095	0.0101	0.184	0.0008	0.3088	0.6425					
HHI	-0.3205	0.2598	0.2015	-0.0953	-0.1578	0.0321	-0.041	0.2144	0.5987	0.2154	-0.1447	1			
	0.00	0.0004	0.0067	0.2031	0.0349	0.67	0.586	0.0039	0	0.0037	0.0526				
D_Assets	-0.0602	-0.1552	-0.2297	-0.0072	0.4167	0.0052	-0.068	-0.0989	0.1166	-0.0123	-0.0047	0.1037	1		
	0.4219	0.0376	0.0019	0.9234	0.00	0.9446	0.3658	0.1878	0.119	0.87	0.9498	0.1661			
D_Global	0.687	0.4799	0.3627	0.7017	0.1209	0.7154	0.7487	0.6214	-0.6513	-0.106	-0.1433	-0.3543	-0.1282	1	
	0.00	0.00	0.00	0.00	0.107	0.00	0.00	0.00	0.00	0.1568	0.055	0.00	0.0863		
D_INSTF	0.2623	0.0531	0.0252	0.0436	0.0423	0.0524	0.0715	0.0111	-0.1303	-0.0617	-0.079	0.1302	0.0585	0.1144	1
	0.0004	0.4794	0.7366	0.5614	0.5736	0.4864	0.3416	0.8826	0.0812	0.4106	0.2919	0.0816	0.4356	0.1261	

Source: Authors’ own creation

Table 3: Mean of Main Variables by the Age of Fund

This table shows the mean of main variables used in the analysis by the age of the funds. The age is the number of years of each fund from its launch year to the end of 2020. The performance variable is the annual growth of the net asset value (NAV) of each infrastructure fund calculated in the period commencing from the launch year to the end of 2020. *ENV_SC*, *SOC_SC*, *GOV_SC* are the Environmental, Social and Governance scores at fund level as provided by Refinitiv database. Controv proxies for ESG Controversies, calculated based on 23 ESG controversy topics; Emissions proxies for the commitment and effectiveness towards reducing CO2 Emissions in the production/construction process; Resource proxies for the reduction of the use of Resources such as polluting materials, energy or water, and Community proxies for the impact of infrastructures on local Communities by protecting public health and respecting business ethics. All ESG-based variables are calculated at the end of 2020 to proxy for the long-term sustainability policy of the funds during their life. Vol_3Y is the volatility, measured by the standard deviation of the net asset value (NAV) of the infrastructure funds over the three-year period 2018-2020. Sharpe_R is the Sharpe Ratio developed by Sharpe (1966) as a measure of the reward to volatility trade-off. It is calculated as the average excess return over the volatility of excess return over the three-year period 2018-2020. The excess return is the fund's portfolio return in excess of the risk-free rate (10-year bond benchmark per country). The volatility of the excess return is measured by the standard deviation of the excess return. AGE is the duration of each infrastructure fund, measured in number of years of operations since its inception. HHI is the Herfindahl-Hirschman index used as a measure of concentration of each infrastructure fund's portfolio investments into sectors such as energy, telecommunication services, healthcare, basic materials. All continuous variables are calculated in the period 2018-2020 to control for endogeneity effects on fund performance that attributed to these fund characteristics which are not related to ESG.

LaunchDateYEAR	N	AGE	Performance	ENV_SC	SOC_SC	GOV_SC	Controv	Emissions	Resource	Community	Vol_3Y	Sharpe_R	AGE	HHI
2007	12	14	2.104	57.141	61.812	58.989	80.996	70.137	66.313	69.300	17.791	0.561	13.233	4057.769
2008	20	13	2.849	56.972	63.270	60.113	82.599	73.032	70.106	71.794	16.570	0.006	12.406	3940.038
2009	4	12	-0.940	58.616	54.623	63.274	87.317	66.588	68.997	67.685	22.567	0.249	11.003	4021.841
2010	16	11	0.077	48.880	54.837	55.239	85.242	58.768	57.372	58.448	19.553	1.045	10.256	3092.925
2011	9	10	3.224	62.552	63.435	61.391	82.987	74.543	71.785	71.139	15.879	0.890	9.002	4129.150
2012	9	9	3.254	58.309	62.253	58.662	79.208	71.382	69.127	70.229	14.293	0.766	8.123	3516.698
2013	20	8	1.957	56.386	60.080	58.495	80.024	67.705	63.707	69.419	16.698	-0.015	7.258	3812.390
2014	25	7	-1.618	61.235	62.911	59.598	80.507	75.772	69.418	74.951	22.457	1.623	6.600	5641.312
2015	22	6	2.405	59.512	63.938	60.711	83.523	77.368	72.649	74.674	15.943	0.505	5.473	4475.679
2016	24	5	5.369	60.012	63.721	60.867	84.925	74.807	69.796	74.674	14.652	0.012	4.525	4407.343
2017	19	4	-0.208	55.919	61.296	58.186	88.470	69.925	65.219	70.413	17.609	1.201	3.537	4014.737

Source: Authors' own creation

Table 4: Baseline results

This table shows the results of the main regression model as per equation (1). The performance variable is the annual growth of the net asset value (NAV) of each infrastructure fund calculated in the period commencing from the launch year to the end of 2020. *ENV_SC*, *SOC_SC*, *GOV_SC* are the Environmental, Social and Governance scores at fund level as provided by Refinitiv database. Vol_3Y is the volatility, measured by the standard deviation of the net asset value (NAV) of the infrastructure funds over the three-year period 2018-2020. Sharpe_R is the Sharpe Ratio developed by Sharpe (1966) as a measure of the reward to volatility trade-off. It is calculated as the average excess return over the volatility of excess return over the three-year period 2018-2020. The excess return is the fund's portfolio return in excess of the risk-free rate (10-year bond benchmark per country). The volatility of the excess return is measured by the standard deviation of the excess return. AGE is the duration of each infrastructure fund, measured in number of years of operations since its inception. HHI is the Herfindahl-Hirschman index used as a measure of concentration of each infrastructure fund's portfolio investments into sectors such as energy, telecommunication services, healthcare, basic materials. D_Assets takes the value of 1 if the infrastructure fund is an equity fund and 0 if it is a bond or a mixed assets' fund. D_Global takes the value of 1 if the infrastructure fund has a global geographic focus and 0 if it has a country-specific investment concentration. D_INSTF takes the value of 1 if the infrastructure fund is an institutional fund, in which institutional investors invest on behalf of a large number of constituents (e.g., pension funds, insurance companies) and 0 if it is a retail fund, whose capital is primarily invested by individuals.

	1	2	3 (Main)
ENV_SC	-0.528***	-0.282***	-0.266***
	(-5.97)	(-3.70)	(-3.78)
SOC_SC	0.560***	0.426***	0.314***
	(5.03)	(4.93)	(3.82)
GOV_SC	0.649***	0.233***	0.0901
	(8.60)	(3.30)	(1.25)
Vol_3Y		-0.600***	-0.446***
		(-10.44)	(-7.61)
Sharpe_R		0.0488	0.0164
		(0.46)	(0.17)
AGE		0.0937	0.138**
		(1.23)	(1.98)
HHI		0.000623***	0.00065***
		(3.08)	(3.34)
D_Assets			0.763
			(0.67)
D_Global			4.278***
			(5.18)
D_INSTF			1.394***
			(2.86)
Const	-41.05***	-14.54***	-7.240
	(-7.43)	(-2.93)	(-1.45)
Obs	180	180	180
Adj R-sq	0.316	0.603	0.672

Source: Authors' own creation

Table 5: Sub-sample analysis

This table shows the results of the sub-sample regression analysis. In this table we re-run our main model as per equation (1) separate for each sub-sample. The sample is split as follows. The first specification is derived by splitting the sample into low and high AUM (asset under management). AUM measures the size with funds being categorized into small vs large-sized ones using the median AUM of all funds, equal to € 20,9450,920 (ln = 19.16). The second split specification is based on the AGE of the funds, thus discriminating between young (low AGE) and old (high AGE) funds. Funds are classified into young (low AGE) and old (high AGE) funds using the median AGE of all funds, equal to 6.85 years. The third split is by low and high HHI funds using the median HHI of all funds (that is 3734). The four split is by funds operating globally (Global_yes) and those locally (Global_no). The performance variable is the annual growth of the net asset value (NAV) of each infrastructure fund calculated in the period commencing from the launch year to the end of 2020. *ENV_SC*, *SOC_SC*, *GOV_SC* are the Environmental, Social and Governance scores at fund level as provided by Refinitiv database. Vol_3Y is the volatility, measured by the standard deviation of the net asset value (NAV) of the infrastructure funds over the three-year period 2018-2020. Sharpe_R is the Sharpe Ratio developed by Sharpe (1966) as a measure of the reward to volatility trade-off. It is calculated as the average excess return over the volatility of excess return over the three-year period 2018-2020. The excess return is the fund's portfolio return in excess of the risk-free rate (10-year bond benchmark per country). The volatility of the excess return is measured by the standard deviation of the excess return. AGE is the duration of each infrastructure fund, measured in number of years of operations since its inception. HHI is the Herfindahl-Hirschman index used as a measure of concentration of each infrastructure fund's portfolio investments into sectors such as energy, telecommunication services, healthcare, basic materials. D_Assets takes the value of 1 if the infrastructure fund is an equity fund and 0 if it is a bond or a mixed assets' fund. D_Global takes the value of 1 if the infrastructure fund has a global geographic focus and 0 if it has a country-specific investment concentration. D_INSTF takes the value of 1 if the infrastructure fund is an institutional fund, in which institutional investors invest on behalf of a large number of constituents (e.g., pension funds, insurance companies) and 0 if it is a retail fund, whose capital is primarily invested by individuals.

	AUM		AGE		HHI		Global	
	low	high	low	high	low	high	yes	no
ENV_SC	-0.336***	0.0372	-0.206***	-0.171	0.0451	-0.394***	-0.0119	-0.635***
	(-2.96)	(0.51)	(-3.11)	(-1.39)	(0.36)	(-3.89)	(-0.17)	(-3.64)
SOC_SC	0.255*	0.0884	0.287***	0.162	-0.208	0.322***	0.254***	0.357**
	(1.97)	(1.12)	(3.47)	(1.28)	(-1.58)	(2.92)	(3.01)	(2.12)
GOV_SC	0.0424	-0.110	0.108	0.108	0.357***	0.0257	-0.0308	0.539***
	(0.34)	(-1.37)	(1.66)	(0.90)	(3.11)	(0.28)	(-0.40)	(3.01)
Vol_3Y	-0.352***	-0.275*	-0.468***	-0.244**	-0.125	-0.347***	-0.435***	-0.363***
	(-4.17)	(-1.69)	(-6.51)	(-2.60)	(-1.59)	(-3.93)	(-4.43)	(-3.78)
Sharpe_R	0.0953	-0.318**	-0.0865	0.188	-0.00537	-0.0364	-0.128	0.142
	(0.69)	(-2.33)	(-1.28)	(0.97)	(-0.04)	(-0.27)	(-1.29)	(0.79)
AGE	0.350**	-0.0132	-0.174	-0.0826	-0.0124	0.228**	0.0124	0.574***
	(2.58)	(-0.28)	(-1.09)	(-0.53)	(-0.13)	(2.61)	(0.22)	(3.06)
HHI	0.00089***	0.0018***	0.0016***	0.00038	-0.0055***	0.0015***	0.00150***	0.00105***
	(3.07)	(5.77)	(9.25)	(1.09)	(-4.21)	(5.34)	(6.19)	(2.70)
D_Assets	0.629	-0.592	-0.0722	0.344	-0.262	-0.987	1.279	0.00
	(0.38)	(-0.44)	(-0.07)	(0.21)	(-0.25)	(-0.35)	(1.52)	(0.00)
D_Global	7.423***	2.928***	8.810***	2.998***	2.430***	9.825***		
	(4.65)	(4.73)	(6.30)	(2.97)	(2.90)	(6.15)		
D_INSTF	2.027**	0.641*	0.787**	1.520*	1.666**	1.548***	0.993**	0.0845

	(2.41)	(1.78)	(2.05)	(1.89)	(2.34)	(2.71)	(2.47)	(0.06)
Const	-3.605	-1.379	-15.56***	-3.634	8.560	-5.355	-9.598	-21.78**
	(-0.47)	(-0.17)	(-3.12)	(-0.52)	(1.24)	(-0.76)	(-1.27)	(-2.26)
Obs	93	87	90	90	80	100	128	52
Adj R-sq	0.649	0.594	0.928	0.328	0.528	0.810	0.436	0.554

Source: Authors' own creation

Table 6: Additional analysis

This table shows the results of the regression model as per equation (2). The performance variable is the annual growth of the net asset value (NAV) of each infrastructure fund calculated in the period commencing from the launch year to the end of 2020. Controv proxies for ESG Controversies, calculated based on 23 ESG controversy topics; Emissions proxies for the commitment and effectiveness towards reducing CO2 Emissions in the production/construction process; Resource proxies for the reduction of the use of Resources such as polluting materials, energy or water, and Community proxies for the impact of infrastructures on local Communities by protecting public health and respecting business ethics. Vol_3Y is the volatility, measured by the standard deviation of the net asset value (NAV) of the infrastructure funds over the three-year period 2018-2020. Sharpe_R is the Sharpe Ratio developed by Sharpe (1966) as a measure of the reward to volatility trade-off. It is calculated as the average excess return over the volatility of excess return over the three-year period 2018-2020. The excess return is the fund's portfolio return in excess of the risk-free rate (10-year bond benchmark per country). The volatility of the excess return is measured by the standard deviation of the excess return. AGE is the duration of each infrastructure fund, measured in number of years of operations since its inception. HHI is the Herfindahl-Hirschman index used as a measure of concentration of each infrastructure fund's portfolio investments into sectors such as energy, telecommunication services, healthcare, basic materials. D_Assets takes the value of 1 if the infrastructure fund is an equity fund and 0 if it is a bond or a mixed assets' fund. D_Global takes the value of 1 if the infrastructure fund has a global geographic focus and 0 if it has a country-specific investment concentration. D_INSTF takes the value of 1 if the infrastructure fund is an institutional fund, in which institutional investors invest on behalf of a large number of constituents (e.g., pension funds, insurance companies) and 0 if it is a retail fund, whose capital is primarily invested by individuals.

	1	2	3 (Main)
Controv	0.108**	-0.0363	-0.0993***
	(2.31)	(-1.07)	(-2.88)
Emissions	-0.343***	-0.305***	-0.309***
	(-3.25)	(-4.14)	(-4.64)
Resource	0.578***	0.270***	0.194**
	(5.07)	(3.18)	(2.49)
Community	0.0885	0.197***	0.102*
	(1.25)	(3.78)	(1.95)
Vol_3Y		-0.673***	-0.558***
		(-12.05)	(-9.53)
Sharpe_R		0.0239	0.00519
		(0.24)	(0.06)
AGE		0.106	0.102
		(1.37)	(1.46)
HHI		0.000477**	0.00062***
		(2.50)	(3.30)
D_Assets			3.991***
			(3.38)
D_Global			4.519***
			(4.73)
D_INSTF			1.117**
			(2.37)
Const	-28.05***	3.293	10.70**
	(-5.12)	(0.71)	(2.39)
Obs	179	179	179
Adj R-sq	0.230	0.639	0.709

Source: Authors' own creation

Table 7: Additional analysis – Sub-sample

This table shows the results of the sub-sample regression analysis. In this table we re-run our main model as per equation (1) separate for each sub-sample. The sample is split as follows. The first specification is derived by splitting the sample into low and high AUM (asset under management). AUM measures the size with funds being categorized into small vs large-sized ones using the median AUM of all funds, equal to € 20,9450,920 (ln = 19.16). The second split specification is based on the AGE of the funds, thus discriminating between young (low AGE) and old (high AGE) funds. Funds are classified into young (low AGE) and old (high AGE) funds using the median AGE of all funds, equal to 6.85 years. The third split is by low and high HHI funds using the median HHI of all funds (that is 3734). The four split is by funds operating globally (Global_yes) and those locally (Global_no). The performance variable is the annual growth of the net asset value (NAV) of each infrastructure fund calculated in the period commencing from the launch year to the end of 2020. Controv proxies for ESG Controversies, calculated based on 23 ESG controversy topics; Emissions proxies for the commitment and effectiveness towards reducing CO2 Emissions in the production/construction process; Resource proxies for the reduction of the use of Resources such as polluting materials, energy or water, and Community proxies for the impact of infrastructures on local Communities by protecting public health and respecting business ethics. Vol_3Y is the volatility, measured by the standard deviation of the net asset value (NAV) of the infrastructure funds over the three-year period 2018-2020. Sharpe_R is the Sharpe Ratio developed by Sharpe (1966) as a measure of the reward to volatility trade-off. It is calculated as the average excess return over the three-year period 2018-2020. The excess return is the fund's portfolio return in excess of the risk-free rate (10-year bond benchmark per country). The volatility of the excess return is measured by the standard deviation of the excess return. AGE is the duration of each infrastructure fund, measured in number of years of operations since its inception. HHI is the Herfindahl-Hirschman index used as a measure of concentration of each infrastructure fund's portfolio investments into sectors such as energy, telecommunication services, healthcare, basic materials. D_Assets takes the value of 1 if the infrastructure fund is an equity fund and 0 if it is a bond or a mixed assets' fund. D_Global takes the value of 1 if the infrastructure fund has a global geographic focus and 0 if it has a country-specific investment concentration. D_INSTF takes the value of 1 if the infrastructure fund is an institutional fund, in which institutional investors invest on behalf of a large number of constituents (e.g., pension funds, insurance companies) and 0 if it is a retail fund, whose capital is primarily invested by individuals.

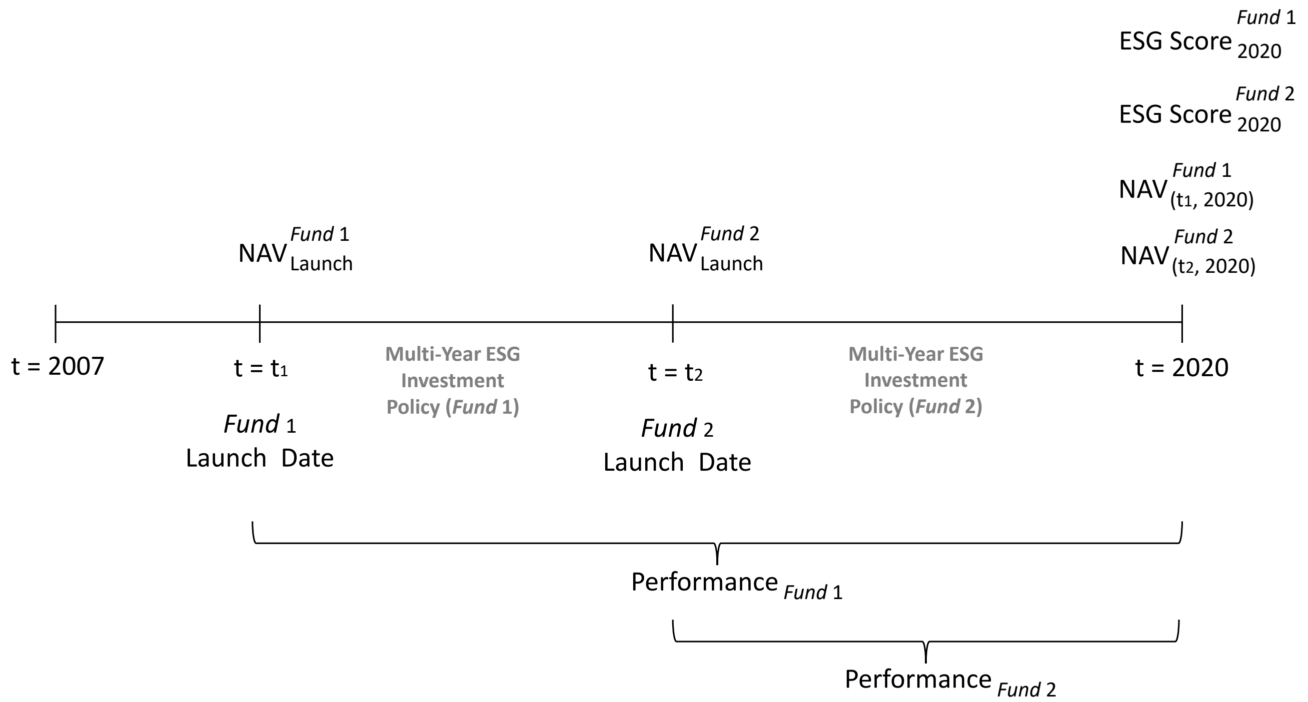
	AUM		AGE		HHI		Global	
	low	high	low	high	low	high	yes	no
Controv	-0.198***	0.0610	0.00223	-0.128**	-0.0883	-0.113**	-0.0592*	-0.282***
	(-3.69)	(1.39)	(0.06)	(-2.09)	(-1.51)	(-2.51)	(-1.66)	(-3.37)
Emissions	-0.399***	-0.00578	-0.260***	-0.0615	-0.0560	-0.588***	-0.00395	-0.665***
	(-4.10)	(-0.06)	(-3.54)	(-0.52)	(-0.54)	(-5.43)	(-0.05)	(-4.86)
Resource	0.214*	-0.312**	0.212**	-0.0347	-0.0286	0.460***	-0.0498	0.496***
	(1.89)	(-2.40)	(2.61)	(-0.29)	(-0.18)	(4.10)	(-0.52)	(3.30)
Community	-0.0692	0.257***	0.0639	0.0833	0.121	0.129*	0.220***	0.0542
	(-0.75)	(3.95)	(1.20)	(1.07)	(1.18)	(1.90)	(3.75)	(0.52)
Vol_3Y	-0.443***	-0.161	-0.441***	-0.373***	-0.335***	-0.504***	-0.275***	-0.669***
	(-4.94)	(-1.07)	(-4.83)	(-4.03)	(-4.12)	(-4.19)	(-3.06)	(-6.87)
Sharpe_R	0.0324	-0.306**	-0.115	0.291	0.0241	-0.0643	-0.0876	0.213
	(0.27)	(-2.47)	(-1.66)	(1.57)	(0.18)	(-0.50)	(-0.91)	(1.41)
AGE	0.107	0.00326	-0.195	0.00882	0.0527	0.120	0.0117	-0.119
	(0.80)	(0.07)	(-1.15)	(0.06)	(0.50)	(1.34)	(0.21)	(-0.53)
HHI	0.0010***	0.00084**	0.0015***	0.00052	-0.0027**	0.0011***	0.0012***	0.00085**
	(3.69)	(2.23)	(9.12)	(1.40)	(-2.07)	(5.16)	(4.48)	(2.53)
D_Assets	4.188***	-2.163	0.818	3.301*	3.044**	2.065	1.542	0.00
	(2.66)	(-1.44)	(0.74)	(1.84)	(2.19)	(0.78)	(1.62)	(0.00)
D_Global	8.594***	3.560***	9.872***	3.093**	3.427***	8.356***		
	(4.13)	(5.16)	(6.33)	(2.32)	(2.89)	(3.58)		

D_INSTF	1.669**	0.766**	0.734*	1.687**	0.877	0.864	0.945**	0.863
	(2.20)	(2.31)	(1.87)	(2.17)	(1.18)	(1.54)	(2.40)	(0.69)
Const	27.82***	0.180	-5.539	12.13	15.36*	7.557	-6.119	39.85***
	(3.40)	(0.05)	(-1.18)	(1.65)	(1.87)	(1.30)	(-1.22)	(3.07)
Obs	93	86	89	90	80	99	127	52
Adj R-sq	0.723	0.654	0.928	0.397	0.462	0.833	0.464	0.679

Source: Authors' own creation

Appendix 1

Infrastructure funds included in our sample were launched in a specific year over the 14-year period 2007-2020. For example, fund 1, established in $t = t_1$, conducts its ESG-driven investment policy, reporting a NAV at the end of t_1 (NAV at launch) and at any future year until t = 2020 (NAV at 2020). The same logic applies for fund 2. At the end of each fund's multi-year ESG-driven investment policy, the growth in the NAV is calculated (NAV (t_1, 2020)) and the ESG impact of all investment decisions undertaken since the fund's launch is assessed through the measurement of the ESG score (ESG Score at 2020). The most updated ESG score measured at the end of the multi-year ESG-driven investment policy fully reflects and synthesizes the end result of each fund's investment decision-making based on ESG/sustainability criteria. Our econometric approach aims to assess the relationship between the ESG-driven investment strategies and the performance of infrastructure funds, that is, to what extent the adoption of ESG criteria in the selection of investments in various infrastructure assets may have impacted the growth in the NAV in the long-medium run.



Source: Authors' own creation

Appendix 2

Variable - abbreviation	Description
Dependent Variable	
Performance – Perform	Infrastructure fund performance measured based on the growth of the net asset value (NAV) from the year of the fund launch until 2020.
Independent Variables	
Environmental Pillar Score – ENV_SC	Environmental Pillar Score at fund level at the end of 2020 as provided by Refinitiv.
Social Pillar Score – SOC_SC	Social Pillar Score at fund level at the end of 2020 as provided by Refinitiv.
Governance Pillar Score – GOV_SC	Governance Pillar Score at fund level at the end of 2020 as provided by Refinitiv.
ESG Controversies - Controv	Sub-score aimed at detecting the existence of ESG-related controversies and/or litigations across all portfolio investments of each fund. Calculated based on 23 ESG controversy topics.
CO2 Emissions - Emissions	Sub-score aimed at assessing the commitment and effectiveness towards reducing CO2 emissions in the production/construction process across all portfolio investments of each fund.
Resource Use - Resource	Sub-score aimed at detecting the reduction of the use of resources such as polluting materials, energy or water across all portfolio investments of each fund.
Community Impact - Community	Sub-score aimed at assessing the impact of infrastructures on local communities by protecting public health and respecting business ethics across all portfolio investments of each fund.
Volatility – Vol_3Y	Volatility measured by the standard deviation of the net asset value (NAV) of the infrastructure funds in the 2018-2020 period.
Sharpe Ratio – Sharpe_R	Sharpe Ratio developed by Sharpe (1966) as a measure of the reward to volatility trade-off for each infrastructure fund. Calculated as the infrastructure fund's average excess return over the volatility of its excess return over the 2018-2020 period. The excess return is the infrastructure fund's portfolio return in excess of the risk-free rate (10-year bond benchmark per country). The volatility of the excess return is measured by the standard deviation of the excess return.
Age - AGE	Duration of each infrastructure fund, measured in number of years of operations since its inception.
Herfindahl-Hirschman Index – HHI	Herfindahl-Hirschman index used as a measure of concentration of each infrastructure fund's portfolio investments into sectors such as energy, telecommunication services, healthcare, basic materials. Calculated over the 2018-2020 period.
Equity Fund – D_Assets	Dummy equal to 1 if the infrastructure fund is an equity fund and 0 if it is a bond or a mixed assets' fund.
Global Fund – D_Global	Dummy equal to 1 if the infrastructure fund has a global geographic focus and 0 if it has a country-specific investment concentration.
Institutional Fund – D_INSTF	Dummy equal to 1 if the infrastructure fund is an institutional fund, in which institutional investors invest on behalf of a large number of constituents (e.g., pension funds, insurance companies) and 0 if it is a retail fund, whose capital is primarily invested by individuals.

Source: Authors' own creation