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Financial flows of five leading banks in Sweden since the Paris Agreement

A research report for the Swedish Environmental Protection Agency

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Executive summary

This study sheds light on the domestic and international financial flows from the largest lenders in Sweden and their alignment with the Paris Agreement. The results show the extent to which banks' financial flows contribute to achieving climate goals consistent with Article 2.1c of the Paris Agreement on climate change, or to delaying that achievement, with some limitations.

We mapped domestic and international asset portfolios and capital flows in climate-relevant sectors (e.g. carbon-intensive sectors, renewable energy) between 2010 and 2020, of the five main banks in Sweden: Svenska Handelsbanken, Skandinaviska Enskilda Banken (SEB), Swedbank, Danske Bank and Nordea. We defined economic flows as new investments in the form of corporate loans, issuance underwritings or listed holdings, primarily focusing on the first two.

We categorized recipients of these flows as high-emitting ("brown") and low-emitting ("green") services, to the extent our data sources allowed. Based on this classification, we combined the analysis of available balance sheets with tracing new investments provided to these and the "residual" ("grey") sectors that are uncategorizable. These metrics capture a large share of the financial flows that should be impacted by alignment to Article 2.1c of the Paris Agreement, without details on the specific environmental performance of specific firms receiving the new investments.

Our analyses indicate a limited alignment with the Paris Agreement's climate goals. We found that financing gradually increased in volume to highly emitting sectors, such as oil and gas exploration and production. The sampled banks have facilitated around USD 150 billion to these sectors since the Paris Agreement took effect in 2016, mainly through syndicated loans (USD 104.4) and bond issuance underwritings (USD 36.3).

The largest expansion took place in the grey sectors, e.g. banks, real estate and corporate finance services. The magnitude of green investments in the form of loans and bonds has also increased, but the overall proceeds (the cash exchanged in a transaction) are significantly lower compared to both brown and grey sectoral flows. Bond issuance and corporate lending to green sectors declined by 2020 compared to 2010, even though it is somewhat offset by equity issuance underwritings.

The distribution of financial flows between brown and green is similar when we include projects under the green tag that fund transitions to environmentally friendly economic activities. Such "transition" financing does not significantly change the distribution of financial flows between brown and green economic activities.

We also found that the composition and magnitude of financial flows depend on the considered time interval. Due to a spike in both underwritings and loan issuances in 2014, new financial flows issued between 2015–2020 may seem to decline, even if new flows in 2020 were substantially higher than in 2010 (e.g. corporate loans to brown sectors). Increasing oil prices from 2003 to 2014 and their collapse in 2014–2016, discussed in detail in the report, may also be reflected in our sample, which led us to trace flows in two windows, from 2010–2020 and 2015–2020, to attempt to tease out effects of the Paris Agreement and outside financial market impacts.

Tracing the final destination of financial flows, especially for banks and other services, is challenging. We are unable to observe how the companies that receive investments allocate capital after it is deployed. Given that the highest fraction of new loans and underwritings from the five banks studied are provided to Western European firms, EU-level regulations such as the EU taxonomy for sustainable activities may address this friction in transparency.

Placing financial flows on a "Paris-compliant" trajectory requires understanding the driving forces behind these numbers, by engaging with relevant stakeholders and increasing the granularity of the underlying data. One takeaway of this research is that what constitutes brown and green investment is far from obvious; however, a clear categorization of sectors is a key ingredient in following a green transition. Therefore, standardization and established definitions should be a top priority for improving transparency on the alignment of financial flows with climate targets.

Keywords: Paris Agreement, Article 2.1c, financial flows, investment, Sweden

Introduction

Broad consensus has been reached on the need to scale up investments in climate change mitigation and adaptation. Once contested, these massive investments are now recognized as key to driving the global trajectory toward a low-carbon path and for reaching "net-zero" emissions globally by 2050.

Article 2.1c of the Paris Agreement established the political mandate to ensure the consistency of financial investments with a climate target below 1.5°C warming. Specifically, Article 2.1c requires Parties to the Agreement to make "finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development" (UNFCCC, 2015, p. 3).

Private financial institutions (e.g. commercial banks) play a key role in meeting these targets, as they provide considerable capital for advancing "green" transitions (e.g. US SIF, 2018) and new fossil fuel–based projects (e.g. Niccolò et al., 2021). In general, financial markets are essential for alleviating firms' financial constraints (Rajan & Zingales, 1998). Since 70% to 90% of greenhouse gas emissions originate from a few real economy sectors (e.g. oil and gas extraction, electric power or transportation; 2DII, 2020), understanding how external capital supply shapes these sectors' emissions carries important implications for the conditions of a green transition. Such understanding paves the way to adopting more ambitious climate policies to reduce emissions from all economic activities.

A plethora of recent pronouncements, intentions and initiatives have emerged on the need to ensure compatibility with the Paris Agreement. Meanwhile, observers have sounded a warning to financial institutions to recognize the current and future impacts of the climate change crisis and the need to incorporate these risks in their strategies.

For instance, the European Central Bank (ECB) recently reported that results from an "ECB-mandated self-assessment by 112 banks – representing 99% of total assets under the ECB's direct supervision – revealed that about 60% of banks envisage meeting the supervisory expectations, by the end of 2022, for practices related to the business environment, management body and organizational structure to address climate risks" and that there is an "alarming" lack of urgency by the banks (ECB, 2020; Houben et al., 2021). The ECB notes that significant risks and vulnerabilities to financial stability in the EU remain in the absence of more ambitious climate action by financial players (ECB, 2021). However, evidence is limited on the magnitude and use of proceeds (or cash exchanged in transactions) and the recipients of climate-relevant financial flows that originate from banks and institutional investors.

This study sheds light on the domestic and international capital flows from the largest lenders in Sweden, to gain a deeper understanding of their alignment with the Paris Agreement. We mapped domestic and international asset portfolios and capital flows of Svenska Handelsbanken, Skandinaviska Enskilda Banken (SEB), Swedbank, Danske Bank, and Nordea in climate-relevant sectors (e.g. carbon-intensive, renewable energy) between 2010 and 2020. We estimated financial flows during both 2015–2020 and 2010–2020, using these overlapping timespans to trace pre-Paris Agreement trends as well.

The pool of institutions we examined is not a full representation of the Swedish financial market. However, the sampled banks are leading institutions in Sweden, which should be a fair indication of the current alignment to the Paris Agreement principles within the country's financial sector.

1. Categorization for analysis

The key research question guiding this study is "To what extent are banks' financial flows (e.g. lending, equity, bond holdings, etc.) contributing to achieving climate goals consistent with Article 2.1c of the Paris Agreement on climate change?" We made a simple categorization of sectors into high-emitting and low-carbon energy services, to the extent available data make this possible. We refer to these sectors as brown and green, respectively; sectors we consider that are outside these categorizations are "grey".

This approach is not without limitations, as it is unable to capture specific details on emissions performance of specific firms. It is also not able to estimate the degree of alignment with the Paris Agreement, or what we refer to here as "Paris alignment", of all sectors. It can, however, capture a large share of the financial flows that should be impacted by alignment to Article 2.1c of the Agreement. We explain the limitations of the coverage we have been able to achieve and reflect on further analyses to improve our understanding of alignment with Article 2.1c.

As there is no established or standard definition of financial flows, we define them as newly issued capital that secures funding for a particular economic activity. The advantage of this approach is that it enables us to trace not only the overall magnitude but also the trend of issued capital, which can illustrate whether actors' behaviour has changed in conjunction with the established Paris Agreement. For some of the sectors, alignment with the Paris Agreement would mean decreasing financial flows, for example, to fossil fuels, which is not the case for other sectors.

Alignment with the Paris Agreement may call for increasing financial flows but to new forms of production or new technologies. This is true for industry, transport and especially agriculture.

Past reporting has not been as comprehensive in analysing Swedish financial flows directed to different sectors of relevance to climate change. For example, Naturskyddsforeningen (2021) summarized the recent fossil fuel investments by the Swedish National Pension Funds (AP Funds), while the Swedish Financial Supervisory Authority (Sveriges Finansinspektion or Finansinspektionen) conducted a pilot study on alignment in the insurance sector (Finansinspektionen, 2021b). In 2021, Finansinspektionen reviewed the extent to which banks consider sustainability risks when assessing the profitability of their business plans and in their risk management (Finansinspektionen, 2021a).

Our contribution to this expanding literature is twofold. First, we cover the regional and industry-level distribution of the flows, as well as the time series of flows, which enables a more granular mapping of the financial sector's climate impact. Furthermore, we add to the contextualization of Paris alignment by classifying the top five Nordic banks' financial flows with a simple yet informative categorization of the financially supported sectors and economic activities into brown versus green. We consider also what economic activities are financed, as the environmental tag on a sector does not necessarily reflect the "colour" of all financial flows poured into a business. This helps us to evaluate not only the magnitude of the overall financial flows but also to understand the potential climate impact of those investments. Even though our categorization is not perfect, it lays an important foundation for understanding how these flows align to Paris.

This report relates to the recently growing but still limited literature attempting to shed light on financial flows/investments and alignment with the Paris Agreement (see an overview of different methodologies and tools for assessing Paris alignment in Table A1 in the appendix). We classify the relevant literature into two categories of studies: Paris Agreement Capital Transition Assessment (PACTA) and non-PACTA. The PACTA tool is a relatively new methodology developed by the non-profit organization 2° Investing Initiative (2DII), for climate scenario analysis of financial institutions. The initiative seeks to use the tool to "foster the alignment of

financial markets and the real economy with a Paris Agreement-compatible world – one that limits global warming to below 2° warming" (2DII, 2020, p. 11).

Since its initial introduction for the analysis of corporate bonds and listed equity portfolios of financial actors, the PACTA tool now has over 1500 global users. These include but are not limited to at least 17 international banks, among other important stakeholders (2DII, 2020).

Given the role of banks in the green transition, 2DII developed a PACTA methodology specific to banks, to help them understand and assess their own contribution to climate change and formulate appropriate climate-related strategies to bring them into alignment with Article 2.1c of the Paris Agreement. This version of PACTA for banks covers five climate-relevant sectors: fossil fuels (e.g. coal mining, oil and gas extraction), steel, cement, electric power and transportation (automotive). The tool's analysis results in an alignment measurement for each sector.

Liechtenstein and Switzerland were among the first countries for which 2DII conducted assessments of financial sectors using the PACTA 2020 tool/methodology, in order to measure their respective climate compatibility or alignment to Article 2.1c of the Paris Agreement. Focusing on the five climate-relevant sectors selected for banks, the Liechtenstein financial sector study covered roughly 70–90% of indirect carbon dioxide (CO_2) emissions emanating from the country's capital market (2DII, 2021). Only 14 institutions participated in this voluntary exercise – less than a full representation of the entire Liechtenstein financial sector. However, the participants are leading actors in the financial market and the respective sectors they serve, making the results fairly representative or generalizable (2DII, 2021).

The results for Liechtenstein showed that about 3–4% and 5–7% of listed equity and corporate bond portfolios respectively of financial institutions are invested in fossil fuels (extractive sector), with exposure to this sector more pronounced for pension funds and insurance companies. The findings highlight that for all climate-important sectors considered, current investments by key Liechtenstein financial actors are not aligned with scenarios that are "better than 2°C" nor with sustainable development scenarios, for oil and coal production, coal power capacity and internal combustion light/heavy-duty vehicle production. On the other hand, investments in the production of electric vehicles looked promising, with alignment of portfolios to Article 2.1c likely under each scenario.

Spuler et al. (2020) applied the PACTA 2020 methodology to measure the extent of alignment of financial flows in Switzerland with the Paris Agreement. Starting with listed equity and corporate bonds covered in an earlier 2017 assessment, the researchers added the Swiss real estate sector and mortgage portfolios to the 2020 exercise. Corporate loans were excluded. With at least two times the number of participants in the 2017 assessment, the participation of 179 actors covered approximately 80% of the actors in the market, across climate-relevant financial sectors and asset classes comprising insurance companies, commercial banks, pension funds and asset managers.

Similar to Liechtenstein, Switzerland's climate-relevant real economy sectors constituted about 70–90% of all indirect emissions in capital markets (Spuler et al., 2020). Overall, the study documented that the financial sector across institutions in Switzerland is misaligned with the Paris Agreement. No single financial institution is aligned with climate goals in more than half of the eight critical climate sectors analysed (Spuler et al., 2020). Additionally, the study revealed continued investment by the Swiss financial market in the expansion of oil production and coal mining, congruent with the Liechtenstein case, that exposes these institutions to significant risks now and in the future.

The studies in Liechtenstein and Switzerland emphasized the lack of more ambition toward Article 2.1c alignment by the financial markets. Each study suggested the need to scale up ambition levels, especially on investments in transformative renewable energy consistent with meeting a below-1.5°C temperature target. A deep dive into the 2020 Swiss study, including

discussions on actions or levers necessary for achieving Paris alignment of financial flows, can be found in Bingler et al. (2021).

A recent PACTA study showed that Norwegian financial institutions also are not fully aligned with Paris, but that many actors are heading toward alignment (Braga et al., 2022). The Norwegian PACTA study covered portfolios of USD 220.5bn covering 70–90% of total assets under management of asset managers, insurance firms and pensions funds. In comparison to other recent PACTA studies, Norwegian financial institutions are slightly ahead in terms of green technologies, exposure and alignment (i.e. they are less exposed to climate-relevant sectors).

Another PACTA study in the Netherlands suggested that activities in the equity portfolios of financial actors (e.g. insurers and pension funds) will likely deviate from a Paris-aligned transition path in the future (As et al., 2021). This will result in growing transition risks for the Dutch financial system.

In addition to these studies above, the PACTA 2020 tool is being used across a number of countries in Europe, including Sweden, Luxembourg, Austria and France (Spuler et al., 2020). Outside of the EU, it is in use in the US, Peru and Brazil (see Braga et al., 2022).

For Sweden, the focus of this report, the Swedish Central Bank (*Sveriges Riksbank* or *Riksbanken*) and Finansinspektionen commissioned an ongoing study of three major Swedish banks' loan portfolio using the PACTA methodology and tool (Riksbanken, 2021). The scenario analysis is expected to give a snapshot of the banks' exposure to climate-related sectors and risks, with the view to understanding the compatibility of these portfolio exposures to and financing for the Paris Agreement's Article 2.1c.

We do not have access to the asset-level data that would be necessary for a PACTA analysis, so we cannot exploit the advantages of this approach. However, our study should provide useful information for this ongoing investigation and perhaps provide a benchmark for a reasonable comparison.

A number of non-PACTA studies, including initiatives and methodologies, have been undertaken or proposed for tracking or quantifying financial flows consistent with Article 2.1c in different contexts. These have different ways to track or quantify public and private financial flows as they relate to financing more climate-consistent economic activities. While some of the methodologies employed or prescribed in some of these studies cannot be viewed as standards that can be applied in all settings, they at least lay some foundation to get a sense of consistency regarding how different financial flows (public and private) align with climate objective(s) in a given context.

In a study of Colombia, for instance, the authors reported they "did not follow a census method or use a statistically representative sample" to assess Article 2.1c alignment of public and private capital flows (Carbajal et al., 2021). The study relied on a literature survey, analysis of existing regulations, and stakeholder interviews, with the intention that the assessment would "initiate a conversation about the consistency of these flows with climate objectives in Colombia". This mapping exercise revealed a rather nascent alignment of the public and private financial flows with a low-emission and climate-resilient development pathway. The authors noted that additional measures such as reduced investment in fossil fuels and a shift away from fossil fuel production and exports are needed for Colombia to significantly align to the Paris agreement. They also strongly recommended particular attention to the policies and actions on a just transition of the energy sector from fossil fuel phaseout (Carbajal et al., 2021).

The OECD, on the other hand, proposed that countries attempt ad-hoc tracking of financial flows to assess their consistency with relevant climate targets, using both available country-specific datasets and commercial vendors as well as plausible estimation methodologies where applicable (Jachnik et al., 2019). The OECD recommendation stemmed from an earlier study

by the non-profit organization I4CE that developed a methodology to map the climate finance landscape in France, which estimated total flows of around USD 30 bn contributing to climate objectives (I4CE, 2018).

Another important non-PACTA initiative for assessing Paris alignment is the Partnership for Carbon Accounting Financials (PCAF). Initially created by Dutch financial institutions in 2015, the PCAF methodology and accompanying tool launched at a global scale in 2019 as an industry-led initiative. PCAF has developed a methodological guideline – Strategic Framework for Paris Alignment – to assist financial institutions in carrying out an assessment of the greenhouse gas emissions from their portfolios (loans and investments), with disclosure as a key component (see PCAF, 2020, 2021). Most importantly, due to the lack of a globally agreed set of standards for measurement and disclosure of emissions financed by financial institutions, PCAF developed the "Global GHG Accounting and Reporting Standard" for the financial industry, covering 15 investment activities and 6 asset classes[1]. The PCAF approach has been globally tested by various banks and investors. PCAF (2021) provides an excellent overview of different methodologies and tools for assessing financial institutions' Paris alignment.

Other studies adopt the "name-and-shame" approach by publishing the financing/investment behaviour of governments and financial industry actors, based on tracking of historical and planned global investments in fossil fuels. Rydlund et al. (2021) specifically focused on the role of Swedish banks in financing activities that have contributed to significant deforestation of the Amazon and Cerrado regions in Brazil. With a spotlight on the seven largest banks in Sweden, the report finds that Sweden and the banks are "exacerbating climate change, health risks" and more through their financial interests in soy and beef value chains (main deforestation drivers) in the two regions. An important aspect of this approach is that "indicted" banks are given the opportunity to respond to the published findings of each study, which are also published on the website of Fair Finance International.

Finally, we review another initiative for assessing Paris alignment, the Science-Based Targets initiative (SBTi). Founded by the World Resources Institute; WWF (the World Wide Fund For Nature or World Wildlife Fund), CDP (formerly the Carbon Disclosure Project) and the UN Global Compact, SBTi aims to drive climate action in the private sector (including financial institutions) by helping these entities to set "ambitious" science-based emissions reduction targets. Recent data (as of January 2022) indicate SBTi has at least 2400 approved and committed science-based targets covering companies and financial institutions that have publicly shown commitment to the initiative (Aden, 2022). A related analysis suggests that SBTi is gradually becoming an industry benchmark for corporations to set ambitious reduction targets of greenhouse gas emissions (Hirvinen & Peurala, 2022). About 80% of the targets are set by companies based in the UK, Denmark, Sweden, Germany, Finland and Norway – all committed to the 1.5°C climate scenario under the Paris Agreement (Hirvinen & Peurala, 2022).

Over the past few years, SBTi developed and published a number of guidelines and industry standards for its stakeholders. These include "SBTi Corporate Net-Zero Standard (October 2021)", "Financial Sector Science-Based Targets Guidance (April 2021)" and "Foundations for Science-Based Net-Zero Target Setting in the Financial Sector (November 2021)" (Fair Finance Guide, 2022; Science-Based Targets, 2021a, b, 2022a-c). Since its inception, the SBTi has worked towards "accelerated private sector climate sector climate mitigation action through transparent, quantitative, and robust targets" (Aden, 2022, p. 38).

From the above review of the relevant literature, we can state that while a lot of progress has been made in the development of tools and methods to assess financial industry players' portfolio alignment to the Paris Agreement, significant gaps remain. There is no clear consensus on which method is the industry gold standard. Neither is there a best practice that suits every

1 Listed equity and corporate bonds, business loans and unlisted equity, commercial real estate, mortgages and motor vehicle loans.

context. Tools and methods such as PACTA, PCAF, science-based targets, and public and private finance tracking mechanisms are not without practical implementation challenges. Access to and availability of granular data and climate-relevant sector classification remain a challenge. Ultimately, the choice of any existing method and/or tool for assessing Paris alignment in the financial sector must be contextualized within a given setting, with realistic assumptions invoked in order to obtain meaningful results and implications thereof.

The remainder of the report is structured as follows. Section 2 covers various details on the research methodology; the results are analysed in Section 3. A discussion of the results, policy implications, and recommendations are presented in Sections 4 and 5, respectively. The report concludes in Section 6.

2. Data and methodology

We describe below how we selected financial institutions for the study, types of financing, and our research methodology.

2.1 Selection of financial institutions

The Swedish financial sector comprises a complex net of enterprises with an increasing number of players, including – among others – banks, credit market institutions, insurance companies, and mutual and pension funds. For example, in December 2018, a total of 124 banks operated in Sweden (Swedish Bankers Association, 2018). However, the financial industry is dominated by a handful number of players (Swedish Bankers Association, 2020), which enables us to focus on those actors and keep the analyses tractable. The pool of institutions, therefore, is not a full representation of the Swedish financial industry, but the results should give a fair indication of the current alignment to the Paris Agreement principles.

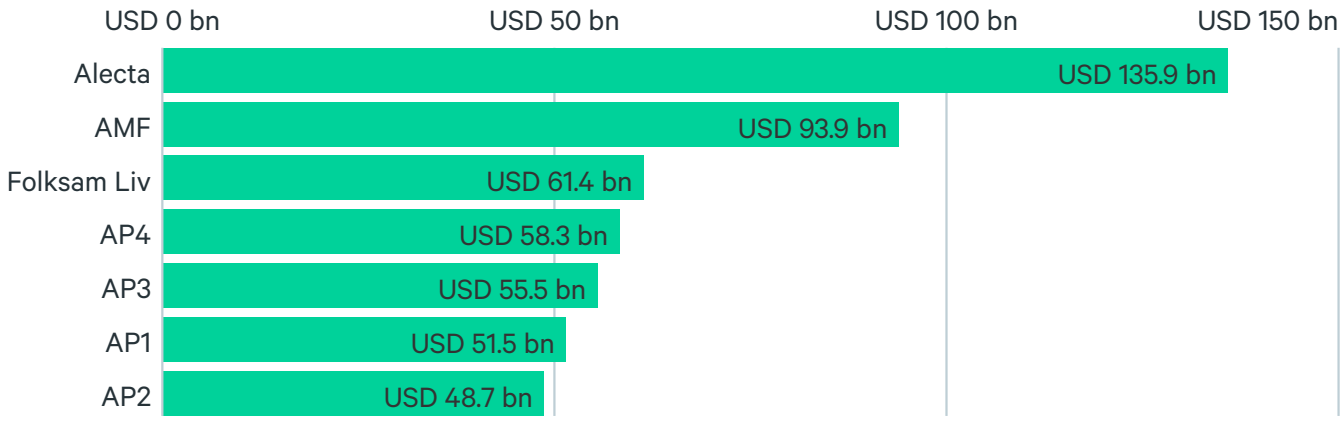
Based on a recent report by the Swedish Bankers Association (2020), we investigated the corporate lending and issuance underwritings of Skandinaviska Enskilda Banken (SEB), Swedbank, Svenska Handelsbanken, Nordea and Danske Bank. Saving banks are excluded, as they represented 3% of all lending in 2020 (Swedish Bankers Association, 2020). Together, the five banks studied represent 90% of total domestic and international lending from Swedish banks and subsidiaries, as well as foreign banks' local branches to the public. This covers households, governments and firms located locally and internationally.

We do not consider other financial investors, such as public pensions (the Swedish National Pension Funds, AP Funds), asset managers (such as Investor AB or EQT AB), and insurance companies (e.g. Alecta, AMF Pension, Folksam) that engage in private equity deals as well as public equity and bond holdings (see selected statistics based on AP funds' reports as well as Sweden's financial supervisory authority and Statistics Sweden, sourced by Svensk Försäkring, in Figure 1). Public Swedish pension funds had assets under management exceeding SEK 2300 bn at the end of 2020 (Naturskyddsforeningen, 2021). This represents 46% of Sweden's nominal GDP in 2020 (Statistics Sweden, 2021).

Asset managers are also important players in the Swedish financial sector. Investor AB and EQT AB represent some of the largest asset management firms in Sweden, with adjusted net asset value of SEK 682 bn as of 30 September 2021 for Investor AB and EUR 71 bn for EQT AB (EQT, 2021). Alecta, Skandia, AMF Pension and Folksam (including KPA and Förenade Liv) provide various insurance services. The magnitude of assets under management (life insurance excluding labour market insurance) represents 60.5% of the total life insurance market in Sweden (Swedish Bankers Association, 2020). At the end of 2020, Swedish insurance companies owned financial assets of about SEK 5600 bn, which is more than Sweden's GDP (Insurance Sweden, 2021).

Understanding the choice of holdings of these other entities is an important exercise for gaining a more complete picture on the financial flows; however, that is outside the scope of our current study due to data limitations.

Figure 1. Total assets under management by selected Swedish institutional investors (December 2021, USD billion)



2.2 Types of financing

Financial institutions can arrange capital through a number of different modalities, such as loans, underwriting of share and bond issuances, as well as investments in bonds and shares issued by the company.

Corporate loans

One way to obtain capital is to borrow money, in most cases from commercial banks. Loans can vary with respect to maturity, guarantees or purpose of financing. For example, the primary purpose of a short-term loan (e.g. invoice financing, payday loans) is to provide capital for temporary business needs (Corporate Finance Institute, 2022).

We use the textbook definition of long-term debt as "any loan or debt obligation with a maturity of more than a year" (Berk & DeMarzo, 2014, p. 26). Long-term debt is especially useful to finance expansion plans of a business. Long-term loans – especially for larger deals – may be extended by a group of financial institutions or loan syndicate in order to avoid excessive single-name exposure as well as mitigate credit and market risk.

"Syndicates often include both banks and non-bank financial institutions, such as collateralized loan obligation structures (CLOs), insurance companies, pension funds, or mutual funds" (Federal Reserve, 2021). A syndicate consists of book runners (or lead arrangers) that conduct due diligence on the borrower and markets the loan package to a group of potential participant lenders (Huang et al., 2018). The lead bank is also responsible for ex-post monitoring of the borrower during the life of the loan (Gadanecz, 2004) and appointing junior participant banks (managers or participants). These institutions typically earn just a margin or no fees but may secure future business relationship with the borrower and the chance to enter a different industrial sector or geographical area (Gadanecz, 2004). The loan syndicate will only undersign the loan agreement if the company can provide certain guarantees that interest and repayments on the loan will be fulfilled.

Some corporate loans are earmarked to finance or refinance, in whole or in part, new or existing green projects (LMA, 2021). In order to promote the development of this product – a green loan – and underpin its integrity, the Asia Specific Loan Market Association, Loan Market Association (EU) and Loan Syndications and Trading Association (US) considered it appropriate to provide market practitioners with a harmonized guideline on what is recognized as a green loan; for more on the guidelines, see LMA (2021).

Bond issuance underwriting

Firms may issue bonds in capital markets to cover their financing needs. Bond issuances may take the form of either a public offering or of a private placement that is reserved to qualified investors. The role of a corporate bond underwriter is to facilitate the sales of newly issued corporate bonds. This includes determining the proper offering price and finding potential investors using the underwriter's investor connections (Dick-Nielsen et al., 2021). However, not all bond (or equity) issues are underwritten. Banks can act as arrangers without underwriting (i.e. purchase bonds themselves).

Bonds may also be earmarked to sustainability-related projects, similarly to green loans. These instruments – green bonds – are "designed to facilitate the sustainable investing for institutional investors such as pension funds, insurance companies or sovereign wealth funds" (Maltais & Nykvist, 2020, p. 3). "Greenness" is primarily defined based on common practice, that is, "the bond's use of proceeds clause is aligned with the Green Bond Principles (GBPs), or other similar voluntary standards. The GBPs have been developed and endorsed by financial actors through the International Capital Markets Association (ICMA). The GBPs list renewable energy, energy and resource efficiency, pollution reduction, water and waste management, conservation, and climate adaptation as the types of projects that can be financed with a green bond" (Maltais & Nykvist, 2020, p. 4).

In addition to green bonds, sustainability and social bonds are also used to reach positive societal and environmental goals. Social bonds are used to partially or fully (re)finance new or existing projects with positive social outcomes (ICMA, 2021a). Affordable housing and community development are common uses of such proceeds. Sustainability bonds are bonds where the proceeds exclusively finance or refinance a combination of both green and social projects (ICMA, 2021b).

Share issuance underwriting

Issuing shares on the stock exchange may be beneficial for a firm, as it could provide extra financing for projects. Firms may issue shares for the first time (Initial Public Offering, IPO), but when a company's shares are already traded on the stock exchange, this is called a secondary offering of additional shares. An investment banking firm or underwriter manages the IPO process and the sale of shares for raising new capital (see Berk & DeMarzo, 2014, p. 813).

Share and bond holdings

Shareholdings enable a direct influence on the company's strategy; hence, they are relevant to what economic activities receive financing. Bond holdings are also an important determinant of a firm's financing constraints as well; therefore, holdings are informative as to what sectors are supported by financial firms.

2.3 Research methodology setup

The objective of this research is to obtain a broad picture of what economic activities and sectors have secured funding from the sampled banks. Capital allocation is a relevant metric of the alignment with the Paris Agreement, which indicates how the Swedish financial industry has performed in attaining net-zero targets.

To meet this research goal, we screened the sampled investors based on two different approaches. On the one hand, we mapped banks' lending portfolios based on available financial reports and estimated financing provided to those sectors that are primarily relevant in attaining net-zero targets. This exercise gives insights into the composition of the customers and the magnitude of available financing for projects, which informs the interpretation of the results from our core analyses based on actual deals. For example, the trend of overall lending to brown sectors may be different from what emerges from the largest deals. As balance sheets are public, it is also appealing to start the analyses with these documents. The lending portfolio in a balance sheet incorporates not only new financial investments, but also reflects the overall portfolio of loans outstanding.

In the second approach, we primarily focus on syndicated and bilateral loan deals, as well as bond and equity issuance underwritings provided by the sampled financial services firms worldwide. The former is the allocation of their own capital, while the latter is a service provided to companies issuing debts. In other words, we aim to capture the new deals of the selected banks.

We expect to capture relevant financial flows for the following reasons. The market for these services expanded over the past several years; for example, the volume of global syndicated loans surpassed USD 5 trillion in 2018 (Refinitiv, 2021). Green bonds and loans have been gaining importance in funding sustainability-related projects (Maltais & Nykvist, 2020), which makes them a rapidly increasing segment of the USD 128 trillion bond market (ICMA, 2020).

As the Swedish financial sector is an integral part of the developed and open financial markets, these trends should be reflected in our sample as well. Furthermore, the green transition as well as several highly emitting industrial processes are capital intensive, which puts investment banking services (such as arranging syndication for a loan) at the focal point of abatement efforts.

As IRENA (2018) pointed out, cumulative investments of USD 120 trillion must be made between 2015 and 2050 in low-carbon technologies to reach climate neutrality. On the other hand, oil and gas exploration and production projects can also generate astronomical costs. For example, from 1966 to 2019, operators have spent a total of CAD 84 bn on exploration, development and production activities offshore of Newfoundland and Labrador (Kaiser, 2021). Gas "fracking" in the US and the Canadian oil or tar sands are also examples of very costly projects (Ihejirika, 2019).

Apart from investment banking services, equity and bond holdings should also be informative regarding financial flows, as demonstrated in earlier studies and reports (e.g. Naturskyddsforeningen, 2021; PACTA, 2021). However, assessing historical holdings is beyond the scope of this report due to the lack of available data on historical investment portfolios. This type of exercise is more relevant for asset owners or asset managers, as banks typically do not hold bonds or equities on their balance sheets.

Financial research strategy

We screened the sampled firms' new deals, including characteristics such as recipients and industry classification, based on two financial databases. In Refinitiv, sourced by Thomson Reuters, we retrieved syndicated and bilateral loans provided by the respective actors and their subsidiaries for the period January 2010 to December 2020. This longer timeframe enables us to examine both compliance with the Paris Agreement starting in 2016 and prior investment trends, which is beneficial for evaluating the transition of the financial industry from different perspectives.

Financial databases record mainly syndicated loans and issuance underwritings, but due to bank secrecy regulations, some bilateral lending between companies and banks may be missing. Such data can sometimes be obtained through company disclosures and company registries; this screening exercise is beyond the scope of the current research. The lending figures, therefore, may underestimate the actual flows. However, given the voluminous capital needed to launch or refinance projects in many sectors, much of the lending is in the form of syndicated loans and bond issuances, which means that the gap in reported numbers should be limited.

Estimating loans and underwriting services by each financial firm

Financial databases often report the characteristics of loan and issuance underwriting deals, including volume and use of proceeds, fees, counterparties or filing date. We recorded individual bank contributions to syndicated loans as well as the proceeds of bond and share issuance underwritings where these details were available in Refinitiv. However, they do not always record the proportions of a given deal that can be attributed to each participant in a transaction, due to secrecy or other reasons. In such instances, we estimated the contribution of the syndicate members (i.e. book runners, managers, participants, agents) based on the following rules of thumb (inspired by Beenes et al., 2021).[2]

Our approach relies on the fees relative to the total fees charged for syndication and underwriting services. We inferred managers' commitments based on these proportions as well as total tranche value[3]. For example, if Bank A received 10% of all fees, and the tranche size was USD 10 million, then 10% • USD 10 million = USD 1 million is assigned to Bank A. The bank's total commitment is the sum of the commitments granted by tranche. The underlying rationale for the estimation is that fees are proportional to the commitments (e.g. the book runner charges the most in a syndication), hence fees represent a syndicate members' lending. In our data for fully observable deal characteristics, book runners received on average USD 0.5 million higher fees than other participants. Furthermore, they contributed on average USD 44.71 million more than the other institutions (average on 2010–2020). When all the managers' fees are reported, we can simply calculate the corresponding commitments as *(Fee/Total fee) · Tranche size*.

When not all deal fees are reported, we adjust the methodology as follows. If deal fees are incompletely reported, but at least two distinct fees are available, the highest one is assigned to book runners, while the rest of the players get an equal proportion of the total fee. Suppose a loan consists of only one tranche with a deal size of USD 200 million, and the deal is arranged by one book runner and three other managers. The highest fee equals USD 1.5 million, and the other reported fee equals USD 0.5 million. Solving the following equation estimates the managers' fees:

$$\#\ \text{manager} \cdot x + \#\ \text{book runner} \cdot (\text{book runner fee} / \text{other fee}) \cdot x = \text{Loan}$$

In other words, the participant managers' and book runner managers' fees are proportional to the reported fees. With the specific example of *x = USD 33.3 million,* the book runner's contribution is USD 100 million, while the other participants committed USD 33.3 million per participant to the deal.

When no fees and commitments are reported for a transaction, we approximated the missing figures based on *other* deals of an investor in a given year, by calculating an average ratio of the book runner and other fees for a given actor and year. The underlying assumption is that firms engage in similar deals; therefore, an average fee or commitment can be proxy for the missing deal characteristics. In principle, we apply the same formula as above but with the average fractions, and hence, we approximate the missing deal contributions based on the available deals. For the remainder of the transactions (when either of the previous steps work), we divided the tranches equally across participants.

2 We conducted this calculation for the entire sample of deals for all firms, then filtered the sampled investors.

3 In practice, deals are reported on the tranche-level. Tranches are slices of an overall indebtedness instrument with varying characteristics (e.g. repayment terms, credit rating) to target different investor clienteles (Berk and DeMarzo, 2014).

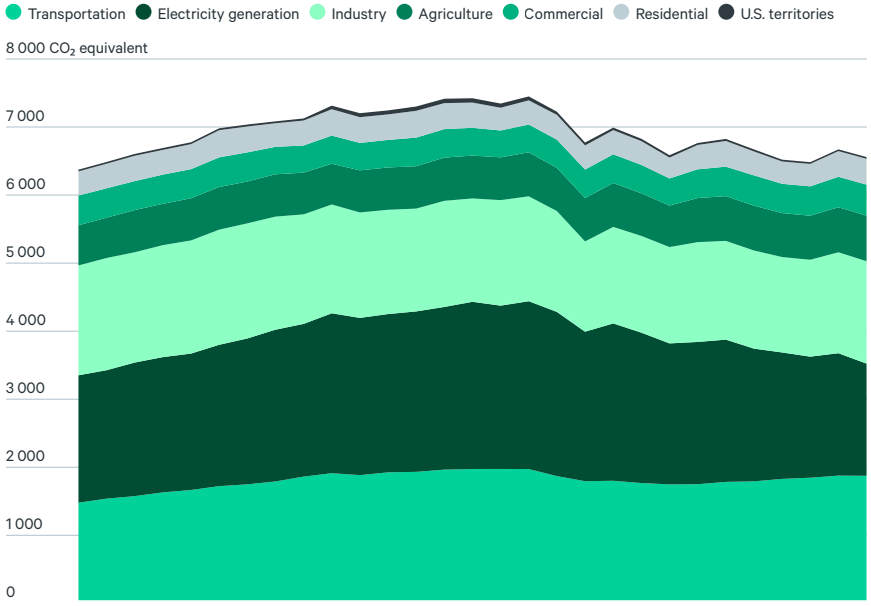
2.4 Sector classification

The objective of our research is to investigate what sectors and economic activities[4] benefited from financing and whether such services support or hinder the alignment with the Paris Agreement. To this end, we tagged economic sectors as high-emitting and low-emitting sectors based on their climate impact. As discussed earlier, we employed a simple categorization of activities to gain a snapshot of capital allocation. Since the majority of new investments take place in Sweden, the EU and the US, we reviewed sectoral emissions of both regions to identify the most "climate-intensive" sectors.

Energy supply, transportation, agriculture and other industries constitute two-thirds of the greenhouse gas emissions in Europe and the US in the entire sample period, illustrated in Figures 2, 3 and 4. We regard these sectors as climate intensive in these jurisdictions in the years of interest[5]. In Sweden, energy supply is largely decarbonized (Nykvist et al., 2020), but the rest of the sectors are still responsible for a great share of emissions.

We used Refinitiv (2020) to characterize green activities, which consist primarily of renewable energy and fuels, equipment, and utilities (see full list in Table 1). The list of green activities is based on Refinitiv's standard league table criteria, screened across bond and loan transaction types as well as use of proceeds in parallel with companies with industry classifications deemed as sustainable using proprietary TRBC industry codes. The remaining sectors, such as real estate services or banking, are grey, as it is either difficult to follow the actual use of proceeds (e.g. banks) or the indirect emissions are likely to be high due to the direct emissions in the supply chain (e.g. real estate). For example, IEA (2021) reports that buildings were responsible for 28% of the global energy-related emissions in 2019. Furthermore, indirect emissions statistics depend on the underlying methodology, which may lead to different conclusions as to whether a sector is climate intensive or not (see e.g. Leturcq, 2020; Law et al., 2018; and Miner, 2010 for the case of timber buildings).

Figure 2. Distribution and time series of greenhouse gas emissions in the US between 1990 and 2018. *Commercial and residential* incorporate greenhouse gas emissions from businesses and homes, and primarily from fossil fuels burned for heat, the use of certain products that contain greenhouse gases, and the handling of waste. The emissions from electricity generation together with commercial and residential sectors is approximately equal to the emissions from energy supply.



Note: CO_2 equivalent (typically abbreviated CO_2-eq.) "is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global-warming potential (GWP), by converting amounts of other gases to the equivalent amount of carbon dioxide with the same global warming" (Source: Eurostat, n.d.)

4 We used the Thomson Reuters Business Classification nomenclature as it is Refinitiv's default classification system.

5 These aggregate statistics incorporate all energy supply (including renewable), but we are able to differentiate green (i.e. renewable) and fossil-based energy generation in our more granular analyses.

Figure 3 . Distribution and time series of greenhouse gas emissions in Europe (between 1990 and 2018)

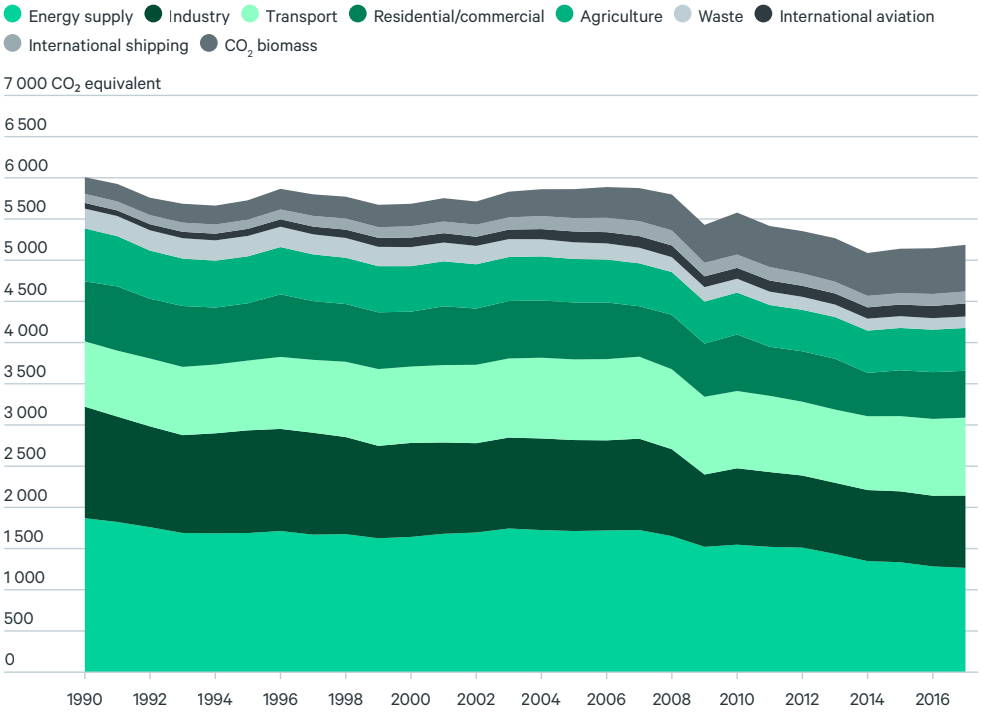


Figure 4. Distribution and time series of greenhouse gas emissions in Sweden (between 1990 and 2019)

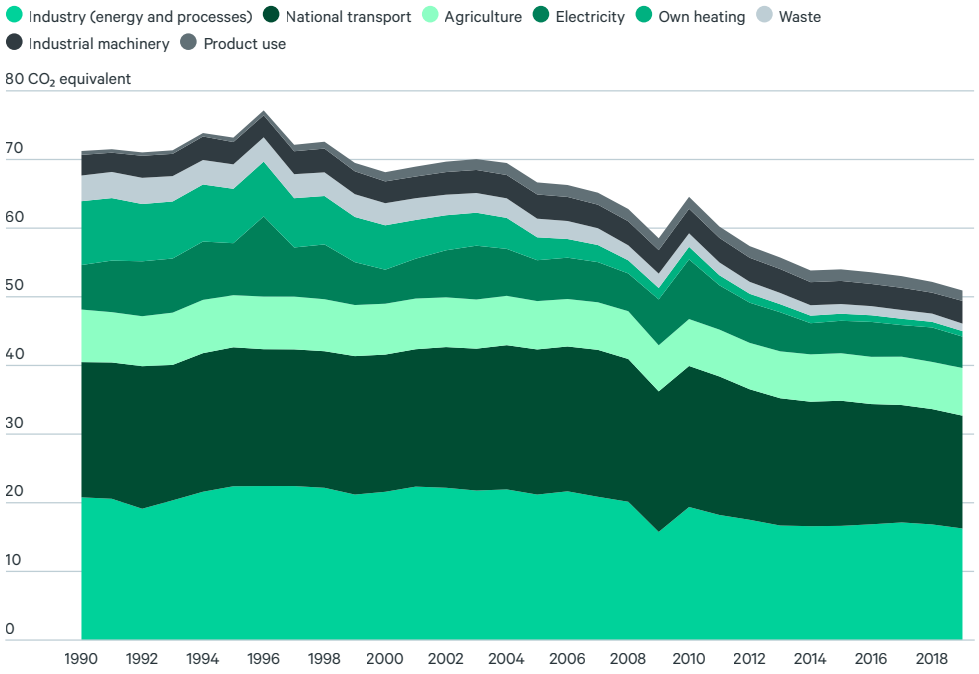


Table 1. List of green economic activities according to the Thomson Reuters Business Classification (TRBC) system

TRBC sector
Renewable energy equipment and services (NEC)*
Wind systems and equipment
Stationary fuel cells
Photovoltaic solar systems and equipment
Thermal solar systems and equipment
Biomass power energy equipment
Waste-to-energy systems and equipment
Hydropower equipment
Wave power energy equipment
Renewable energy services
Geothermal equipment
Renewable fuels (NEC)
Biodiesel
Ethanol fuels
Pyrolytic and synthetic fuels
Biomass and biogas fuels
Hydrogen fuel
Carbon capture and storage
Electrical (alternative) vehicles
Sustainable and energy efficient home builders
Organic farming
Power charging stations
Alternative electric utilities
Hydroelectric and tidal utilities
Solar electric utilities
Wind electric utilities
Biomass and waste-to-energy electric utilities
Geothermal electric utilities
Independent power producers (NEC)
Renewable independent power producers

*NEC: not elsewhere classified, which is a typical categorization when a firm engages in multiple type of businesses (e.g. electricity generation based on fossil fuel and renewables

Classification of financial flows

Apart from aggregate capital influx to economic sectors, we measure alignment through what projects are financed as the environmental tag on a sector does not necessarily reflect the "colour" of all financial flows poured into a business. For instance, a brown firm may embark on abatement (e.g. invest in renewable energy sector), which is a capital-intensive commitment. Therefore, we complement our research with a detailed analysis of the activities that are supported. Given that only loan and bond issuances are accompanied with enough information to infer the "shade" of the granted capital, we ignore equity issuances. However, these closed deals represent only 5% of the overall investment portfolio.

Brown flows

We categorized a financial flow as brown if it entered a brown economic sector without any climate change mitigation incentives. A typical brown flow lacks a "green bond", "sustainable bond", "social bond", or "green loan" tag. Such a flow also lacks a green use of proceeds, which are defined and characterized by Refinitiv, similarly to the green activities (Table 1). These consist of energy efficiency, environmental protection projects, green bond purposes, green construction, renewable energy, "self-certified green", sustainability, waste and pollution control, water efficiency and sustainability, and social uses.

Transitional flows

A transitional flow goes to a brown sector with a transitional purpose. We regard bonds with green, sustainable, or social use of proceeds provided to a brown firm as transitional. Green loans are scrutinized further based on the use of proceeds notes[6], which specifies the project financed in more detail.

We excluded a green loan from the sample if the purpose of the issuance was not specific (e.g. attaining a Sustainable Development Goal, or SDG), since we cannot evaluate how the borrowers aim to use the funds granted. Furthermore, we do not regard an investment transitional if it was deployed to improve energy efficiency of an already available brown technology (e.g. oil extraction). This choice is based on the view that such investment ultimately supports the continued fossil fuel–based production in the brown sectors that must be phased out in order to align with the Paris Agreement; therefore, improvements in emissions intensity do not meet the bar of being transitional.

The use of proceeds notes includes the acquisition of green assets (e.g. a wind farm) as well, which are regarded as transitional flows in this study due to their contribution to net-zero targets. However, one can argue that those new flows may not be dedicated to a green transition. For example, the oil giant BP pledged to transform into an integrated energy company based on advancing offshore wind (BP, 2021). This commitment could help the UK deliver its green goals, and green investments could enable a diversification of the company's asset portfolio. On the other hand, diversification does not necessarily imply an eventual transition to a green operation, especially in light of the multibillion-dollar investments in fossil fuels. Concerns of this kind have led to claims of greenwashing and several lawsuits in the US against oil firms (BBC, 2021).

Green flows

We regard all other (i.e. not transitional) green loans and green, social and sustainable bonds issued as green, regardless of the clarity of use of proceeds and target sector.

Notes on the financial flows' classification

The simple categorization we use provides a coarse snapshot of sectoral financial flows, but it has clear limitations. Since the backbone of the approach is the aggregate sectoral emissions, actual brown flows might be overestimated. For example, the manufacture of batteries is

6 These notes are not available for green bonds; hence, we might overestimate the actual transitional flows.

regarded as brown in this report, but that activity is considered green under the EU taxonomy for sustainable activities, or "EU taxonomy" (European Commission, 2021a).

Furthermore, the approach cannot capture the region-specific emissions of a sector. An industrial sector may be considered brown because of high energy usage, but if that energy is largely in the form of electricity and the grid in the relevant region is largely serviced by low-carbon energy sources, then the emissions from that electricity use may be low. That could be the case for a battery plant, for example.

We categorized flows into specific sectors as granularly as the available data allowed (i.e. on the Thomson Reuters Business Classification or TRBC five-digit level), in order to minimize potential misclassification. As a robustness exercise, we also discuss the sensitivity of our results, based on the EU taxonomy.

However, clearly, much more granularity down to firm specific data would be needed to provide a robust categorization of high, low and transitional economic activity. The EU taxonomy reporting by firms will improve the data availability at least for EU corporate entities, but large data gaps will remain. The mapping of financial flow alignment with Paris from firm level data to provide an aggregate picture of Paris alignment is a very large undertaking, both in terms of data and analysis requirements.

3. Results

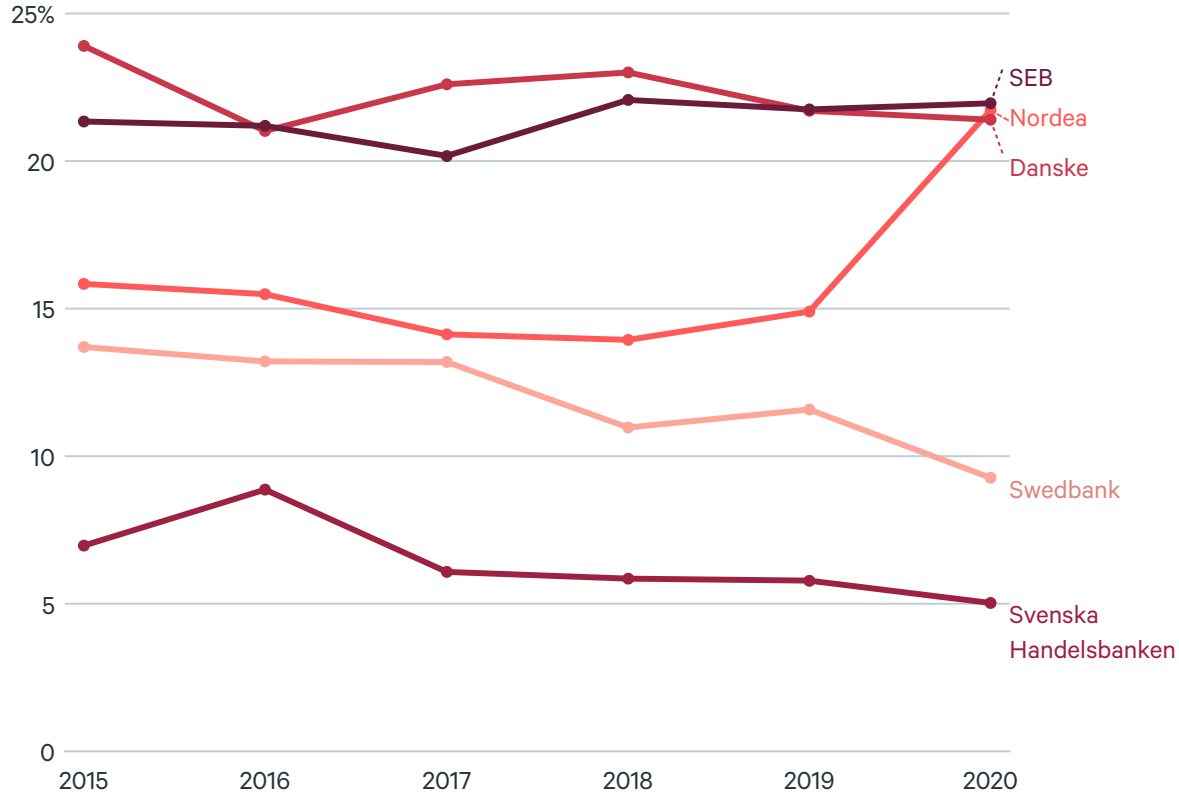
Below we present results based on the balance sheets, aggregate trends, and investments according to the type of deal, including loans, equity and bond issuances and underwriting , for the five banks studied.

3.1 Results based on the balance sheets

We started with the analysis of balance sheets and calculated the fraction of loans provided to brown sectors (including domestic and international lending portfolio)[7]. As demonstrated by Figure 5, the ratios vary between 12% and 22% in the sample period (2015–2020) and exhibit moderately increasing trends for most of the commercial banks with smaller fluctuations across time. Given that the overall lending portfolios of the examined banks slightly increase over time (Figure 6), financing provided to brown sectors slowly increase over the sample period[8]. This suggests that capital allocation may provide a gradually increasing level of funding for the same polluting economic activities after the Paris Agreement[9], which casts doubt on these institutions' alignment with the Agreement.

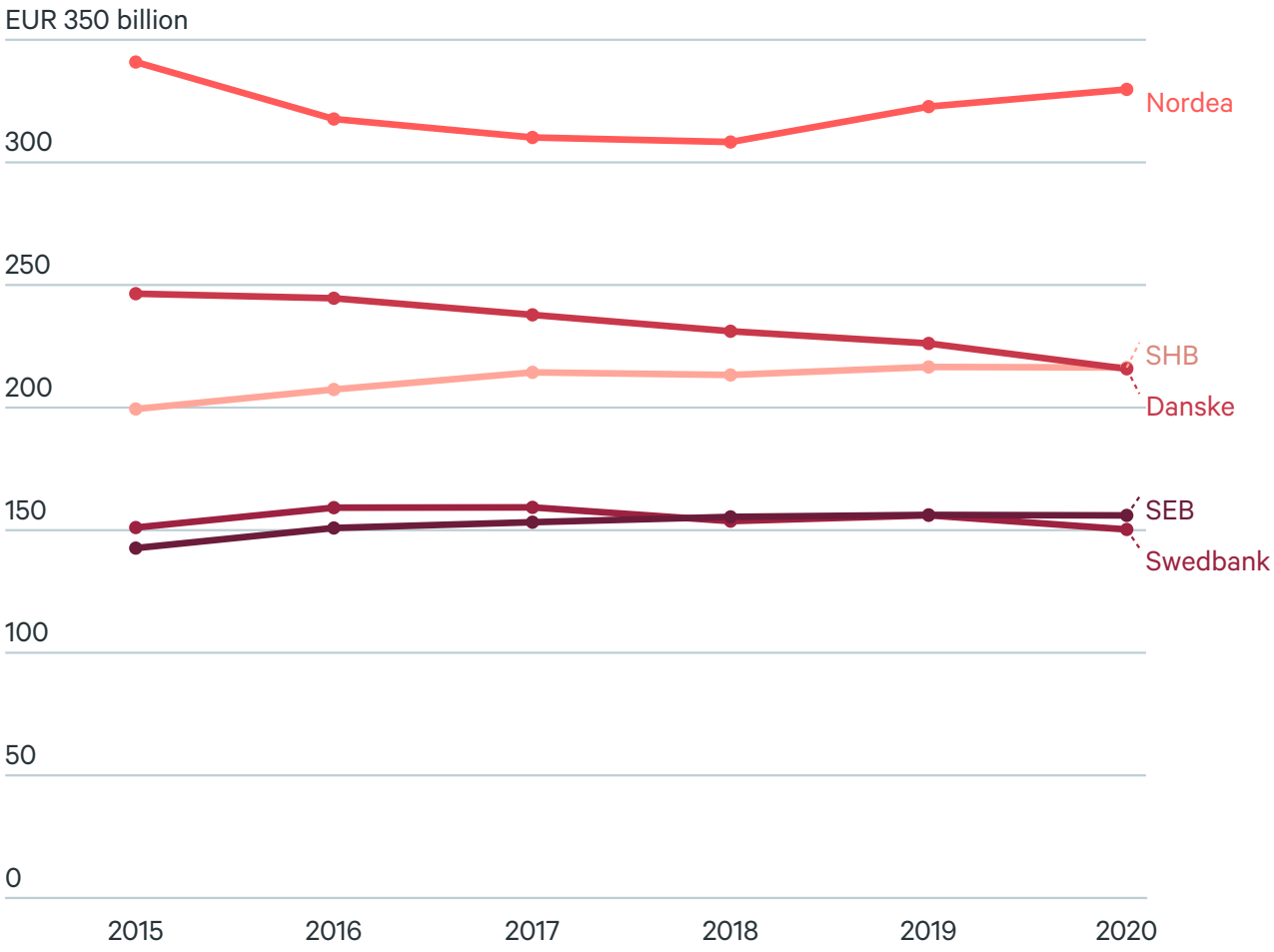
A caveat with the balance sheet approach is the lack of standardization across reports (Judge & Berner, 2019), which makes comparison challenging. Furthermore, those financial statements do not highlight green financing. Brown sectors such as transportation or utilities incorporate electric cars and renewable energy as well, but those cannot be isolated from their fossil-based counterparties. Therefore, the brown asset ratio may overestimate the financing granted to brown sectors.

Figure 5. Fraction of brown asset value and total assets in the largest Nordic banks (SHB is Svenska Handelsbanken).



7 Apart from 2018 and 2019, Svenska Handelsbanken did not report a sectoral-level lending portfolio; hence, we left that bank out of the analysis.
8 The figures report the overall portfolio (not only newly issued financial flows), including short- and long-term lending.
9 This corresponds to an average of 12% over 2015–2020 across all four banks under consideration, and 27% for banks with increasing brown asset ratio.

Figure 6. Lending portfolio of the largest Nordic banks (EUR bn)



3.2 Aggregate trends

In order to address the issue above, we turn to our more granular approach. Therefore, we continue with documenting aggregate trends emerging from all the deals. Figure 7 demonstrates that the examined financial actors have facilitated USD 656 bn since the Paris Agreement commenced, mainly by syndicated loans (USD 246 bn) and bond issuance underwritings (USD 380 bn). This pool of investment – which is provided mainly by the main commercial banks – is concentrated to Western Europe and the United States (Table 4). The magnitude of equity issuances is, however, marginal (USD 30 bn).

These investment patterns are likely associated with the crude oil price movement over the past decades. The surging crude oil prices likely drove up investments in e.g. exploration and production of fossil energy carriers (EIA, 2015) until 2014. Since oil is a major input in the economy, rising commodity prices could influence other industrial sectors' investment decisions especially those that are reliant on oil (e.g. transportation). The drop in oil prices after 2014 was primarily driven by the oversupply of oil due to booming US shale oil production as well as receding geopolitical concerns (World Bank Group, 2018). On a global scale, investments in oil and gas upstream ramped up from USD 511 bn to USD 779 bn between 2010 and 2014 but tanked by 25% by the end of 2015 (IEA, 2020). These macroeconomic trends are expected to shape the demand for new investments in multiple sectors, which is relevant for the narrative of financial firms' compliance with Paris Agreement. As the oil supply shock coincides with the Paris Agreement, we employ different reference years[10] to evaluate the trends in new

10 We compare new investments in 2020 with new investments in earlier years to capture investment trends.

investments. This mitigates the concern that we overstate the implications of, for example, declining investments in oil exploration. Two natural benchmarks are year 2010 and 2015, since the Paris Agreement commenced in 2015 and the global economy has started its recovery from the financial crisis in 2008.

As shown in Figure 8, the volume of deals is expanding, with a spike in 2014 as well as an increasing number of deals until 2014. The trend reverses afterwards but exhibits a slight increase from 2017. The importance of benchmarks is even more emphasized when we break down the aggregate financial flows based on the "colour" of the addressee sectors. The fraction of new flows dedicated to brown, grey and green sectors is shown in Figure 9, and the actual flows deployed to the same sectors in Figure 10. As illustrated in both figures, brown investments increased since 2017, after a sharp decline from 2015. Grey investments started recovering as early as 2015.

As reported in Table 2 and Table 3, the new-deal portfolio and the yearly issued volumes change between 2010 and 2020 as well as between 2015 and 2020. The overall results suggest that the fraction of new deals dedicated to brown economic activities shrank with both benchmarks, but the absolute magnitude increases, especially compared to 2010. Grey and green sectors exhibit an increasing trend in both fraction and volume of new deals. However, although the expansion in the green sector is high in percentage terms since 2015, it is marginal in absolute value (USD 1.31 bn in 2020).

Table 2. Change in new-deal portfolio weight, aggregated for the five banks sampled.

Since 2010	Brown: –14.81%	Grey: +4.33%	Green: –6.61%
Since 2015	Brown: –14.82%	Grey: +5.27%	Green: +37.52%

Table 3. Change in yearly issued volume, aggregated for the five banks sampled.

Since 2010	Brown: +45.31%	Grey: +77.98%	Green: +18.38%
Since 2015	Brown: +4.27%	Grey: +28.87%	Green: +68.35%

Figure 7. Cumulative volume of deals after the Paris Agreement (2016–2020, USD bn). Deals consist of corporate loans and issuance underwritings of bonds as well as equity, aggregated for the five banks sampled.

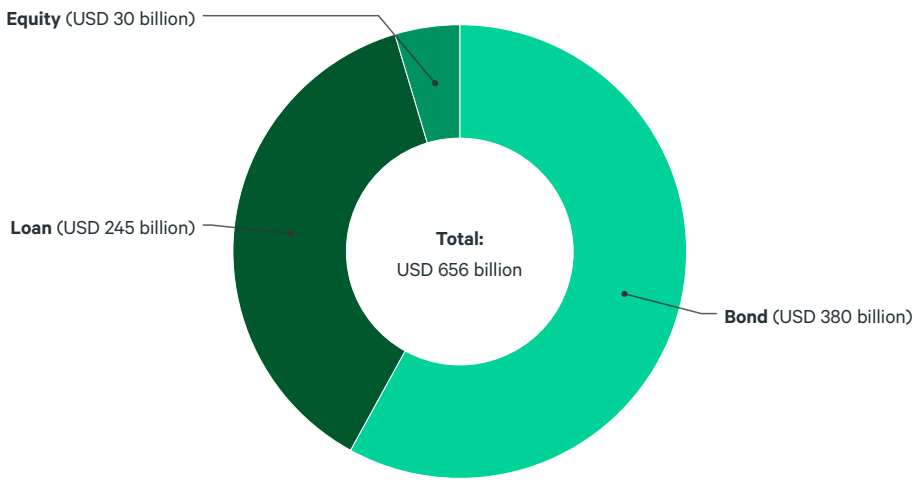


Figure 8. Aggregate volume of financial flows and number of new deals provided by the largest Nordic banks. Deals consist of corporate loans and issuance underwritings of bonds as well as equity.

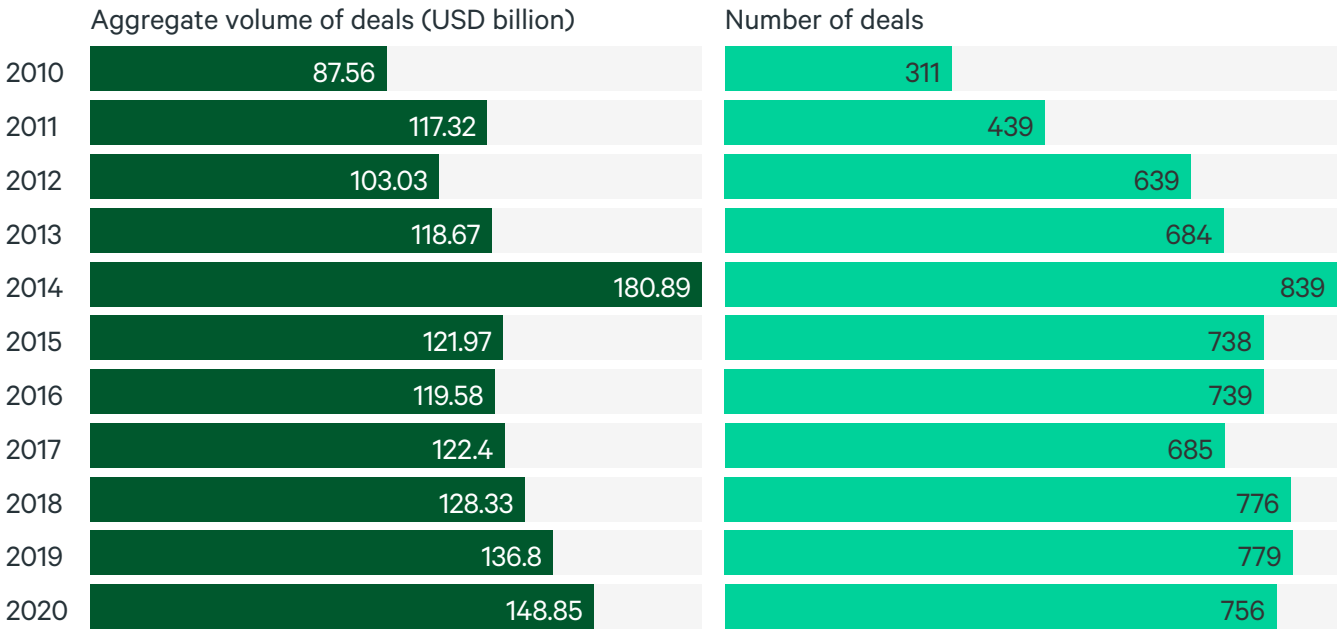


Figure 9. Distribution of all deals across brown, grey and green sectors. Deals consist of corporate loans and issuance underwritings of bonds as well as equity.

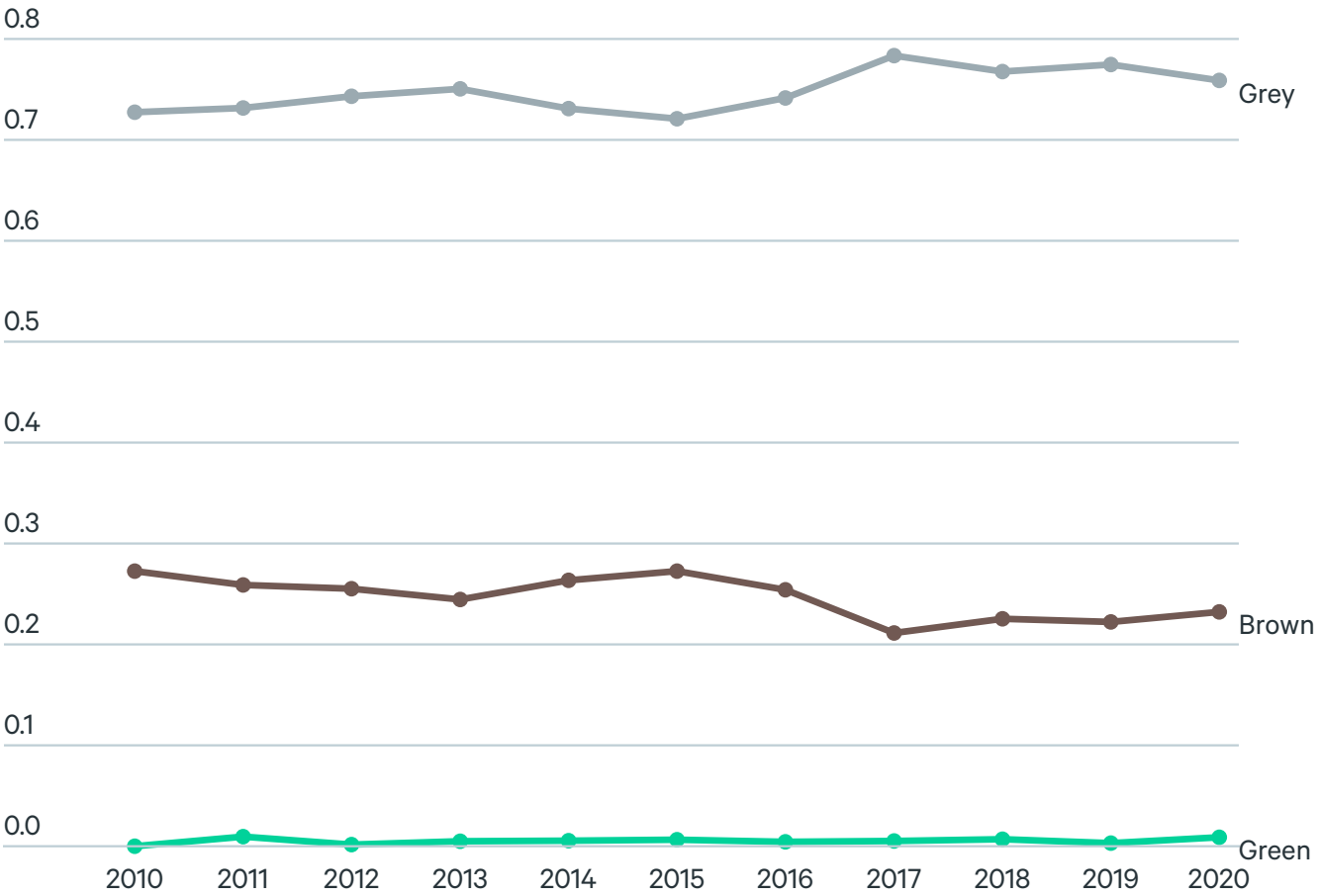


Figure 10. Aggregate volume of all deals in the brown, grey and green sectors (USD bn). Deals consist of corporate loans and issuance underwriting of bonds as well as equity.

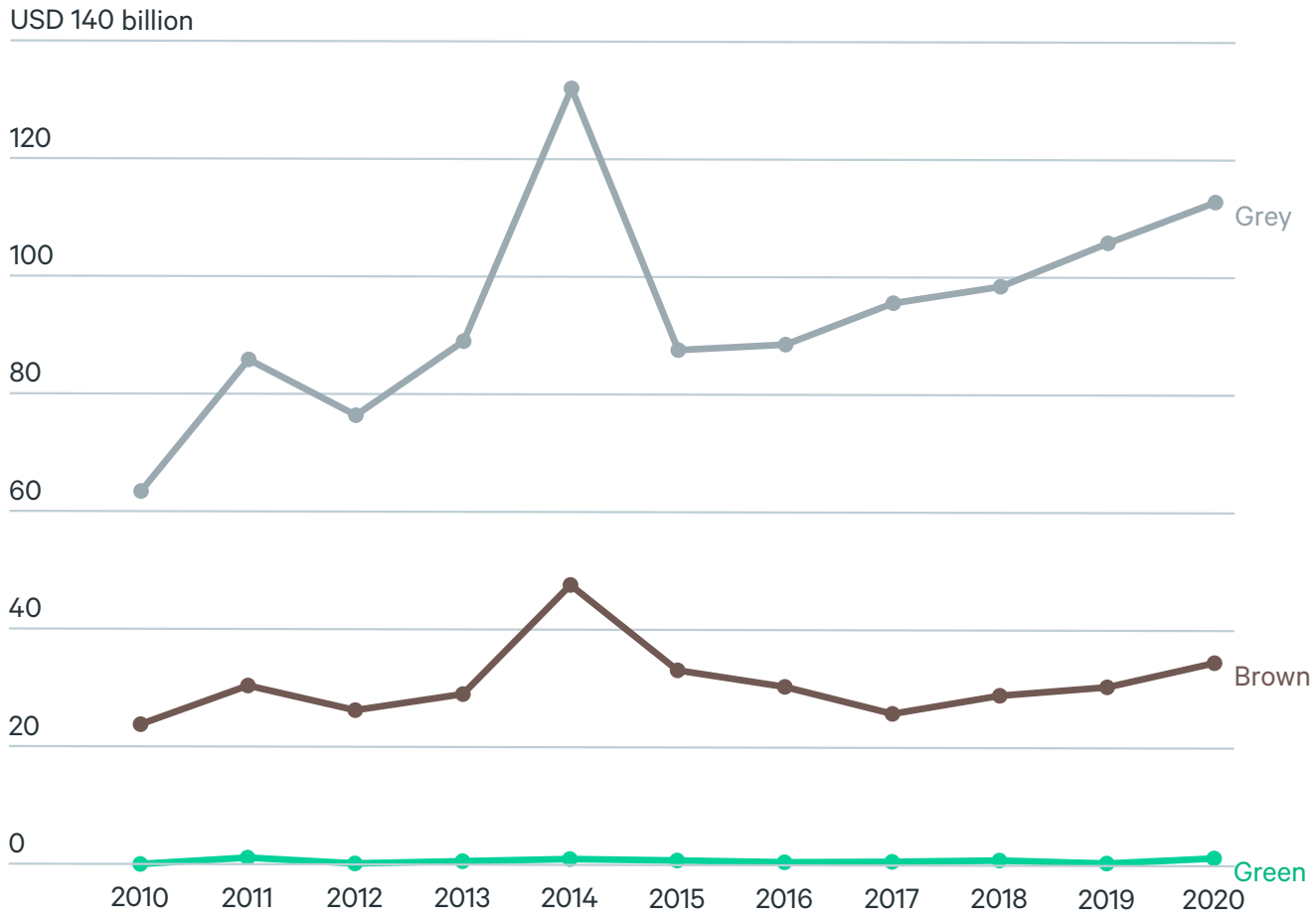


Table 4. Geographical distribution of financial flows (aggregate between 2016–2020, USD bn)

	Deal volume (USD bn)		
Region	**Loan**	**Bond**	**Equity**
Western Europe	221.49	353.90	29.48
North America	19.00	18.72	0.23
Eastern Europe	2.93	2.03	0.11
North Asia	0.98	1.97	0.00
Southeast Asia	0.71	1.21	0.06
Sub-Saharan Africa	0.52	0.50	0.00
Caribbean	0.37	1.55	0.23
Japan	0.00	0.46	0.00
South America	0.00	0.00	0.02
Middle East	0.00	0.00	0.17

These results are consistent with the findings based on the balance sheets. Although the relative weight of new funding for brown sectors decreases until 2020 (Table 2), the overall capital to brown assets increases with both benchmarks. This suggests an increasing demand for financing in the brown sectors[11] and that economies recovered from the effects of the collapsing oil prices. It also indicates that financing is not clearly aligned with the Paris Agreement. However, isolating the effect of the macroeconomic turbulence after the agreement requires further research. In order to understand these figures better, we analyse investments per deal type as well.

3.3 Investments per deal type

The aggregate statistics demonstrate an increasing trend in new lending and underwriting deals in all the colours of the economy. However, understanding the contribution of different deals to the overall transaction landscape is also relevant, as is understanding the economic activities that use financing. As syndicated loans are primarily arranged by a few banks and successful underwriting includes a closer contact with bond and equity markets, industries raise funding through different financing forms.

Corporate loans

As illustrated by Figure 11, the sampled banks provided a gradually expanding pool of new corporate loans (i.e. syndicated and bilateral loans) to customers until 2014, followed by a stagnating trend. Table 7 is consistent with Berk & DeMarzo (2014) in that lending is primarily allocated to capital-intensive industries, such as oil exploration and production as well as marine freight and logistics. On the other hand, the portfolio weight of brown flows declined on both time horizons (Figure 12). The symmetric pattern in the figure is the consequence of moderate green lending. In terms of yearly issuances, brown flows exhibit a substantial expansion by 2020 when the benchmark year is 2010 but a contraction when compared with 2015 (Figure 13). This difference (see Table 5 and Table 6) can be explained by that the issued amount of capital plateaued in 2014 but followed smaller yearly issuances. This led to a higher (lower) issuance volume in 2020 than in 2010 (2015). Green volumes expanded, but – similarly to the aggregate statistics – the magnitudes are marginal.

Table 5. Change in new-deal portfolio weight, for corporate loans aggregated for the five banks sampled.

Since 2010	Brown: -8.27%	Grey: +4.34%	Green: +15.74%
Since 2015	Brown: -10.31%	Grey: +10.45%	Green: +43.49%

Table 6. Change in yearly issued volumes, for corporate loans aggregated for the five banks sampled.

Since 2010	Brown: +42.31%	Grey: +61.88%	Green: -2.70%
Since 2015	Brown: -10.56%	Grey: +10.14%	Green: +43.09%

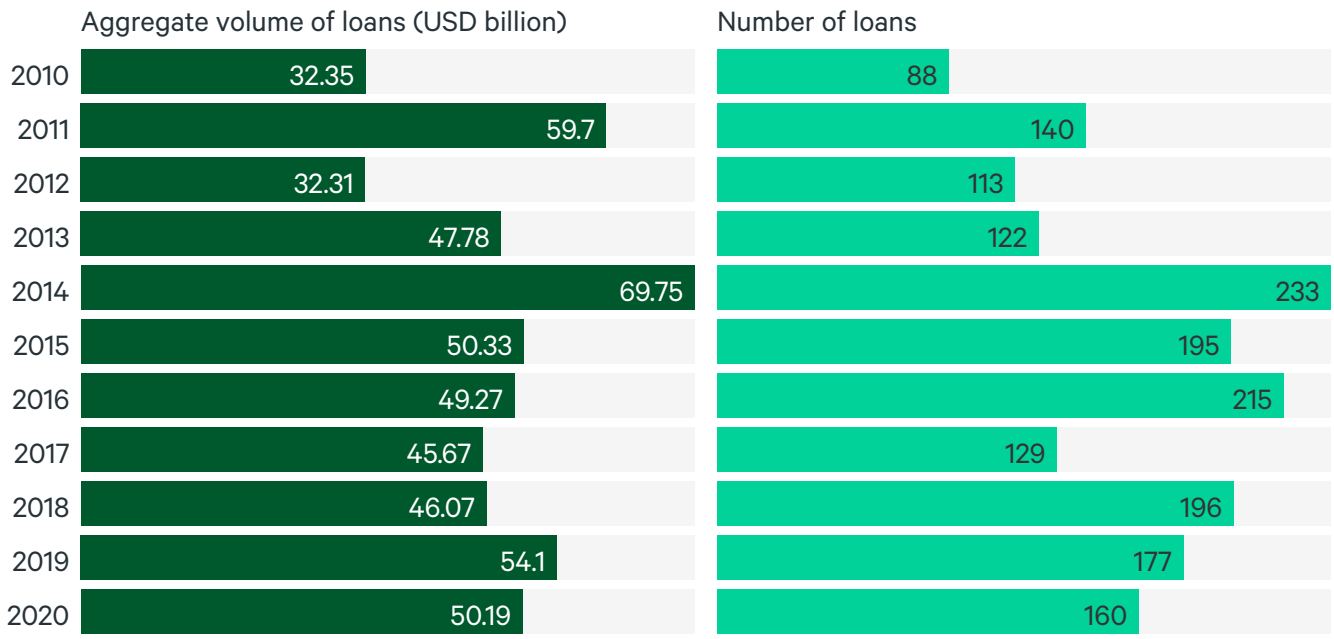
In terms of sectoral distribution, industrial equipment, oil and gas exploration and production as well as oil and gas transportation services are primarily responsible for the increasing lending trend in the brown sector, given the USD 997 million new corporate loans in 2010 and USD 7942 million in 2020 granted for these activities. On the other hand, the peak in new corporate loans in 2014 ramped up the benchmark for the 2015–2020 comparison, which yields decreasing portfolio weight and newly issued loans in the brown sector (see Figure 13). The fluctuating aggregate

11 The aggregate trends of new deals cover issuance underwriting as well, while we concentrate on the loan portfolio in the balance sheets.

level originates from that capital deployment is not uniform across sectors and time. For example, offshore oil exploration and production received USD 361 million in 2014, and then USD 516.6 million in 2018 without any allocated capital in between. However, there are exceptions, i.e. several economic activities that deployed funding on the entire sample horizon: e.g. oil and gas drilling, iron and steel, or oil and gas transportation services.

With both benchmarks, corporate financial services[12], business support services[13], and consumer goods conglomerates are the main beneficiaries of new corporate loans in the grey sector, followed by real estate rental and development firms, electric utilities[14], and pharmaceutical companies. The green sector is primarily represented by renewable energy equipment and services as well as wind systems and equipment. Other activities such as renewable energy services or alternative electric utilities scarcely received financing. Green loan issuance exhibits a declining trend between 2010 and 2020 (except wind systems, where financing ramped up in 2014 and 2015). Renewable independent power producers[15] raised a substantial amount of capital in 2020 (USD 732 million), which offsets the decline in renewables on the 2015–2020 horizon.

Figure 11. Aggregate volume of syndicated loans and number of new deals provided by the largest Nordic banks.



12 Examples include direct finance leasing, sale-leaseback, factoring, entrusted loans and the provision of advisory services
13 Such as restroom cleaning services and supplies, carpet and tile cleaning services, first aid and safety services
14 Grey electric utilities are firms that provide both renewable and fossil-based electricity production.
15 Not public utility firms that own facilities to produce electric power for sale to utilities and other end users

Figure 12. Distribution of new syndicated loan deals across brown, grey and green sectors, provided by Nordic banks.

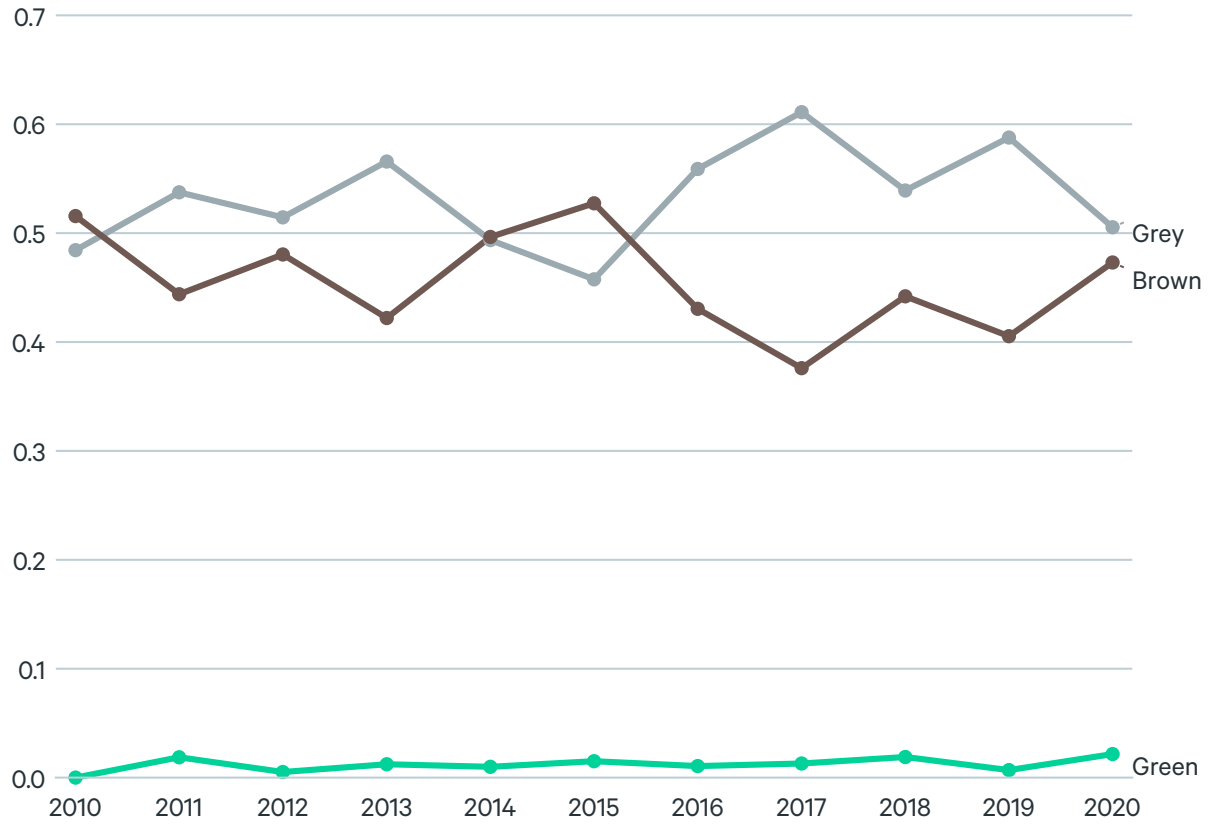


Figure 13. Overall volume of new syndicated loan deals provided by Nordic banks (USD bn)

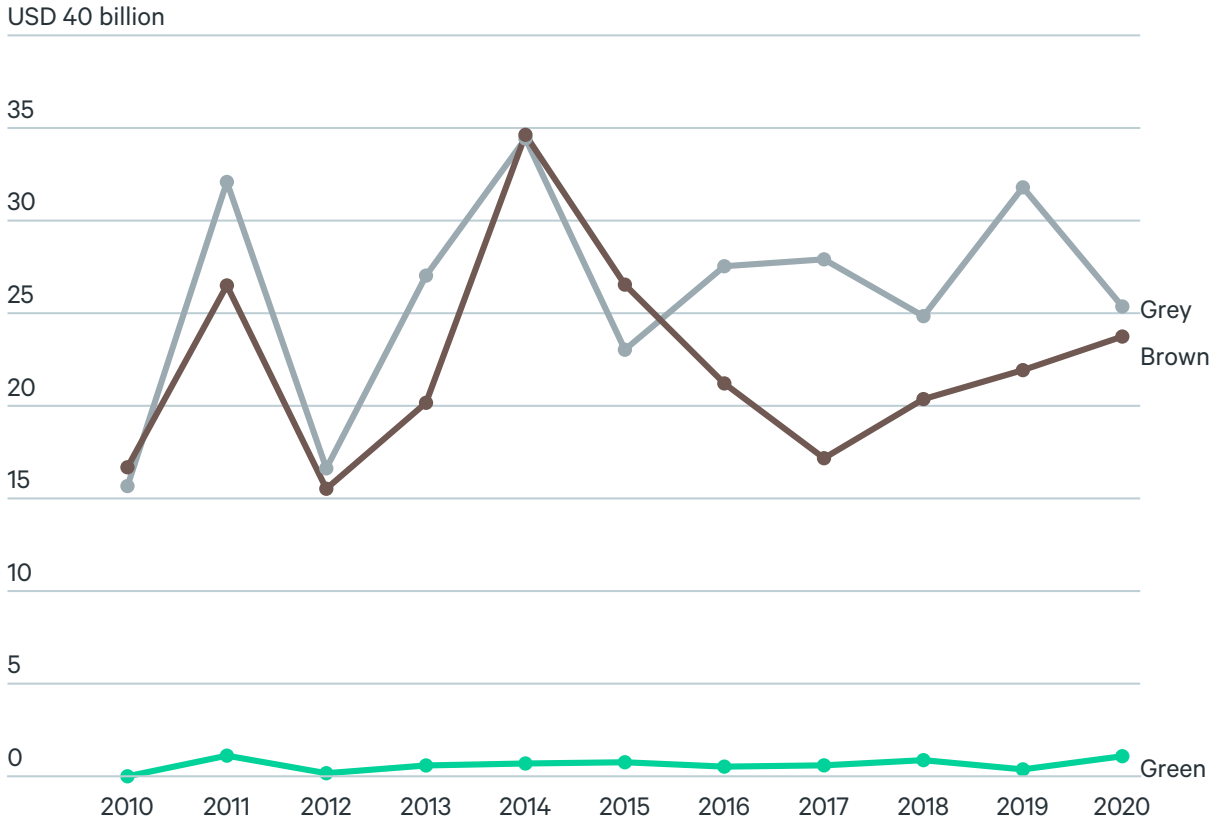


Table 7. Top 10 TRBC activities in terms of granted corporate loans (aggregate volume between 2016 and 2020, USD bn). "Fraction of all" refers to what fraction of all issuances was provided to a sector.

TRBC Activity	Loan (USD bn)	Fraction of all
Electric utilities (NEC)	13.2	5.40%
Oil and gas exploration and production (NEC)	11.6	4.74%
Business support services (NEC)	8.3	3.37%
Corporate financial services (NEC)	6.1	2.49%
Industrial machinery and equipment (NEC)	5.5	2.25%
Marine Freight and logistics (NEC)	5.5	2.23%
Construction and engineering (NEC)	5.4	2.20%
Pharmaceuticals (NEC)	5.0	2.05%
Paper products (NEC)	5.0	2.03%
Deep sea freight	4.8	1.95%

Equity issuance underwriting

The magnitude of equity issuances fluctuated on the entire sample horizon, which is coupled with a slightly increasing count of issuance deals (Figure 14). As Figure 15 and Figure 16 demonstrate, both the weight of brown flows in the new-deal portfolio as well as the yearly issuances decreased over both time horizons. However, this does not represent a markable change in the overall narrative given the marginal pool of equity issuances compared to bond and loan deals. Given that the equity market is much slimmer than e.g. bond markets, this result is not surprising.

Table 8. Change in new-deal portfolio weight, for equity, aggregated for the five banks sampled.[a]

Since 2010	Brown: –56.29%	Grey: +80.91%
Since 2015	Brown: –24.94%	Grey: +9.64%

[a] Not including green flows in absolute terms, as green investments equated to close to 0 in 2010 and 2015, which would have produced around 1000% increase in issued volumes by 2020. This might lead to the conclusion that equity issuances financed voluminous green projects. The same reason goes for Table 9. The magnitude of green investments reached USD 0.235 billion by 2020.

Table 9. Change in yearly issued volumes, for equity, aggregated for the five banks sampled.

Since 2010	Brown: –64.18%	Grey: +48.23%
Since 2015	Brown: –11.44%	Grey: +29.36%

Brown underwritings are dominated by a decline on both horizons, mainly due to services related to oil and gas and construction. The largest drop took place in the integrated oil and gas sector, where firms firms are involved in the entire value chain of production, from exploration to refinement and distribution; these dropped USD 2688 million in 2010, then discontinued issuances.

As the sector started to deploy financing through syndicated loans more recently, the firms in the sector likely switched financing sources. However, equity issuance underwritings to airlines, homebuilding or paper products expanded (on average, USD 200 million on both horizons), which could not offset the sizeable contraction of new issuances. Even with the expansion, the sum of proceeds is one order of magnitude less than bond or loan issuances, which could be explained by the numerous disadvantages that issuers face: e.g. the high cost of equity issuance or the downwards price pressure from an increased supply of shares (Bethel & Krigman, 2008). The main investee sectors are reported in Table 10.

Figure 14. Aggregate volume of equity issuance underwritings and number of new deals provided by the largest Nordic banks.

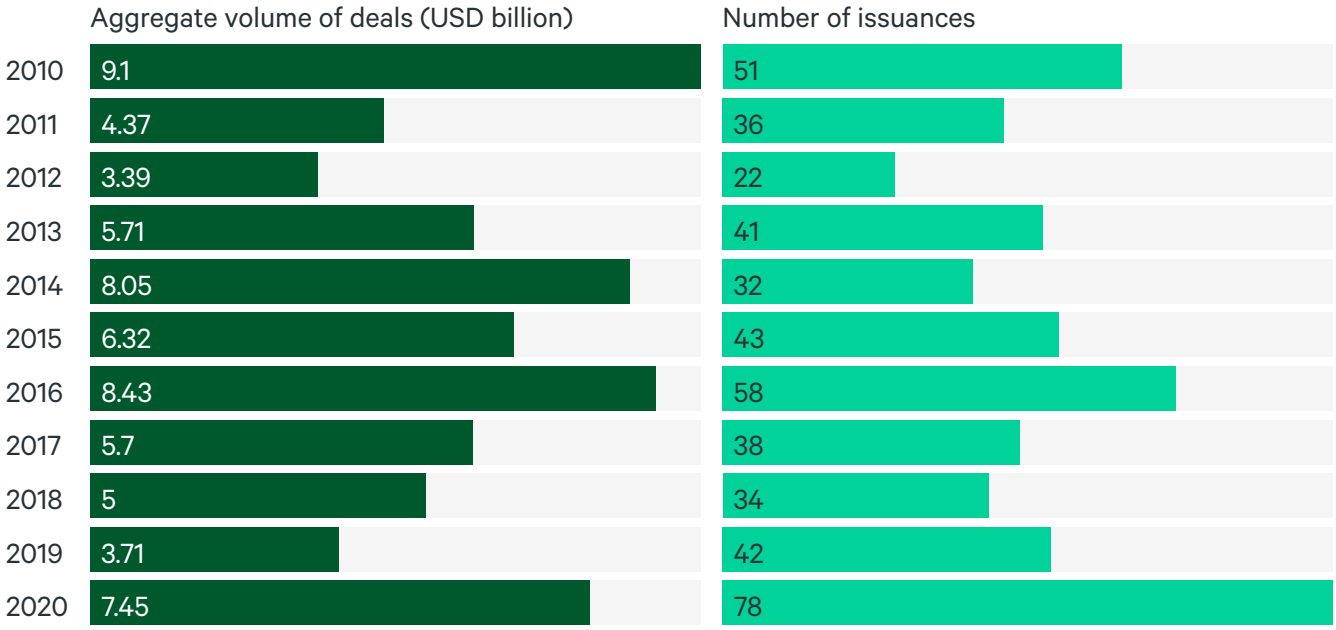


Figure 15. Distribution of new equity issuance underwriting deals across brown, grey and green sectors, provided by Nordic banks.

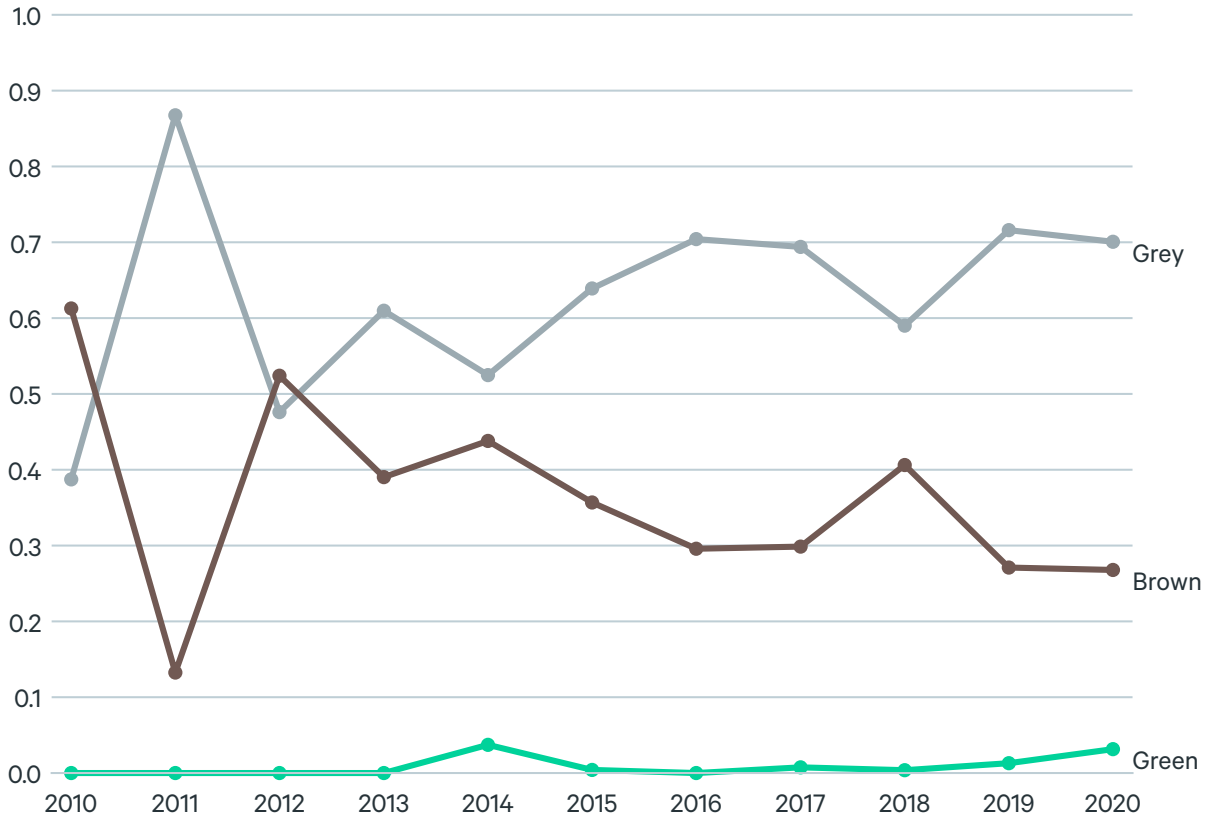


Figure 16. Overall volume of equity issuance underwriting deals provided by Nordic banks.

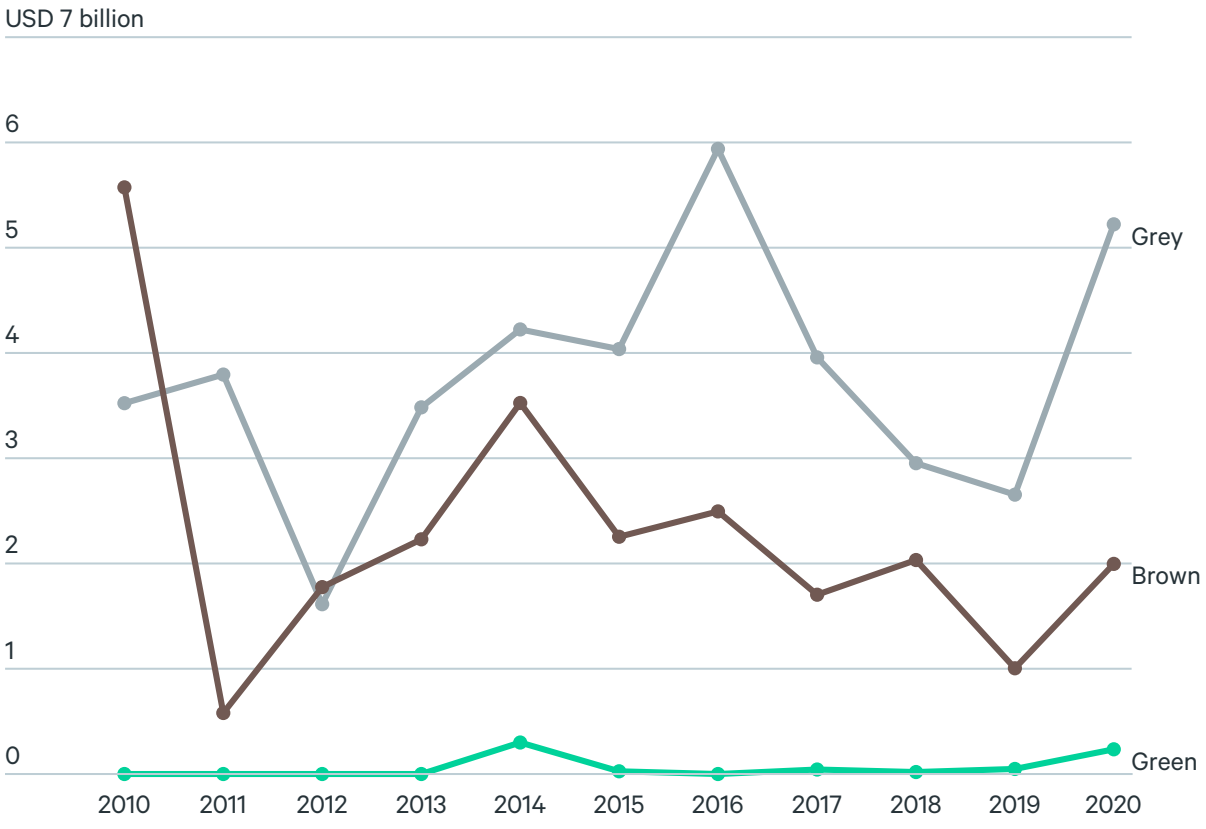


Table 10. Top 10 TRBC activities in terms of equity issuance underwriting (aggregate volume between 2016 and 2020, USD bn). "Fraction of all" refers to what fraction of all issuances was provided to a sector.

TRBC Activity	Deal (USD bn)	Fraction of all
Electric utilities (NEC)	2.6	8.68%
Real estate rental, development and operation	2.5	8.15%
Banks (NEC)	1.1	3.75%
Healthcare facilities and services (NEC)	0.9	3.12%
Cloud computing services	0.9	2.89%
Aerospace and defence (NEC)	0.9	2.83%
Residential real estate rental and development	0.8	2.58%
Industrial machinery and equipment wholesale	0.8	2.54%
Pharmaceuticals (NEC)	0.7	2.36%
Airlines (NEC)	0.7	2.27%

Bond issuance underwriting

Bond issuance underwriting exhibits an upward-sloping trend (except after the spike in 2014), both in terms of issuance volume as well as number of deals (Figure 17). A sizeable expansion in both brown and grey flows, especially in the latter sector, are illustrated Figure 18 and Figure 19: newly underwritten grey bond issuances expanded by 86% by 2020 (surpassed USD 80 bn), while brown flows quadrupled by 2020 (reached USD 10 bn). On the other hand, green flows (in terms of volume and portfolio weight) fell by more than 60% against both benchmark years. The majority of this capital is provided to other banks, governments and consumers (Table 13). Figure 20 shows that the Finnish and Swedish governments, as well as Scania, European Investment Bank, and other Nordic banks, issue the majority of bonds. However, we cannot trace the journey of this capital further, to see which economic sectors or firms are supported after the banks deploy bond financing.

Table 11. Change in new-deal portfolio weight for bonds underwritten by the five banks studied.

Since 2010	Brown: +194.58%	Grey: –5.94%	Green: –82.40%
Since 2015	Brown: +45.79%	Grey: –2.62%	Green: –80.53%

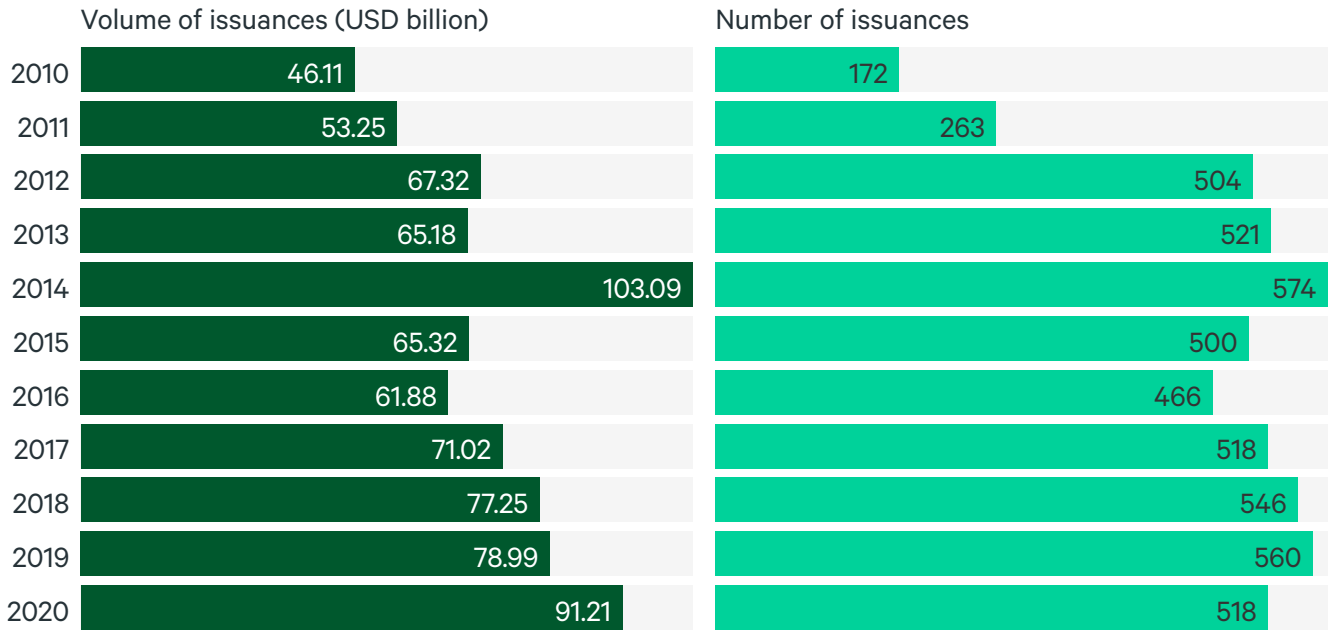
Table 12. Change in yearly issued volumes for bonds underwritten by the five banks studied.

Since 2010	Brown: +482.65%	Grey: +86.05%	Green: –65.19%
Since 2015	Brown: +103.56%	Grey: +35.96%	Green: –72.81%

On both horizons, heavy machinery and vehicles[16] benefited from the largest expansion of new capital: from USD 136 million in 2010 to USD 1.901 bn in 2020. Highway and airport operators, paper product firms[17], and forest and wood product firms follow the list, but firms engaging in oil and gas services also continued to receive new capital. Governments, real estate rental and operations, banks, and corporate financial services lead the expansion in grey sectors.

Similar to corporate loans, capital to green activities declined over the years due to two reasons: not all green businesses (i.e. electric utilities, independent power producers, and renewables) received green financing in all years, and the available new capital exhibited a declining trend as well. For example, wind systems and equipment received USD 278 million in 2010, and then USD 137 million in 2015, alternative electric utilities USD 223 million in 2011 and USD 100 million in 2020.

Figure 17. Aggregate volume of bond issuance underwritings and number of new deals provided by the largest Nordic banks.



16 For example, firms providing mining and rock excavation equipment and related services, or rock drilling tools and hydraulic attachments

17 Companies that engage in e.g. pulp, timber and biofuel businesses.

Figure 18. Distribution of new bond issuance underwriting deals across brown, grey and green sectors, provided by Nordic banks.

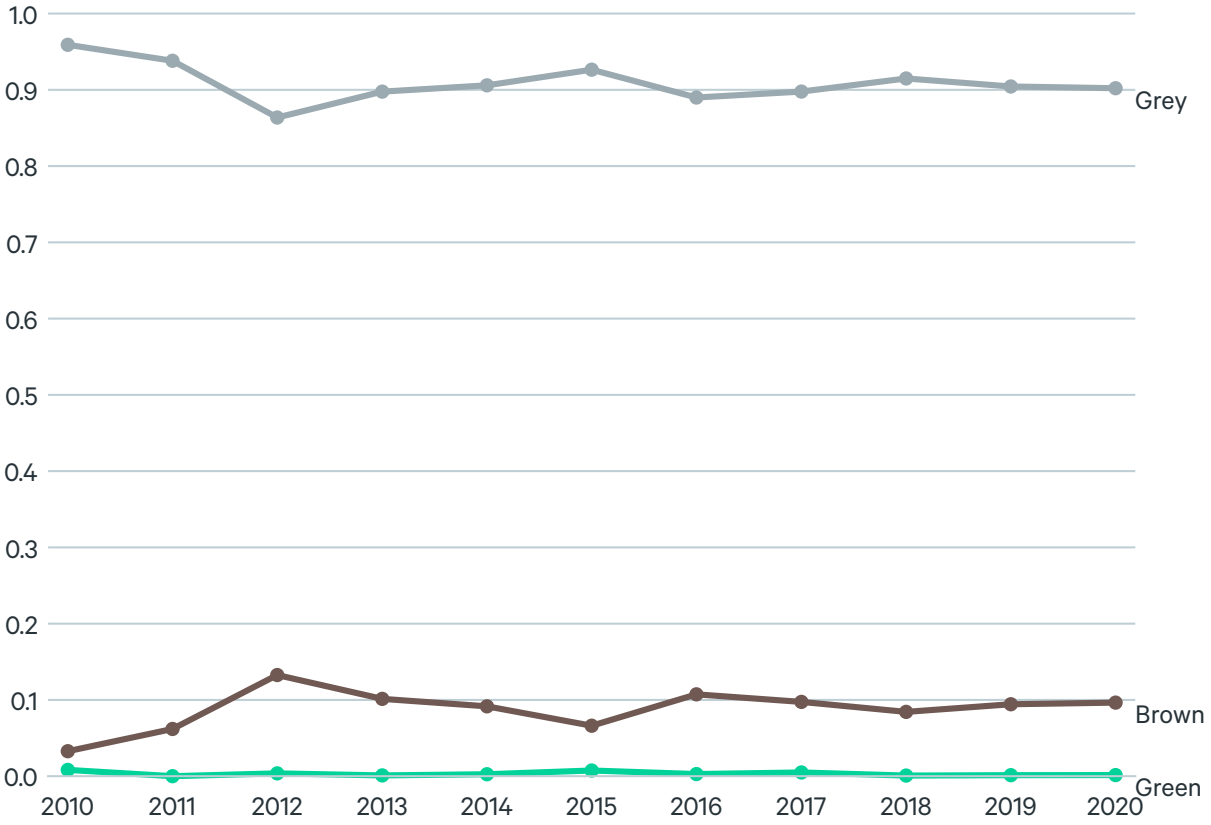


Figure 19. Overall volume of bond issuance underwriting deals provided by Nordic banks.

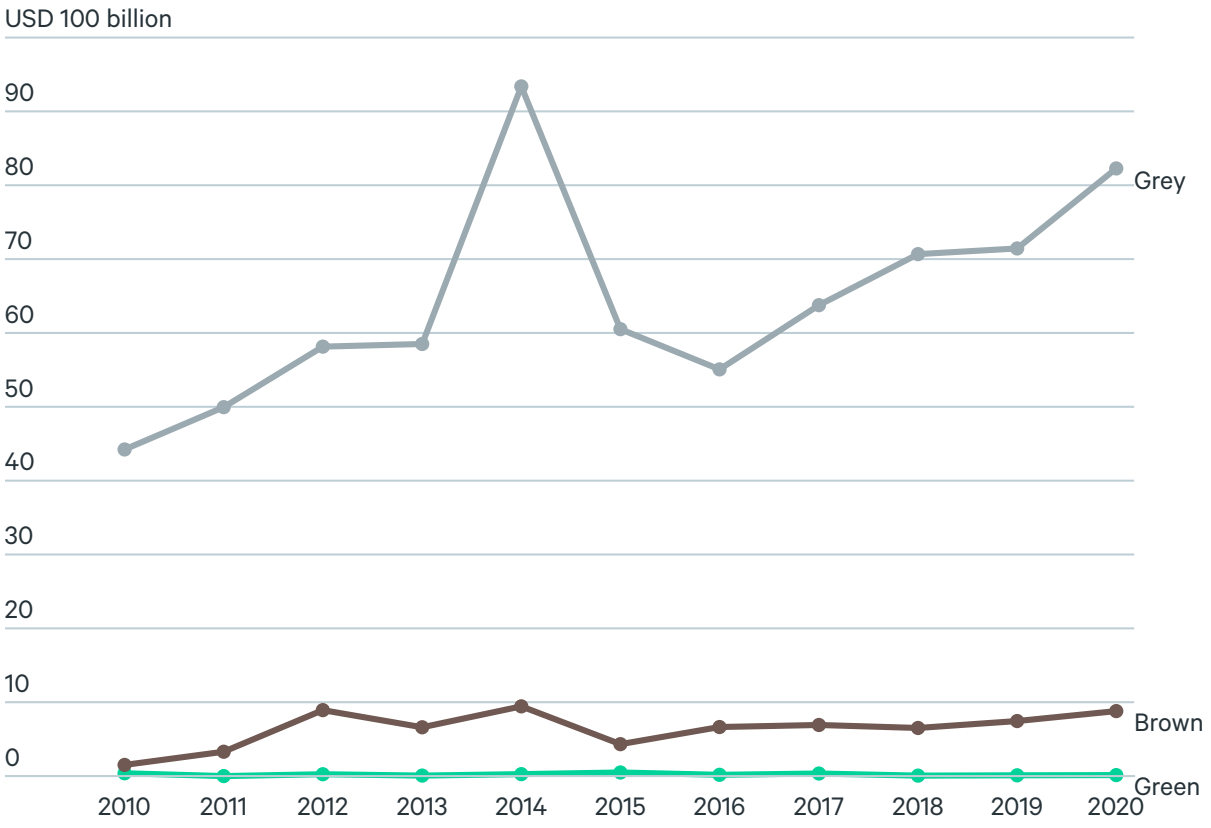


Figure 20. Top 10 issuer of bonds (aggregate volume, 2016–2020, USD million)

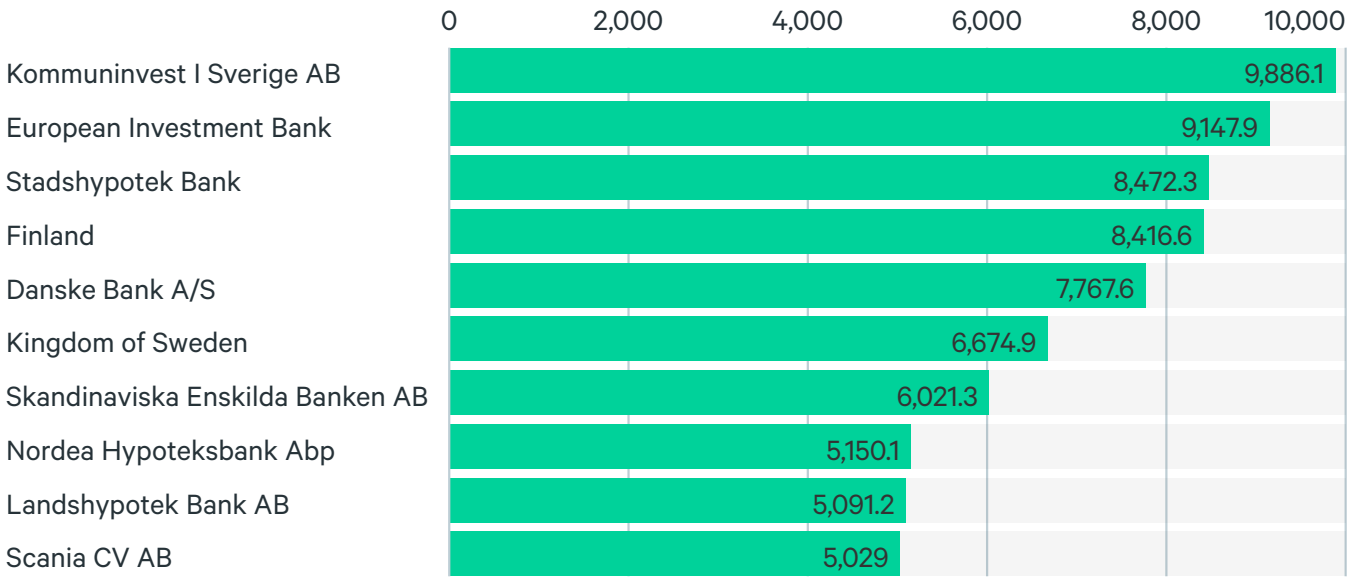


Table 13. Top 10 TRBC activities in terms of bond issuance underwriting (aggregate volume between 2016 and 2020, USD bn). "Fraction of all" refers to what fraction of all issuances was provided to a sector.

TRBC Activity	Deal (USD bn)	Fraction of all
Banks (NEC)	97.2	25.6%
Corporate financial services (NEC)	35.0	9.2%
Real estate rental, development and operations	28.2	7.4%
Corporate banks	26.6	7.0%
Government and government finance (NEC)	23.5	6.2%
Public finance activities	18.2	4.8%
Consumer lending (NEC)	17.6	4.6%
Retail and mortgage banks	13.8	3.6%
Commercial loans	7.4	2.0%
Electric utilities (NEC)	7.0	1.8%

4. Discussion of results

The results suggest that several highly emitting economic activities such as oil and gas exploration and production drive the increasing trend in brown sectoral flows.

Green financing appears to be moderate compared to the multibillion-dollar investments into other sectors, which explains the substantial percentage changes in investments in green sectors. However, bond issuance and corporate lending to green sectors declined by 2020 compared to 2010, which is somewhat offset by equity issuance underwritings (Table 2).

Financing provided to financial and real estate services firms as well as industrial players engaging in multiline businesses dominates the landscape in the grey sectors. According to the European Commission (2021b), acquisition and ownership of buildings are regarded as green under the EU taxonomy if buildings adhere to certain energy efficiency requirements.

Financial activities contribute to climate adaptation if those are related to underwriting of climate-related perils. Given that we neither observe energy consumption nor underwritings that are connected to climate-related perils, we might have overestimated the financing to grey activities (and underestimate green). Despite these uncertainties, the more granular statistics suggest that we correctly classified the majority of sectors.

4.1 Distribution of financial flows

Apart from the sectoral distribution of financing, the colour of the flows is also informative of the alignment with the Paris Agreement: a brown firm may also intend to invest in green technologies for abatement. Two-thirds of the studied financial flows have gone to grey sectors since the Paris Agreement commenced, with about a fifth to brown, a tenth to green, and less than 1% to transition investments, as shown in Figure 21.

Similar to the sectoral distribution, a huge majority of the overall capital investments (USD 657 bn) is neither brown nor green (i.e. “rest”, for example real estate or banking sector), while brown flows represent almost 22% of the total capital pool. Green and transitional financial flows are smaller, as they constitute 10.3% and 0.5% of the overall investments, respectively. The magnitude of green investments, however, has expanded rapidly, as illustrated by Figure 22: the outstanding green bonds and loans summed to USD 5 bn in 2010, while the same sum almost reached USD 30 bn in 2020. These numbers show that green financing is still relatively slim, despite the expanding trends of green bond issuance.

4.2 Alignment with the EU taxonomy

The European Commission, along with setting the objectives of the European Green Deal, established a sustainable taxonomy to set common grounds for defining environmentally sustainable activities (European Commission, 2021a). The basis for the taxonomy, the Taxonomy Regulation defines six environmental objectives (e.g. climate change mitigation and adaptation) and various technical screening criteria for controlling which economic activities contribute to each objective. An activity is included in the taxonomy (taxonomy-eligible) if it makes a substantial contribution to at least one environmental objective, does no significant harm to any other environmental objectives, and meets minimum social safeguards.

These requirements exclude certain “dirty” sectors such as oil and gas production from the list. Other highly polluting activities, that are expected to undergo decarbonization, are marked as “transitional” if producers are among the best performers in the industry in terms of environmental impact (e.g. steel and cement). If an economic activity is pursuing (enabling) climate change mitigation and complies with the technical screening

criteria, then it is regarded as "enabling" (e.g. manufacturing of batteries[18] or low-carbon technologies for transport).

Similar to our approach, emissions represent an important building block of the taxonomy, but the EU classification rests on a more complex evaluation of sectors. As discussed before, this may lead to different estimates on the magnitude of financial flows arriving to green and brown activities. Measuring the discrepancy is, however, challenging due to data limitations on the characteristics of production. This makes it implausible to isolate top performers from their competitors.

Even though some manufacturers deliver relatively environmentally friendly iron, steel and cement products, we do not consider those sectors as Paris aligned due to the high greenhouse gas emissions in the production processes. We focus our attention to those economic activities that are brown in our categorization, but at least partially green (enabling) according to the EU taxonomy. Our robustness check assumes that all the brown flows in the selected sectors are misclassified (and green in reality). This analysis yields an upper bound of the error as it is unlikely that all production processes qualify for green environmental tag in a more polluting sector (e.g. due to inevitable technical differences across actors).

The selected sectors in our classification are *Electrical Components and Equipment* (e.g. battery production), *Construction and Engineering, Marine Freight and Logistics, Ground Freight and Logistics, Marine Port Services,* and *Highway and Rail Tracks*. Most overlapping activities are part of the transportation sector as some of the brown economic activities in our classification are not EU taxonomy-aligned (e.g. fossil fuel utilities, oil and gas drilling), and others are clearly green in the EU taxonomy (e.g. electricity generation from wind power). Furthermore, mapping the EU taxonomy to Refinitiv's green list is also challenging in case of transportation. For example, the Refinitiv activity *Biodiesel* is listed under renewable energy, but it is not entirely clear if biodiesel-driven vehicles are also part of the subclass or listed elsewhere (and embedded in some other classes). In the taxonomy, on the other hand, biofuel-driven vehicles are regarded "enabling".

To estimate the magnitude of potentially incorrectly classified financial flows, we sum up all the loans, issued bonds and equities to the aforementioned sectors and normalize with either the sum of brown flows or the sum of all financial flows (total, all the sectors). Figure 23 reports the time series of the errors. When the benchmark is brown flows, the ratio floats around 10%; it is 3% when we normalize with overall flows. If all these flows were misclassified, then the ratio of brown flows in Figure 21 would be 20.5% and 12.8% for green flows. Therefore, the narrative remains intact: brown flows are still greater than green.

4.3 Lag in the Paris Agreement's effects

Our results may be influenced by the time needed for the Paris Agreement to have a significant effect on financial flows. On the one hand, the binding agreement may not have had an immediate impact on the financial sector given that it can take time to reorient financial services to greener investment opportunities. On the other hand, the Paris Agreement could have immediately shaped market players' exposure to transition risks through altering the profitability and viability of dirtier businesses (Reghezza et al., 2021).[19] Due to public scrutiny, banks' misaligned decisions may undermine their reputation as well (Reghezza et al., 2021). Therefore, it could be in the interest of banks to signal commitment to the market and take actions accordingly as soon as possible.

18 The production should include recycling end-of-life batteries, manufacture of rechargeable batteries and battery packs, and accumulations from secondary raw material.

19 "Transition risks arise from adjustments made towards developing a green economy and depend on the timing and speed of this process. Unanticipated changes in climate policies, regulations, technologies and/or market sentiment could provoke a repricing of the value of bank assets" (Reghezza et al. 2021).

In accordance with our results, Reghezza et al. (2021) documented empirically that the share of polluting firms in euro-area banks' loan portfolios decreased shortly after the Paris climate conference (COP21) and President Trump's decision not to uphold the Paris Agreement. Given our data limitations, we did not attempt to test the same hypothesis with our sample. Instead, we aimed to infer shifts based on public reports of the financial institutions shortly after the Paris Agreement was signed.

We found that both Nordea (2015) and SEB (2015) signalled commitment to a green transition in their annual reports, as well as by selling assets or not entering into new business relationships with coal-related businesses, respectively. However, these commitments are limited only to coal-based businesses, which suggests that these banks did incorporate the guidelines of the Paris Agreement into their upcoming investment decisions but in a way that enables a rather slow-paced transition. We did not see similar statements in the other banks' annual reports, but they disseminate their sustainability-related work in other documents. For example, Handelsbanken (2020) focuses on an expansion of green loan issuance, exclusions and active engagement in portfolio management. In summary, banks are actively engaged in a green transition, but the commitments may not be enough for a fast reorientation.

Figure 21. Distribution of brown, grey and green financial flows for the five leading banks in Sweden, shown as aggregate financial flows between 2016 and 2020.

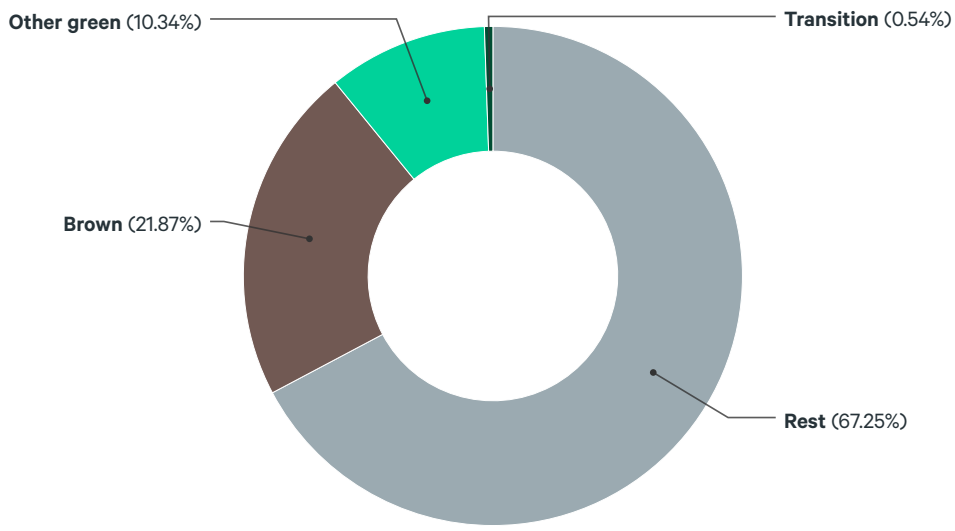


Figure 22. Distribution of green bond and loan issuances across brown, grey and green sectors, with aggregated volume between 2016 and 2020 for the five banks studied.

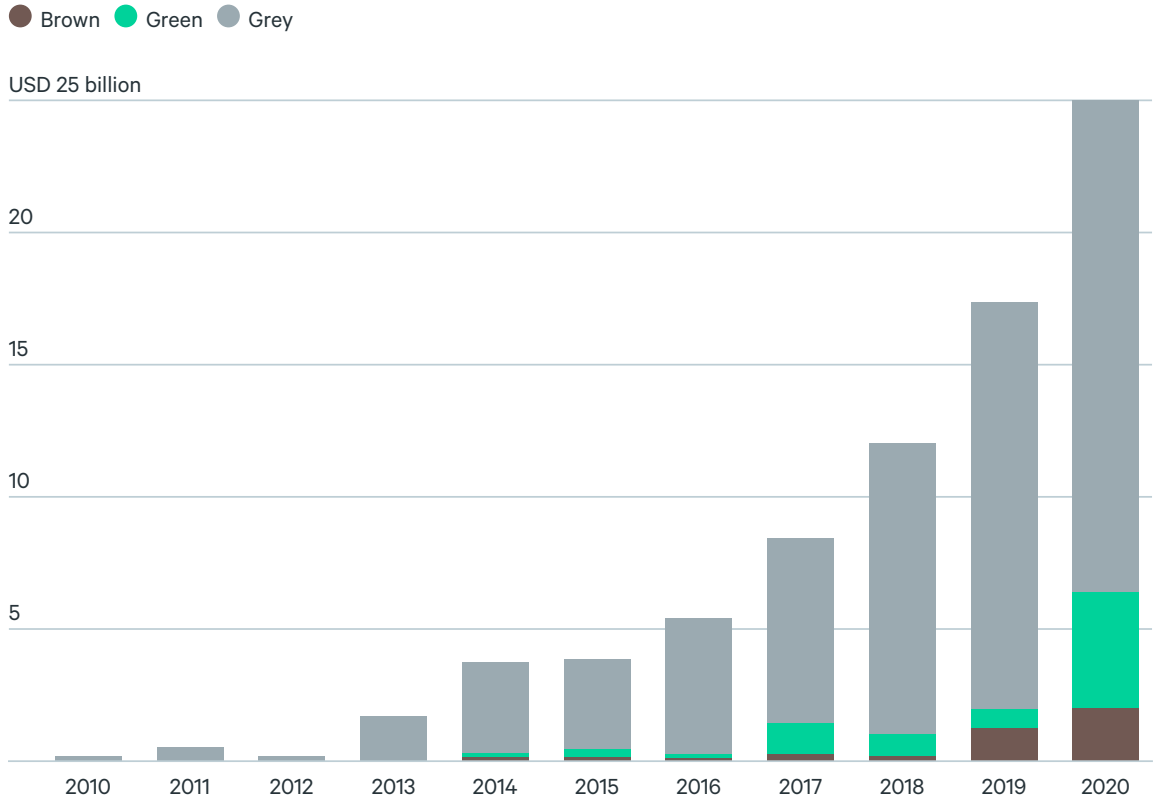
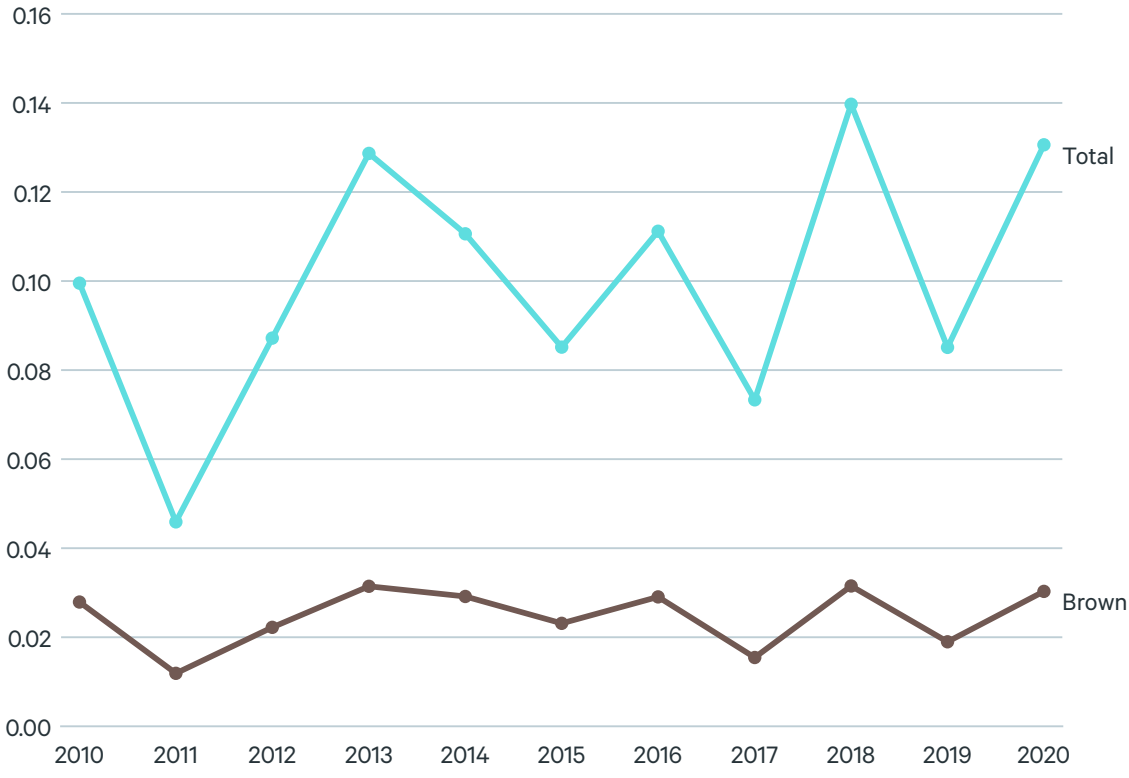


Figure 23. Ratio of brown flows to total financial flows to Electrical Components and Equipment, Construction and Engineering, Marine Freight and Logistics, Ground Freight and Logistics, Marine Port Services, Highway and Rail Tracks.



5. Policy implications and recommendations

Our results from studying the five leading banks in Sweden indicate a trend of increasing new investments provided to highly emitting sectors, including fossil fuel exploration and production as well as manufacturing of industrial equipment. We documented an increasing pool of new capital arriving to various business and financial services, as well as moderate new investments into green activities. The discrepancy in investments is similar when we classify financial flows with respect to their colour. Based on these preliminary results, we present a few recommendations for consideration.

It is material to any net-zero goals to phase out new investments into fossil fuel projects and channel that capital into green activities. Therefore, it is critical to understand the underlying reasons that hamper the transition to green investments, especially in light of the sizeable new fossil fuel investments documented in the study. Timperley (2021) suggested that fossil fuel subsidies are one of the chief financial barriers. Subsidies, in the form of tax breaks, direct payments or fuel price ceilings, artificially lowers the price of fossil fuels and their production, which may make new fossil fuel projects very profitable.

As discussed earlier, further dialogue with stakeholders and more granular analyses, as well as more comprehensive reporting of relevant data, will be necessary to arrive at a more robust understanding of the results. Standardization and established definitions should also get a top priority. Our research shows that what constitutes brown and green is far from obvious; however, clear categorization of sectors is key in tracking a green transition.

The transition of a sector and the whole economy cannot be charted without transparency in financing (i.e. how funds are used). One possibility is that all bond issuers should be required to disclose how funds will be used. “Forms of sustainable finance have grown rapidly in recent years, as a growing number of institutional investors and funds incorporate various Environmental, Social and Governance (ESG) investing approaches” (Boffo & Patalano, 2020, p. 3). In principle, investors and issuers that take into account societal issues in investing are more likely to avoid controversies and improve their reputations in the medium to long term (Boffo & Patalano, 2020). These practices are more likely to retain customers and employees, as well as maintain the trust of shareholders during periods of uncertainty and transition. However, “even though the users of ESG information largely retrieve information from the issuers’ disclosures, ESG scores from major ratings providers (when data is commercially available) can vary greatly from one ESG provider to another” (Boffo & Patalano, 2020, p. 27; see e.g. ASIFMA, 2020). A clear and harmonized disclosure for ESG data providers is a necessary step to highlight the real climate impact of a firm and the related sector and to guide investors in their choice of assets.

6. Conclusions

Article 2.1c of the Paris Agreement established the political mandate to ensure the consistency of financial flows with sustainable climate development goals. Addressing the climate crisis requires governments as well as the private sector, including the financial industry, to take immediate actions.

We highlighted the economic activities and sectors that secured financing from financial investors in the form of corporate loans, issuance underwritings or listed holdings. Given that there is no standard definition of financial flows, we interpreted them as new investments in various sectors and assets. We classified sectors based on their historical emissions and Refinitiv's list of green activities. Our research design combined the analysis of public balance sheets with a granular investigation of individual deals from 2010 to 2020.

This exercise shed light on the Swedish financial industry's alignment with the Paris Agreement, through screening the largest banks operating in Sweden. Investigating financial flows starting before the inception of the Paris Agreement enabled us to gain a deeper understanding of the trends of new financial investments and, therefore, how the climate pact may have shaped the investment strategies of relevant financial players.

Both approaches indicate a limited alignment with the agreement, as they highlight a gradually increasing volume of financing to brown sectors. The deal-level analyses revealed that the examined financial actors have facilitated USD 656 bn since the Paris Agreement commenced, mainly by syndicated loans (USD 245 bn) and bond issuance underwritings (USD 380 bn). The magnitude of green investments has also increased, but the overall proceeds is marginal compared to both brown and grey sectoral flows.

We find that depending on the benchmark, the composition and magnitude of financial flows provided by institutional investors could be very different. Due to a spike in both underwritings and loan issuances in 2014, the new financial flows issued under the period of 2015–2020 may exhibit a declining tendency, even if a new flow in 2020 was substantially higher than in 2010 (e.g. corporate loans to brown sectors).

We documented the largest expansion in grey sectors, in particular among banks and real estate firms. However, it is challenging to trace the final destination of the capital flows overall, as we do not observe how the institutions allocate the capital after it is deployed. Given that the highest fraction of new loans and underwritings are provided to Western European firms, EU-level regulations, such as the EU taxonomy for sustainable activities, may address this friction in transparency.

Putting financial flows onto a Paris-compliant trajectory requires understanding the driving forces behind these investments, by engaging with relevant stakeholders and increasing the granularity of the underlying data, which should be complemented with listed equity and bond holdings. Furthermore, financial institutions are just one of the contributors of capital to both green and brown investments. Corporate self-financing is a major capital provider that also needs to be studied.

In sum, a lot of work is left to be done for a net-zero future, which should build on an alliance of policymakers, the financial market, and society as a whole. That work requires transparency and data availability, particularly for investment flows as a first step.

References

2DII. (2020). *PACTA for Banks Methodology Document: Climate scenario analysis for corporate lending portfolios, version 1.1.0*. https://www.transitionmonitor.com/pacta-for-banks-2020/methodology-and-supporting-materials/

2DII. (2021). *Methodology & Supporting Documents*. https://www.transitionmonitor.com/pacta-for-banks-2020/methodology-and-supporting-materials/

Aden, N. (2022). *One foot in front of the other: Science-based targets and the march to net zero. The Green Bond: Your insight into sustainable finance*. https://sebgroup.com/siteassets/cision/documents/2022/20220203-sebs-the-green-bond-energy-investments-to-surge-in-2022-en-0-3045550.pdf

As, R. van, Dijk, J., Jagt, L. van der, Piljic, D., Toor, J. van, & Zwemstra, A. (2021). *Balancing sustainability: Integrating sustainability risks into the core processes of the financial sector*. De Nederlandsche Bank.

ASIFMA. (2020). *Data Challenges and Opportunities for ESG and Sustainable Finance in Asia Pacific*. https://www.asifma.org/wp-content/uploads/2020/12/asifma-fosda-esg-and-sf-data-challenges-and-opportunities-in-asia-f20201221c.pdf

BBC. (2021, November 6). *Climate change: The US state taking on an oil giant for greenwashing*. https://www.bbc.com/news/blogs-trending-59070451

Beenes, M.,Warmerdam, W., Termorshuizen, D. (2021). Exposing Scandinavian Bank Finance for Fossil Fuels. https://fairfinanceguide.se/media/60041/banking-on-thin-ice.pdf

Berk, J., & DeMarzo, P. (2014). *Corporate Finance - Third edition*. Pearson.

Bethel, J. E., & Krigman, L. (2008). Managing the Costs of Issuing Common Equity: The Role of Registration Choice. *Quarterly Journal of Finance and Accounting*.

Bingler, J. A., Kellenberger, S., & Watson, C. (2021). *Consistency case study: Actions supporting Article 2.1c of the Paris Agreement in Switzerland. San Francisco and London: Climate Works Foundation and ODI. Part of 'Climate-consistency of finance flows: IGST case study series*. https://odi.org/en/publications/consistency-case-studies-actions-supporting-article-21c-of-the-paris-agreement-in-colombia-and-switzerland/

Boffo, R., & Patalano, R. (2020). *ESG Investing: Practices, Progress*. https://www.oecd.org/finance/ESG-Investing-Practices-Progress-Challenges.pdf

BP. (2021, February 8). *Bp advances offshore wind growth strategy; enters world-class UK sector with 3GW of advantaged leases in Irish Sea*. https://www.bp.com/en/global/corporate/news-and-insights/press-releases/bp-advances-offshore-wind-growth-strategy.html

Braga, C., Vleeschhower, M., Pacheco, D., Büchler, A., & Wessel, J. (2022). *Heading North: Assessing the alignment of the Norwegian financial sector with the Paris Agreement*. (2oC Investing Initiative (2DII) PACTA Publication). https://2degrees-investing.org/resource/assessing-the-alignment-of-norways-financial-sector-with-the-paris-agreement/

Carbajal, A. L., Squella, X. R., & Watson, C. (2021). *Consistency case study: Actions supporting Article 2.1c of the Paris Agreement in Colombia* (Climate-Consistency of Finance Flows: IGST Case Study Series). https://www.climateworks.org/wp-content/uploads/2021/03/iGST_21c_Case_Study_Colombia.pdf

Corporate Finance Institute. (2022). *What is a Short Term Loan?* https://corporatefinanceinstitute.com/resources/knowledge/finance/short-term-loan/

Dick-Nielsen, J., Stenbo Nielsen, M., & von Ruden, S. L. (2021). The value of bond underwriter relationships. *Journal of Corporate Finance, Vol. 68*.

ECB. (2020). *Guide on climate-related and environmental risks: Supervisory expectations relating to risk management and disclosure*. https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.202011finalguideonclimate-relatedandenvironmentalrisks~58213f6564.en.pdf

ECB. (2021). *Climate-relate risk and financial stability*. https://www.ecb.europa.eu/pub/pdf/other/ecb.climateriskfinancialstability202107~87822fae81.en.pdf

EIA. (2015, September 24). *Today in Energy. Sustained low oil prices could reduce exploration and production investment*. https://www.eia.gov/todayinenergy/detail.php?id=23072#

EQT. (2021). *EQT 2021 Q3 interim report*. https://news.cision.com/eqt/r/eqt-ab--publ--q3-announcement-2021,c3436066

Eurostat. (n.d.) Glossary: Carbon dioxide equivalent (Accessed 20 June 2022). https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Carbon_dioxide_equivalent#:~:text=A%20carbon%20dioxide%20equivalent%20or,with%20the%20same%20global%20warming

European Commission. (2021a). *EU Taxonomy Compass*. https://ec.europa.eu/sustainable-finance-taxonomy/activities/activity_en.htm?reference=3.4

European Commission. (2021b). *EU Taxonomy Compass. Acquisition and ownership of buildings*. https://ec.europa.eu/sustainable-finance-taxonomy/activities/activity_en.htm?reference=7.7

Fair Finance Guide (2022). https://fairfinanceguide.se/

Federal Reserve. (2021). *Syndicated Loan Portfolios of Financial Institutions*. https://www.federalreserve.gov/releases/efa/efa-project-syndicated-loan-portfolios-of-financial-institutions.htm

Finansinspektionen. (2021a). *Enhanced review of sustainability in banks*. https://www.fi.se/en/published/press-releases/2021/enhanced-review-of-sustainability-in-banks/

Finansinspektionen. (2021b). *Sustainability Report 2021- the climate in focus*. https://www.fi.se/en/published/reports/reports/2021/sustainability-report-2021--the-climate-in-focus/

Gadanecz, B. (2004). *The syndicated loan market: Structure, development, and implications* (BIS Quarterly Review). https://www.bis.org/publ/qtrpdf/r_qt0412g.htm

Handelsbanken. (2020). Annual Sustainability Report, 2020. https://www.handelsbanken.se/shb/inet/icenten.nsf/vlookuppics/nl_about_nl_annual_and_sustaibability_2020/$file/annual_and_sustainability_report2020.pdf

Hirvinen, T., & Peurala, M. (2022). *The Green Bond: Your insight into sustainable finance. Science-based targets initiative and its impact on capital flows*. https://sebgroup.com/siteassets/cision/documents/2022/20220203-sebs-the-green-bond-energy-investments-to-surge-in-2022-en-0-3045550.pdf

Houben, S. J., Schellekens, G., & Zander, K. (2021). *The clock is ticking for banks to manage climate and environmental risks*. https://www.bankingsupervision.europa.eu/press/publications/newsletter/2021/html/ssm.nl210818_5.en.html

Huang, R., Zhang, D., & Zhao, Y. (2018). Relationship Banking and Loan Syndicate Structure: The Role of Private Equity Sponsors. *The Financial Review*. https://doi.org/10.1111/fire.12146

I4CE. (2018). *Landscape of climate finance in France: Edition 2018*. https://www.i4ce.org/download/2018-edition-of-i4ces-landscape-of-climate-finance/

ICMA. (2020). *Bond Market Size*. https://www.icmagroup.org/Regulatory-Policy-and-Market-Practice/Secondary-Markets/bond-market-size/

ICMA. (2021a). *Social Bond Principles*. https://www.icmagroup.org/sustainable-finance/the-principles-guidelines-and-handbooks/social-bond-principles-sbp.

ICMA. (2021b). *Sustainability Bond Guidelines*.

IEA. (2020). *Global investments in oil and gas upstream in nominal terms and percentage change from previous year, 2010-2020*. https://www.iea.org/data-and-statistics/charts/global-investments-in-oil-and-gas-upstream-in-nominal-terms-and-percentage-change-from-previous-year-2010-2020

IEA. (2021). *Tracking Buildings 2020*. https://www.iea.org/reports/tracking-buildings-2020

Ihejirika, N. (2019). The Canadian Oilsands and Strategic. *The Oxford Institute for Energy Studies*, *56*.

Insurance Sweden. (2021). *Insurance companies have large assets*. https://www.svenskforsakring.se/en/the-insurance-industry/insurance-companies-have-large-assets2/

IRENA. (2018). *Global Energy Transformation: A roadmap to 2050*. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Apr/IRENA_Global_Energy_Transformation_2019.pdf

Jachnik, R., Mirabile, M., & Dobrinevski, A. (2019). *Tracking finance flows towards assessing their consistency with climate objectives: Proposed scope, knowns and unknowns* (No. 146; OECD Working Papers). https://www.oecd-ilibrary.org/environment/tracking-finance-flows-towards-assessing-their-consistency-with-climate-objectives_82cc3a4c-en

Judge, K., & Berner, R. (2019). *The data standardization challenge* [Columbia Law and Economics Working Paper].

Kaiser, M. J. (2021). A Review of Exploration, Development, and Production Cost Offshore Newfoundland. *Natural Resources Research*, *30*, 1253–1290.

Law, B. E., Tara, W. H., Logan, T. B., Jeffre, J. K., Polly, C. B., & Mark, E. H. (2018). Land use strategies to mitigate climate change in carbon dense temperate forests. *Proceedings of the National Academy of Sciences*, *Vol.115*(14). https://doi.org/10.1073/pnas.1720064115

Leturcq, P. (2020). GHG displacement factors of harvested wood products: The myth of substitution. *Nature*.

LMA. (2021). *Green Loan Principles*. https://www.lma.eu.com/application/files/9115/4452/5458/741_LM_Green_Loan_Principles_Booklet_V8.pdf

Maltais, A., & Nykvist, B. (2020). Understanding the role of green bonds in advancing sustainability. *Journal of Sustainable Finance and Investment*. https://doi.org/10.1080/20430795.2020.1724864

Miner, R. (2010). *Impact of the global forest industry on atmospheric greenhouse gases* (No. 159; FAO Forestry Paper). https://www.fao.org/3/i1580e/i1580e00.htm

Naturskyddsforeningen. (2021). *Våra fossila pensioner- En granskning av AP-fondernas aktiva ägande av fossila bolag*. https://old.naturskyddsforeningen.se/sites/default/files/dokument-media/vara_fossila_pensioner_2021_03_05_0.pdf

Niccolò, M., Steckel, J. C., & Jakob, M. (2021). Finance-based accounting of coal emissions. *Environmental Research Letters, 16(4)*(044028). https://doi.org/10.1088/1748-9326/abd972

Nordea. (2015). Nordea 2015 Annual Report. https://www.nordea.com/en/doc/nordea-bank-annual-report-2015.pdf

Nykvist, B., Maltais, A., & Olsson, O. (2020). *Financing the decarbonisation of heavy industry in Sweden*. https://www.stockholmsustainablefinance.com/financing-the-decarbonisation-of-heavy-industry-sectors-in-sweden/#:~:text=A%20new%20report%20by%20researchers,additional%20to%20those%20needed%20to

PACTA. (2021). *Assessing the alignment of the Liechtenstein financial sector with the Paris Agreement*. https://2degrees-investing.org/resource/assessing-the-alignment-of-the-liechtenstein-financial-sector-with-the-paris-agreement/

PCAF. (2020). *The Global GHG Accounting and Reporting Standard for the Financial Industry*. https://carbonaccountingfinancials.com/standard

PCAF. (2021). *Strategic Framework for Paris Alignment: A global landscape overview of resources for financial institutions, from measuring financed emissions to taking action*. Guidehouse, PCAF Secretariat.

Rajan, R. G., & Zingales, L. (1998). Financial dependence and growth. *The American Economic Review, 88(3)*, 559–586.

Refinitiv. (2020). *Sustainable Finance Review- Full Year 2020*.

Refinitiv. (2021). *Global Syndicated Loans Review- first half 2021*.

Reghezza, A., Altunbas, Y., Marques-Ibanez, d'Acri, C. R. & Spaggiari, M. (2021). Do banks fuel climate change? ECB Working Paper No. 2550. https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2550~24c25d5791.en.pdf

Riksbanken. (2021). *Klimatrisker i policyarbetet* (Riksbankens Klimatrapport, December). https://www.riksbank.se/globalassets/media/rapporter/klimatrapport/2021/riksbankens-klimatrapport-december-2021.pdf

Rydlund, M., König, J., & Engqvist, J. (2021). *Forests on Fire: The role of Swedish banks in deforestation of the Amazon and Cerrado*. https://fairfinanceguide.org/ff-international/case-studies/2020/forests-on-fire/

Science-Based Targets (2022a). https://sciencebasedtargets.org/

Science-Based Targets (2022b). About us. https://sciencebasedtargets.org/about-us

Science-Based Targets (2021a). SBTi Corporate Net-Zero Standard. https://sciencebasedtargets.org/resources/files/Net-Zero-Standard.pdf

Science-Based Targets (2022c). Financial Sector Science-Based Targets Guidance. https://sciencebasedtargets.org/resources/files/Financial-Sector-Science-Based-Targets-Guidance.pdf

Science-Based Targets (2021b). Foundations for Science-Based Net-Zero Target Setting in the Financial Sector: Draft for Public Comment. https://sciencebasedtargets.org/resources/files/Foundations-for-Science-Based-Net-Zero-Target-Setting-in-the-Financial-Sector.pdf

SEB. (2015). SEB 2015 Annual Report. https://webapp.sebgroup.com/mb/mblib.nsf/alldocsbyunid/32751F6CED9544D1C125869C00552508/$FILE/annual_report_2015.pdf

Spuler, F., Thoma, J., & Frey, R. (2020). *Bridging the gap- measuring progress on the climate goal alignment and climate actions of Swiss financial institutions*.

Statistics Sweden. (2021). *Snabba fakta om Sveriges BNP*. ttps://www.scb.se/hitta-statistik/sverige-i-siffror/samhallets-ekonomi/bnp-i-sverige/

Swedish Bankers Association. (2018). *Banks in Sweden 2018*. https://www.swedishbankers.se/media/4145/1407-sbf-bankerna-i-sverige_en04.pdf

Swedish Bankers Association. (2020). *Bank and finance statistics, 2020*. https://www.swedishbankers.se/media/4944/1407-sbf-bank-och-finansstatistik_202005_en02.pdf

Timperley, J. (2021). *The Fight To End Fossil-Fuel Subsidies. Vol. 598*.

UNFCCC. (2015). *United Nations Framework Convention on Climate Change: Paris Agreement*. https://unfccc.int/sites/default/files/english_paris_agreement.pdf

US SIF. (2018). *Report on US Sustainable, Responsible and Impact Investing Trends. Report by the US SIF Foundation*.

World Bank Group. (2018). *Global Economic Perspectives: Broad-based upturn, but for How Long?* https://openknowledge.worldbank.org/handle/10986/28932

Appendix

Table A1. Summary of different methodologies and tools for assessing Paris alignment

	Measurement	Target-setting	Steering	Tracking progress	Reporting
Tool/methodology	PCAF – Partnership for Carbon Accounting Financials	SBTi – Science Based Targets Initiative	PACTA – Paris Agreement Capital Transition Assessment	Transition Pathway Initiative	Poseidon Principles
Sector	Cross-sectoral	Cross-sectoral	Power, fossil fuels, automobile, cement, steel, shipping and aviation	Cross-sectoral	Shipping
Asset classes	Listed equity and bonds, business loans and unlisted equity, commercial real estate, mortgages, motor vehicle loans, project finance	Real estate (commercial and residential), mortgages, electricity generation project finance, corporate debt and equity	Public equity, corporate bonds, corporate lending	Equities (assets to include fixed income)	Lenders, lessors, and financial guarantors with shipping portfolios
Metrics/data	Greenhouse gas emissions	Greenhouse gas emissions	Technology exposure based on asset-level data or greenhouse gas emissions intensity	Carbon intensity	Annual Efficiency Ratio based on fuel consumption
Geographical coverage	Initially Netherlands (14 financial institutions – 2015), then to North America (Canada & United States) and now global.	Global	Global	Global	Global

Sources: Wissenburg et al. (2021), PCAF (2020) and 2DII (2021) with authors' additional elaboration

Notes: Measurement (how do I measure progress?); Target-setting (where do I want to go?); Steering (how do I get there?); Tracking progress (where do I stand?); Reporting (how I am doing?)

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