DOI: 10.1111/eufm.12515

ORIGINAL ARTICLE

EUROPEAN FINANCIAL MANAGEMENT WILEY

How to green the European auto ABS market? A literature survey

Carmelo Latino[1] | **Loriana Pelizzon**[1,2,3] | **Max Riedel**[1]

[1]Financial Markets Department, Leibniz Institute for Financial Research SAFE, Frankfurt am Main, Hesse, Germany

[2]Economics Department, Ca' Foscari University of Venice, Venezia, Italy

[3]CEPR, London, United Kingdom

Correspondence
Max Riedel, Financial Markets Department, Leibniz Institute for Financial Research SAFE, Theodor-W.-Adorno-Platz 3, Frankfurt am Main, Hesse 60323, Germany.
Email: riedel@safe-frankfurt.de

Funding information
Bundesministerium für Bildung und Forschung, Grant/Award Number: 01LA2208A

Abstract

This literature survey explores the potential avenues for the design of a green auto asset-backed security (Green Auto ABS) by focusing on the European auto securitization market. In this context, we examine the entire value chain of the securitization process to understand the incentives and interests involved at various stages of the transaction. We review recent regulatory developments, feasibility concerns, and potential designs of a sustainable securitization framework. Our study suggests that a Green Auto ABS could be based on both a green use of proceeds and a green collateral-based methodology.

KEYWORDS

car loans, low-emission vehicles, regulation, securitization, sustainable finance

JEL CLASSIFICATION

G12, G23, G28

We would like to thank John A. Doukas (the Editor) and an anonymous referee for excellent feedback and guidance. We also gratefully acknowledge helpful comments from Marco Angheben, Nikolai Badenhoop, Andrea Bedin, Jan-Peter Hülbert, Usman Jamil, and Ludovic Thebault. We are responsible for all remaining errors. Open Access funding enabled and organized by Projekt DEAL.

1 | INTRODUCTION

Climate change is one of the greatest challenges of our time and poses nothing less than an existential threat to humanity. In response, the European Union has implemented a number of policies aimed at mitigating environmental impacts and steering the economy toward climate neutrality. The transportation sector, which is responsible for almost one-quarter of greenhouse gas (GHG) emissions in Europe and is the main source of urban air pollution (European Commission, 2021), is at the forefront of sectors undergoing profound transformations. The environmental impacts associated with the manufacture, use, and disposal of automobiles are well documented (e.g., Golinska, 2016) and subject to continuous improvement. However, the way the financial industry can accelerate and accommodate this transformation and the effects of such actions on the economy have received little attention in the literature. The European Commission's Action Plan, adopted in 2018, aims to reorient capital toward sustainable investments, to mainstream sustainability into risk management, and to foster transparency and long-termism (European Commission, 2018a). On the consumer side, about 80% of Europeans approve of energy efficiency (European Commission, 2018b), while investors are keen to incorporate sustainability into their investment criteria (Eccles & Klimenko, 2019).

In this review article, we explore the potential design of a 'green' auto asset-backed security (Green Auto ABS) and how its introduction could foster the sale of zero- or low-emission vehicles (ZLEVs).[1] With approximately EUR 72 billion in outstanding assets in the first quarter of 2024, the auto ABS market accounts for about 40% of Europe's total securitized consumer loans, providing a crucial source of funding and liquidity for the automotive finance sector (Association for Financial Markets in Europe (AFME), 2024). The uptake in ZLEV sales, through Green Auto ABS, would align with the decade-long regulatory efforts to reduce GHG emissions in the transportation sector (Haasz et al., 2018; Walsh, 2011, 2000),[2] and therefore support meeting European climate targets. Furthermore, the introduction of a Green Auto ABS in Europe could meet the demand of institutional investors aiming to align their portfolios with sustainable investment criteria, in accordance with the Sustainable Finance Disclosure Regulation (SFDR). This alignment would contribute to reducing the carbon footprint of both investment institutions and originators while increasing their Green Asset Ratio (GAR). Consequently, it would incentivize banks to enhance their financing options for green vehicles and ultimately spur ZLEV sales. To the best of our knowledge, this is the first paper to bring together the literature in environmental economics and finance to explore potential avenues for the design of a Green Auto ABS framework.

How and to what extent can a 'green' feature be introduced into the auto loan and lease securitization process? First, it is necessary to understand the anatomy of the securitization market and define what 'green' would actually mean in this context. There are multiple parties involved in the securitization process, either directly or indirectly, meaning that the green component (i) can be introduced at different stages of the process, (ii) can vary in degree, and (iii) can encompass different dimensions. For instance, a bank could either exclusively evaluate

[1]Throughout this document, in line with European Commission (2017), when referring to ZLEVs (high-emission vehicles, or HEVs), we refer to vehicles that emit CO_2 below (above) 50 g/km. Hence, the universe of ZLEVs consists of both electric and plug-in hybrid vehicles (EVs and PHEVs), while a CO_2 threshold of 0 g/km would restrict ZLEVs exclusively to EVs.

[2]According to European Environment Agency (2018), a typical electric car in Europe produces about 17%–30% fewer GHGs than its gasoline or diesel equivalent across its life cycle.

the greenness of a collateralized vehicle in a loan (e.g., by focusing on its CO_2 emissions), take into account the entire value chain of the product (i.e., the greenness of the vehicle's manufacturer and that manufacturer's supply chain), or use the proceeds collected from the securitization process to finance green activities, which is known as the use of proceeds (UoP) approach. The time dimension of the green component also plays a certain role, considering that the transition to a sustainable green economy unfolds over several decades. Consequently, the green component could recognize the industry's achievements to date *and* provide forward-looking incentives for all parties to continue investing in green technologies.

Regulation and fiscal incentives are essential amplifiers and accelerators for greening the economy. Much effort, thought, and financial resources have been dedicated to developing green frameworks, legislation, and investment incentives to market participants. Building on what has already been achieved and learning from past mistakes can help shape long-term viable solutions. In this respect, we contribute to the literature by reviewing recent legislative developments and studies on the effectiveness of incentives in the context of the green transition, with a special focus on Green Auto ABS.

Our review of the literature is organized into three parts. We start with an outline of the general auto-securitization process. We then examine how the individual parts of the process could be supplemented with a green component and review related findings on this nascent topic in existing research. Finally, we present current and proposed regulations with the aim of understanding how the green component could be defined and where the main challenges to its implementation lie.

2 | DISSECTING THE SECURITIZATION PROCESS

Auto securitization is the process of pooling auto loans and leases into an ABS and selling it to institutional investors. The process involves several parties, including sponsors, special purpose vehicles (SPVs), originators, car dealerships, credit rating agencies, and investors.

A sponsor is the entity that initiates the securitization transaction by selling or transferring exposures to the issuing entity, an SPV, that is a separate legal entity created for a specific objective: to isolate financial risk.[3] An originator is a financial institution that originates the assets that will be securitized. A sponsor can also be the originator of the assets.

Originators of auto loans and leases are typically either captive banks or (noncaptive) retail banks.[4] A captive bank is owned by a car manufacturer and serves as its financing arm. It typically works closely with the car dealerships that are affiliated with its parent company. By contrast, a retail bank can have a financing arrangement with a car dealer but does not need to, as it can provide a loan to its customer upon request.

Auto loans (or leases) are collateralized by the underlying vehicles and once originated, the bank can decide to securitize them (either on its own initiative or through a sponsor) to obtain funding for its business. In the process, the assets are sold to the SPV, typically via a what is known as a true sale transaction, while the SPV in turn raises the funds for the purchase on the capital market by issuing an ABS with regular payment promises and different seniority levels,

[3]SPVs are designed to be bankruptcy-remote, which means that their assets and liabilities are segregated from those of their originators or sponsors. Therefore, ABS investors generally do not have recourse to the originators of the underlying exposures or to the sponsors.

[4]In some cases, large lease or car rental companies can also engage in securitization.

or 'tranches'.[5] Rating agencies provide credit ratings on the various tranches, based on the credit risk of the underlying pool of exposures. The most senior tranches of Auto ABS have a safe-asset status similar to sovereign bonds (Gorton, 2017). Tranches are typically sold to institutional investors such as banks, insurance companies, and pension funds (Della Croce & Gatti, 2014), depending on their risk preferences. Due to the product's complexity, retail investors are generally not the target group.

In the next subsections, we describe the auto securitization market and its functioning in greater detail. In particular, we focus on the main actors in the market to understand their interactions and identify sustainability-related information that could be used in a structured and transparent manner to measure the greenness of an Auto ABS transaction.

2.1 | Loan and lease origination

A vehicle is the second most expensive single item purchased by a typical household behind only a home. Therefore, the majority of vehicle purchases is financed via loans and leases that are commonly originated at dealerships.[6]

While some prospective buyers may gather information about car models online and even place orders through the Internet, most buyers still prefer to visit a dealership to get a firsthand experience of a car's look and feel. As noted by Golara et al. (2021), dealerships are still the primary location for finalizing the majority of car deals. Dealers arrange auto loans through indirect auto financing by acting as intermediaries between the vehicle buyer and the dealer's partner bank. The dealer's main goal is to close the car purchase before the interested buyer leaves home and collects information about other, potentially cheaper, financing options (e.g., at the buyer's house bank). This means that dealers have some negotiation power about the financing details they try to exercise. In particular, they have a certain degree of discretion about the interest rate charged on car loans, depending on the financing arrangements with their captive and noncaptive bank partners.

2.1.1 | Captive and noncaptive banks

Dealers' partner banks vary by business relation and product type. Franchise dealers that represent a particular car manufacturer typically work with that manufacturer's financing arm, which is a captive bank, when financing new cars. To finance used vehicles, dealers can work with the captive bank and noncaptive banks, depending on the franchise contract, while independent dealers typically partner with noncaptive banks. However, not all self-proclaimed captive banks are truly captive. Some specialized banks offer white label captive banking services to car manufacturers that do not have their own operating financing arm. This is

[5]An ABS is typically tranched into a senior and one or several mezzanine and junior tranches. The most junior tranche is referred to as the equity tranche since it is the first to absorb losses. DeMarzo (2005) presents a theoretical explanation of tranching by showing that pooling assets prevents informed investors from selectively purchasing only the highest-quality components of the pool, which in turn reduces the adverse selection problem that uninformed investors may face.

[6]According to Ed Paulat of GM Financial, '[f]ully amortising loans ...[were] the preferred option for 70% of people who financed a new car [in 2015]' (Motor Finance Online, 2016).

usually the case for foreign car manufacturers that intend to establish a strong presence in a given market.

Regardless of the exact financing arrangement, dealers generally prefer to offer their customers loans that are most financially rewarding for their own business (Ho & Stoll, 1981). In addition, captive and non-captive banks have discretion about different financing and purchasing options when, for example, promoting the purchase of ZLEVs and HEVs. In this context, Beyene et al. (2022) examine the change in bank credit conditions following the Dieselgate scandal in 2015. The authors show that noncaptive banks imposed stricter credit conditions on loans for diesel cars than did captive banks. Captive banks, on the other hand, reduced interest rates relative to gasoline vehicles to support HEV purchases. These findings and the close relationship between dealers and their partner banks indicate that fostering the purchases of ZLEVs involves aligning the incentives of manufacturers, lenders, dealers, and consumers.

2.2 | Consumers

2.2.1 | Consumer preferences

In the long run, consumer preferences and purchase decisions are essential for ZLEVs to achieve high market penetration. Surveys have shown that factors in EV adoption include moral and social motives (Bobeth & Kastner, 2020; Kastner et al., 2021), charging infrastructure concerns (Haustein & Jensen, 2018), and real-life usage experience (Jensen et al., 2014). However, preferences can change over time, as shown by Keller et al. (2021). Covering the period 2013 to 2019, those authors find that preferences for EVs develop in an unpredictable and non-monotonous way. The most important factor in consumers' purchase decisions throughout time is the cost of electricity per 100 km, not the vehicle's purchase price. This finding might be surprising but is in line with studies showing that higher fuel prices induce households to buy hybrid vehicles (Beresteanu & Li, 2011) or switch cars in general (De Borger et al., 2016).

The extent to which EVs will become a common means of transportation remains uncertain for multiple reasons. For instance, Jensen et al. (2014) observe that the EV purchase intention decreases after an individual real-life trial period of using the vehicle, while Keller et al. (2021) find that prospective buyers are concerned about batteries catching fire and the general environmental friendliness of EVs (e.g., due to electricity being generated in coal-fired power plants).

Therefore, promoting the uptake of ZLEVs involves addressing consumer concerns through services such as providing extended battery warranties or implementing targeted information campaigns (Krupa et al., 2014). In addition, well-designed financial incentives can also stimulate demand, a topic we cover in the next section.

2.2.2 | Financial incentives

Offering preferential loan conditions, such as lower interest rates for ZLEVs can potentially promote low-emission mobility. Banks determine loan conditions based on their risk exposures and are driven by factors such as the probability of default on loan repayment and the loss-

given default (LGD). The former metric depends on a borrower's credit risk, while the latter depends on the value of the underlying collateral. Whether there actually exists a risk differential between ZLEVs and HEVs is not obvious and requires a thorough investigation.[7] The following paragraphs aim to shed some light on this important and still unanswered question.

Credit risk A borrower's credit risk depends on his or her financial circumstances. In general, higher wealth or income is accompanied by a lower risk of defaulting on the loan repayment schedule. The channel through which a green component could affect a borrower's credit risk is thus that individual's disposable income. A ZLEV that positively impacts the borrower's disposable income can reduce the credit risk and consequently justify preferential interest rates from the bank's perspective. The following aspects of a ZLEV could affect disposable income: tax exemptions, environmental programs, and costs associated with travel, vehicle maintenance, and repair.

Tax exemptions of various forms are a common approach to incentivizing the purchase of certain vehicle types. For instance, in 2009 Germany introduced a motor vehicle tax exemption for passenger cars emitting CO_2 below a certain threshold (95 g/km from 2014), while taxing every additional gram of CO_2 by two euros. Similar tax-related incentives exist in the United States (Sallee, 2011), Canada (Chandra et al., 2010), Switzerland (Alberini & Bareit, 2019), and many EU countries (see European Automobile Manufacturers' Association [ACEA], 2022).[8] Tal and Nicholas (2016) provide support for the effectiveness of this kind of fiscal measure. In their preference survey of plug-in vehicle owners in the United States, the authors find that more than 30% of sales are attributed to the federal tax credit.

Two types of environmental programs were popular in recent decades: scrappage programs and environmental bonuses. The former are intended to provide economic incentives to purchase a new, more fuel-efficient vehicle when trading in an old car. Such programs have been introduced around the globe, with varying degree of success (see, e.g., Mian & Sufi, 2012; Müller & Heimeshoff, 2013). The latter type are intended to incentivize the purchase of electric and hybrid cars by offering a discount on the purchase price. Such initiatives have been introduced in Austria (E-Mobilität), Germany (Umweltbonus), France, Sweden (Klimatbonus), and the United States (ACEA, 2022). Clinton and Steinberg (2019) demonstrate the effectiveness of direct purchase rebates for the US market.

As to maintenance and repair cost differences between ZLEVs and HEVs, there is not yet a consensus in the research. For instance, Iwata and Matsumoto (2016) find that the per-kilometer travel cost of hybrid vehicles is much lower than that of gasoline vehicles even after accounting for depreciation costs. According to Propfe et al. (2012), the maintenance and repair costs for ZLEVs are lower than for conventional cars. However, findings suggest that the total cost of ownership (TCO) for EVs is below that of internal combustion engine vehicles in countries like Norway, while in other countries they are either at par or higher (Levay et al., 2017). Even if the TCO of ZLEVs were lower, that would not necessarily imply high disposable income for the vehicle owner. Improved technical efficiency may result in increased consumption due to the *rebound effect* (Frondel et al., 2008; Small & Dender, 2007). The rationale behind the rebound effect is that with a lower cost of driving, people tend to drive

[7]The European Commission High-Level Expert Group on Sustainable Finance recommends that the European Commission investigate whether there is a risk differential justifying the introduction of 'green supportive' and 'brown penalising' factors (High-Level Expert Group on Sustainable Finance [HLEG], 2018).

[8]The ACEA provides a broad, comprehensive study of tax exemptions for ZLEVs around the globe; those reports are updated annually back to 2001.

more, offsetting the energy savings that could otherwise have been attained. If the rebound effect is sufficiently large, the justification for implementing policy measures that promote energy efficiency can be weakened (Sorrell & Dimitropoulos, 2008). In the area of energy-efficient vehicles, Seebauer (2018) studies adopters of electric cars in Austria and finds that social norms for environmentally conscious consumption may increase the rebound effect. However, De Haan et al. (2007) do not find a rebound effect for hybrid and electric vehicles in Switzerland.

To summarize, fiscal incentives targeting ZLEVs have the potential to positively affect borrowers' disposable income and thus reduce their credit risk. In addition, when electricity is cheaper than fossil-based alternatives, consumers can benefit from reduced fuel costs, resulting in incremental income. Nevertheless, the relationship between ZLEVs' TCO and credit risk remains an open question.

Collateral value An auto loan is typically collateralized by the purchased vehicle. The main role of collateral is to reduce the lender's asymmetric information about the borrower's credit risk and thus to avoid credit rationing (Bester, 1985; Igawa & Kanatas, 1990). The lender is thus exposed to the borrower's credit risk and, in case of a default, to the collateral's resale value.

Information about collateral values is asymmetrically distributed not only between borrowers and lenders but also among lenders themselves. In particular, vertically integrated lenders—that is, captive banks—have superior information about the quality of collateral than do nonintegrated lenders. This was demonstrated by Stroebel (2016) for property developers in the United States. Like car manufacturers, property developers use their affiliated financing arms to finance their customers' real estate purchases. Stroebel (2016) finds that the better-informed lender's collateral portfolio outperforms that of the non-integrated lender. The latter compensates for this information disadvantage by charging higher interest rates. While a similar study has not yet been conducted for captive automobile lenders in Europe, Barron et al. (2008) show in their theoretical model that the differences in lending behavior between captive finance companies and independent lenders can also lead to the adoption of more lenient credit standards by the former group. The downside of collateral use from a lender's perspective is that it generates borrower moral hazard with regard to the pledged asset's maintenance or 'care' (Igawa & Kanatas, 1990). Loan over-collateralization, periodic collateral maintenance requirements, and inspections can reduce this concern.

There are reasons to believe that the green component will affect a vehicle's collateral value and therefore the lender's LGD. The collateral value is tied to the vehicle's depreciation rate, market demand, and consequently the resale price. Given the current state of the relevant technologies, it is plausible to expect that depreciation rates of HEVs and ZLEVs will differ.[9] However, the empirical findings on this topic are still mixed. On one hand, Gilmore and Lave (2013) find that vehicles with better fuel economy, such as hybrid cars, retain a higher proportion of their initial price in the used car market. On the other, Schloter (2022) shows that EVs have a substantially higher depreciation than gasoline vehicles (13.9% vs. 10.4% per annum). However, it is worth noting that technological improvements, competition, and

[9]According to European DataWarehouse (2022), for a sample of European auto loans, it appears that residual values for EVs have witnessed a steady growth between 2017 and 2021, establishing them as frontrunners in terms of value retention. Following close behind are gasoline vehicles, which also demonstrate favorable residual values.

restrictions on certain technologies or fuel types will affect the future demand for ZLEVs, their depreciation rates, and their resale prices.[10]

In relative terms, since HEVs are fiscally discouraged products through initiatives like additional CO_2 taxation, they are likely to be traded at a discount in the medium to long run, suggesting that the resale price of ZLEVs will include a green price premium. Whether such differences in the fundamentals of the collateral values of ZLEVs and HEVs could justify an interest rate discount for ZLEVs through the LGD channel is an open question.

2.3 | Car dealerships

Car dealerships partner with banks to provide on-site financing options to prospective buyers. The partner banks set interest rates based on a borrower's credit history and loan attributes, while dealers can add an additional amount, known as a markup or dealer rate, to the bank's interest rate to cover their costs for facilitating the loan. The total interest rate paid by the borrower is the combined amount of the bank's interest rate and the dealer rate (Cohen, 2012; Jiang et al., 2022). This approach can result in customers paying more for the vehicle than they would have if they had secured financing elsewhere (Davis & Frank, 2011).[11] For the US market, White and Munger (1971) find that most car buyers are seemingly unaware of such arrangements between the dealer and the bank, as they usually fail to seek the lowest-cost loan for which they could have qualified.

Dealers may also make auto loans more attractive to customers. For instance, Melzer and Schroeder (2017) show that they offer lower interest rates for vehicle buyers with expected binding usury limits or may even offer zero-percent financing to counter a sudden drop in vehicle demand (Copeland & Hall, 2011). To spur sales, automobile manufacturers frequently use promotions that include cash incentives. These incentives may be targeted directly to customers through well-publicized advertisements or indirectly through cash payments to dealers for each settled sale. Busse et al. (2006) find that direct targeting is more effective than indirect targeting, as dealers attempt to maximize profits by reducing the pass-through rate of cash rebates to customers. They conclude that direct targeting can reduce information asymmetries and increase the buyer's negotiating power vis-à-vis the dealer.

Dealers could play a crucial role in the decarbonization of the transportation sector. For instance, they could provide consumers with detailed breakdowns of the TCOs for both HEVs and ZLEVs, which could involve explaining upfront purchase costs, ongoing operating costs, and potential incentives or subsidies. However, it seems that instead of promoting ZLEV purchases, car dealerships pose a barrier at the point of sale, as they perceive these vehicles to have a less viable business case than traditional gasoline and diesel vehicles (Zarazua de

[10]For instance, there is a global trend to attempt to phase out internal combustion engine vehicles over the next several decades (Burch & Gilchrist, 2020; Fulton et al., 2019; Meckling & Nahm, 2019), which will likely positively affect demand for ZLEVs. Prices can be influenced in either direction, depending on the forces at play. Competition, as seen recently in the EV market, may prompt manufacturers to cut prices. A prominent example is Tesla Motors, which has lowered prices on several occasions within a short period of time (He, 2023). On the other hand, systemic disruptions, such as the COVID-19-induced semiconductor shortage or supply bottlenecks for raw materials, can lead to longer-term increases in both new and used vehicle prices (Coffin et al., 2022).

[11]From conversations with industry representatives, we understand that the concept of the dealer markup rate is more widespread in the United States than in Europe.

Rubens et al., 2018). For example, focusing on small towns and rural areas in Sweden, Eriksson and Olsson (2022) find that rural car dealers tend to endorse conventional cars. Similarly, O'Neill et al. (2019) report that car dealers in Ireland predominantly direct customers toward conventional cars.

In summary, the literature documents that dealers can use a variety of informational and financial tools to promote ZLEV sales. Dealers can educate prospective buyers about the benefits of ZLEVs and can provide financial incentives such as cash rebates, low interest rates, and reduced sale prices. However, ensuring that information is disseminated transparently and objectively and that green promotions have a high pass-through rate to the vehicle buyers is crucial. Public advertising can be one effective way to achieve this goal. Transparent advertising provides customers with the necessary information and bargaining power to fully benefit from financial incentives.

2.4 | Banks

Banks have a variety of funding needs, including meeting regulatory capital requirements, financing loan and investment portfolios, and managing liquidity. One way that banks can raise funds is through issuing ABS, one key benefit of which is allowing banks to raise funds without having to issue either equity or debt. Thus, securitization provides banks with an additional source of funding, allowing for funding sources diversification and making bank lending less sensitive to the cost of funds shocks (Loutskina, 2011).[12] Additionally, once ABS are issued, they can serve as collateral for obtaining liquidity from central banks (see, e.g., Van Bekkum et al., 2017).

Securitization can be a useful tool for managing interest rate, currency, and credit risk. By issuing ABS tied to specific assets or pools of assets, banks can transfer some of the risk associated with those assets to investors (Ambrose et al., 2005; Michalak & Uhde, 2012). This can be particularly advantageous for banks seeking to maintain a strong capital position or facing regulatory constraints on their ability to issue new debt.

In general, securitization can be used to convert illiquid loans into liquid securities (Loutskina, 2011) and thus plays an important role in banks' liquidity and funding management. The funds collected from an ABS issue enable banks to originate more loans to borrowers, which can help to increase the flow of credit to households and businesses and promote economic growth (Baradwaj et al., 2015) and the transition to a sustainable economy. However, securitization also entails certain risks for the sponsor or the originator of the underlying assets. The originator (or sponsor) must retain no less than 5% of the material net economic interest to signal to investors that the underlying exposures have a certain quality (Krahnen & Wilde, 2022). In case of deterioration in the credit quality of the underlying assets, the originator (or sponsor) is therefore typically the first to absorb losses.

Beyond the general advantages of securitization, banks could benefit from issuing green ABS for two specific reasons. First, green ABS could reduce the number of stranded assets in originators' portfolios, thereby mitigating their climate-related risks, as outlined in Section 4.1. Second, in light of the recent EU regulation on sustainable finance, banks have

[12]As an alternative to loan securitization, a bank can also sell its whole loan portfolio to specialized buyers that are interested in holding consumer finance exposures.

powerful incentives to promote their EU taxonomy-aligned portfolios. This could be achieved by green ABS transactions, as discussed in detail in Section 4.2.

3 | AUTO ABS AND GREEN SECURITIZATION

The first auto loan ABS worldwide were issued in the United States in the late 1980s by General Motors Acceptance Corporation (GMAC), which was the financing arm of General Motors. In Europe, the first auto ABS were offered in the early 2000s; the European market grew rapidly and peaked in 2007. The global financial crisis had a ripple effect on all securitization markets, including the auto ABS market. This led to increased regulation of the financial industry and thus to higher compliance costs for ABS issuers, which reduced the profitability of this market segment. To revive the market, regulators have recently sought to increase standardization in and the transparency of the securitization process.[13] In addition, the European Central Bank actively supported the securitization market through measures such as providing collateral, regulatory, and quantitative easing for ABS (Braun, 2018).[14]

Auto ABS are the fourth largest form of securitization in the EU (European Systemic Risk Board, 2022). Between 2011 and 2023, the yearly average volume of new auto ABS issuances in Europe was approximately EUR 29 billion (Association for Financial Markets in Europe (AFME), 2024). Germany typically accounted for about one-third of all new issuances, followed by Spain, France, and the United Kingdom. The market is largely dominated by captive banks; Volkswagen emerged as the biggest issuer and had a market share of over 16% in H1 2022.

The issuance of auto ABS benefits both loan originators and investors. Loan-originating banks can use the proceeds from the sale of an auto ABS to fund new auto loans, which can help increase the flow of credit to the economy. Auto ABS investors benefit from the issuance of these securities as they typically offer attractive yields. Additionally, auto ABS offer investors an opportunity to gain exposure to the auto loan market, which can be an attractive option for those looking to diversify their portfolios.

From the risk perspective, one key concern for banks is the credit risk of the underlying auto loans. Since banks have to keep some 'skin in the game'—usually by retaining the riskiest tranche (i.e., the equity tranche)—they need to ensure that the pools of originated and securitized auto loans are both well diversified and of high credit quality; otherwise, a higher rate of defaults and losses for the bank can result (Krahnen & Wilde, 2022).[15] Similarly, one of the main risks for investors is the potential for losses in the event of excessive defaults on the underlying exposures. This could occur if the distribution of exposures is unbalanced: what is known as a concentration risk can arise if, for instance, the collateral pool is comprised only or largely of a certain type of vehicle (e.g., diesel cars). Such risks can materialize in the wake of

[13]For example, consider the simple, transparent, and standardized initiative outlined in Section 4.

[14]The ECB performed collateral easing by reducing the minimum credit rating for Eurosystem collateral-eligible ABS in 2012, advocated against the discriminatory regulatory treatment of ABS in forthcoming regulations in 2013, and introduced the Asset-Backed Securities Purchase Programme in 2014.

[15]Studies show that the design of a retention scheme matters in this regard (Fender & Mitchell, 2009; Nicoló & Pelizzon, 2008). In fact, retaining the equity tranche is not necessarily the optimal form of retention; depending on the setup, other approaches can dominate.

unforeseen external events like the Dieselgate scandal in 2015.[16] Additionally, a variety of vehicle-related risks could emerge from regulatory changes affecting certain vehicle types (e.g., a ban on combustion engines), product defects (e.g., battery explosions in EVs), or geopolitical factors (e.g., supply shortages of gasoline or electricity).[17] These risks could adversely affect the collateral values of asset pools that are overly focused on a particular vehicle category, whether HEVs or ZLEVs. Therefore, ensuring adequate diversification of the collateral pool is crucial. Further research is needed into how this can be achieved within a strictly green collateral pool.

3.1 | Features of green securitization

There is presently no consensus definition of green securitization (Petit & Schlosser, 2020), which could be based on two distinct criteria. The first criterion is the UoP approach, where the ABS issuer commits to use the funds received from the securitization to finance future green projects or assets (e.g., by providing credit to finance ZLEV purchases). The second criterion pertains to the predominant green feature of the underlying collateral. In this collateral-based approach, the greenness of the ABS is determined by the environmental characteristics of the assets in the pool. For instance, auto loans and leases could be labelled green depending on the CO_2 emissions of the underlying vehicles, as outlined by André et al. (2022).

In the case of the UoP approach, the securitization of non-green exposures and the commitment to use the proceeds to finance green assets create a green feedback loop through which originators can increase the proportion of green loans in their portfolios. Agliardi (2022) analyzes the impact of such an arrangement on banks' portfolio exposures and their alignment with global climate targets. The findings suggest that this approach can lead to more resilient and mission-aligned financing institutions, underscoring its potential as a viable solution for promoting sustainable finance.

Petit and Schlosser (2020) note that employing the UoP approach could result in a transaction that is only partially considered 'green' because it is possible for brown assets to still serve as collateral for the securities being issued. By contrast, the collateral-based approach is only feasible if there is already a pool of green assets large enough to create an ABS. This is a drawback for those originators who hold a low share of green assets in their portfolios. However, in the aggregate, the collateral-based approach would provide an incentive to originate more green loans and leases. Hence, while banks would diversify their investments in (future) green activities in the medium to long term under the UoP approach, the collateral-based approach could have a much more immediate and direct impact on the composition of banks' auto loan portfolios, which would promote the transition to low-emission mobility at the

[16]That scandal negatively affected used car prices and customers' willingness to buy a diesel car, as documented for the Israeli market by Ater and Yoseph (2022), and induced a negative spillover effect to unaffected products from the same manufacturer, as observed in the US market by Che et al. (2023). However, to our knowledge and following discussions with industry representatives, no risk materialized to auto ABS investors in the aftermath of the scandal.

[17]Recent history has witnessed instances of vehicle bans, battery-related risks, and supply-related issues. Holland et al. (2021) discuss a ban on gasoline vehicles and show that a transition to EVs is not optimal at the current level of substitutability because a gasoline vehicle production ban would lead to large deadweight losses. Conversely, Plötz et al. (2019) argue that a well-designed car ban could play a strong role in achieving long-term GHG and air pollution targets. In the realm of batteries, Christensen et al. (2021) assert that lithium-ion batteries have penetrated everyday life faster than our understanding of the risks and challenges associated with them. Finally, Wu et al. (2019) point out that the EV supply chain differs from the one for traditional vehicles, with the risk level of EV supply chains in China between 'general' and 'high'.

societal level. Undoubtedly, both approaches would add a distinctly green feature to the auto ABS, making it an attractive investment product to different types of investors.

Indeed, studies show that institutional investors care about climate and carbon risks across different asset classes (e.g., Bolton & Kacperczyk, 2021; Krueger et al., 2020). Capasso et al. (2020) find that companies with a high carbon footprint are perceived by the market as, ceteris paribus, more likely to default. Such risk considerations are due to both financial and nonfinancial factors, including regulatory requirements, protection of investors' reputation, and peer pressure. As a result, demand for green investments is outstripping supply, with institutional investors seeking to buy green fixed-income products through a variety of investment channels, including ABS. In fact, a survey of European asset managers ranked clean transport among the most preferred green investments (Sangiorgi & Schopohl, 2021). These findings suggest that there is space for a Green Auto ABS in the securitization market. However, according to Kontz (2023), ESG funds do not appear to differentiate between high- and low-emission ABS in the United States, while in Europe Beyene et al. (2022) find that increased transparency on cars' environmental performance following the Dieselgate scandal may not be enough to affect banks' financing of HEVs. In addition, the demand for green investments cannot be met at any price. Sangiorgi and Schopohl (2021) find that an important factor in investing in a green fixed-income product is competitive pricing vis-à-vis its non-green counterpart. Studies also highlight that transparency and comparability in ESG reporting play an essential role in the investment decisions of institutional investors across the globe (Amel-Zadeh & Serafeim, 2018; Eccles et al., 2017). For issuers of green products, reporting costs are a key factor that needs to be considered, but there are positive effects attached to it: Flammer (2021) shows that investors respond positively to green bond issuance announcements, which benefits corporate issuers in terms of an increase in ownership by long-term investors.

To summarize, the increasing demand for sustainable and environmentally friendly transportation, regulatory pressure to reduce emissions, and investor demand for green investment products have led in recent years to discussions about the potential for designing and introducing a Green Auto ABS. There are various proposals regarding how a Green Auto ABS could be constructed, ranging from purely green asset pools consisting solely of loans and leases on ZLEVs to a green proceeds approach where the originator would commit to finance assets and projects that comply with the EU taxonomy. Below, we briefly review the features of Green Auto ABS globally, with particular attention to the approaches prevalent in markets outside Europe.

3.2 | Global developments in green auto securitization

According to the Structured Finance Association (2022), Green Auto ABS deals represented USD 3.5 billion of the USD 29 billion in issuer-designated ESG securitizations offered globally in 2021. Europe is presently lagging behind China and the United States when it comes to green auto securitization. One of the main causes for this disparity is the availability of ZLEVs to be used as collateral in the securitized pool. To better illustrate the share of ZLEVs in the ABS pool and how it is changing over time, we manually review a total of 225 European auto ABS prospectuses and collect fuel-type information on the underlying vehicles.[18] As reported in

[18]Since 2016, some auto ABS issuers have disclosed the composition of underlying vehicles by fuel type, CO_2 emissions, Euronorm standard, and auto energy performance certificate labeling in their prospectuses. Data on European auto ABS are sourced from the European Data Warehouse (EDW).

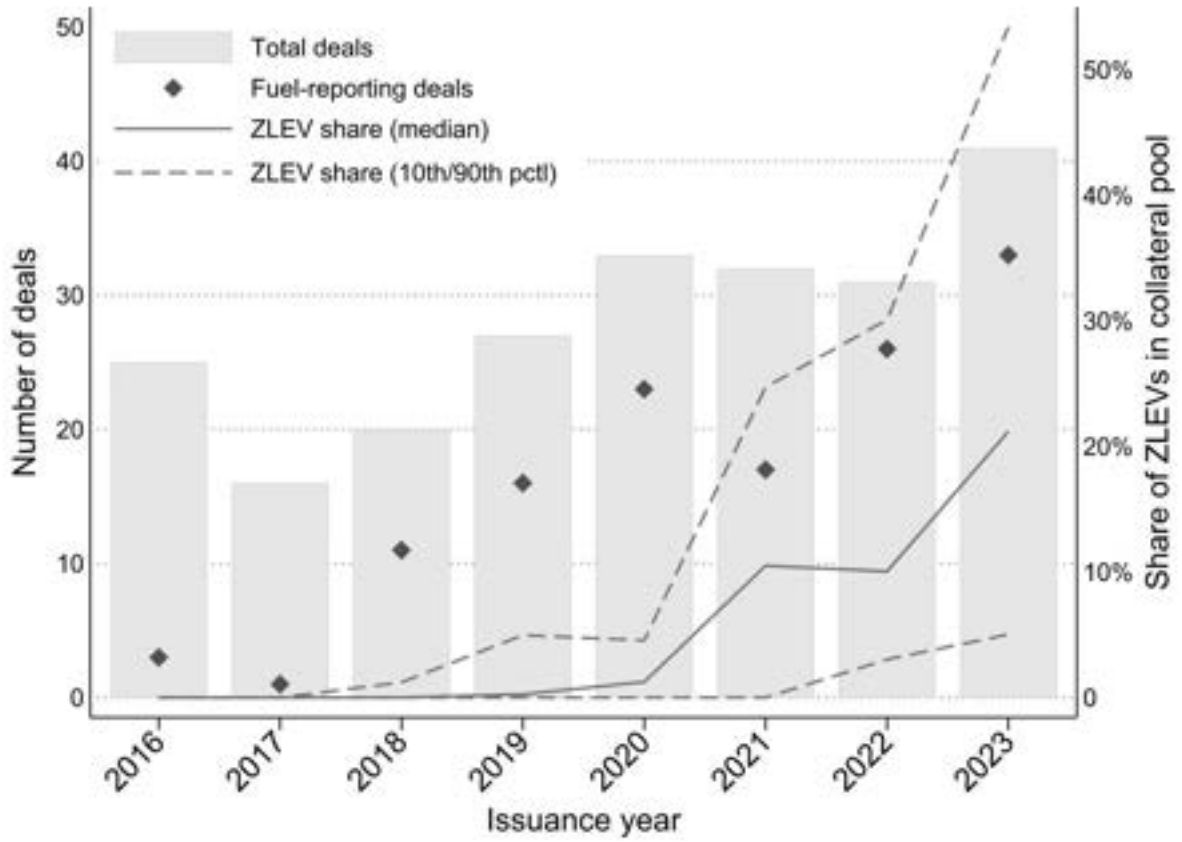

FIGURE 1 Zero- or low-emission vehicles in European auto ABS collateral pools. *Note*: This figure depicts the evolution of the European auto ABS market over time. The light gray bars (left *y*-axis) represent the total number of Eurosystem-eligible deals issued in a year. The dark gray diamonds count the number of deals whose offering prospectuses report the distribution of the underlying collateral by fuel type. The solid and dashed blue lines (right *y*-axis) report the median and 10th/90th percentiles of the ZLEV (i.e., EV and PHEV) share in the collateral pool of fuel-type-reporting auto ABS. The data come from the European DataWarehouse, and the ZLEV share was hand-collected from auto ABS offering prospectuses. [Color figure can be viewed at wileyonlinelibrary.com]

Figure 1, the share of ZLEVs in the collateral pool of European Auto ABS was close to 0% in 2016, with only 3 of 25 issued deals reporting the fuel type distribution in their offering prospectuses. These figures have improved over time, reaching a median ZLEV share of 21% in 2023, with about 80% of deals (33 of 41) reporting this information in their prospectuses. However, the share of ZLEVs remains quite low in securitized collateral pools. So far, only one deal, issued in 2023, has been backed exclusively by plug-in hybrid vehicles. This deal was referred to in the media as a Green Auto ABS, despite the absence of a formal definition of this term.

By contrast, in the United States the very first Green Auto ABS was issued by Toyota Financial Services in 2014. This deal was based on the UoP approach, with the proceeds committed to financing the purchase of 39,900 retail vehicles that adhere to certain standards, such as fuel consumption and emissions. Since then, multiple green securitizations have been successfully completed, including the car rental company Hertz's first-ever green car rental deal in 2023. In the United States, the most frequently used approach for defining a green auto deal thus far has involved UoP.

Conversely, China has been employing the collateral-based approach to define green auto securitizations. Between 2019 and June 2023, there were 17 green auto transactions; 14 were

issued by captive finance corporations, and the remainder by commercial banks. Comparing these deals with 179 conventional auto ABS issued in China, Ng et al. (2023) note that green transactions can be concentrated in certain vehicle models. In addition, the authors find that the residual values of ZLEVs are lower than those of HEVs, with ZLEVs exhibiting higher depreciation rates. Indeed, the future resale values of ZLEVs may carry greater uncertainty due to a lack of extensive historical data, dependence on government subsidies, connections to the manufacturer, and technological obsolescence (S&P Global Ratings, 2021).[19] These findings suggest that, to mitigate concentration risks and the risks associated with high collateral depreciation rates, a hybrid model using both the UoP and the collateral-based approaches could lead to the most effective framework for defining a Green Auto ABS.

Overall, establishing clear standards for green vehicle loans and green securitizations would very likely benefit the development and impact of both the market and the associated research field. The next section provides an overview of recent regulatory developments and discussions on this topic.

4 | GREEN AUTO ABS IN EUROPE

Several studies have investigated the degree to which transition risks are factored into the pricing of financial assets (see, e.g., Bolton & Kacperczyk, 2023). This body of work frequently begins with noting that an increasing number of major institutional investors have identified environmental issues as a key element in their portfolio allocation strategies (Giglio et al., 2021). Therefore, it is crucial to understand how green securitization can help investors align their portfolios with their environmental objectives. In this section, we first explore how auto ABS can be classified as green in Europe. To do so, we provide a comprehensive review of the European regulatory framework and propose possible avenues for classification. Following this, we examine policy measures that could support the development of the Green Auto ABS market in Europe.

4.1 | European regulatory framework

Over the course of the last decade, the European securitization market has been subject to multiple regulatory frameworks. However, it was not until recent years that the market entered the realm of sustainability debates. Following the global financial crisis in 2008, the EU introduced the first regulation in 2009 with the goals of mitigating risks, creating a level playing field for securitization transactions across the EU, and promoting market transparency and investor protection.[20] Most notably, it required financial vehicle corporations to disclose statistics on their assets and liabilities on a quarterly basis. The regulation was recast in 2013, requiring issuers of securitized products to disclose more information about the underlying assets and the structure of securitization transactions.[21] In 2017, the EU introduced new due

[19]According to the Deutsche Automobil Treuhand (DAT) (2021) report, gasoline vehicles that are 3 years old retain 58% of their initial list price, in contrast to EVs that maintain only 47% of their original value. This finding was echoed by Hertz's January 2024 announcement that it would sell approximately 20,000 EVs in its U.S. fleet due to high depreciation expenses and repair costs (Gomes & Joseph, 2024).

[20]See Regulation (EC) No. 24/2009.

[21]See Regulation (EU) No. 1075/2013.

diligence requirements, risk retention rules, and a new category of simple, transparent, and standardized (STS) securitizations.[22] The STS framework came into effect in 2019 with the aim of reviving the securitization market by providing benefits for both issuers and investors.[23] A striking innovation in this framework was the requirement to publish data (where available) on the environmental impact of the assets underlying the securitizations.[24] In 2021, the STS framework was further amended with the goal of developing a sustainable securitization framework based on a report by the European Banking Authority (EBA) (2022).[25]

That EBA report provides multiple avenues for a sustainable securitization framework. An important consideration in setting out the framework was to ensure that securitization products were not put at a competitive disadvantage vis-à-vis other types of funding instruments (e.g., covered bonds). For this reason, the EBA advises building the framework on the voluntary EU Green Bond Standard (EU GBS) and adjusting it for the specific context of securitization transactions.[26] As a general rule, to obtain the green label under the EU GBS, a bond-issuing company must use 100% of the bond proceeds to finance EU taxonomy-aligned investments, even if the company is not green as a whole or the bond is not secured by green assets. In the case of an ABS transaction, this UoP approach would practically (and unintentionally) result in a purely collateral-based approach. To understand this, we have to remember that loan origination and securitization in an ABS transaction are performed by two separate entities; the loan-originating financial institution and the ABS-issuing SPV. According to the EU GBS definition, the UoP approach should apply at the issuer level, which is the SPV. In a true sale transaction, the SPV would use its proceeds to purchase the securitized pool of collateral from the loan-originating bank, which would imply that the underlying exposures would have to comply with the EU taxonomy, effectively turning the UoP approach into a collateral-based approach.[27] Such an application of the EU GBS has two major shortcomings. First, the issuance of a green ABS would not require the lender to use the proceeds to finance new taxonomy-aligned loans. Second, there is currently a lack of available green collateral that can be securitized, making the UoP approach impractical at the SPV level. As a possible solution, the EU GBS could be amended for securitization transactions by requiring the UoP approach to apply at the originator level instead of the issuer level. This adjusted EU GBS would ensure that future loans would be used exclusively to finance taxonomy-aligned assets and activities. However, the pool of securitized assets would in this case not be required to be aligned with the

[22]See Regulation (EU) No. 2017/2402.

[23]For issuers, STS securitizations enjoy more favorable regulatory treatment, including lower capital requirements for banks that invest in STS-securitized products. For investors, STS securitizations offer a higher degree of transparency, standardization, and quality assurance, which can increase the attractiveness of an investment. In May 2022, the ESAs launched a joint consultation paper on the draft regulatory technical standards with regard to the content, methodologies, and presentation of disclosures pursuant to Art 22(4) and 26d(4) of Regulation (EU) 2017/2402. As the proposed standards do not contain any specific principal adverse impact indicator in relation to auto loans and leases, indicators are derived from the EU taxonomy regulation.

[24]The STS framework did not provide a definition of those environmental performance measures. This led to inconsistent reporting practices due to different definitions of energy performance certificates (e.g., for cars) across the relevant countries.

[25]See Regulation (EU) 2021/557.

[26]The EU GBS was developed to establish a common set of criteria for what constitutes a 'green' bond and is intended to apply to a wide array of fixed-income products, including ABS.

[27]Only true sale transactions are within the scope of the EU GBS. Due to their complexity, synthetic securitizations are not considered for the sustainable securitization framework.

EU taxonomy, leaving room for 'adverse green selection of assets'. This effect can occur if originators are incentivized to sell their stale, brown assets through a green ABS. To mitigate this risk, investors can be provided with sustainability information on the underlying collateral pool, making the underlying exposures comparable across securitizations.

The precise scope of sustainability-related data on the underlying portfolio has yet to be determined. Opinions on this topic vary widely across market participants and stakeholders.[28] Despite these variations, there is general agreement on the need for sustainability disclosure requirements to be standardized, simplified, and harmonized. The aim is for reporting costs to be reasonable and for the scope of requirements to be aligned with those applicable to other financial products. In addition, the sustainability indicators are expected to be obtainable by both captive and noncaptive auto lenders. There is a strong preference to collect data at the level of securitized exposures rather than the level of car manufacturers, as their information is not readily available to lenders and issuers and places a disproportionate burden in several respects.[29,30] Market participants suggest reporting information such as the share of ZLEVs in the securitized portfolio, the average CO_2 emissions of underlying vehicles, and their European emission standards.[31] Furthermore, the loan originator should disclose its policy for evaluating sustainability factors in the credit granting process. According to EBA (2022), there are three potential avenues for a sustainable securitization framework. In each approach, the EU taxonomy alignment of both the proceeds and the underlying collateral portfolio plays a role, but it does so to different degrees. The most flexible (light green) approach allows for a choice at the originator level; an ABS could be labelled green if the transaction either is comprised predominantly of green collateral (e.g., above two-thirds of the portfolio) or meets the 'adjusted EU GBS' framework (i.e., 100% green UoP at the originator level). In the more restrictive (medium green) approach, the green label could be obtained either (i) by a combination of a certain green collateral share (e.g., above 50% of the portfolio) *and* a commitment to use a specific share of the proceeds (e.g., 51% or more of UoP) to finance taxonomy-aligned assets or (ii) if the transaction meets the adjusted EU GBS framework. The last (dark green) approach would

[28]For an overview, please refer to the joint consultation paper on the principal adverse impact indicators conducted by the European Supervisory Authorities (European Securities and Markets Authority, European Banking Authority, and European Insurance and Occupational Pensions Authority, 2022, 2023) and the responses from participating stakeholders.

[29]ESG information at the manufacturer level (e.g., social, human resources, human rights, anticorruption, and anti-bribery matters) poses a data collection challenge, particularly for noncaptive lenders, as they must rely on third-party vendors and the completeness and accuracy of the data sets those vendors provide. ESG information may also not be readily available for used vehicles whose manufacturers have merged with another firm and no longer have a separate identity or who have gone out of business. In addition, the timing of data collection and dealing with subsequent updates are challenging issues. For instance, constantly evolving ESG information could be collected at different points in time: (i) on the vehicle construction date, (ii) on the auto loan origination date, or (iii) on the auto loan securitization date. Subsequent data updates could either be ignored (i.e., the green label of the Auto ABS would not change during its lifetime) or could be updated periodically (i.e., the green label of the Auto ABS could potentially be revised, depending on factors such as changes in sustainability thresholds).

[30]Regardless of the type and scope of exposure-level information, European Securities and Markets Authority (2021) is explicit on its quality: proxy data are not permitted. The originator must always provide actual information on specific underlying exposures.

[31]Some market participants suggest linking a vehicle's green label to its Euro emission standard. Since the legal requirements on air pollution for vehicles are becoming steadily stricter, linking the green label to the Euronorm would ensure that the label accounts for technological progress over time.

encompass an integrated framework, requiring a minimum share of green collateral in the underlying portfolio and full compliance with the adjusted EU GBS framework.

Irrespective of the final definition of a green label for Auto ABS, the corresponding loan-level disclosure framework will likely require some adjustments, as it does not currently cover essential vehicle-related sustainability information such as CO_2 emissions and fuel type (André et al., 2022). As of this writing, the only relevant data field included in the European Securities and Markets Authority's Auto ABS loan and lease level disclosure template is the auto energy performance certificate. In its current form, this variable creates more confusion than clarity for its users since the classification system for auto energy performance certificates varies from one member state to another (Panizza et al., 2022), meaning that the same vehicle can have a high rating in one country and a low rating in another. To address these issues, Hackmann et al. (2024) propose including two vehicle identifiers in the disclosure template: the Type Approval Number and the Type-Variant-Version Code. These identifiers can be used to integrate loan-level data with sustainability-related vehicle information from ancillary sources while keeping originators' additional reporting costs to a minimum.

In conclusion, there is no one-size-fits-all approach in the development of a green label for securitization transactions in Europe. Various stakeholders agree on the need to adopt simple and transparent sustainability criteria that do not create an uneven playing field among securitizers or disadvantage the asset class relative to other financial instruments. Overall, a dual approach involving both the UoP- and collateral-based methodologies seems inevitable, although the specifics remain to be clarified.

4.2 | Demand for Green Auto ABS in Europe

By aligning with the European objective of directing investments toward green activities, the development of a Green Auto ABS market would not only benefit institutional investors, such as insurance companies, pension funds, and mutual funds committed to investing in green assets, but would also offer advantages to banks originating these deals.

Institutional investors could use Green Auto ABS to support aligning their portfolios with sustainable investment criteria, in line with the SFDR.[32] The SFDR mandates that financial market participants and advisers marketing to EU clients provide extensive sustainability-related disclosures. It classifies investment funds into three categories: Article 6 funds, which do not integrate sustainability; Article 8 funds, which promote environmental or social characteristics; and Article 9 funds, which are dedicated to sustainable investment objectives. Early evidence shows that SFDR labels matter in attracting capital flows (Scherer & Hasaj, 2023). For instance, Becker et al. (2022) analyze the effect of the introduction of the SFDR in Europe and find that Article 8 and 9 funds experience significantly higher net fund flows after the public disclosure of fund labels. Consequently, the increased investor demand for Article 8 and 9 funds could incentivize asset managers to enhance their sustainability efforts and invest more in the Green Auto ABS space.

On the other hand, by retaining the equity tranche, originators will effectively be compelled to keep a green asset in their portfolios. This is in the interest of banks, as they have to report their GARs. As a matter of fact, Article 8 of the taxonomy regulation imposes an obligation on

[32]Regulation (EU) 2019/2088.

both financial and nonfinancial entities to reveal key performance indicators pertaining to the taxonomy. More specifically, financial entities are required to disclose an indicator that shows the extent of their exposure to activities that meet the taxonomy criteria. Hence, credit institutions subject to disclosures under the Non-Financial Reporting Directive—those with more than 500 employees—will be required to disclose their GARs.[33] The GAR refers to the proportion of a credit institution's assets that finance and are invested in EU taxonomy-aligned economic activities as a proportion of total covered assets (Partiti, 2023). Investors will be able to use GARs to identify both the top performers and underachievers in green finance. A substantially low GAR may raise concerns about a bank's ESG profile and therefore deter certain investor groups.

To the extent that the GAR can influence investors' decisions, banks will have a strong incentive to improve their exposure to sustainable products to lower their cost of capital (see, e.g., Cornell, 2021; Pástor et al., 2021). Therefore, banks issuing a Green Auto ABS can benefit from the retention of the equity tranche as it will boost their GARs, similarly to bonds issued according to the EU Green Bond standard.[34] In summary, as regulators and policymakers around the globe increase their focus on sustainable finance, any improvement in its GAR will help a bank meet regulatory requirements and comply with sustainability-related reporting and disclosure obligations.

5 | CONCLUSION

In this paper, we present a comprehensive survey of the existing literature on auto asset-backed securities and examine the relevant regulatory advancements in this field. By considering the entire value chain of the securitization process, we explore how a Green Auto ABS and corresponding sustainable securitization framework could be designed.

We find that the green component can be incorporated into various stages of the securitization process. However, it is not clear which stage of the process is most efficient for introducing the green component in terms of balancing various stakeholders' needs and constraints. In addition, the functioning of the economic channels at play is not yet well established. Therefore, further research is needed on this nascent topic.

CONFLICT OF INTERESTS STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ORCID

Carmelo Latino https://orcid.org/0000-0002-0036-7078
Loriana Pelizzon http://orcid.org/0000-0003-4489-0167
Max Riedel https://orcid.org/0000-0001-5353-2519

[33]Directive 2014/95/EU.

[34]See Brühl (2023) for a discussion of the benefits and limitations of the GAR.

REFERENCES

Agliardi, R. (2022). Green securitisation. *Journal of Sustainable Finance & Investment*, *12*(4), 1330–1345. https://doi.org/10.1080/20430795.2021.1874214

Alberini, A., & Bareit, M. (2019). The effect of registration taxes on new car sales and emissions: Evidence from Switzerland. *Resource and Energy Economics*, *56*, 96–112. https://doi.org/10.1016/j.reseneeco.2017.03.005

Ambrose, B. W., LaCour-Little, M., & Sanders, A. B. (2005). Does regulatory capital arbitrage, reputation, or asymmetric information drive securitization? *Journal of Financial Services Research*, *28*(1), 113–133. https://doi.org/10.1007/s10693-005-4358-2

Amel-Zadeh, A., & Serafeim, G. (2018). Why and how investors use ESG information: Evidence from a global survey. *Financial Analysts Journal*, *74*(3), 87–103. https://doi.org/10.2469/faj.v74.n3.2

André, L., Grept, A., Laut, N., Plantier, G., Sapey-Triomphe, Z., & Weber, P.-F. (2022). *Climate risk measurement of assets eligible as collateral for refinancing operations—focus on asset backed securities (ABS)* (Working paper 858). Retrieved from https://ideas.repec.org/p/bfr/banfra/858.html

Association for Financial Markets in Europe (AFME). (2024). *Securitisation Data Report Q1 2024*. Association for Financial Markets in Europe. https://www.afme.eu/Portals/0/DispatchFeaturedImages/Securitisation%20Data%20Report%20Q1%202024-1.pdf

Ater, I., & Yoseph, N. S. (2022). The impact of environmental fraud on the used car market: Evidence from dieselgate. *The Journal of Industrial Economics*, *70*(2), 463–491. https://doi.org/10.1111/joie.v70.2

Baradwaj, B. G., Dewally, M., & Shao, Y. (2015). Does securitization support entrepreneurial activity? *Journal of Financial Services Research*, *47*(1), 1–25. https://doi.org/10.1007/s10693-013-0175-1

Barron, J. M., Chong, B.-U., & Staten, M. E. (2008). Emergence of captive finance companies and risk segmentation in loan markets: Theory and evidence. *Journal of Money, Credit and Banking*, *40*(1), 173–192. https://doi.org/10.1111/jmcb.2008.40.issue-1

Becker, M. G., Martin, F., & Walter, A. (2022). The power of ESG transparency: The effect of the new SFDR sustainability labels on mutual funds and individual investors. *Finance Research Letters*, *47*, 102708. https://doi.org/10.1016/j.frl.2022.102708

Beresteanu, A., & Li, S. (2011). Gasoline prices, government support, and the demand for hybrid vehicles in the United States. *International Economic Review*, *52*(1), 161–182. https://doi.org/10.1111/iere.2011.52.issue-1

Bester, H. (1985). Screening vs. rationing in credit markets with imperfect information. *The American Economic Review*, *75*(4), 850–855.

Beyene, W., Falagiarda, M., Ongena, S., & Scopelliti, A. (2022). *Do lenders price the brown factor in car loans? Evidence from diesel cars* (Swiss Finance Institute Research Paper No. 22–76). https://doi.org/10.2139/ssrn.4245777

Bobeth, S., & Kastner, I. (2020). Buying an electric car: A rational choice or a norm-directed behavior? *Transportation Research Part F: Traffic Psychology and Behaviour*, *73*, 236–258. https://doi.org/10.1016/j.trf.2020.06.009

Bolton, P., & Kacperczyk, M. (2021). Do investors care about carbon risk? *Journal of Financial Economics*, *142*(2), 517–549. https://doi.org/10.1016/j.jfineco.2021.05.008

Bolton, P., & Kacperczyk, M. (2023). Global pricing of carbon-transition risk. *The Journal of Finance*, *78*(6), 3677–3754. https://doi.org/10.1111/jofi.v78.6

Braun, B. (2018). Central banking and the infrastructural power of finance: The case of ECB support for repo and securitization markets. *Socio-Economic Review*, *18*(2), 395–418. https://doi.org/10.1093/ser/mwy008

Brühl, V. (2023). The Green Asset Ratio (GAR): A new key performance indicator for credit institutions. *Eurasian Economic Review*, *13*, 57–83. https://doi.org/10.1007/s40822-023-00224-0

Burch, I., & Gilchrist, J. (2020). *Survey of global activity to phase out internal combustion engine vehicles. March 2020 Revision*. Center of Climate Protection. https://theclimatecenter.org/wp-content/uploads/2020/03/Survey-on-Global-Activities-to-Phase-Out-ICE-Vehicles-update-3.18.20-1.pdf

Busse, M., Silva-Risso, J., & Zettelmeyer, F. (2006). $1,000 cash back: The pass-through of auto manufacturer promotions. *American Economic Review*, *96*(4), 1253–1270. https://doi.org/10.1257/aer.96.4.1253

Capasso, G., Gianfrate, G., & Spinelli, M. (2020). Climate change and credit risk. *Journal of Cleaner Production*, *266*, 121634. https://doi.org/10.1016/j.jclepro.2020.121634

Chandra, A., Gulati, S., & Kandlikar, M. (2010). Green drivers or free riders? An analysis of tax rebates for hybrid vehicles. *Journal of Environmental Economics and Management*, *60*(2), 78–93. https://doi.org/10.1016/j.jeem.2010.04.003

Che, X., Katayama, H., & Lee, P. (2023). Product-harm crises and spillover effects: A case study of the Volkswagen diesel emissions scandal in eBay Used Car Auction Markets. *Journal of Marketing Research*, *60*(2), 409–424. https://doi.org/10.1177/00222437221115616

Christensen, P. A., Anderson, P. A., Harper, G. D., Lambert, S. M., Mrozik, W., Rajaeifar, M. A., Wise, M. S., & Heidrich, O. (2021). Risk management over the life cycle of lithium-ion batteries in electric vehicles. *Renewable and Sustainable Energy Reviews*, *148*, 111240. https://doi.org/10.1016/j.rser.2021.111240

Clinton, B. C., & Steinberg, D. C. (2019). Providing the spark: Impact of financial incentives on battery electric vehicle adoption. *Journal of Environmental Economics and Management*, *98*, 102255. https://doi.org/10.1016/j.jeem.2019.102255

Coffin, D., Downing, D., Horowitz, J., & LaRocca, G. (2022). *The roadblocks of the COVID-19 pandemic in the US automotive industry* (Working Paper ID-091). Office of Industries, U.S. International Trade Commission. Retrieved from https://www.usitc.gov/publications/332/working_papers/final_the_roadblocks_of_the_covid-19_pandemic_in_the_automotive_industry.pdf

Cohen, M. A. (2012). Imperfect competition in auto lending: Subjective markup, racial disparity, and class action litigation. *Review of Law & Economics*, *8*(1), 21–58. https://doi.org/10.1515/1555-5879.1501

Copeland, A., & Hall, G. (2011). The response of prices, sales, and output to temporary changes in demand. *Journal of Applied Econometrics*, *26*(2), 232–269. https://doi.org/10.1002/jae.v26.2

Cornell, B. (2021). ESG preferences, risk and return. *European Financial Management*, *27*(1), 12–19. https://doi.org/10.1111/eufm.v27.1

Davis, D., & Frank, J. M. (2011). *Under the hood: Auto loan interest rate hikes inflate consumer costs and loan losses* (Working paper). https://doi.org/10.2139/ssrn.1860188

De Borger, B., Mulalic, I., & Rouwendal, J. (2016). Measuring the rebound effect with micro data: A first difference approach. *Journal of Environmental Economics and Management*, *79*, 1–17. https://doi.org/10.1016/j.jeem.2016.04.002

De Haan, P., Peters, A., & Scholz, R. W. (2007). Reducing energy consumption in road transport through hybrid vehicles: Investigation of rebound effects, and possible effects of tax rebates. *Journal of Cleaner Production*, *15*(11–12), 1076–1084. https://doi.org/10.1016/j.jclepro.2006.05.025

Della Croce, R., & Gatti, S. (2014). Financing infrastructure-international trends. *OECD Journal: Financial Market Trends*, *2014*(1), 123–138. https://doi.org/10.1787/19952872

DeMarzo, P. M. (2005). The pooling and tranching of securities: A model of informed intermediation. *The Review of Financial Studies*, *18*(1), 1–35. https://doi.org/10.1093/rfs/hhi008

Deutsche Automobil Treuhand (DAT). (2021). *DAT Barometer-Gesamtübersicht 2021*. Deutsche Automobil Treuhand. https://barometer.dat.de/PDF/GESAMT2021.pdf

EBA. (2022). Developing a framework for sustainable securitisation. EBA/REP/2022/06, European Banking Authority. https://www.eba.europa.eu/sites/default/documents/files/document_library/Publications/Reports/2022/1027593/EBA%20report%20on%20sustainable%20securitisation.pdf

Eccles, R. G., Kastrapeli, M. D., & Potter, S. J. (2017). How to integrate ESG into investment decision-making: Results of a global survey of institutional investors. *Journal of Applied Corporate Finance*, *29*(4), 125–133. https://doi.org/10.1111/jacf.12267

Eccles, R. G., & Klimenko, S. (2019). The investor revolution. *Harvard Business Review*, *97*(3), 106–116. https://hbr.org/2019/05/the-investor-revolution

Eriksson, L., & Olsson, L. (2022). The role of middle actors in electrification of transport in Swedish rural areas. *Case Studies on Transport Policy*, *10*(3), 1706–1714. https://doi.org/10.1016/j.cstp.2022.06.009

European Automobile Manufacturers' Association (ACEA). (2022). ACEA tax guide 2022. https://www.acea.auto/files/ACEA_Tax_Guide_2022.pdf

European Commission. (2017). Commission Regulation (EU) 2017/1151. Official Journal of the European Union. https://eur-lex.europa.eu/eli/reg/2017/1151/oj

European Commission. (2018a). *Action Plan: Financing Sustainable Growth*. Official Journal of the European Union. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0097

European Commission. (2018b). *Special Eurobarometer 479: Future of Europe*. Technical report. https://europa.eu/eurobarometer/surveys/detail/2217

European Commission. (2021). *Sustainable & Smart Mobility Strategy. Putting European transport on track for the future, Mobility and Transport*. European Commission. https://transport.ec.europa.eu/document/download/be22d311-4a07-4c29-8b72-d6d255846069_en?filename=2021-mobility-strategy-and-action-plan.pdf

European DataWarehouse. (2022). *New Year Research Update (28 February 2022)*. European DataWarehouse. https://eurodw.eu/wp-content/uploads/European-DataWarehouse-New-Year-Research-Update-28th-Feb-2022-2.pdf

European Environment Agency. (2018). Electric vehicles from life cycle and circular economy perspectives. EEA Report No. 13/2018. https://www.eea.europa.eu/ds_resolveuid/51ca95217e9848278a028b7db5381cc2

European Securities and Markets Authority. (2021). *Questions and Answers On the Securitisation Regulation*. ESMA33-128-563. https://www.esma.europa.eu/sites/default/files/library/esma33-128-563_questions_and_answers_on_securitisation.pdf

European Securities and Markets Authority, European Banking Authority, and European Insurance and Occupational Pensions Authority. (2022). *Joint Consultation Paper on sustainability disclosures for STS securitisations*. https://www.esma.europa.eu/press-news/consultations/joint-consultation-paper-sustainability-disclosures-sts-securitisations

European Securities and Markets Authority, European Banking Authority, and European Insurance and Occupational Pensions Authority. (2023). *Final Report on draft Regulatory Technical Standards*. Joint Committee of the European Supervisory Authrities. https://www.eba.europa.eu/sites/default/documents/files/document_library/Publications/Draft%20Technical%20Standards/2023/JC%202023%2013/1055704/JC%202023%2013%20-%20Final%20report%20on%20ESG%20disclosure%20for%20STS%20securitisations.pdf

European Systemic Risk Board. (2022). *Monitoring systemic risks in the EU securitisation market*. European Systemic Risk Board. https://www.esrb.europa.eu/pub/pdf/reports/esrb.report_securisation.20220701~27958382b5.en.pdf

Fender, I., & Mitchell, J. (2009). *Incentives and tranche retention in securitisation: a screening model* (Working Paper Research 177). https://www.bis.org/publ/work289.pdf

Flammer, C. (2021). Corporate Green bonds. *Journal of Financial Economics*, *142*(2), 499–516. https://doi.org/10.1016/j.jfineco.2021.01.010

Frondel, M., Peters, J., & Vance, C. (2008). Identifying the rebound: Evidence from a German household panel. *The Energy Journal*, *29*(4), 145–163. https://doi.org/10.5547/ISSN0195-6574-EJ-Vol29-No4-7

Fulton, L. M., Jaffe, A., & McDonald, Z. (2019). Internal combustion engine bans and global oil use. UC Davis Institute of Transportation Studies Research Report - UCD-ITS-RR-19-45. https://itspubs.ucdavis.edu/publication_detail.php?id=3218

Giglio, S., Kelly, B., & Stroebel, J. (2021). Climate finance. *Annual Review of Financial Economics*, *13*, 15–36. https://doi.org/10.1146/financial.2021.13.issue-1

Gilmore, E. A., & Lave, L. B. (2013). Comparing resale prices and total cost of ownership for gasoline, hybrid and diesel passenger cars and trucks. *Transport Policy*, *27*, 200–208. https://doi.org/10.1016/j.tranpol.2012.12.007

Golara, S., Dooley, K. J., & Mousavi, N. (2021). Are dealers still relevant? How dealer service quality impacts manufacturer success. *Production and Operations Management*, *30*(10), 3560–3578. https://doi.org/10.1111/poms.13450

Golinska, P. (2016). *Environmental issues in automotive industry*. Springer.

Gomes, N., & Joseph, W. (2024). *Rental giant Hertz dumps EVs, including Teslas, for gas cars*. Reuters. https://www.reuters.com/business/autos-transportation/hertz-sell-about-20000-evs-us-fleet-2024-01-11/

Gorton, G. (2017). The history and economics of safe assets. *Annual Review of Economics*, *9*(1), 547–586. https://doi.org/10.1146/economics.2017.9.issue-1

Haasz, T., GómezVilchez, J. J., Kunze, R., Deane, P., Fraboulet, D., Fahl, U., & Mulholland, E. (2018). Perspectives on decarbonizing the transport sector in the EU-28. *Energy Strategy Reviews*, *20*, 124–132. https://doi.org/10.1016/j.esr.2017.12.007

Hackmann, A., Lindner, V., Pelizzon, L., & Riedel, M. (2024). *Vehicle identifiers: the key to jump-starting the European Green Auto ABS market?*. (SAFE White Paper No. 100). https://safe-frankfurt.de/fileadmin/user_upload/editor_common/Policy_Center/SAFE_White_Paper_100.pdf

Haustein, S., & Jensen, A. F. (2018). Factors of electric vehicle adoption: A comparison of conventional and electric car users based on an extended theory of planned behavior. *International Journal of Sustainable Transportation*, *12*(7), 484–496. https://doi.org/10.1080/15568318.2017.1398790

He, L. (2023). *Chinese electric car makers suffer as Elon Musk doubles down on Tesla price war*. CNN. https://edition.cnn.com/2023/04/20/investing/china-tesla-ev-price-cuts-intl-hnk/index.html

High-Level Expert Group on Sustainable Finance (HLEG) (2018). *Final Report 2018 by the High-Level Expert Group on Sustainable Finance*. European Commission. https://finance.ec.europa.eu/system/files/2018-01/180131-sustainable-finance-final-report_en.pdf

Ho, T., & Stoll, H. R. (1981). Optimal dealer pricing under transactions and return uncertainty. *Journal of Financial Economics*, *9*(1), 47–73. https://doi.org/10.1016/0304-405X(81)90020-9

Holland, S. P., Mansur, E. T., & Yates, A. J. (2021). The electric vehicle transition and the economics of banning gasoline vehicles. *American Economic Journal: Economic Policy*, *13*(3), 316–344. https://doi.org/10.1257/pol.20200120

Igawa, K., & Kanatas, G. (1990). Asymmetric information, collateral, and moral hazard. *The Journal of Financial and Quantitative Analysis*, *25*(4), 469–490. https://doi.org/10.2307/2331011

Iwata, K., & Matsumoto, S. (2016). Use of hybrid vehicles in Japan: An analysis of used car market data. *Transportation Research Part D: Transport and Environment*, *46*, 200–206. https://doi.org/10.1016/j.trd.2016.03.010

Jensen, A., Cherchi, E., & Ortúzar, J. D. (2014). A long panel survey to elicit variation in preferences and attitudes in the choice of electric vehicles. *Transportation*, *41*(5), 973–993. https://doi.org/10.1007/s11116-014-9517-6

Jiang, Z., Wei, Y. M., Chan, T., & Hamdi, N. (2022). Designing dealer compensation in the auto-loan market: Implications from a policy change. *Marketing Science*, *42*(5), 839–1028. https://doi.org/10.1287/mksc.2022.1418

Kastner, I., Becker, A., Bobeth, S., & Matthies, E. (2021). Are professionals rationals? How organizations and households make E-Car investments. *Sustainability*, *13*(5), 2496. https://doi.org/10.3390/su13052496

Keller, K., Schlereth, C., & Hinz, O. (2021). Sample-based longitudinal discrete choice experiments: Preferences for electric vehicles over time. *Journal of the Academy of Marketing Science*, *49*(3), 482–500. https://doi.org/10.1007/s11747-020-00758-8

Kontz, C. (2023). *Do ESG investors care about carbon emissions? Evidence from securitized auto loans* (Working paper). https://doi.org/10.2139/ssrn.4357312

Krahnen, J.-P., & Wilde, C. (2022). Skin-in-the-game in ABS transactions: A critical review of policy options. *Journal of Financial Stability*, *60*, 100998. https://doi.org/10.1016/j.jfs.2022.100998

Krueger, P., Sautner, Z., & Starks, L. T. (2020). The importance of climate risks for institutional investors. *The Review of Financial Studies*, *33*(3), 1067–1111. https://doi.org/10.1093/rfs/hhz137

Krupa, J. S., Rizzo, D. M., Eppstein, M. J., Brad Lanute, D., Gaalema, D. E., Lakkaraju, K., & Warrender, C. E. (2014). Analysis of a consumer survey on plug-in hybrid electric vehicles. *Transportation Research Part A: Policy and Practice*, *64*, 14–31. https://doi.org/10.1016/j.tra.2014.02.019

Levay, P. Z., Drossinos, Y., & Thiel, C. (2017). The effect of fiscal incentives on market penetration of electric vehicles: A pairwise comparison of total cost of ownership. *Energy Policy*, *105*, 524–533. https://doi.org/10.1016/j.enpol.2017.02.054

Loutskina, E. (2011). The role of securitization in bank liquidity and funding management. *Journal of Financial Economics*, *100*(3), 663–684. https://doi.org/10.1016/j.jfineco.2011.02.005

Meckling, J., & Nahm, J. (2019). The politics of technology bans: Industrial policy competition and Green goals for the auto industry. *Energy Policy*, *126*, 470–479. https://doi.org/10.1016/j.enpol.2018.11.031

Melzer, B., & Schroeder, A. (2017). *Loan contracting in the presence of usury limits: Evidence from automobile lending* (Consumer Financial Protection Bureau Office of Research Working Paper No. 2017-02). https://doi.org/10.2139/ssrn.2919070

Mian, A., & Sufi, A. (2012). The effects of fiscal stimulus: Evidence from the 2009 cash for clunkers program. *The Quarterly Journal of Economics*, *127*(3), 1107–1142. https://doi.org/10.1093/qje/qjs024

Michalak, T. C., & Uhde, A. (2012). Credit risk securitization and bank soundness in Europe. *The Quarterly Review of Economics and Finance*, *52*(3), 272–285. https://doi.org/10.1016/j.qref.2012.04.008

Motor Finance Online. (2016). *Room for further finance growth in Europe's largest car market*. Motor Finance Online. https://www.motorfinanceonline.com/features/room-for-further-finance-growth-in-europes-largest-car-market-4843395

Müller, A., & Heimeshoff, U. (2013). Evaluating the Causal Effects of Cash-for-Clunkers Programs in Selected Countries: Success or Failure? (No. 79802). VfS Annual Conference 2013 (Duesseldorf): Competition Policy and Regulation in a Global Economic Order. https://ideas.repec.org/p/zbw/vfsc13/79802.html

Ng, H., Yang, J., & Wan, T. (2023). *What Investors Want to Know: Chinese Green Auto ABS*. Fitch Ratings Special Report. https://www.fitchratings.com/research/structured-finance/what-investors-want-to-know-chinese-green-auto-abs-18-09-2023

Nicoló, A., & Pelizzon, L. (2008). Credit derivatives, capital requirements and opaque otc markets. *Journal of Financial Intermediation*, *17*(4), 444–463. https://doi.org/10.1016/j.jfi.2008.03.001

O'Neill, E., Moore, D., Kelleher, L., & Brereton, F. (2019). Barriers to electric vehicle uptake in ireland: Perspectives of car-dealers and policy-makers. *Case Studies on Transport Policy*, *7*(1), 118–127. https://doi.org/10.1016/j.cstp.2018.12.005

Panizza, G., Garrod, A., Conti, P., Chaudhry, M., & Aufsatz, C. (2022). European Auto ABS: Auto EPCs on a Diverging Road. DBRS Morningstar Commentary. https://dbrs.morningstar.com/research/402539/european-auto-abs-auto-epcs-on-a-diverging-road

Partiti, E. (2023). *Green asset ratio and taxonomy disclosures for credit institutions*. (TILEC Discussion Paper No. 2023-04). https://doi.org/10.2139/ssrn.4383133

Pástor, L., Stambaugh, R. F., & Taylor, L. A. (2021). Sustainable investing in equilibrium. *Journal of Financial Economics*, *142*(2), 550–571. https://doi.org/10.1016/j.jfineco.2020.12.011

Petit, C. A., & Schlosser, P. (2020). *Rationale, potential and pitfalls of green securitization* (Robert Schuman Centre for Advanced Studies Research Paper No. RSCAS 35). https://hdl.handle.net/1814/67018

Plötz, P., Axsen, J., Funke, S. A., & Gnann, T. (2019). Designing car bans for sustainable transportation. *Nature Sustainability*, *2*(7), 534–536. https://doi.org/10.1038/s41893-019-0328-9

Propfe, B., Redelbach, M., Santini, D. J., & Friedrich, H. (2012). Cost analysis of plug-in hybrid electric vehicles including maintenance & repair costs and resale values. *World Electric Vehicle Journal*, *5*(4), 886–895. https://doi.org/10.3390/wevj5040886

Sallee, J. M. (2011). The surprising incidence of tax credits for the toyota prius. *American Economic Journal: Economic Policy*, *3*(2), 189–219. https://doi.org/10.1257/pol.3.2.189

Sangiorgi, I., & Schopohl, L. (2021). Why do institutional investors buy green bonds: Evidence from a survey of European asset managers. *International Review of Financial Analysis*, *75*, 101738. https://doi.org/10.1016/j.irfa.2021.101738

Scherer, B., & Hasaj, M. (2023). Greenlabelling: How valuable is the SFDR Art 9 label? *Journal of Asset Management*, *24*(7), 541–546. https://doi.org/10.1057/s41260-023-00319-y

Schloter, L. (2022). Empirical analysis of the depreciation of electric vehicles compared to gasoline vehicles. *Transport Policy*, *126*, 268–279. https://doi.org/10.1016/j.tranpol.2022.07.021

Seebauer, S. (2018). The psychology of rebound effects: Explaining energy efficiency rebound behaviours with electric vehicles and building insulation in Austria. *Energy Research & Social Science*, *46*, 311–320. https://doi.org/10.1016/j.erss.2018.08.006

Small, K. A., & Dender, K. V. (2007). Fuel efficiency and motor vehicle travel: The declining rebound effect. *The Energy Journal*, *28*(1), 25–51. https://doi.org/10.5547/ISSN0195-6574-EJ-Vol28-No1-2

Sorrell, S., & Dimitropoulos, J. (2008). The rebound effect: Microeconomic definitions, limitations and extensions. *Ecological Economics*, *65*(3), 636–649. https://doi.org/10.1016/j.ecolecon.2007.08.013

S&P Global Ratings. (2021). ESG Industry Report Card: Auto Asset-Backed Securities. Comments. https://www.spglobal.com/ratings/en/research/articles/210331-esg-industry-report-card-auto-asset-backed-securities-11860341

Stroebel, J. (2016). Asymmetric information about collateral values. *The Journal of Finance*, *71*(3), 1071–1112. https://doi.org/10.1111/jofi.2016.71.issue-3

Structured Finance Association. (2022). *Driving Towards Decarbonization: Connecting Auto ABS to Climate Change*. SFA Research Corner. https://structuredfinance.org/wp-content/uploads/2022/01/SFA-Research-Corner-Driving-Towards-Decarbonization-Connecting-Auto-ABS-to-Climate-Change.pdf

Tal, G., & Nicholas, M. (2016). Exploring the impact of the federal tax credit on the plug-in vehicle market. *Transportation Research Record*, *2572*(1), 95–102. https://doi.org/10.3141/2572-11

Van Bekkum, S., Gabarro, M., & Irani, R. M. (2017). Does a larger menu increase appetite? Collateral eligibility and credit supply. *The Review of Financial Studies*, *31*(3), 943–979. https://doi.org/10.1093/rfs/hhx112

Walsh, M. (2011). Global trends in motor vehicle pollution control: A 2011 update part 3. *Combustion Engines*, *147*(4), 98–103. https://doi.org/10.19206/CE-117083

Walsh, M. P. (2000). Motor vehicle pollution control. *Platinum Metals Review*, *44*(1), 22–29. https://doi.org/10.1595/003214000X4412230

White, J. J., & Munger, F. W. (1971). Consumer sensitivity to interest rates: An empirical study of new-car buyers and auto loans. *Michigan Law Review*, *69*, 1207.

Wu, Y., Jia, W., Li, L., Song, Z., Xu, C., & Liu, F. (2019). Risk assessment of electric vehicle supply chain based on fuzzy synthetic evaluation. *Energy*, *182*, 397–411. https://doi.org/10.1016/j.energy.2019.06.007

Zarazua de Rubens, G., Noel, L., & Sovacool, B. K. (2018). Dismissive and deceptive car dealerships create barriers to electric vehicle adoption at the point of sale. *Nature Energy*, *3*(6), 501–507. https://doi.org/10.1038/s41560-018-0152-x

How to cite this article: Latino, C., Pelizzon, L., & Riedel, M. (2024). How to green the European auto ABS market? A literature survey. *European Financial Management*, 1–24. https://doi.org/10.1111/eufm.12515