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SAFE White Paper No. 87 | October 2021

Leibniz Institute for Financial Research SAFE
Sustainable Architecture for Finance in Europe

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A primer on green finance: From wishful thinking to marginal impact*

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October 2021

Abstract

We raise some critical points against a naïve interpretation of “green finance” products and strategies. These critical insights are the background against which we take a closer look at instruments and policies that might allow green finance to become more impactful. In particular, we focus on the role of a taxonomy and investor activism. We also describe the interaction of government policies with green finance practice – an aspect, which has been mostly neglected in policy debates but needs to be taken into account. Finally, the special case of green government bonds is discussed.

Introduction

Climate change is one of the most significant global challenges of our time. Massive joint efforts by policy makers, business leaders, academic researchers, and society are needed to combat the acceleration of climate change. Specifically, the financial sector is under increasing pressure from the public to contribute to the cause.

Given the importance of combatting climate change, economic contributions should be meaningful and support the goal of sustainability in the best possible way. The share of asset management services directed toward sustainable activities has steadily risen over the past 10 years. According to Morningstar, the total volume jumped significantly to \$1.7 trillion in 2020 (Jessop and Howcroft, 2021). Global fund managers like Blackrock, Vanguard, and Fidelity, as well as the leading asset managers in Europe, for example, DWS, Union Investment, and DEKA in Germany, have placed “green” portfolio strategies and “sustainable” exchange-traded funds (ETFs) at the top of their marketing list, offering it to institutional and retail clients.¹

At first sight, this seems to be quite a dramatic change for an industry that was traditionally single-mindedly focused on performance in a well-defined cash-flow-oriented way, in which returns and risk

* SAFE policy papers represent the authors' personal opinions and do not necessarily reflect the views of the Research Center SAFE or its staff.

¹ "ESG" refers to environment, social, governance. We use the terms "ESG", "sustainable", and "green" as synonymous in the following.

were the only factors that counted. How can we interpret the apparent shift in the investment industry to sustainability as a leading criterion for asset selection and portfolio composition? What are the implications for “real” investment spending and asset pricing? To answer these questions, we take a look, although a skeptical one, at today’s green finance policies, both in the private and public sectors.

Much of the sustainability promises by fund managers turn out to be cheap talk, with only a minor impact on the real economy, if any impact at all. The main reason for our critical assessment is the difficulty of linking funding and investment in a comprehensible, traceable way.

Economists call the lack of a recognizable connection between funding and spending a lack of identification. It is one reason we conclude that the current green finance strategies and policies are largely “wishful thinking.” We raise more critical points against a naïve interpretation of “green finance” products and strategies, which are included in part I of the paper. These critical insights are the background against which instruments and policies can be designed that might allow green finance to indeed become impactful. Part II of the paper explores such design features by focusing on two developments: the role of transparency/disclosure, like a taxonomy, and the importance of investor activism, like institutional investors in conjunction with proxy voting specialists.

In part III, we look at public activities closely linked to green finance. Most importantly, designing a regulatory framework to address ESG concerns and internalizing externalities via market mechanisms (Pigouvian taxes, carbon dioxide [CO₂] emission trading) are well-established policy responses to collective-action problems. The interaction of these government policies with green finance practice has been mostly neglected in policy debates but needs to be taken into account. We also look at the special case of green government bonds.

We summarize our analysis as follows: Green finance is an attempt by private investors to realize “green” corporate practice that exceeds the “green” standards set by the democratically legitimized parliamentary process. Green finance is stricter or greener than the prevailing regulatory rules. The marginal (or excess) ESG effects of green finance represent a *private contribution to a public good*, as the green investors bear the costs of voluntarily propagating the stricter green standards. These costs come in the form of a reduced return per unit of risk (i.e., a decrease in the Sharpe ratio). To make a real difference, investors who are prepared to allocate a significant proportion of their private wealth into truly green but underperforming financial products have to be sufficiently numerous. In addition, the interplay between green finance and government policies must not lead to full crowding out. Time will reveal the feasibility of a real impact on ESG goals.

I. Green finance credulity

In this part, we present three arguments for why green finance as we know it and as it is widely practiced today, is likely to be ineffective.² The term *credulity* in the title of this section points to wishful thinking that, in our opinion, has shaped first generation green finance discussions to the present day. Second-generation green finance thinking is what we are advocating and presenting in the latter parts of this paper. There, we will discuss how financial policies and instruments may become *credibly* green, or verifiably impactful.

For the time being, however, we start with green finance policies, which one can observe daily in newspapers, op-eds, advertisements of institutional investors, and investor reports published by banks, insurance companies, or public agencies. We present three elements of credulity that may be summarized in three hypotheses:

- First, attributability: when investors hand over funds to a company, they believe they understand how the money will be spent: (“green”) bonds or other funding sources can be attributed to particular (“green”) investment projects carried out and disclosed by the company.
- Second, addition: when investors hand over new funds to a company, they assume that any green investment funded with their money adds to all green investments the company would have done anyway, regardless of investors’ “green” money inflow.
- Third, segregation: when investors tilt their portfolios toward green investments, thereby diverting their funds away from other non-green (brown) investments, then these latter projects will be negatively affected; in particular, investors may encounter difficulties in finding adequate sources of finance that can replace the diverted funds.

These three behavioral hypotheses carry a strong element of credulity, as far as green funding is concerned, as they are at odds with basic insights of corporate finance. We will present these hypotheses—attributability, addition, and segregation—in more detail below.

A. Attributability: The relationship between assets and liabilities in corporate balance sheets

Think of a typical T account representing the sources and uses of funds at firm X at the end of the year. Its balance sheet shows several asset classes: real estate, machines and equipment, accounts receivable, and cash. Among the assets are a wind power generator and a small coal-fired power plant

² For a similar line of argument, see Wissenschaftlicher Beirat beim Bundesministerium der Finanzen (2021).

used to produce part of the energy consumption of the firm. Different items also appear on the right-hand side of the balance sheet, namely, bank debt, accounts payable, and equity.

Now assume the firm issues a new bond that is supposed to substitute for the rather expensive bank loan. The bond prospectus advertises it as a “green bond” because the bond commits its proceeds to be backed up at all times by net-zero machinery and equipment, notably wind power generation. What can be said about the “green” role of the bond?

Obviously, not much. First, the firm’s balance sheet contains several assets, some green and some brown, like the coal power unit. Could we say that a particular item from among all funding sources, like the proceeds from the bond issue, is funding a particular item on the asset side, like the wind power engine? The answer is “no,” as no visible tie or link joins the funding decision and the investment decision. In fact, in the above example, both power generators were already in place when the bond was issued. Even if there were a time gap between the two decision processes, for example, the green power generator is bought after the bond has been issued, whether the bond issue is the reason for acquiring the power generator or whether it would have been acquired anyway, with or without the bond issue, remains unclear.

There is no causal relationship between funding and investment, and, hence, to say otherwise is inappropriate. In a more general sense, each funding source of a company stands to contribute to the funding base of all assets sitting on the firm's balance sheet. One can always ask the following test question: How different would the asset composition be if one euro of the planned funding line was not forthcoming? In most realistic cases, the answer to the counterfactual scenario is: No difference at all, because the euro assumed missing from the favored funding line most likely would be substituted by an additional euro from another funding line or from the firm’s cash account.

The almost-trivial insight that all the firm's financing instruments jointly cover the entirety of the asset portfolio, without any attribution being possible, has long been recognized in corporate finance theory. The insight resembles the basic idea behind the Modigliani-Miller (MM) theorem, namely that for funding instruments to matter for valuation, there must be a direct connection between funding source (e.g. debt or equity) and the investment decision (e.g. which corporate asset to acquire). Without such a direct connection, there is no material impact on the value of the firm.³

Against this backdrop, the term "green financing," as it is often used nowadays by firms and in capital markets, can be easily misleading, because managerial decisions about production techniques and the firm's investment in machinery and equipment hardly ever depend on a particular funding source.

³ The classical argument in favor of analyzing informational (and other) imperfections as the source of impact the choice of financial instruments has on company valuation is Jensen and Meckling (1976).

Note that, for the most part, regular revenue from sales generates corporate funding. Funding through loans or the issuance of securities, what is labeled as “green finance,” is typically a minor part of corporate cash flow. For this reason, ESG-compliant spending, as with any other investment of the firm, is funded by the totality of the cash flow generated by the firm. This fundamental feature of the company balance sheet, according to which the cash surpluses of all assets taken together are to be attributed to the liabilities facing the firm, is often overlooked in the public debate; green financing is no exception here.

B. Additionality: Relationship between new funds and existing assets

According to the MM theorem, the value of a firm (defined as a portfolio of assets) is disconnected from the type of financial instrument used for funding. The flipside of the MM irrelevance hypothesis is the insight that a real (causal) impact from the composition of liabilities on the value of the firm exists if and only if the use of a particular funding instrument will change the asset composition held by the firm in a predictable way. For example, when a company substitutes an outstanding bank loan with a newly issued green bond, does this funding “swap” trigger a change in asset composition, for example, the acquisition of a more ESG-compliant machine? The same question about induced asset composition can be asked if the green bond represents a net increase in funding, rather than a substitute for other funding sources. The emphasis in the previous sentence is on the words “change,” “trigger,” and “substitute.” If a particular financial instrument is said to be *causally* related to a specific investment, there must be a *difference* between the actual investment and the counterfactual investment. For the link to exist between a new type of financial contract (“green”) and a new type of machine (“ESG compliant”), some detectable, enforceable relationship between the funds and their use is needed. Some observers (Levy, 2017) argue that smart contracting may be a promising avenue toward causal linkages.⁴

That said, measuring additionality in terms of the characteristics of green investments or ESG criteria, is a complex task in and of itself. We have nothing to add to this measurement issue in this paper; in the following, we simply assume that “green” or ESG criteria have been properly defined and there is agreement in how to measure goal achievement.⁵

C. Substitutability: Pricing of securities in markets

From the last section we know that, in most cases, the attributability issue precludes a direct link between assets and liabilities, a preclusion that renders a causal relationship between financing and

⁴ The term “smart contract” goes back to Szabo (1997).

⁵ A discussion of measurement issue relating to additionality in terms of climate goal achievement can be found in Greiner and Michaelowa (2003).

investment difficult to validate. But even if the exact channel of impact cannot be identified, perhaps an aggregate effect affecting the firm's cost of capital more generally can be observed? The standard argument in favor of a green premium, a "greenium," that is, lowering firms' cost of capital, relies on a price pressure effect in the market for corporate funds (Heinkel et al., 2001). Price pressure is demand driven when available financial instruments are no longer seen as perfect substitutes by investors. If parts of the investment universe are seen as "green," whereas others are not or even qualify as "brown," demand by investors who value "green" as an argument in their utility function may drive up prices, thereby lowering yields. The argument assumes the supply of qualifying green financial instruments falls short of demand; otherwise, a simple asset holding swap between "green" and "brown" investors would be possible without any significant price effect.

When "green" investors tilt their portfolios toward "green" companies, the cost of capital of the latter, as well as the expected portfolio return of "green" investors, decreases. Thus, being "green" is costly in a pecuniary sense and at least neutral in an expected utility sense.

The bulk of the early literature argues differently in assuming an excess return for green investors. The early empirical literature suggests that "green" investment outperforms conventional investments. In a 2015 metastudy with more than 2,000 academic papers in the sample, Friede et al. (2015) find "the large majority of studies" report positive outperformance. These findings clearly contradict the above argument that a pro-green argument in the utility function of investors drives a greenium (a decrease in the firm's cost of capital), resulting in an *underperformance* vis-à-vis conventional investments (Kapaun et al., 2021).

More recent empirical work by Pastor et al. (2021) reconciles the positive outperformance so widely found in the previous literature with the equilibrium underperformance ("greenium") argument. The authors point to a hindsight bias in the form of a climate concern shock that alters the economic behavior of consumers, producers, and the state in a way unpredictable in prior periods. Thus, given the recent increase in climate concerns, a climate-concern factor explains the outperformance of portfolios comprising a set of "green" criteria. Put differently, the observed outperformance of so-called "green" or "sustainable" investment strategies can be traced back to a portfolio composition that systematically selected ex post winners, namely, those stocks that were positively surprised by the climate-concern shock. Scrupulous empirical research tries to avoid this form of hindsight bias. The findings in Pastor et al. (2021) support our earlier statement that "green" investment policies will lead to reduced return expectations.

In the following, we will paraphrase the general insight in the preceding section, this time differentiating more finely between passive and active/activist investors. We first look at passive

investment strategies; active (or activist) strategies will be dealt with in part II. We use the term “passive investment” interchangeably with “index investment.” Pursuing a passive strategy means that, based on some ESG index, the securities held in a portfolio are selected from a universe of existing stocks in the market. The portfolio may contain bonds or shares. A direct influence on corporate investment policy is not sought, in contrast to an active portfolio strategy.

In a well-functioning capital market, the passive portfolio strategies of individual investors do not affect the overall attainment of ESG goals. In an integrated, information-efficient market, the diversion of investment funds into a subclass of potential investments will not affect the relative prices of investment alternatives, such as equities, or at least not permanently. In an open market, liquid funds from other investors for whom the pursuit of ESG goals is irrelevant will offset the diversion of funds; the supply of liquid funds is infinitely elastic. Accordingly, any effect on stock prices, or bond prices for that matter, be they positive or negative, requires a change in the firms' underlying expected cash flows, but a passive investment strategy does not entail this.

The neutrality of passive investments disappears when the demand for ESG stocks exceeds the supply at prevailing prices. If many passive investors appear in a market for ESG stocks, investor influence on the attainment of ESG goals becomes possible, even if these investors do not exert any influence on the management of the companies whose shares they hold. Investors change the relative cost of the capital of ESG companies compared to that of conventional companies, thereby creating incentives for conventional companies to transform into ESG companies. This change in the relative cost of capital arises from the large number of investors who prefer ESG investments and are willing to outbid other investors by forgoing returns. Investors might forgo returns, for example, because they derive greater non-financial benefits from ESG investment. As the cost of capital for ESG investments has fallen relative to the cost of capital for conventional investments, more ESG investment projects are becoming worthwhile, implying a positive net present value of cash flows for these projects. As a consequence, companies will transform themselves by altering their investment portfolio.

Thus, passive ESG investors typically suffer a financial loss, as already stated earlier, and as Barber et al. (2021) confirm in a recent study. The authors find that so-called “impact funds” in the venture capital markets realize a lower internal rate of return compared with their non-impact-oriented peers, the difference amounting to -4.7 percentage points. The authors relate the differential to investors' utility function, expressed by a higher willingness to pay. The lower cost of capital of ESG companies mirrors the lower returns of those investing in green stocks. The expansion of ESG activities is made possible by the willingness of ESG investors to forgo returns to achieve their goals (Pastor, Stambaugh, and Taylor 2020), and this willingness defines the extent to which green impact can be expected through a cost of capital effect.

Some papers develop these arguments in greater detail, among them, Heinkel et al. (2001) who develop a model with neutral investors, for whom ethical considerations are absent from their investment decision-making process, and green investors who refuse to invest in companies that do not meet their ethical standards. At the same time, there are two types of companies: those with clean production technologies that meet the demands of green investors, and those with polluting production technologies that green investors avoid, at least as long as these companies do not change their production technology. The refusal of green investors to invest in the latter companies changes the risk-sharing opportunities available in the market. Now, fewer investors are willing to buy into these companies. As a result, the share prices of these companies fall as investors lose opportunities to diversify risk. Companies will find it worthwhile to switch to clean production technology if the cost of the switch is less than the cost of capital saved by it. According to a calibration performed by Heinkel et al. (2001), at least 20% of all investors must be green before they can affect the cost of capital and thus real economic investment decisions.

The central assumption of Pastor et al. (2020), among others, is that investors have different preferences for ESG investments, so that the fulfillment of ESG criteria directly feeds into their utility function. The larger the difference in investor utility between green and brown investment types, the larger the ESG investment volume will become. Several empirical studies provide results consistent with these model-theoretic considerations. For example, Hong and Kacperczyk (2009) examine so-called "sin stocks," that is, shares of companies from, for instance, the alcohol, tobacco, and gambling sectors, which exhibit low social acceptance. The authors show that these companies have significantly higher costs of capital than do other companies. The authors identify the avoidance of these stocks by large institutional investors, because of social norms or regulatory and legal risks, as the main mechanism. As a result, these companies show lower participation of institutional investors and a lower number of analysts accompanying them. The authors interpret this evidence to mean that investors avoid sin stocks because of social norms and non-financial preferences, thereby knowingly accepting a financial loss.

Chava (2014) shows that shares of companies that use production technologies that are particularly harmful to the environment have significantly higher expected returns compared to those of green companies. Moreover, such companies pay higher interest rates on bank loans. The evidence in this study suggests that this is not compensation by investors for unobserved insolvency risks. Rather, the higher cost of capital is attributed to ESG investors avoiding these companies. Riedl and Smeets (2017) show that investors who want to invest in line with their social preferences are willing to forgo a portion of their financial returns in order to purchase fund shares committed to socially responsible investments.

In sum, these papers show that investors in ESG stocks earn lower returns when compared with the overall market, but these investors do not consider this financial underperformance to be detrimental given their personal preferences for responsible investing.

It is important to note the ex ante focus of this analysis on expected returns. This direction does not preclude the possibility that ex post individual or even all ESG stocks outperform conventional stocks (Pastor, Stambaugh, and Taylor 2020 and 2021). This outperformance can occur, for example, with unexpected changes in the ESG preferences of customers and investors. Following an exogenous shock, customers may demand goods and services from green suppliers. One could also conceive that many market participants had not yet realized the full impact of climate change and have only corrected their expectations, so that green shares generate a positive excess return. Conversely, conventional companies would be exposed to the risk of stranded assets, that is, assets that are reduced in value by unexpected depreciation or, in extreme cases, mutate from an asset to a liability. The distinction between ex ante expected returns and ex post realized returns is therefore of central importance to the economic valuation of ESG investments; it is equally important for the conduct of empirical research, as an ex post design of a “green” portfolio strategy may inadvertently tilt the portfolio composition in a way that could not have been achieved ex ante, except accidentally.

II. Green finance credibility: Toward a more impactful investment strategy

Traditionally, policy makers have sought to regulate the production side of companies through regulatory measures, e.g., to internalize environmental externalities. These policy measures include technical regulations, eco-taxes, working time guidelines, job security standards, and more. More recently, the pursuit of societal goals has expanded to the financing side. Budgets driven by such objectives are either public in nature, as in the EU's Green Deal⁶ or the federal government's green bonds, or found in the private sector, as in the investment strategies of large pension funds, the product offerings of investment companies, or the plans and financial statements of national and international corporations. The aim of these initiatives is to enable individual investors to contribute to the achievement of societal goals.

A. Taxonomy strategy of the European Commission

We demonstrate above that the lack of attributability of assets and liabilities makes it very difficult for researchers to identify a causal relationship between green financing and an actual greening of a

⁶ The plan includes the 17.5 billion euros Just Transition Fund, as well as regulatory and tax incentives. The overall package is expected to achieve a mobilization of one trillion euros over one decade for the purpose of climate neutrality (European Commission 2020).

company's production. The problem increases in complexity if we take into account the global value chains of modern production processes and multidimensional societal objectives. The pursuit of ESG goals not only requires companies to reduce their CO₂ emissions but also requires corporations to be socially responsible regarding labor standards, fair pay, avoidance of child labor, mitigation of local pollution, reduction of waste, and so on. The measurement of whether the multitude of ESG activities reach their goals also generates considerable problems. A single indicator cannot easily express how green or how social a company is. If ESG goal attainment were only recorded at the individual company level or production stage, without taking into account the corresponding goal attainment at the preliminary stage, a company could always feign a high level of goal attainment by outsourcing undesirable activities. Therefore, the entire value chain must be captured. Doing so will enable investors to make an informed choice about the capital market so that funds are allocated in the desired direction.

In the case of CO₂ emissions, the problem is approximately solved, at least for the sectors covered by EU emission trading (ETS). Every company in the European production chain has to purchase certificates to cover the extent of its own CO₂ emissions. The cost of these certificates is reflected in the price of the intermediate or final product. In the case of two otherwise identical products, the product produced with fewer CO₂ emissions can be offered at a lower price.

For the many other conceivable ESG dimensions, including environmental-, society- and governance-related criteria, a comprehensive measurement system does not yet exist. Significant conceptual issues also need to be dealt with. The European Commission has tried to develop a taxonomy to classify products according to their fulfillment of the ESG goals. This taxonomy has become the cornerstone of the Commission's ESG policy agenda. Some critics fear that a multidimensional classification of all production processes along the value chain may become a "bureaucratic monster" (Wehrmann 2020) that is particularly harmful to small or medium-sized companies (SMEs), which may face severe difficulties in monitoring all their (maybe even one-time or occasional) suppliers.

Even if the monitoring problem can be reduced by implementing low-cost technologies (e.g., via block chains), the fundamental problem of a merely binary metric is still there. The taxonomy of the European Commission defines threshold values that bring entire companies on one side of the spectrum, either green or non-green (brown). Hence, the taxonomy is incapable of delivering information about (also small) changes in ESG levels. Therefore, unless the current taxonomy system

is augmented to produce cardinal data (and thus probably adding to the administrative complexity), it is of little value for the assessment of green finance effectiveness.⁷

At this point, any metric, be it binary or numerical/cardinal, will clearly require frequent observation and long-term collection of data in order to facilitate the emergence of valid and trustworthy metrics that can inform us about the market.

B. Activist investment strategies

While the information provided by the taxonomy in its current format and ambition, namely, delivering a binary metric for evaluating “green” impact, is not really helpful for passive investors to ensure a greener production, an activist investment strategy is an alternative and may be a more promising way to go. An active investment strategy requires intervention at the individual company level to enforce ESG goals. Unlike the passive ESG-oriented strategy, where many investors take a position via their portfolio decision, the investment here is not primarily directed at the ESG companies but precisely at conventional companies with the intention of trigger change and inducing higher ESG values.⁸

On the equity side, this intervention can take the form of voting in annual general meetings or joining the company's supervisory board. This intervention can take place via all financial instruments, bonds or equities, provided that the scale of investment is large enough to be perceived as a relevant investor. Usually only institutional investors can reach the required scale.

If the company previously followed a profit-maximizing path, then the said intervention will push the firm off the profit-maximizing path and lower the firm's market value. After all, if an ESG-compliant change in corporate behavior, as for example the installation of additional emissions filters, increases the value of the company, then a profit-maximizing firm would carry out this investment anyway; no active investor would be required in this case.

As a result, the intervention of active investors will generally reduce the profitability of the company, thereby decreasing shareholder value. From the investor's perspective, the return on investment

⁷ The one exception is a company that, in a given time period, switches from brown to green, or vice versa. Note that the incentive structure is different in ETS. Emission levels exist on a continuum. Each ton of avoided CO₂ emissions reduces the company's obligation to purchase emission certificates. ETS faces the same problem of shifting socially undesirable activities to countries not participating in ETS. This is why carbon border adjustments are discussed as a means to combat carbon leakage.

⁸ Note that in this case, the measurement problem regarding ESG goals is significantly smaller. First, agreeing on a common taxonomy is unnecessary. Second, the different ESG goals do not have to be aggregated. All that is needed is that activist investors in one company agree which ESG goals to pursue and how to control the management of their own company in regard to those goals.

decreases. As a result, an active investment strategy can indeed help achieve ESG goals, while going hand in hand with diminishing returns (Oehmke and Opp, 2020).

From the investor's perspective, such a strategy may be nevertheless worthwhile. Active investors will offset lower financial returns by gaining greater satisfaction according to their genuine preferences. Moreover, in some cases of inefficient management decision-making due to ignorance or negligence, an active investor may remedy the situation by pursuing ESG goals, while earning an excess return. Dimson et al. (2015) document how active shareholders can lead firm management to pursue ESG goals and increase market value. They find positive outperformance only if interventions reach their ex ante declared goal; that is, interventions are so-called "successful engagements." There is zero outperformance otherwise. Lastly, and related to the second point, an investor with private information on, for example, climate risk mitigation techniques, could intervene by uplifting firm profitability. In a similar vein, expected regulatory changes may increase the future profitability of otherwise loss-making endeavors, thereby defining a valuable target for early-stage investors.⁹

A number of publications address the broader, active influence investors have on a company's strategy. For example, Landier and Lovo (2020) emphasize the importance of market frictions regarding the influence that ESG funds exert on companies. The authors show that the greater the frictions present in a capital market, the more impactful are the funds (for an early study of these effects, see Scholes, 1972). They conclude that these funds can be most effective in less-efficient markets, such as with unlisted companies or small firms. The authors also show that these funds can amplify their effect by intervening in management decisions, for example, by imposing supplier restrictions on the company.

These findings on the particular importance of active investors in attaining ESG goals suggest that legislators should pay attention to the opportunities of active influence when regulating corporate governance. Giving more power to owners and the supervisory bodies vis-à-vis firm management could make a contribution to the attainment of ESG goals. The following questions are increasingly being asked: What responsibilities do supervisory boards of listed companies bear in addition to their duties in the implementation of ESG goals? And how can they fulfill these responsibilities? In contrast to passive investments, active investments allow investors participation in these bodies, which enables investors to influence investment policy and capital budgeting.

Another implication from above is that the impact via active investors may be larger for firms with ample room for improvement on an ESG scale. For instance, a coal-run power plant may earn "green" points, that is, reduce its emissions significantly, when additional air filter systems are mounted,

⁹ The second and third arguments apply not only to green investments but to any active portfolio strategy.

thereby exceeding the regulatory requirements. Of course, the additional costs of the extra filter runs counter to the company's profit interests. Gollier and Pouget (2014) use the catchy term "washing machine" to characterize how higher expected returns may result from turning a "brown" firm into a "green" one.

III. Green finance and government policy

A. Interaction of government policies and private investment strategies

If green finance goes beyond accounting tricks and really leads to a change in the production process, investors' actions can be seen as a private contribution to a public good. The slowdown of global warming, which provides non-rival, non-excludable benefits to mankind, is a textbook example of a public good.¹⁰ The reduction of a company's CO₂ emissions is a private contribution to this global public good. As it is financed by the investor's lower return, green financing could be seen as an example for the private provision of a public good (Cornes and Sandler, 1986). It is well-established that private contributions alone will not achieve a Pareto optimal provision of the public good. In general, private contributions lead to an underprovision. A welfare-maximizing government could achieve an efficient solution, but the (tax-financed) government provision usually crowds out some, but not all, private activities. Some private contributions remain despite comprehensive government activities as investors obtain a warm-glow utility (Andreoni, 1990) from their own contributions, i.e. they draw a personal benefit from doing good to society.¹¹

Somewhat surprisingly, the government as a crucial player is entirely absent in the literature on green finance. This absence might be justified if private and government activities take place in separate spheres and do not interact. Then the private provision would simply top up whatever the government had provided. However, this is certainly not the case. Provision by the government partially crowds out private activities. And a welfare-maximizing government will anticipate that the green preferences of some investors will lead to additional private contributions to the public good. The key question is: Will an increase in green investors who are willing to make private provisions increase the size of the public good when government provisions are taken into account? Unfortunately, there is no guarantee that more green investors would really make the economy greener. A formal analysis of the interaction shows that, on the one hand, an increase in the number of green investors leads to additional (warm-glow) contributions to the public good. This effect *per se* makes the economy

¹⁰ See Buchholz and Sandler (2021) for a comprehensive survey of global public goods.

¹¹ In a recent paper on green finance, Hakenes and Schliephake (2021) use this warm-glow mechanism. They formulate the model in terms of a disutility (guilt) from investments in polluting production.

greener. On the other hand, a higher number of private contributors also enhance the crowding-out effect, which induces the government to optimally provide less of the public good. The net effect of which is ambiguous.

Future research should more closely investigate the interaction of green investors and government provision. Future research may find it most promising to focus on government provision of the public good, rather than relying on a multitude of private contributors. A comprehensive emission trading system, which encompasses all sectors, is more likely than a purely private contribution mechanism to achieve the mitigation targets for CO₂ emissions.

B. The case of green government bonds

ESG-guided investments play an important role outside of the private sector too. The issuance of so-called “green government bonds” has also increased significantly in recent years. In September 2020, the Federal Republic of Germany also issued green government bonds for the first time. An issue volume of 6.5 billion euros was matched by demand for 33 billion euros. The special design of these securities includes the issue of so-called “twin bonds,” in which a green security with the same maturity and coupon is issued alongside a conventional federal security. The green bond as one twin replaces part of the auction volume of the conventional bond that is the other twin. This issue design is intended to ensure that green government bonds can be exchanged for conventional government bonds at any time and thus have comparable liquidity. Their design also allows the federal government to be sure that green government bonds do not have higher costs for the federal government as the issuer (but of course no higher returns for investors either).

On the expenditure side, already-planned government spending that is compatible with green goals offsets the proceeds from the issue of green government bonds. According to press reports, this kind of spending includes energy-efficient building refurbishment, the e-car purchase premium, or public transport. Following this policy, the Ministry of Finance has asked all ministries to look for expenditures in their respective budgets that are compatible with green goals. Accordingly, the maximum volume of federal green bonds is derived from the volume of existing spending in the federal budget that is compatible with green goals.

Such an approach suggests that government expenditures that are planned anyway and meet ESG criteria are quantified in their sum and attributed in their amount to the green federal bonds of the corresponding extent. Ultimately, only a portion of the previously conventional government bonds will be substituted by or renamed to green ones. This assessment is also supported by the design of green twin bonds, which replace part of the volume of conventional bonds.

In this context, analogous considerations apply to the public sector similar to companies. For the federal government, issuing green federal bonds may be worthwhile under certain conditions. First, more favorable financing conditions can be achieved if investors' willingness to accept disadvantages in returns can be exploited. Second, large government issuers can hope to create an attractive benchmark investment instrument that can also serve as a benchmark for the euro area in this asset class and gain an advantage in returns from this base rate structuring role. The reasonableness of this strategy can be explained by the significant and likely continuously growing demand for ESG-compatible investments.

Green government bonds also carry the risk of creating a superficial, economically unsound argument for expanding government debt. This is because the argument could be used in the public debate that already-planned new debt now has to be increased further in order to meet the demand for ESG-compatible investments. From the investor's point of view, investing in green government securities — as in the case of green corporate bonds — may be disadvantageous: returns must be compensated by the individual utility gains from a socially "good" form of investment.

This should not imply an expectation on the part of investors that the government will specifically use their funds to do more to achieve ESG goals. Such a direct link between funds raised through green government bond issuance and government spending of an ESG nature does not generally exist. This is because individual parts of the revenues are not causally linked to a specific use; nor do the principles enshrined in budgetary law in public finance provide for such earmarking. Associating the issue proceeds of green government bonds with ESG-compatible government spending may give investors the impression of an actual connection, but green government bonds do not *per se* have a higher and more attributable ESG impact than conventional government bonds. In this respect, they are no different from a conventional government bond.¹²

There is an important difference between corporate financing and public financing: While companies raise both equity and debt capital on capital markets, governments only act as debtors on capital markets. Equity investors, in particular, have the opportunity to exert influence on the management of these companies by strongly pursuing ESG goals or, in extreme cases, even replacing management. This possibility, however, does not exist in the case of sovereign financing. Rather, the pursuit of ESG

¹² A massive expansion of green bonds could, if necessary, be used strategically to bind the successor parliament shortly before elections. The successor parliament then would be limited in its spending decisions if the volume of green bonds were sufficiently large. However, this would curtail the parliament's budgetary right and thus democracy. In terms of ESG objectives, green government bonds would be counterproductive if they divert funds from otherwise active portfolio investors, resulting in less-active green investment in the corporate sector overall. However, the volume of green government bonds has so far been too small to trigger diversion effects on a significant scale.

goals is subject to political decision-making and thus to the parliamentary process. The ability of capital markets to influence the attainment of ESG goals is thus significantly lower in the case of governments than in the case of companies because investors as a group of actors do not have a privileged voice in the political decision-making process or, according to the widespread view, should not have one. The role that active investors can play in the case of companies falls to the electorate in the case of governments.

IV. Policy Conclusions

These fundamental considerations give rise to a number of recommendations for financial policy geared toward ESG criteria. The promotion of real economic goals through corresponding guidelines for expenditure financing is only conceivable under restrictive conditions. We highlight ten important arguments:

1. In perfect capital markets, real economic goals, such as those actually pursued by ESG, cannot be easily promoted by investment decisions.
2. The difficulty of establishing clear links between the origin and the use of funds, especially in the case of larger companies or public budgets, calls into question the usefulness of ESG-oriented financing.
3. To determine reliably the impact of ESG-oriented financing, comprehensive, detailed, and very costly recordings of real economic activities across the entire value chain of companies would be necessary. Such a taxonomy carries the risk of being highly complex and excessively costly.
4. The central yardstick for ESG-oriented financing should be the expected changes in the real economy, e.g., in environmental quality.
5. A change in the real economy may occur if private investors actively exert a formative influence on a company's environmental and social actions, not least by accepting a personal reduction in earnings. Future regulation for active investors in terms of proxy voting and proxy advisors needs to account for this aspect to enable investors to steer a company's set of goals.
6. There is no comparable possibility for investors to exert influence in the case of the state, as budgeting is the main responsibility of the legislative power.
7. In principle, a real economic effect is also conceivable in the case of passive investment, but only if the number of passive investors is large and if the markets are characterized by specific frictions and inefficiencies. Under perfect capital market conditions, the countervailing decisions of other investors tend to neutralize the investment decisions of ESG-oriented savers.
8. The thrust of policy effort should be devoted to maintaining a consistent and reasonable regulatory framework for achieving ESG goals at the lowest possible social cost. For example, any

given mitigation target for CO₂ emissions can be achieved through a comprehensive emission trading system. This regulatory system defines a timeline of maximum CO₂ emissions allowed per period. The price mechanism can help all individuals and firms to reach a feasible and cost-efficient adjustment path toward a CO₂-neutral society. Compensation or transfer payments can be devised to mitigate any undesired distributional side effects of those general measures. No additional mechanisms on the financing side are needed; additional measures, such as green financing, might even distort the efficient allocation.

9. Green government policies, such as ETS, has been founded on a democratically legitimized decision process, giving it a higher level of legitimacy. In contrast, selective measures taken by some firms, but not by others, and carried out by some investors, but not by others, are subject to concerns about competitive issues and other biases. As a result, priority should be given to collective action toward societal goals over individual forms of green activism (such as green finance).¹³
10. More research is needed into the interaction between private efforts and public provision. The literature on green finance thus far has focused on private initiatives and has largely neglected the government as a key player. Before recommending more private efforts into green finance, we should be sure that this really brings us closer to our ESG goals.

¹³ The literature extensively covers direct environmental policy measures, such as eco-taxes, certificate trading, or technical regulations, which this study does not address. This study also excludes a current discussion of the expansion of monetary policy to include the ESG dimension. See, for example, Schoemaker (2021) and Papoutsis et al. (2021) for a supportive view on an expansion of the ECB mandate, and Cornell (2020) for a critical view.

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