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**Financial markets and the transition to a low-carbon economy:
Challenging the dominant logics**

Guest editors' introduction to the Special Issue *Financial markets and the transition to a low-carbon economy*

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Financial markets and the transition to a low-carbon economy: Challenging the dominant logics

Guest editors' introduction to the Special Issue *Financial markets and the transition to a low-carbon economy*

Abstract

Financial markets play a major role in contributing to the transition to a low-carbon economy. Although many initiatives and developments are taking place, this is just the beginning. In this paper, we argue for a theory of change – a theory rooted in logics that will help financial markets play a key role in the transition to a low-carbon economy. We argue that the current dominant logics in finance – short-termism, predictability of the future based on ex-post data, price efficiency, and risk-adjusted returns – impede the effective integration of climate considerations in financial markets. We suggest four alternative logics that can enable and foster a change towards the low-carbon economy: long-termism, systems interconnectedness, carbon price dynamics, and active ownership.

Key words:

Financial markets; Climate change; Low-carbon economy; Theory of change

1. Introduction

The 2015 United Nations Conference of the Parties (COP21) in Paris was certainly a milestone towards combating climate change. The message was clear: we need to reduce global carbon emissions in order to keep warming to below the 2 degrees Celsius threshold (UNFCCC, 2015). This message was echoed by diverse global voices¹. The objectives are well defined in terms of carbon emissions and required technological deployments to keep the global average temperature rise below 2°C (International Energy Agency, 2014; Meinshausen et al., 2009). From an optimistic point of view, one may argue that the technology-driven transition to a low-carbon economy is well under way. However, what is less clear is how to accelerate the pace of this transition.

Governments are key actors to stimulate changes – notably through regulations. However, relying uniquely on governmental actions might represent too long and cumbersome of a process – especially since climate change is a global common good issue that requires globally aligned policies. Thus, waiting for far-reaching, internationally agreed climate policies might be problematic for combatting an issue where timing is everything. This argument becomes even more crucial in light of recent political developments in the United States, one of the major global economies.

Despite some encouraging developments in the fight against global warming, current policies and market signals are still far from enough to limit the rise in average global temperatures to 2°C. A report showed that the 50 largest corporate emitters reporting to the Carbon Disclosure Project actually increased their greenhouse gas (GHG) emissions between 2009 and 2013 (CDP/PwC, 2013). The UN Intergovernmental Panel on Climate Change predicts that on its current course the world will warm by 3°C by 2100 (Holder, Kommenda, & Watts, 2017).

As many scholars have argued, financial markets have huge impacts in society as they directly influence the functioning, priorities, and values of businesses (Davis & Kim, 2015). As such, financial markets can play a key role in fostering sustainable development (Busch, Bauer, & Orlitzky, 2016) and have the capacity to create significant change – also in the climate context. There is an urgent need to accelerate further low-carbon investments, which we define as financial institution and investor practices that support and facilitate the transition towards a low-carbon economy through low-carbon and renewable technologies as well as

¹ Including Pope Francis (Pope Francis, 2015), Governor of the Bank of England Mark Carney (Carney, 2015) and Chinese President Xi Jinping (Xi, 2014)

energy efficiency measures. In doing so, financial markets act in their own interest. First, there is a clear risk argument: failure to meet the Paris target may be devastating for the planet and thus for the economy. As Dimitris Tsitsiragos from the International Finance Corporation has put it, “*Climate change is not just an environmental challenge— it is a fundamental threat to development in our lifetime*” (Tsitsiragos, 2016). Second, there are plenty of new investment opportunities. To reach the targets, significant investments in low-carbon assets are required (Campiglio, 2016; Polzin, 2017). The International Energy Agency (2014) estimates that cumulative investments of \$53 trillion in energy supply and energy efficiency over the period from 2014 to 2035 are required. This consists not only of a shift from fossil fuels to renewable energy investments but also in much more investment in energy efficiency. The scale of the investment needed is indeed well beyond the capacity of the public sector alone. If financial markets massively step in and redirect capital, they will have the capacity to contribute to significant changes, be it through dedicated financial instruments or the allocation choices investors make.

According to a UNEP (2015) report, the financial system can play three key roles to enable the transition: 1) recognize the costs and risks of high-carbon and resource-intensive assets; 2) allocate sufficient attractively priced capital to low-carbon, resource-efficient assets; and 3) ensure that financial institutions and consumers are resilient to climate shocks, including natural disasters. While the roles seem clear, a number of impediments are still limiting their capacities to create the necessary change.

In this paper, we develop three main arguments to explore the role of financial markets in transitioning to a low-carbon economy. First, we examine how finance and climate change influence and depend on each other. Second, we discuss the key challenges for financial markets to incorporating climate change related considerations. We argue that the challenges are rooted in the dominant logics in finance. Third, we argue for a theory of change and offer suggestions for alternative logics that can serve as pillars for initiating an effective change towards a low-carbon economy through financial markets.

2. Connecting finance and climate change

For a long time, financial markets have ignored the ecological conditions of the planet despite the fact that financial flows play a fundamental role in almost every activity of the

Anthropocene (Galaz, Gars, Moberg, Nykvist, & Repinski, 2015). In light of recent initiatives and political developments, it seems to be broadly accepted that financial markets can only flourish in the long run based on intact and functioning ecological systems (Scholtens, 2017). However, despite this insight, the contribution of financial markets to solving one of the most pressing issues, climate change, remains rather marginal. It is also only recently that scholars in the fields of ecology and finance have begun to consider and integrate each other's work (Galaz et al., 2015; Linnenluecke, Smith, & McKnight, 2016).

Many developments illustrate that there are already strong interactions between financial markets and climate change. Voluntary initiatives have emerged from the financial sector, like the Principles for Responsible Investment, the Montreal Pledge, the Portfolio Decarbonization Coalition, or Climate Action 100+. New institutions addressing the need for climate related data have emerged, such as the Carbon Disclosure Project (CDP), and divest/invest campaigns have been initiated, such as the Fossil Free Campaign led by 350.org. Another example is the Financial Stability Board's Climate Disclosure Taskforce lead by Michael Bloomberg, whose objective is to give recommendations on what and how information should be disclosed by companies to better inform investors, lenders, and insurers about climate related financial risk (TCFD, 2017). Financial service providers are also starting to tackle the issue by designing so-called "low-carbon" or "carbon-efficient" financial products. In addition, regulatory bodies are acknowledging the potential role of the financial market. As an illustration, in May 2015 France passed a new legislation on climate reporting for investors, requiring mandatory Environmental, Social, and Governance (ESG) and climate policy reporting by all asset owners on a "comply or explain" basis.

One of the most noticeable recent efforts in connecting finance and climate change was the High-Level Expert Group on Sustainable Finance (HLEG, 2018). In 2016, the European Commission selected 20 experts from a mix of assets owners, asset managers, banks, data providers, research institutes, and NGOs (Robinson-Tillet, 2016). The task of the expert group was to develop recommendations for the European Commission's position on sustainable finance, particularly regarding climate change. Based on the group's recommendations, the European Commission published its action plan on '*Financing Sustainable Growth*' (European Commission, 2018) in March 2018. Next to a common taxonomy for sustainable investments and concrete data, reporting, and transparency requirements, addressing climate change is a core component of the action plan. The European Commission clearly stated the

role and responsibility of the financial sector in reaching the EU's 2030 targets from the Paris agreement, including a 40% cut in greenhouse gas emissions.

With or without regulation, financial markets are directly exposed to the consequences of climate change. This exposure relates to mitigation, that is reducing or preventing emissions of greenhouse gases – e.g., investments in new technologies, renewable energy, making older processes more energy efficient – as well as adaptation, that is adjusting to the impact of climate change – e.g., helping populations, economies, and ecosystems to adapt to the changing environment (Boissinot, Huber, & Lame, 2015). While both mitigation and adaptation efforts are equally important from a holistic climate change (risk) management perspective, this paper focuses on the former, i.e., efforts towards a low-carbon economy.

As such, there seems to be a broad agreement that financial markets can play an essential role in the transition towards the low-carbon society of the future. Investors and companies already face the substantial financial risks of seeing their assets become stranded in the context of a transition to a low-carbon economy (Ansar, Caldecott, & Tilbury, 2013; Leaton, 2013; Linnenluecke et al., 2016). This already calls for new ways of integrating climate change related financial risk for investors. Beyond required disclosure and portfolio adjustments, the financial sector can drive the quantity and type of finance made available to support efforts towards a low-carbon and climate-resilient development. It can thereby contribute to all other sectors' transitions by determining access to funding in the banking, insurance, and capital markets depending on firms' sustainability performance.

However, despite all the evidence that finance is a key ingredient in the global response to climate change, the financial flows contributing to the reduction of emissions (mitigation responses) and to the adaptation to current and future climate variabilities (adaptation responses) remain limited. In other words, effective and far-reaching low-carbon and climate-reflective investments still remain a rather elusive goal (Scholtens, 2017).

Moreover, while ambitious initiatives and new products can be transformative, they are not always successful. Understanding and acknowledging both their potential and limitations, and at the same time acknowledging the dynamics of (future) institutional and market developments, is key. As an illustration, we refer to the venture capitalists (VCs) in the US who miscalculated the renewable power investments they made in the first decade of the 21st century (Ginsberg & Marcus, 2018; Marcus, Malen, & Ellis, 2013; Marcus, 2015). At first glance, these investments looked attractive, but several events changed the storyline. In 2008

the global financial crisis took place and it was followed by slow recovery in Europe, which led to a decrease in renewable energy incentives. The US Congress did not pass important climate change legislation in 2009, the Waxman and Markey bill, which sneaked by in the House by a vote of 219-212 but then failed to make it through the Senate. This bill formally was called the "American Clean Energy and Security Act," of May 15, 2009. It was 1,400-page bill and it would have created emissions caps through 2050 for a number of greenhouse gases, including carbon dioxide, and started a system for trading emissions allowances. Nearly at the same time, China started to invest heavily in low-cost wind and solar technologies, while the U.S. VCs had favored more advanced technologies. The more advanced technologies that the U.S. VCs favored could not compete with the low cost Chinese alternatives. Another important and unexpected development was the role hydraulic fracking played in lowering fossil fuel prices. Low cost natural gas and oil flooded the market in the 2012-2014 periods and brought oil and natural gas prices down by about a third (Marcus, 2019). As a result, what the VC first considered to be very profitable investments in cleaner energy and renewable technologies, turned out to be much less successful. This example shows that despite the role VCs could have played, this form of funding did not produce the anticipated results. The performance expectations of the main stakeholder group (the financial backers), who held the venture capitalists accountable, was not met.

The required transformation will entail significant dedicated investments in the coming years. In 2018, global investment flows still support industrial sectors with high carbon emissions, while investments dedicated to an effective shift in the energy system towards low-carbon technologies remain insufficient. As Guez and Zaouati (2015) have written, *“Transforming the economic model is extremely costly. We have to re-envision the allocation of capital in order to support social and technological innovations, to design and build sustainable infrastructure, and to finance the energy transition. Reinvented, finance could become a powerful lever for setting these transformations in motion”* (cover page).

From the above, we can see that many initiatives are on their way and steps are being taken towards mitigation. However, a lot more needs to occur to make financial markets effective in promoting a low-carbon economy. In addition to the development of new tools, products, and processes, a deep and fundamental change is required. For financial markets to be able to act as a change agent to bring solutions to the problem of climate change, we must challenge the dominant logics that are guiding the sector.

3. Key challenges: the dominant logics in financial markets

The reluctance of financial markets to more proactively incorporate climate change considerations within investment appraisals and practices can be attributed to the logics that dominate the financial system. Despite the 2008 financial crisis, the financial system seems to remain locked in its “old” logics. We argue that those dominant logics are preventing the financial markets from developing their full capacity to drive change towards a low-carbon economy.

In reference to the neo-institutional perspective, institutional logics define the organizing principles of an institutional field, such as its values, norms, assumptions, and practices (Thornton, Ocasio, & Lounsbury, 2012). Institutional logics are socially constructed, historical patterns of cultural symbols and material practices by which individuals and organizations give meaning to their daily activities, organize time and space, and reproduce their lives and experiences (Thornton & Ocasio, 2008). In other words, they guide the behavior of actors within this field and render actions “comprehensible and predictable” (Lounsbury, 2002, p.255).

In the financial sector, neoclassical economic thinking has shaped the dominant logics. This thinking is rooted in individualism, profit maximization, and economic rationality (Friedman, 1970; Jensen, 2002; Lydenberg, 2014). It is reflected and grounded in several key components and tools (Pérez & Vernengo, 2010) such as the efficient market hypothesis, the trade-off paradigm between risk and return, Markovitz’s Modern Portfolio Theory, the Modigliani-Miller’s arbitrage principles, and the Black-Scholes-Merton approach to option pricing. As argued by Lydenberg (2014), those tools have directed financial markets and their actors toward a rational rather than a reasonable approach to finance. On the one hand, reasonable behavior involves consideration of the effect of one’s actions on others and is concerned with the protection or enhancement of the common good. On the other hand, rational behavior focuses on self-interests and the most efficient means of achieving one’s personal ends.

We argue that four dominant logics in finance are hindering the capacity of financial markets to effectively contribute to climate change mitigation. These interwoven logics are based on the view of markets as being fully efficient, transparent, and rational. We argue that climate change requires looking beyond neoclassical theories and assumptions. As Dumas and Louche (2016) propose, there is a need for more flexibility to adopt a broader view of finance by allowing the consideration of non-financial issues in investment decision-making.

Short-termism

Financial markets are dominated by a short-term logic that directly contradicts the need for a long-term approach to sustainability challenges in general and climate change in particular. We refer to “short-termism” when short-term gains compromise long-term objectives (Laverty, 1996).

Short-termism has been fostered within the financial community over time. As stated by the World Bank² in 2017, the average US investor saw his or her portfolio entirely change in less than eleven months, a change that would have taken five years in the mid-1970s. Similarly, Cremers, Pareek, and Sautner (2014) show that the average investor holds his or her portfolio for slightly more than a year. Through such behavior, investors are putting high pressure on the real economy to deliver short-term optimal outcomes (Barton et al., 2017). This is in contradiction to the findings of academic studies that show that short-termism 1) is hampering business success (Flammer & Bansal, 2017), and 2) has been linked to poor sustainability outcomes (Bansal & DesJardine, 2014).

These developments have been acknowledged as by-products of capitalism, resulting from a quest for speed and efficiency (Rosa, 2013). Even if short-termism is a general phenomenon in our societies, it seems to be even more accentuated in the financial world (Dumas & Louche, 2017). It has been shown that the quarterly reporting requirement for publicly traded firms promotes managerial short-termism (Kraft, Vashishtha, & Venkatachalam, 2018). As an extreme manifestation of this logic, we refer to high frequency trading, where time is counted in nano-seconds.

Although criticisms of short-termism are not new (Laverty, 1996), the origins of the 2008 financial crisis again demonstrated its relevance. Yet investors still focus on the quarterly earnings or short-term portfolio returns, which comes as no surprise: this behavior is directly linked to the way asset managers and client advisors are incentivized. Indeed, reward schemes in the financial community tend to encourage short-term behavior and short-term profits. As a result, the financial community inhabits a world of immediate gains and presses companies for quarterly results. This is a source of a certain “myopia” that hinders financial actors and managers looking to properly consider long-term value creation and the fundamental value of firms.

² <https://data.worldbank.org/indicator/CM.MKT.TRNR?view=chart>

There is obviously a tension between the fast-paced nature of financial markets and the longer view of climate change. First, the dominance of short-termism does not allow the development of measures extending well beyond the traditional horizon of investment appraisals. Second, it provides no incentive for businesses to change established practices and behavioral patterns. Long term is not only about buying and holding for a long period of time; it also means incorporating climate change related risks and opportunities within investment decisions. However, the correlation between climate change and related financial consequences is not always easy and immediate. As an externalized cost, it is still uncertain how these costs will materialize for individual assets and investments. We conclude that, as of today, the financial implications of climate change are not well understood by many financial market participants because the materiality of climate change is not of relevance in a world dominated by short-termism.

Predictability of the future

The financial community works with and around the logic of predictability. Models and tools have been designed to predict future values – to a large extent – based on past performance. Such approaches favor quantitative measures, as they appear to reduce uncertainties by making investment variables more tangible (Slawinski, Pinkse, Busch, & Banerjee, 2017).

However, climate change is characterized by a high level of uncertainty. These uncertainties pertain to certain scientific aspects as well as economic, regulatory, and social consequences (Stern, 2006). The notion of uncertainty links directly with time. Prelec and Loewenstein (1991, p.784) have noted that “*time and uncertainty are typically correlated with one another in the real world*” and that “*anything that is delayed is almost by definition uncertain*”. Uncertainty stresses the lack of information about general future developments and the likelihood that they will materialize (Slawinski et al., 2017). Such information cannot be found in ex-post data about markets and individual assets. Thus, coping with this missing information becomes an impossible task. Slawinski et al. (2017) argue that such uncertainties are one of the factors explaining organizational inaction on climate change. The same thing can be argued with regard to the predictability logic in financial markets: the result of uncertainty is inaction. We conclude that the inherent uncertainties in the climate change context apparently paralyze financial actors; established tools and evaluation methods are unable to incorporate data on climate impacts based on ex-post data, which in turn prevents investors from effectively integrating climate change into their decisions, resulting in inaction.

Price efficiency

Despite numerous criticisms, the vast majority of economists and actors in financial markets believe that markets operate efficiently (Fama, 1970). This efficiency logic is captured in the notion of “price” as the best estimate of value and the most rational basis for decision-making (Lydenberg, 2014). The price of assets is seen as the best available measurement of value; it incorporates all available information in its determinations. As Friedman and Friedman (1972) argue: “*The price system transmits only the important information and only to the people who need to know*” (p. 15). In the literature, this notion of efficient prices is reflected by the so-called Efficient Market Hypothesis (EMH).

In this price efficiency logic, all financially relevant information and values should be captured. However, the notion of efficiency apparently works only when all actors have the same type of information and, even more importantly, when they believe that this information is financially relevant. However, climate related considerations involve a whole range of new aspects and considerations and their individual financial consequences are subject to uncertainties that cannot yet be accounted for properly. Information about these aspects and uncertainties is not accessible to all financial actors and, notably, many still doubt that such information is actually relevant from a materiality point of view.

As a result, the actual and potential negative consequences of climate change are certainly not a natural component of the current price building mechanisms. Taking them into account would necessitate measuring and accounting for new non-financial aspects and their likely consequences. There are two ways ahead. On the one hand, the established logic could be rooted in better foundations. In this sense, it can be argued that more transparency about the consequences and more reliable data are required. Based on this, financial actors will adjust the pricing models accordingly. On the other hand, it might be necessary to revise the established price efficiency logic and question the belief that actors are efficient and rational, and current prices are the best available approximation of all value-relevant information. We therefore conclude that within the current logic – presuming that all relevant information is already incorporated – important climate-related consequences and their materiality remain ignored.

Risk-adjusted returns

Traditionally, the risk/return logic is to mitigate risks and at the same time to maximize monetary returns (Hawley & Lukomnik, 2018). This logic focuses on what is measurable –

again, typically based on ex-post data – and therefore tends to neglect risks that stem from non-financial, future, and not yet perfectly quantifiable conditions and developments.

Climate change constitutes a risk factor since regulators and markets react to the increasing economic, social, and environmental impacts of climate change. Related risks can be of different kinds: regulatory, litigation, or reputational. The response should be the introduction of additional metrics for evaluating assets on climate change related risks and adjusting investment decisions accordingly – as proposed by the Task Force on Climate-related Financial Disclosures (TCFD, 2017). However, such efforts are still on a conceptual level and have only recently started to enter political processes and discussions among practitioners.

Moreover, ex-post data might not be a good indication of future return profiles for new investment opportunities in the climate change context, for instance, regarding investments that accelerate renewable energies and energy efficiency measures. Furthermore, new innovative start-ups that consider climate change as an opportunity may become more profitable and/or less risky over time. Thus, we conclude that established calculation methods for risk-adjusted returns have to be extended and take into account further information about new aspects that will influence both future returns and risks.

4. Theory of change – new logics for financial markets

We argue that the four dominant and interwoven logics in finance are constraints on promoting effective change towards climate mitigation. Although many may argue that these logics are central for maintaining profitability and stability in the financial sector, we argue the opposite. While climate change interferes with these logics in many regards, these logics are not compatible with what needs to be happening – notably from a materiality point of view. For example, stranded assets will affect investments in the long run, i.e. it is not a short-term issue. As it is a relatively new topic, evaluations of past developments based on ex-post data will not be very useful. Although the information about stranded assets as a new risk topic is available, the risks associated with stranded assets seem not to be a widely shared notion. Stranded assets constitute a new financial risk, which is not reflected by current price mechanisms, yet it remains unclear how it should be displayed in risk-adjusted return evaluations. Thus, we ask what we can conclude about the future logics of financial markets.

Many practitioners – notably in the emerging field of impact investors – recognize the need for change in the financial system and ask for a theory of change. While the notion of a theory of change sounds highly appealing, developing such a comprehensive new theory is a huge task. Based on our argument that the dominant logics in finance are not well positioned to incorporate climate change and related financial consequences adequately, we suggest in the following section alternative logics that can serve as pillars for such a theory of change.

Long-termism

At the core, an important way to foster low-carbon investments is through the regulation of disclosure practices that allow for an analysis of the long-term consequences of climate change on an individual asset basis. As one key component, these disclosure practices pertain to the accountability of low-carbon strategies. Existing efforts towards enhancing disclosure practices can serve as a starting point for establishing a long-term logic.

In the US, for instance, companies listed with the SEC are subject to its federal securities regulations, which require listed companies to have high standards of information reporting and disclosure. This is perceived as essential to an effective control of corporate executives in a situation of separation of ownership and control. Furthermore, in 2014 the European Union adopted a Non-Financial Reporting Directive requiring larger companies to disclose social, environmental, and diversity information. This directive is considered to be the most significant EU-wide legislative initiative to promote sustainability reporting.

France is an interesting example of disclosure practices. In 2016 the French government created two certifications tools for financial products in order to integrate sustainability aspects: the Socially Responsible Investment label (SRI) and the Energy and Ecological Transition for the Climate label (TEEC). While the SRI label encompasses a broad range of ESG criteria, the TEEC goes one step further. It was created specifically to stimulate the green economy by identifying products that genuinely finance activities with measurable environmental benefits (Novethic, 2016). Related sectors range from transport and renewable energies to waste management and energy efficiency. A third component of the French policy effort is Article 173 of the Energy Transition Act. Published in December 2015, it defines the reporting requirements for asset owners with regard to the application of ESG criteria in their financial management, with climate risks being the leading issue.

While all of these are promising efforts, they all still fall short in facilitating the implementation of a long-term logic – a key requirement to drive the transition towards a low-

carbon economy through financial markets. Despite many initiatives to disclose and assess the performance and risks of firms regarding climate change, it appears that it is still extremely difficult to comprehend the relevance of climate change from a materiality point of view. First, existing data on corporate carbon performance is not very consistent and a huge data gaps exists. Second, while studies have argued that it is possible to hedge against climate risks using lower carbon intensities (Andersson, Bolton, & Samama, 2016; Schoenmaker & van Tilburg, 2016), such analyses neglect further important aspects, such as decarbonizing options and carbon dependencies. Moreover, corporate carbon data is typically backward looking. For holistic climate risk analyses, forward-looking data – e.g., based on scenario analyses capturing long-term trends – is essential.

Systems interconnectedness

Low-carbon investing requires adopting what Hawley and Lukomnik (2018) have called a modern systems perspective. In the systems perspective (Meadows & Wright, 2008; Mele, Pels, & Polese, 2010), we need to move from focusing on the micro (security and portfolio) to focusing on the system (societal), to connect the different levels, and to understand the interactions between the different parts of the system. The core idea is to understand and connect value that is created at company and portfolio level to the benefits this value creation entails at the system or society level. In other words, systems interconnectedness is about reconnecting society to capital markets rather than thinking of capital markets as isolated from society. As Hawley and Lukomnik (2018) write, recognizing systems interconnectedness as a new logic would improve our understanding of risk/return profiles as part of a more holistic approach.

At the same time, adopting such a systems interconnectedness logic requires investors to acknowledge and embrace paradoxes. Making climate change an integral part of finance and adopting a systems perspective blurs the boundaries between financial and non-financial values (Louche & Dumas, 2018). Low-carbon investments are a fertile ground for paradoxes as they have to deal with “contradictory yet interrelated elements that exist simultaneously” (Smith & Lewis, 2011, p.386). For example, a new dam for energy production certainly is a low-carbon investment option. However, several potentially negative consequences must be taken into consideration when financing a dam project, from the changing ecological conditions in the run-off area to the social impacts on the local communities where the dam is constructed.

Managing such ambiguity and conflicting objectives is challenging for financial actors trained and educated to deal primarily with financial aspects. Paradoxes are recognized and studied in the field of corporate sustainability (e.g. Hahn, Figge, Pinkse, & Preuss, 2018; Ivory & Brooks, 2018). Related insights need to be incorporated in the field of finance. Notably, scaling up low-carbon investments requires financial actors with the necessary technical and financial skills as well as capabilities, such as paradoxical and reflective thinking, to be able to deal with ambiguity and tensions (Hahn, Preuss, Pinkse, & Figge, 2014; Putman, Fairhurst, & Banghart, 2016). It also requires the design of new tools to address contradictory information (Louche & Dumas, 2018).

Carbon price dynamics

The transition towards a low-carbon economy through financial markets requires a new risk pricing logic. We argue that there are at least three theoretical rationales for extending the established pricing mechanisms towards incorporating carbon price dynamics. First, in the aftermath of the Paris agreement, political efforts will continue to internalize the negative externalities in the climate context – be it via carbon taxes or market-based mechanisms such as emission trading schemes. Second, stranded assets constitute a new risk dimension and, thus, lower risk premiums for low-carbon countries and companies can be expected. Third, low-carbon investments are likely to change the return-risk profiles over time. All three examples illustrate the emergence of new carbon price dynamics.

Using a data set of 23 OECD countries, Crifo, Diaye, and Oueghlissi (2017) empirically show that environmental ratings significantly decrease government bond spreads and are complementary to financial ratings in assessing country risk. Consistent with Bauer and Hann's study (2010), this result confirms that pricing risks in the climate context is an important driver in assessing country risks. In the corporate context, Kölbel, Busch, & Jancso (2017) find that corporate social irresponsibly increases financial risk. Not implementing a carbon management strategy and climate mitigation efforts certainly can be considered irresponsible business practices. Yet many investors use extra-financial ratings – i.e. ratings that also cover information about climate related risks – solely as a (marginal) supplement to financial ratings. While there is empirical evidence that such ratings can – already today – be relevant from a materiality point of view, the carbon price dynamics will further reinforce their relevance. Much remains to be done to price climate risks effectively and consistently. The sophisticated utilization of climate related information in both sustainability as well as financial ratings is a key component for the transition towards a low-carbon economy.

Active ownership

We argued that proactively addressing climate change is in the very interest of financial actors. While this can be achieved through passive selection of according assets, an even more effective way is shareholder activism and engagement (Gifford, 2010). Active ownership through shareholder engagement can be defined as the mechanism used by shareholders to express their dissatisfaction with a firm's ESG performance (Goodman, Louche, Cranenburgh, & Arenas, 2014). Instead of simply divesting, investors actively address and discuss issues with corporate management (Dimson, Karakaş, & Xi, 2015; Clark, McGill, Saito, & Viehs, 2015). Shareholder engagement can be done through different means and tools, such as letter writing, asking questions at annual general meetings, and filing and voting resolutions, but also through formal and informal dialogue with management or the board, or through engagement with the public (Lydenberg, 2007; Sjöström, 2008).

In recent years, active ownership has become increasingly important among responsible investors (O'Sullivan & Gond, 2016). Although quantitative measurement of the impact of engagement activities remains elusive, many signs show that it does play a significant role in changing companies' policies and actions. In light of climate change and the need for urgent action, investors should incorporate active ownership as an inherent logic that constitutes a natural component of any investment activity with listed firms.

Investor Relations Officers (IROs) are linked to the active ownership logic. The role of an IRO is to provide "timely, accurate and complete information" about a corporation's business fundamentals and future to the financial community – notably security analysts, investors, and potential investors – to help them make better informed decisions (Farraghe, Kleiman, & Bazaz, 1994; Marston & Straker, 2001). To assess the company's business fundamentals, investors have traditionally asked for financial information. Yet, the demand for extra-financial data is growing as investors increasingly consider non-financial aspects in their assessment of companies. However, Crifo, Escrig-Olmedo, and Mottis (2018) show that the integration of environmental factors by IROs is still in the earliest stages. Thus, there is much room for progress regarding the integration of climate-related issues into traditional investor-relation practices.

5. Conclusion and contributions of the special issue

Financial markets can clearly become a key driver for the necessary change towards a low-carbon and climate resilient economy. This requires that low-carbon investments do not remain merely a buzzword and lose their essence, but become serious goals of the economy. For this, we argue, the dominant logics in finance need to be revisited. In this article, we propose alternative logics that can serve as a starting point for developing a broader theory of change.

In the spirit of such a theory of change, each paper in this special issue offers unique insights into how financial markets can contribute to a low-carbon economy. The special issue covers empirical studies as well as thought papers that explore ways in which financial markets are already paving the way for change and could or should do so in the future. Although the contributions represent various perspectives and disciplines, they all share the common understanding that the financial community not only has the capacity to play a significant role in the transition towards a low-carbon economy, but also has a responsibility to do so. Research on financial markets and climate change is still an emerging field. With this special issue, we hope to accelerate the discussion and encourage academics to further delve into this area.

Simon Zadek's paper, *Financing a just transition*, takes a policy perspective to address the role of financial markets in the climate change context. After reviewing some of the irreducible facts and discussing why finance has so far failed in its ultimate purpose of financing tomorrow's inclusive and sustainable economy, he discusses when and how to intervene in the finance-climate nexus. He argues that non-market as well as market interventions are required, but more importantly that actors from both the private and public spheres ought to extensively engage and work with each other. He also makes a call for finance to embrace the bigger picture in all its complexity to be able to align not only to the climate goal but also more broadly to the Sustainable Development Goals.

The paper by Paul Shrivastava, Laszlo Zsolnai, Mark Stafford-Smith, David Wasieleski, Thomas Walker, Olaf Weber, Cary Krosinsky, and David Oram, *Finance and Management for the Anthropocene*, stresses the importance of reassessing the impact and role of finance and economics as a human social activity on nature, and in achieving or impeding global sustainability. It proposes leverage points for change toward sustainability stewardship. In particular, the paper evaluates how financial stakeholders should address planetary boundaries

and offers a modified stakeholder theory, from which future directions for finance in the Anthropocene are proposed.

Chelsie Hunt and Olaf Weber's paper, *Fossil fuel divestment strategies: Financial and carbon related consequences*, brings us into the fossil fuel divestment movement. They analyze its consequences on the economy by studying both the financial effect of divestment and the influence of divestment strategies on the carbon intensity of portfolios. Based on Canadian data over the 2011–2015 period, the study suggests higher risk-adjusted returns and lower carbon intensity of the divestment strategies compared to the benchmark. This outcome suggests that divestment is not only an ethical investment approach but may also address financial risks caused by climate change and reduce the carbon exposure of investment portfolios.

Finally, Alexander Bassen, Katrin Gödker, Florian Lüdeke-Freund, and Josua Oll analyze how climate-friendly investing can be promoted among retail investors by drawing on behavioral research in *Climate Information in Retail Investors' Decision-Making: Evidence From a Choice Experiment*. In particular they conduct a choice experiment with three label designs for climate performance information and test their potential to promote the adoption of climate-friendly investment practices. The study shows that intuitive decision-makers tend to place significantly more weight on a fund's climate performance compared to its financial performance whatever their environmental preferences are. Based on this outcome, the paper categorizes investors according to their cognitive reflection – a significant step beyond past behavior or attitudes.

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