IT'S ON YOU!

Bringing climate assessments for household credit into the 21st Century

H2020 - Grant agreement No 649982

2° Investing Initiative

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About the Sustainable Energy Investing Metrics project:

The project aims to develop a climate performance framework and associated investment products that measure the exposure of financial portfolios to the 2°C economy. The metrics, benchmarks, and tools will enable investors to align their portfolio with decarbonization roadmaps. The project runs from March 2015 to March 2018 and mobilizes over €2.5m in funding. Consortium members in the project include the 2° Investing Initiative, CIRED, WWF Germany, Kepler-Cheuvreux, Climate Bonds Initiative, Frankfurt School of Finance & Management, CDP, WWF European Policy Office and the University of Zurich.

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1. Introduction

The Paris Agreement Art. 2.1(c) creates a political mandate to align financial flows with climate goals, sparking a flurry of activity by state and non-state actors to develop the needed methodologies. There has been significant progress in this regard with projects such as the Paris Agreement Capital Transition Assessment and "Developing Sustainable Energy Investment (SEI) metrics, benchmarks and assessment tools for the financial sectors". This report situates itself in the broader context of above mentioned market initiatives and research around aligning financial markets with the Paris Agreement with a focus on 2°C scenario and climate assessments for consumer loans.

Despite their prominence, climate assessments for consumer loans have been limited to date, with few pilots and limited adoption by market actors. This report represents the first overview of climate assessment and 2°C scenario alignment analysis for consumer loans. The aim of this report is to take a closer look at the different consumer loan types and assess how and in what way climate indicators could be found to benchmark these investments similarly against different climate scenarios. This assessment will not cover mortgages, which are treated separately in an in-depth report here.

The report will mobilize the existing approaches for portfolio analysis (2° Investing Initiative, 2015a, 2° Investing Initiative, 2015b), all of which can be transferred and adapted to consumer loans. The discussed methodologies are:

- **Carbon footprinting:** A cross-loan assessment of exposure to GHG emissions.
- **Green/brown metrics**: A loan specific metric to distinguish between activities and technologies that are climate solutions and climate problems.
- **Climate (ESG) scores:** Qualitative indicators provided by ESG (environment, social and governance) analysis based on quantitative and qualitative indicators such as carbon footprints and green/brown metrics.

Consumer loans comprises **four different loan or debt types: mortgages, student loans, automobile loans and general household credit (e.g. credit cards debt, payday loans)**. The composition of these vary from country to country, with mortgages being the largest in most. Both carbon footprinting and green/ brown metrics, and therefore ultimately climate scores as well are easily transferable to secured loans such as mortgages or automobile loans. For unsecured consumer loans such as credit card debt or student loans, the data requirements for implementation are much higher as the connection to a physical asset is not as straightforward as for secured loans.

In terms of impact, climate assessments for consumer loans can generate both behavioural effects on consumers, as well as changes in the relative pricing of low-carbon to high-carbon lending instruments. At the same time, it is unclear to what extent this area of research can help inform and improve financial risk assessments.

The remainder of the report is structured as follows: section 2 takes a closer look at the four different types of consumer finance at how they vary across countries, more specifically the United States and Germany. In Section 3 climate methodologies are discussed, and their feasibility is assessed regarding the different loan types. Section 4 provides some concluding remarks.

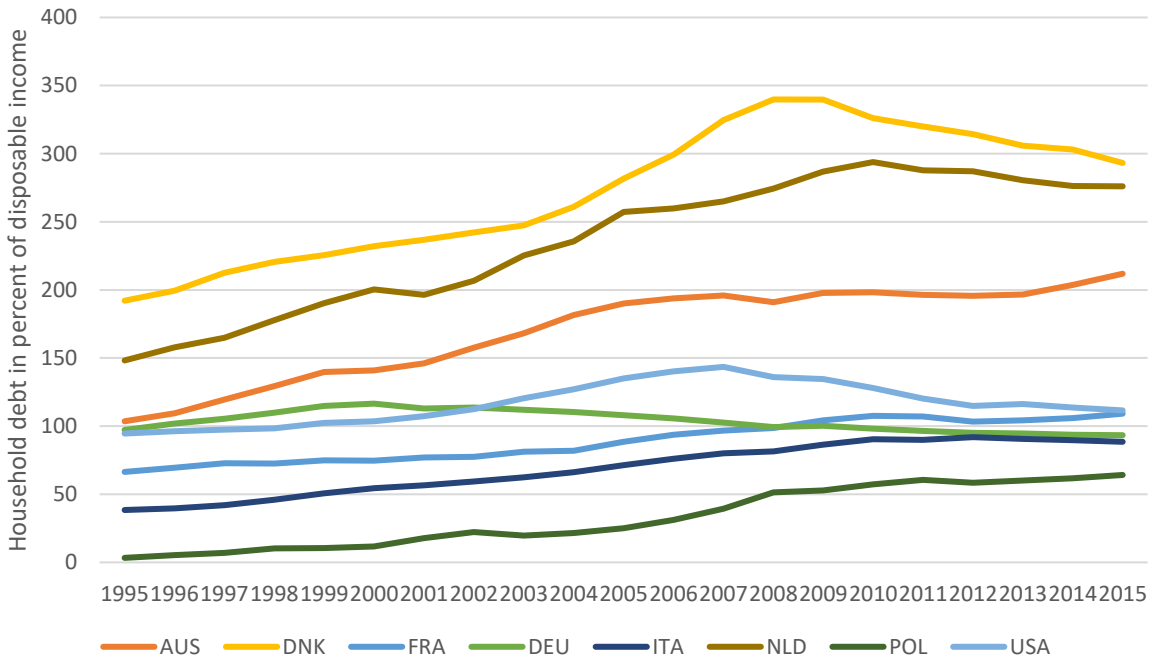
2. A typology of household credit

2.1 Overview

The interest in consumer loans for the use of climate indicators is twofold. Firstly, household debt plays a prominent role in OECD economies and secondly, they let us draw conclusions about consumer behaviour. The volume of consumer loans varies from country to country. Even across OECD countries it is difficult to say what would constitute a normal level. Household debt ranges from around 60% of net disposable income in some Central and Eastern European countries such as Poland to over 100% in United States and France and finally to above 200% in countries like Australia, Denmark, or the Netherlands.

Figure 1 shows the household debt in percent of disposable income from 1995 onwards for selected OECD countries. The common trend for nearly all countries is that household debt increased up to the financial crisis in 2008. While household debt keeps on increasing for some countries even after the financial crisis for the majority it turns flat or starts to decline slowly. The reasons for the different developments are often country specific and have been subject of various economic studies of with a distinct focus on mortgage loans (Zinman, 2015; André, 2016; Barba & Pivetti, 2008; Mian & Sufi, 2014). However, the fact that the overall level of household debt remains high throughout the selected countries is of interest, as it bestows relevance to the analysis of household debt.

Figure 1: Household debt in percent of disposable income from 2000 - 2015



Source: https://data.oecd.org/hha/household-debt.htm

Furthermore, not only the absolute amount of consumer loans varies across countries but their composition as well. According to (Zinman, 2015) mortgage debt is above 50% of total household debt in every G7 country except Italy. Mortgage debt is the main type of secured debt. It is secured in a way that in a way that the physical asset behind the loan which serves as collateral in case of insolvency of the debtor. In comparison an unsecured loan could be a student loan or credit card debt, which would leave nothing to repossess in the case of an insolvency.

2.2 Credit instruments by type

The following briefly summarizes the different type of debt instruments and their classification:

- **Mortgage loans** are a type of **secured personal loans** used to buy or renovate some form of real estate. They constitute by far the largest single share of loan types. Moreover, from a climate perspective they are arguably the most important type of credit as real estate constitutes an estimated 36% of total GHG emissions worldwide.[1] Given its prominence, and its frequent treatment as a distinct asset class, climate assessments for mortgages are addressed in a separate, stand-alone report.[2]

- **Automobile loans** are also a type **of secured personal loans** which are used to buy a personal road transport vehicle (e.g. light-passenger duty vehicle, minibus, motorcycle).[3] These are either provided by a traditional bank or by a **captive lender** (i.e. the financing arm of an automobile manufacturer). Automobile loans intuitively also play a critical role from a climate perspective. The transport sector accounts for an estimated 23% of global GHG emissions, of which ~74% is road transport. Of those, around half are related to light-duty vehicles. By extension, around 8-10% of global GHG emissions are linked to light-duty vehicles. As will be explored later, of particular interest with regard to decarbonization here is the question of the switch to sustainable powertrains (e.g. electric) and fuel efficiency.

- **Student loans** are **unsecured personal loans**, as they lack a physical asset behind the loan (although of course in theory a non-physical asset in the form of augmented human capital). Their importance varies immensely from country to country and the way the higher education is financed. Thus, in the United States and the United Kingdom, student loans play an important role, while in countries like Germany – with a free tertiary education system – they are almost non-existent. The logic of climate impacts for student loans are of course more difficult to parse than for physical assets, that is not to say however that they are irrelevant.

- **General household credit** is also a form of **unsecured loan**. Within this category, the most prominent type is credit card debt. The analysis of credit card debt is limited by the availability and the quality of data at hand. Other credit instruments however also exist, such as **deferred payment schemes** for larger types of **household appliances**. These types of loans are usually also provided by a captive lender (e.g. the credit card company or the vendor of household appliances). While not secured, the upside of this type of credit instrument from a data and assessment perspective is that it is usually associated with some form of direct expenditure and can thus be linked to an economic activity, which in turn can be linked to a climate impact.

Without creating a hierarchy, it is nevertheless important to disentangle the different options of climate assessments by instrument. As the categorization highlights, assessments likely from a technical perspective in practice require tailored approaches for each type of instrument. Moreover, the application of assessments in different countries may be more or less relevant given the prominence of the underlying financing in the total balance sheet.

[1] https://aaltodoc.aalto.fi/handle/123456789/29022
[2] "Aligning Buildings with a Climate Compatible 2050: Insights and developments from the Green Bond Market" Climate Bonds Initiative
[3] While technically covering non-automobile vehicles as well (e.g. motorcycles), the instrument is generally referred to as automobile loans in macro statistics and sector classification schemes.

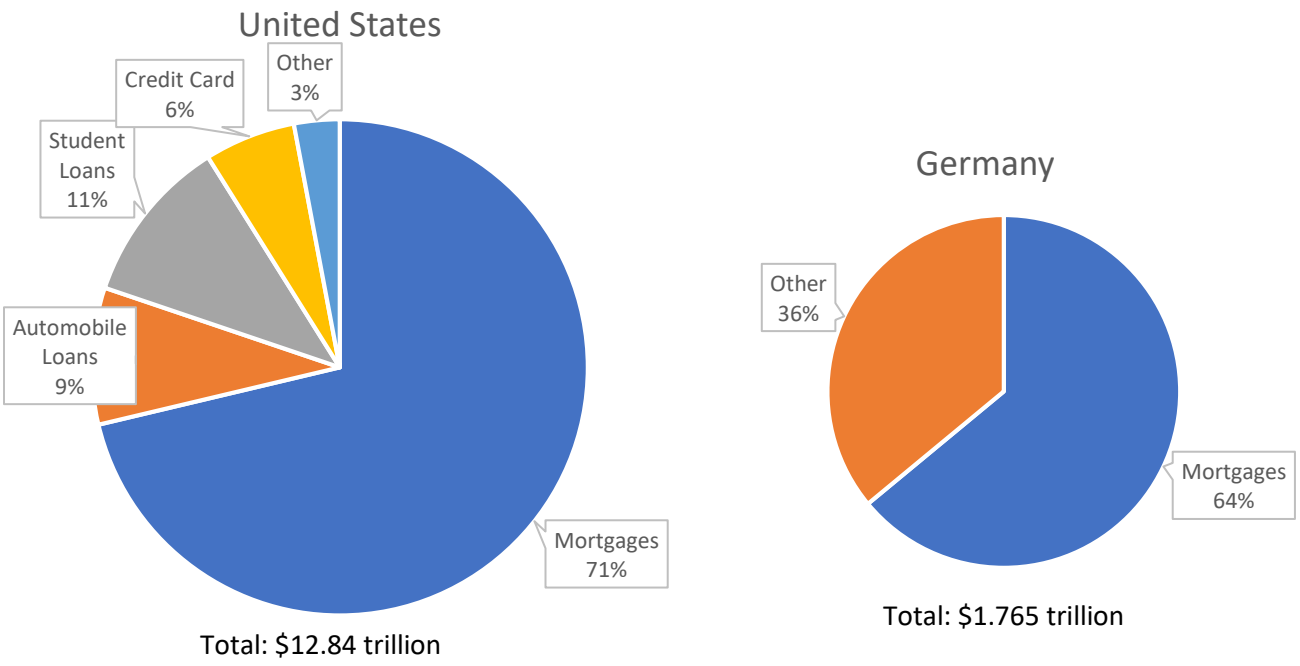
CASE STUDY: CONSUMER LOANS IN GERMANY AND THE UNITED STATES

The following highlights the differences in composition for two different countries, i.e. the United States and Germany. Figure 2 depicts the composition of household debt in the two countries. With close to $13 trillion the US household debt market is more than seven times larger than the German one. German household debt has been on a slow decline since the mid-2000s as seen in Figure 1. As with most OECD economies, mortgage and home equity loans make up the single largest share of debt with around 71 percent in the US and 64 percent in Germany. Uniquely to the US, student loans with around 11 percent make up the second largest share, representing close to $1.3 trillion. To put this into perspective, in the United Kingdom which also charges for tertiary education, total outstanding student debt just surpassed $130 billion in early 2017 (Monaghan & Weale, 2017).

Automobile and credit card loans make up 9 percent and 6 percent respectively in the US. The residual share of consumer finance, such as sales financing and personal loans, is bundled in 3% other category.

For Germany the situation is broadly similar, if in absolute terms on a much smaller scale. As the Bundesbank only publishes data on mortgage loans, comparisons beyond this point are not possible. The next chapter will discuss how and in what way climate indicators can be used to analyze and label consumer loans.

Figure 2 Total Debt and its Composition in Germany and the United States in trillion USD for latest available data



Source: Own illustration with data from (Federal Reserve Bank of New York, 2017; Bundesbank, 2016; Destatis, 2016).
Please note that the pie charts are not drawn to scale.

3. Assessing the climate impact of household credit

3.1 Overview

Assigning climate indicators to consumer loans is no easy task, not at least since consumer loans are such a diverse class of investments. Several different frameworks are possible to assess consumer loans with different focus and possible application each:[4]

- **Carbon footprinting**: GHG emissions accounting of the underlying activity.
- **Green/brown metrics:** A loan specific metric to distinguish between activities and technologies that are 'climate solutions' and 'climate problems'.
- **Climate/ESG scores:** Qualitative indicators provided by ESG (environment, social and governance) analysis based on quantitative and qualitative indicators such as carbon footprints and green/brown metrics.

A possible application with consumer loans is given in the remainder of the section. Table 1 gives a more detailed overview of all three methodologies first.

Table 1: Overview of climate-friendly metrics and their potential application to consumer finance

	Description & Example	Application	Pros	Cons
Carbon Footprint	Cross-loan type assessment of exposure to greenhouse gas (GHG) emissions	• Connecting the dots between loan types and climate change • Screening on micro-level e.g. credit card purchases • Real estate energy efficiency measures • Behavioural change through gamification	• Broad information on climate intensity of sectors • Prominence among corporates and experience • Standardization of corporate reporting across models for automobile loans	• High uncertainty associated with data at purchase level for credit card debt • Incomplete coverage • Lack of accounting standard
Green/ Brown Metrics	Loan-type specific indicators distinguishing between activities and technologies that are climate solutions and climate problems	• Negative / positive screening for a specific loan type e.g. automobile loans • Behavioural change trough gamification approach on individual level • Engagement on investment	• Quantitative indicator with high data transparency	• Not applicable to all loan types • Difficult to aggregate across loan types
Climate /ESG Scores	Qualitative indicators based on quantitative and qualitative climate metrics, including carbon and green / brown exposure metrics.	• Engagement on climate issues together with non-climate issue • Behavioural change through gamification approach on individual level	• Summary indicators capturing a range of factors • Established frameworks	• Black box • Risk of greenwashing • Not directly linked to a specific strategy

Source: Authors, based on 2°ii 2015

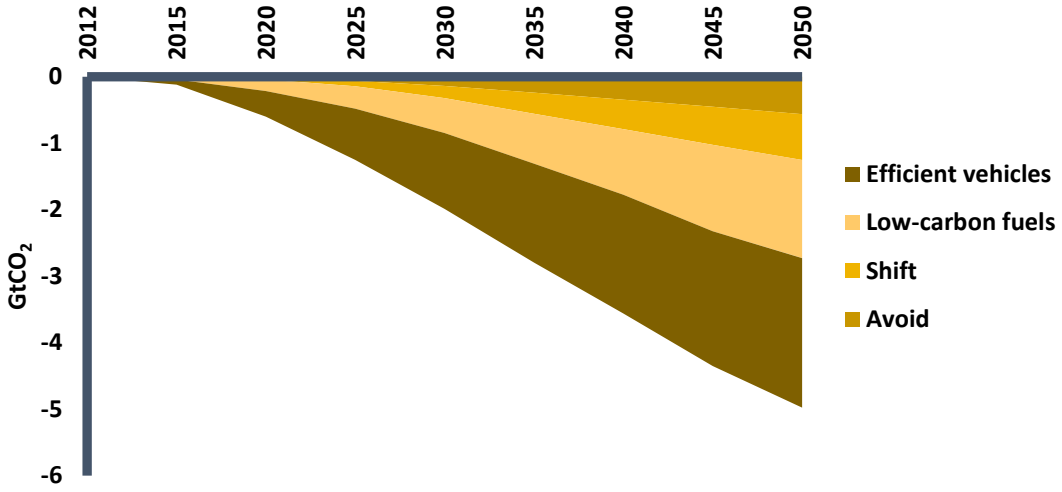
[4] For a more detailed discussion of climate friendly metrics, see (2° Investing Initiative, 2015)

3.2 Automobile loans

Assessing the impact of secured loans is in so far easier than unsecured loans as there is a physical asset behind the loan for which a climate metric can be computed. As data availability is highest in the US, the following examples will be based on US data, however in most western countries the situation is comparable. The automobile market consists of loans, leases and cash purchases for new and used cars respectively (KPMG, 2012; Experian, 2016). Even though leases are growing in share, loans still make up around 54 percent of new car purchases, with around 31 percent leases and 15 percent cash purchases (Experian, 2016). Only about a third of car loans are given by banks, another 25 percent are provided by the financial subsidiaries of the producer, i.e. Honda Finance or Ford MCC. The remainder of car loans are provided by various other financial institutions such as credit unions (Experian, 2016).

The first question in terms of climate assessments is the scope. Arguably, the assessment should be restricted to loans for purchasing a new car, as only these change the composition of a car fleet, while the purchase of a used car only changes the ownership structure of the fleet. [5] At the same time, second hand car markets are a key value driver. For example, the collapse of the second-hand diesel market in Europe sends a significant signal to the new car market and indeed from a financial risk perspective are not to be discounted. Thus, while not directly financing changes in the car composition, second-hand car financing does send market signals

Figure 3: Light duty vehicle emissions avoidance required under



Source: 2ii and IEA, 2015

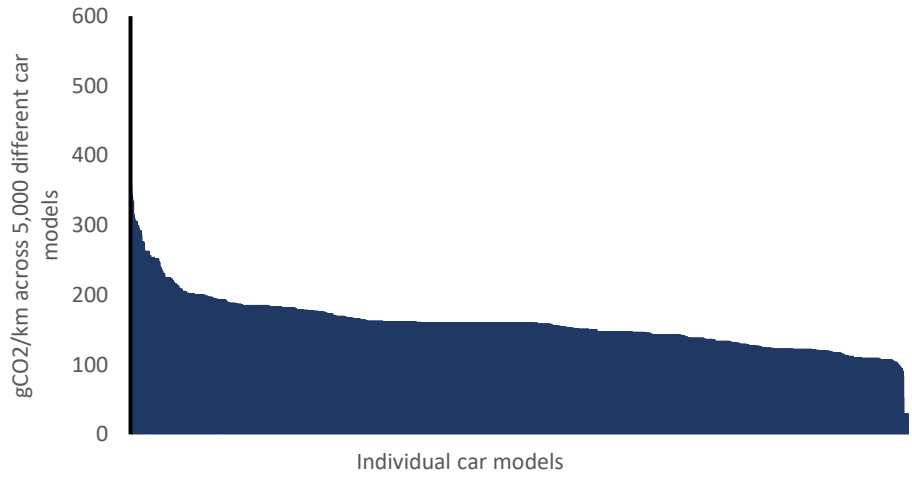
To achieve the required emissions reductions in the automobile market (see figure 3) the IEA has focused on four drivers of decarbonization: efficient vehicles, low-carbon fuels, shift, and avoid. The results of applying the relative contribution of these four drivers to light duty passenger vehicle decarbonisation can be seen in Figure 3. As will be outlined below, given the relative maturity of low-carbon alternatives to internal combustion engines (ICE) for light passenger duty vehicles compared to for example shipping and aviation, it is likely that in this case the relative contribution of 'low-carbon fuels' to decarbonisation is higher for LDV than for the market as a whole. Nevertheless, the broad ratios are likely to hold, with efficiency and low-carbon fuels accounting for the primary driver.

[5] It can of course also be applied to loans used for purchasing used cars as well.

In the analysis of the automobile sector, it is also important to analyse the financing structure. Estimating total financing levels from investment levels is relatively trivial in the case of automotive financing due to the relative simplicity of automotive financing vs. power sector financing. Largely personal vehicles are either not financed (i.e. paid for upfront in cash, 15% of sales), leased (a record 31% of the market in 2016), or purchased with a loan (54% in 2016). Within the portion purchased with a loan, average loan-to-value (ratio of loan amount to value of automobile) is around 90% for household purchases (95% of total market; Automotive Fleet 2017). For simplicity and illustration, here we assume these financing ratios will be stable for the near term (through 2025). These assumptions yield a total financing level of approximately $270 billion/yr in 2016, matching the total new car loan origination value (CFPB 2017; EXPERIAN 2017)

Given the availability of granular and automobile-specific scenarios for the automobile sector, the analysis may be more straight-forward than for diverse economic activities. On the one hand, as highlighted above, specific scenario data exists, including detailed scenario data on needed improvements in terms of 2°C. Equally, there is a significant body of data on the climate performance of cars

Figure 4: Distribution of GHG emissions intensity by car model



Source: 2°ii 2017

Efficiency figures for light-passenger duty vehicles are publicly available in most major geographies and can be used for calculating a carbon footprint for example (see Fig. below). These can then also be benchmarked to IEA scenarios in terms of GHG emissions trends. However, it would make sense to focus on "production" emissions only, as emissions through different types of usage are hard to predict and might be caught through the analysis of credit card debt (e.g. buying gas). While data is readily available, it should also be noted that fuel efficiency estimates are fraught with data problems. As highlighted by Tietge et al. (2015),[6] the difference in lab to real-world performance of cars has skyrocketed to 40-50%. This should give moment for pause in applying the data, especially since differences are not equally distributed across car manufacturers.

[6] https://www.theicct.org/sites/default/files/publications/ICCT_LaboratoryToRoad_2015_Report_English.pdf

An alternative approach is to discriminate car models based on powertrain (e.g. hybrid, fuel cell, electric, internal combustion engine). This is the approach currently applied in the 2°C scenario analysis tool developed as part of the Sustainable Energy Investing metrics and LIFE Paris Agreement Capital Transition Assessment projects for corporate credit and equity portfolios. The following case study highlights this approach in more detail.

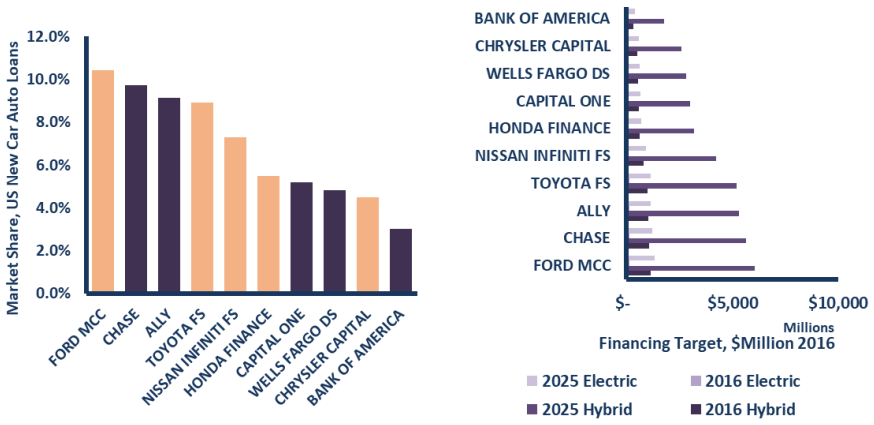
CASE STUDY – DEVELOPING FINANCING TARGETS FOR AUTO CREDIT PORTFOLIOS (TAKEN FROM WEBER ET AL. 2017)

Unlike with power sector financing, mandate-driven organizations do not represent a material share of the financing market in automotive finance, which is instead largely made up of banks and bank-like entities (e.g. credit unions) as well as 'captive' financing companies, wholly owned subsidiaries of automakers that provide financing to purchasers of that company's (and only that company's) vehicles (see Figure below, top 10 auto loan financers in US). Assigning financing targets for green vehicles to such captive financers, as would be required under the assumption that all financial institutions should do their 'fair share' toward the 2°C goal (2DII 2015; 2017), is not necessarily fair to these companies, since they are extremely unlikely to meet their financing target if the underlying automotive producer is not producing enough green vehicles.

Despite this inflexibility, financing targets using a 'fair share' logic are consistent with the broader discussion on Science-Based Targets (SBTI 2017) and are thus adopted here. The figure below shows derived financing targets for the top 10 automotive loan companies in the US market. It is clear that substantial growth is required to meet hybrid and electric vehicle financing goals, with hybrid vehicle financing needs growing by over 400% and electric vehicle financing needs growing by over 800% from 2016 to 2025 target levels. For instance, based on current market shares, Ford Motor Credit's 2016 target grows from approximately $140 million of EV loan origination in 2016 to $1.3 billion EV loan origination in 2025 to support its 'fair share' in the 2C transition under current price levels.

The approach suggested here allows for both a climate assessment in general terms as well as specific benchmarking of the 2°C alignment of different auto credit portfolios. Such an approach then could hypothetically also be extended to the securitization market with auto-loan backed securities.

Figure 5: Market shares for different captive lenders and respective estimated hybrid and electric vehicle financing targets under a 2C scenario and "fair share" assumption.



Source: 2°ii 2017(b)

3.3 Student loans

Student loans are a prime example of an unsecured personal loan. There is no physical asset as equivalent, which could be repossessed in case of the beneficiary becoming insolvent. The difficulty of assigning student loans a climate indicator is their intangibility. To date, there are no known market pilots on how to treat the climate friendliness or climate impact of student loans. As a result, this paper cannot rely on existing publicly available approaches. Instead, three potential research and application avenues are discussed, notably:

- Analysing the footprint of the university degree in terms of the GHG emissions associated with studying;
- Analysing the impact of the activities associated with the job likely to result from the degree;
- Analysing the income effects and by extension economic activity effects of a university degree.

Each of these avenues will be discussed in turn.

In a straightforward approach it might make sense to treat a university just like any other company and use their reported GHG emissions to calculate a carbon footprint for each university. In this scenario the student loan for one student would equal one share. The total number of shares could equal to the total number of students and faculty as well as administrative staff. Additional information such as does the student live in university housing or not, did the student graduate or not, etc. could be included in analysis.

The shortcoming with this approach is that the 'return on investment' takes place after the degree. In some ways, it is not the degree, but the future economic activity that is financed with a student loan (and indeed that is responsible for repaying it). The approach thus is somewhat reminiscent of the recent green bond issuance by the Mexico City airport, which paid for energy efficiency upgrades, but where the bond is repaid through airline airport fees.

An alternative approach is to discriminate student loans based on the impact of the economic activity expected to be implemented as a result of the degree obtained. Thus, somebody doing a degree in renewable energy management could be considered to have a low-carbon profession in the future, whereas somebody engaged in studying fields related to coal mining or oil & gas could be said to have a high-carbon degree. Indeed, such an approach would reflect the green / brown logic highlighted in the framework discussion above.

The challenge of course with this approach is that very few degrees neatly slot into one or the other category (e.g. energy economics), nor will they necessarily lead to 'default jobs'. The approach could be applied however similarly to a 'green bond' logic based on a degree classification, especially in the context of the proliferation of climate change and environmental management (and even sustainable finance linked) masters and degrees. Of course, this approach creates both a high risk of unintended consequences (assuming it actually drove action on the ground) as well as raising politically sensitive issues related to discriminating between degrees.

The third approach involves treating a university degree as a standalone impact on future earnings and by extension economic activity. This approach applies the following logic (illustrated using data from the United Kingdom):

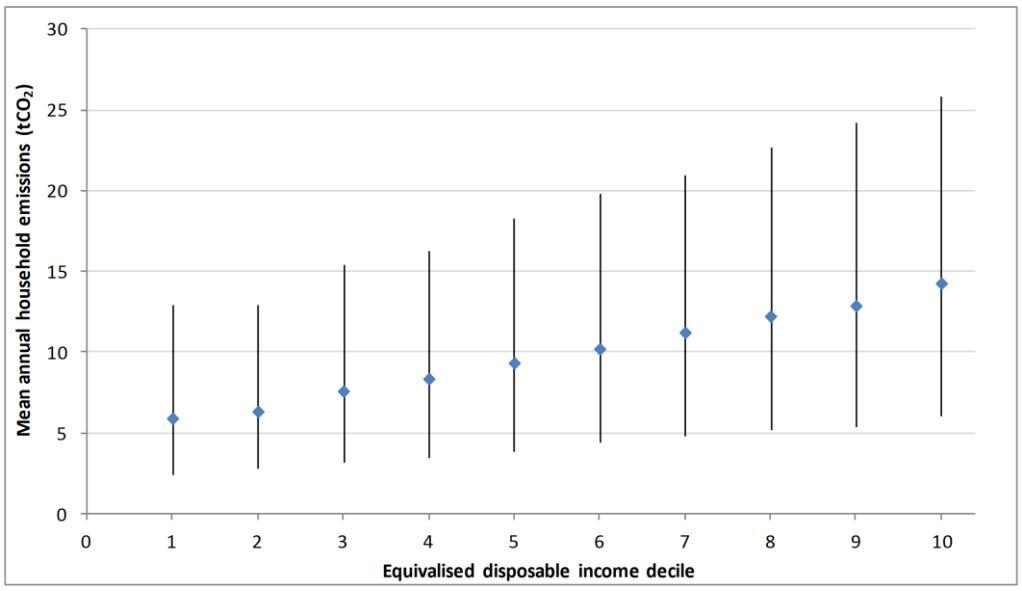
- Individuals with university degrees have higher expected lifetime earnings. In the United Kingdom, the average for this is around EUR 10,000 per year.[7]

- Higher incomes are correlated with a lifestyle and expenditure profile that is more carbon intensive. This is due to more disposable income, but also the allocation of disposable income in terms of expenditure choices. Thus, individuals in high-income households have higher usage rate of air travel and personal vehicles (taxis or personal cars). Naturally, there may be some offsetting effects. More high-income households may be more likely to invest in energy efficiency (given their access to related information as well as capital for upfront efficiency investments) and may also be more likely to pursue a 'low-carbon', vegetarian diet. According to a UK study from 2010 (admittedly somewhat out of date), 7% of individuals with household income above ~EUR 50,000 are vegetarian versus 2% with income less than ~EUR 18,000.[8]

The figure below shows the estimated mean household emissions and their distribution across 10 income deciles for the United Kingdom, demonstrating the point that households with higher income will have higher GHG emissions. The data provided here could be used to estimate the 'GHG emissions impact' of a university degree in terms of total household GHG emissions over the lifetime of an individual.

Of course, such an approach raises significant questions, not the least 'penalizing' studying, the inability to use this approach to discriminate within the asset class, and the significant uncertainty around consumption choices that lead to wide distributional outcomes. Indeed, it is this element that will be of focus for the next asset class under discussion – household credit.

Figure 6: The correlation between household income and annual household emissions in the United Kingdom



Source: Joseph Rowntree Foundation, 2013

[7] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/610805/GLMS_2016_v2.pdf
[8] https://www.vegsoc.org/page.aspx?pid=755

3.4 General household credit

Relative to student loans, the case is somewhat easier if more data intensive for the other major type of unsecured personal loans – general household credit and notably credit card debt. Credit card debt could also be analysed by either a carbon footprint or green/ brown methodology. The key here is that a credit card company knows to a certain degree on what their customers spend their money on. If they were to analyse the purchases made, banks could allocate an appropriate carbon footprint each purchase. The credit card company could then inform the consumer about her carbon footprint together with the monthly credit bill as well as accurately assess the carbon footprint of the credit card debt on its balance sheet.

This approach obviously works better the more transactions can be accurately be properly classified. For this a database would be needed connecting different transactions like buying gas, eating at a restaurant or shopping for groceries. But these examples already show the difficulty of this endeavour. While a carbon footprint for tank of gas is easily comparable a meal at a restaurant or groceries are not. The credit card provider only knows the total amount but not the individual items. Surely a vegetarian meal should have a lower carbon footprint than a meal at a steakhouse. The same holds true for grocery shopping. It all depends of what kind of groceries one buys. This means carbon footprint for credit card data can supply rough estimates at best.

An alternative to such fine-grained data analysis might be the use of a green/ brown metric. This way certain groups of transactions could be taken together and labelled accordingly. Here the claim would not be to provide an exact carbon footprint but just an indication of what helps and what does not. Nevertheless, even a green/ brown metric suffers from lack of insufficiently precise data if one thinks again of the grocery shopping example.

Whatever approach is ultimately chosen the real value here might not lie in the analysis for the bank or credit card company but in the information for the consumer. Climate indicators for consumers that come with their purchases have the possibility to influence the consumers decision as he or she acts upon this information. This type of analysis would not need to stop at credit card debt either, all types of cashless payment systems such as mobile payments could be included. Two of these systems which are already in place and are being used is South Pole's *Climate Credit Card* and Ant Financial Services' *Ant Forest App*.

Other types of consumer loans are deferred payment schemes. These kinds of schemes are often used when larger household appliances such as washing machines, dishwashers, refrigerators or television sets are purchased. Deferred payment schemes are usually handled directly between consumer and a captive lender, i.e. a financial subsidiary of the retailer or producer. The approach for the assessment for these kind of loans is similar as for other kinds of secured loans. Most household appliances come with an energy efficiency label. All household appliances in the European Union for example are regulated under the Energy Efficiency Directive (European Union, 2012). These labels can be used to calculate average yearly electricity consumption and hence approximate a carbon footprint. Using the green/brown metric could be even easier if climate solution and problem levels are chosen according to the EU directive's labels.

CASE STUDY – SOUTH POLE GROUP CREDIT CARD

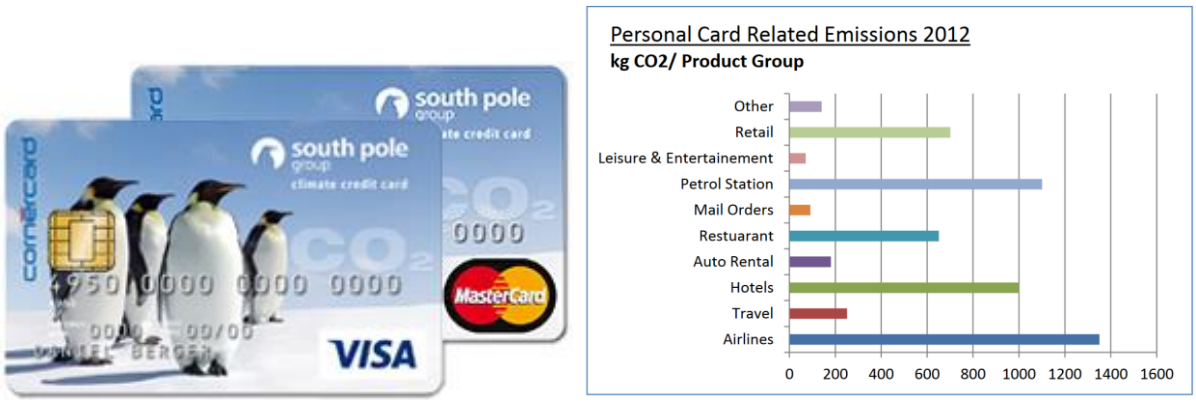
The Swiss company South Pole in cooperation with the bank Cornèr Bank came up with an approach to track and offset ones' personal carbon footprint through analysing credit card purchases. Every purchase that is done using their *Climate Credit Card* is categorized and linked to a certain expense category for which average emission of greenhouse gases are known (South Pole, 2011). This allows South Pole to calculate the related CO_2 emissions and eventually so offset these emissions through buying carbon certificates and investments into emission reduction projects.

The process is specified by three distinct steps (South Pole, 2018):

- Average emissions per Swiss franc are calculated for various expense categories and stored in a database
- Annually, the emissions over all expense categories are aggregated, through summing expenses per category
- The resulting amount of CO_2-equivalent is offset via carbon credits and various GHG emission reduction projects around the globe

Figure 7 below highlights the relative estimated emissions intensities of different product groups (based on 2012 estimates). One challenge with this approach of course is the need for average emissions estimates, which might hide specific low-carbon or high-carbon consumption choices (e.g. a meat free diet in the restaurant or retail food basket, or the rental of an electric vehicle). It stands out the highest emissions are also from the groups easiest identifiable on the credit card bill such as plane tickets, petrol and hotel bookings. Mail orders which have a larger carbon footprint due to their associated shipping and delivery costs are listed as an additional category and not subsumed in the retail category. Despite these shortcomings, this approach provides a first understanding of GHG emissions of consumers and if augmented with specific consumer information could provide a promise for future applications.

Figure 7: South Pole Group / Cornercard credit card and sample results of GHG emissions intensity



Source: South Pole

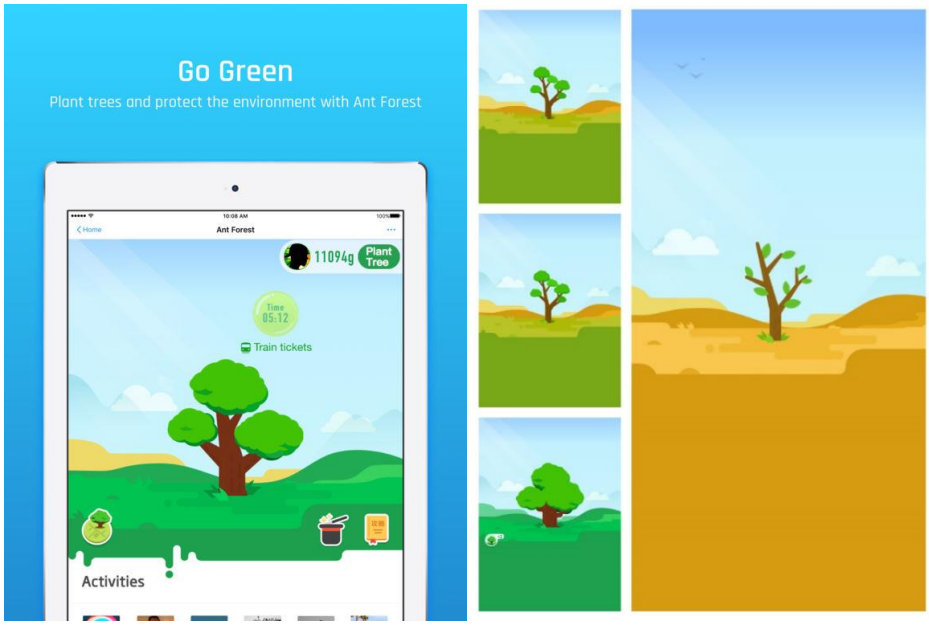
CASE STUDY – ANT FINANCIAL GROUP

Ant Financial is a related company of the Chinese internet retail giant Alibaba and offers a mobile payment service as well as range of other financial services to its 450 million users (Green Digital Finance Alliance, 2017, p. 7). Ant tries to induce carbon-footprint-reducing behaviour through a gamification approach. Their app Alipay allows users to join the Ant-Forest. Users are provided with individualized carbon savings data based on their payments on Alipay and credits them "green energy" points for it. It lets users then connect their virtual identities to the ant forest app and tries to induce competition in-between users. Lastly, they provide a real-world carbon offset as reward through a carbon sink project. Ant Financial collaborated with the Beijing Environmental Exchange in order to develop their carbon accounting methodology (Green Digital Finance Alliance, 2017).

The interface which is integrated in the popular Chinese mobile payment app Alipay compares users avoided emission to a pre-determined benchmark, by tracking their payments and activities. One example provided by Ant is if the user buys a metro ticket in the morning to commute to work instead of taking the car or pays his bills online to reduce paper waste. During the pilot stage nine different activities, among them certain types of transport and entertainment, were benchmarked and could be considered in the individual carbon footprint. Based on these estimates for reduced emissions users earn "green energy" points which are used to grow "virtual trees". Once their "virtual tree" is fully grown Ant Financial Services plants a real tree in forestation project to stop desertification in Inner Mongolia. Figure 8: Interface of the Ant Forest App shows the interface of the Ant Forest integration of Alipay with a virtual tree in the making.

The Ant Forest app had a hugely successful start with an uptake of around 40% of Ant Financials 450 million users in just nine months avoiding an estimated 150,000 tons of CO_2 emissions and over 1 million trees being planted (UNEP Newscentre, 2017).

Figure 8: Interface of the Ant Forest App



Source: Apple App Store

CASE STUDY – ASN BANK

ASN Bank is a Dutch bank with the explicit aim of becoming carbon neutral by 2030. To achieve this goal, they partnered with Ecofys and created a carbon profit and loss methodology allowing them to calculate their emissions as well as avoided emissions across all scopes. Emissions are usually classified into scope 1 – 3 emissions. Scope 1 emissions are all direct emission by ANS Bank itself such as fuel for their cars. Scope 2 emissions are indirect emissions caused for example through the consumption of electricity and heating. Scope 3 emissions are other indirect emissions not covered under scope 2 emissions like purchased goods and services and in the case of a bank emissions related to their investments. Their net emissions are calculated by the difference between emissions and avoided emissions. The methodology builds on five core principles:

1. The methodology should lead to a carbon neutral economy if it were used economy wide;
2. It should involve all assets of the financial institution;
3. It uses absolute data, e.g. ton of carbon dioxide equivalent;
4. The methodology allocates emissions proportionally to the financial institutions and
5. The methodology can be performed on a yearly basis to monitor progress.

As stated in ASN's report their scope 3 emissions are mainly due it's investments. Consumer loans are in their framework subsumed as debt investments which in turn is separated in five different classes i) government bonds ii) mortgages iii) housing corporations iv) green bonds and sustainability bonds as well as v) general loans. While this approach means that consumer loans are accounted for in the framework they are, besides mortgages, not explicitly listed. ASN Bank has set a target to be climate neutral by 2030. Figure 9 illustrates this approach of offsetting emissions with avoided emissions. It shows the actual avoided emissions for the year 2013 and the envisaged target of a complete offset in 2030. The goal in 2030 will both comprise an absolute reduction in caused emissions by around 3% as well as a roughly tripping of the avoided emissions. The latter is mainly to be generated through additional energy savings measures.

Figure 9: Caused and avoided emissions

Source: ASN

4. Outlook

Consumer finance is a large topic, which has previously been neglected in climate based financial analysis. However, it seems possible to simply transfer large parts of the already existing portfolio analysis methodology to secured personal loans such as mortgages, automobile loans and other smaller types of secured loans. This might also to a certain degree be the case for unsecured personal loans such as student loans and credit card debt. Although the data requirements tend to be much higher in order to classify individual purchases with a meaningful climate indicator. It is clear, that there is no one size fits all solution for all types consumer loans. The analysis has shown that it largely depends on what kind and in which quality the data is available for each loan type. Combined approaches like climate scores or even ESG scores might best suited to get started until the data requirements are met.

What shows great promise and has eventual implications beyond portfolio or consumer loan analysis it the creation of a carbon or climate indicator for consumers. If such an indicator could be provided in a timely manner, that is close to the time of purchase, it could have serious potential to induce behavioural change in consumer behaviour as these try to adapt their lifestyles to a low-carbon economy. Ant Financial together with UN Environment founded the Green Digital Finance Alliance to further this approach and should surely be followed with interest.

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