



BANCA D'ITALIA
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A FIRST ANALYSIS ON THE GREEN SECURITIZATIONS IN ITALY

by Francesco Cusano, Danilo Liberati, Stefano Piermattei and Lorenzo Rubeo*

Abstract

This paper analyses the market for green securitizations in Italy. Green securitizations are financial instruments for which there are currently no universally accepted definitions or standard methodologies to identify them. Firstly, we discuss possible definitions and ways to identify these instruments. Secondly, we describe the main characteristics of the market for green securitizations originated by banks in Italy during the decade 2010-19. We find that banks' securitized loans to 'brown' (less sustainable) economic activities grew much more rapidly than those to 'green' ones suggesting that banks preferred to keep loans to 'green' activities in their balance sheets and to derecognize loans to 'brown' ones. Finally, we show that the usual indexes of carbon content of Italian banks' loans overestimate the amount of financed emissions if they do not take banks' securitizations into account.

JEL Classification: G21, G23, Q56.

Keywords: green securitizations, carbon emissions.

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1. Introduction¹

Nowadays, terms as “sustainable finance” or “green investing” entered the glossary of the global financial markets.² Portfolios of the main financial institutions over the world contain green assets like green bonds or sustainable loans in which the credit is used for the achievement of environmental objectives. The appeal of the market for these instruments is growing rapidly due to the recent evolution of legal and regulatory regimes aiming at shedding light on the definitions and on the use of these instruments, as well as to initiatives with the scope of incentivizing the transition toward a greener economy, also benefiting from the change in investors’ preferences who care more about the future of the planet. In this respect, the research for new green financial instruments to enlarge as much as possible the range of sustainability-related products is a fundamental step to improve the transition process.

Among green financial instruments, green securitizations represent a new tool for financial institutions to access funding for environmental initiatives. Despite their increasing relevance in financial markets, green securitizations are financial instruments for which there are currently no universally accepted definitions or standard methodologies to identify them. According to Fitch Ratings (2021, 2022), the green securitizations market is still at an early stage and, in the short term, it should remain concentrated in three main green asset classes (home loans for energy-efficiency improvements, rooftop solar loans and electric vehicles); however, there is room for a fast growth of the market as structured finance investors are increasingly considering sustainability in their investment decisions and financial institutions are able to transfer large part of the credit risks. The Climate Bond Initiative (CBI, 2017 and 2018) highlights how green securitizations are able to unlock funds for small-scale low carbon projects. The potentials and the drawbacks of green securitizations are described by Petit and Schlosser (2020), who stress that the main pitfall for the development of green securitizations is the absence of standardized definitions and common methodologies to identify risks and green loan contracts.³

¹ We thank Laura Graziani Palmieri, Luciano Lavecchia, Laura Mellone, Giorgio Nuzzo and Roberto Sabbatini for useful comments on earlier versions of the paper. The views expressed herein are solely those of the authors and do not necessarily reflect the views of the Bank of Italy.

² In this work we use the adjectives “green”, “sustainable”, “environment-friendly”, “environmentally sustainable” as synonyms to indicate instruments, projects and initiatives with a positive impact on environment and climate.

³ The effectiveness of the green asset securitizations also depends on the legal and government bottlenecks of the reference countries (Zhang et al., 2023); see also Agliardi (2022) for a discussion on the green securitizations’ role in terms of climate risk management.

The European Banking Authority (EBA, 2022) analyzed the challenges in introducing sustainability in the European Union (EU) securitizations market by focusing first on the application of existing EU regulations on sustainable finance to securitizations (e.g. the EU Green Bond Standard, the EU Taxonomy and the Sustainable Finance Disclosure Regulation) and second on the possibility to develop a specific regulatory framework for sustainable securitizations. The European Investment Bank (EIB, 2021) shows that there is an insufficient development of green securitizations in Europe and recommends (Recommendation 3) to promote green securitizations products to close the gap with respect to other green market segments.

The green profile of the securitizations may also be observed by their role in the construction of indicators measuring the carbon content of bank loans. Currently, as remarked by the Partnership for Carbon Accounting Financials (PCAF, 2022), the Financed Emissions Standard does not provide explicit guidance on methods to calculate financed emissions for every financial product including securitized loans. Nonetheless, a securitized loan may be derecognized from the banks' balance sheet even if, at the origin, it participated in financing carbon emissions. The removal of derecognised loans may affect the calculation of the financed emissions indicators, especially if we assume that banks specialized in lending to "brown" industries are more likely to securitize related higher transition risks. This is a relevant point, considering that banks actively manage credit risks via securitization and they could be tempted to not properly include transition and physical risks in the evaluation of loans' riskiness if they have the opportunity to securitize and derecognize loans from their balance sheets (Nguyen et al., 2022; Ouazad and Kahn, 2022). In this respect, Müller et al. (2022) analyse how financial institutions use securitizations to manage their exposure to firms' transition risks: they show that banks are more likely to securitize loans granted to firms with worsening environmental profile.

With respect to a strand of literature that in general has been so far mainly theoretical, this paper contributes to the literature debate by proposing a quantitative analysis on green securitizations in Italy. In particular, the contribution of this paper is twofold. First, we contribute to the sustainable finance literature by trying to define and identify "green securitizations" based on regulatory frameworks as well as the current state of the market. We show that the market is increasing over time though it remains quite contained and linked to large operations. Moreover, we conclude that, for the time being, given the state of information available and lacking ESG borrower-by-borrower data, the more feasible way to define a

securitization as “green” is to assess the sustainability of the economic activity – in terms of NACE classification – of the borrower of the underlying securitized loans. Focusing on the Italian market, we show that banks’ securitized loans to “brown” economic activities grew much more rapidly than “green” activities, suggesting that banks preferred to keep loans to “green” activities in their balance sheet and to derecognize loans to the less sustainable ones. Second, we assess the role of securitizations into the measurement of the carbon content of the Italian loans. We show that not considering securitized and derecognized loans in the computation of the usual indexes of carbon content implies an overestimate of the amount of financed emission.

The paper is structured as follows. Section 2 briefly reviews the recent literature on the green financial instruments; section 3 illustrates the various criteria to define and label a securitization as “green” and their practical limits; section 4 describes the current state of the green securitizations market; section 5 analyses the sustainability profile of securitized loans in Italy whereas section 6 estimates the impact of securitizations on the carbon content of Italian loans; section 7 concludes.

2. Literature review on green financial instruments

Green financial instruments (bonds, equities, loans and securitizations) issued by banks or other financial intermediaries can play a fundamental role in financing, speeding up and improving the transition process to a more sustainable economy (Sachs et. el, 2019; Sartzetakis, 2021). Given that the increasing interest in the sustainable finance is a relatively new phenomenon, the literature dealing with these instruments and markets is quite recent (Ozili, 2022).

So far, the literature on green assets dealt mainly with the market for green *bonds* covering various aspects (Liberati and Marinelli, 2022). Some authors dealt with the delineation of possible regulatory setup able to penalize brown and support green assets in the calculation of capital requirements (D’Orazio and Popoyan, 2019; Thomä and Gibhardt, 2019). Others focused on the actual economic motivations behind the issuance of green bonds that can be others than the genuine promotion of green projects and investments, such as regulatory arbitrage mechanisms or the so-called *greenwashing* (Flammer, 2021; Xiao et. al., 2021). Other strands of literature focused on investors’ preferences towards green assets and socially responsible investments, highlighting how they can be driven more by social preferences than by financial motives when choosing green assets (Riedl and Smeets, 2017). Moreover,

investors' preferences may be related to the existence of a premium, commonly called *greenium*, for investing in green bonds: however, from the empirical point of view, most authors actually found lower yields for green bonds than for conventional assets (Baker et al., 2018; Gianfrate and Peri, 2019; Zerbib, 2019) while only few scholars find no statistically significant premium (Tang and Zhang, 2020) or higher returns for green bonds (Bachelet et al., 2019).

As complement of the green debt, green *equities* refer to instruments having the aim to raise capital to use for environmental goals. In the last few years, warnings about the possibility for the occurrence of a speculative “green” equities bubble arose due to the outperformance of companies belonging to more sustainable economic sectors (Aramonte and Zabai, 2021; Borio 2022); however, other authors argued that this may improve the transition process toward a more sustainable economy (Lehnert, 2022). Moreover, as shown by Jourde and Stalla-Bourdillon (2021), the risk of an emerging bubble disappears once the valuations of firms are performed by using environmental scores (the “E” of “Environmental, Social and Governance” – ESG) and not only by looking at the trajectory of portfolios' prices.

Green *loans* share the same goal of the previous instruments even if the green label is mainly associated to the borrower rather than issuer and/or lender based on the definition of Green Loan Principles (Berrou et al. 2019). As pointed out by Dursun-de Neef et al. (2022) firms using green loans are more effective in shrinking their environmental emissions than those borrowing sustainable loans even if the overall ESG performance may decrease due to the weakness in the social performance. Moreover, Degryse et al. (2023) find that when the loan agreements are signed by green firms and green banks, green loans are cheaper and mostly reflect the environmental attitudes of the firms, in particular after the Paris Agreement in 2015.⁴

Concerning *securitizations*, the recent (and rather limited) literature mainly analyzed their role to manage banks and other financial intermediaries' risks related to the climate change and the transition process. While securitizations are in principle important instruments to increase and improve the financing of sustainable projects, they could be nonetheless used to reduce lenders' risks towards less sustainable industries and activities, implying an incorrect pricing of transition and physical risks (Ouazad and Kahn, 2022) given the possibility to sell and derecognize loans from the balance sheets (Müller et al., 2022; Nguyen et al., 2022). Few works

⁴ See: <https://unfccc.int/process-and-meetings/the-paris-agreement>.

up to now have focused on the estimation of bondholders' returns when investing in green securitizations (Agliardi, 2022) and on their policy implications (EBA, 2022).

3. On the definition of “green” securitization

Securitization generally refers to the process in which an entity defined as “originator” transforms a pool of financial or non-financial assets (normally many separate assets that generates receivables) into tradable financial instruments (securities). This process consists in selling the assets to a financial vehicle corporation (FVC) that repays the originator by issuing securities. The securities are sold to investors whose returns are drawn from the cash flows of the underlying assets (asset-backed securities – ABS – or mortgage backed securities – MBS – when the originator sells a pool of residential mortgages, collateralized debt obligations – CDO –, etc.), such as loans, leases or receivables against other assets. The underlying assets are the collateral of the securities issued. In this work we will focus on securitizations in which the originators are banks. The vast majority of securitizations is used by banks to refinance loans to existing assets, and banks are the main originators of asset-backed securities.

In this respect, a securitization could be labelled as “green” along different dimensions. Generally, two main criteria⁵ (EBA, 2022; Agliardi, 2022) are considered when evaluating the sustainability characteristics of a securitization transaction⁶:

- i.* whether the collateral of the securitization are green assets, for example loans granted by the originator to the borrowers for the development of green projects, or other green assets that have a positive environmental impact (i.e. energy-efficient mortgages, electric auto loans/leases, solar leases, etc.).
- ii.* whether the use of the proceeds raised or the capital relief gained by the transaction are used by the bank to (re)finance in full or in part assets or projects that have a positive impact on environmental factors.

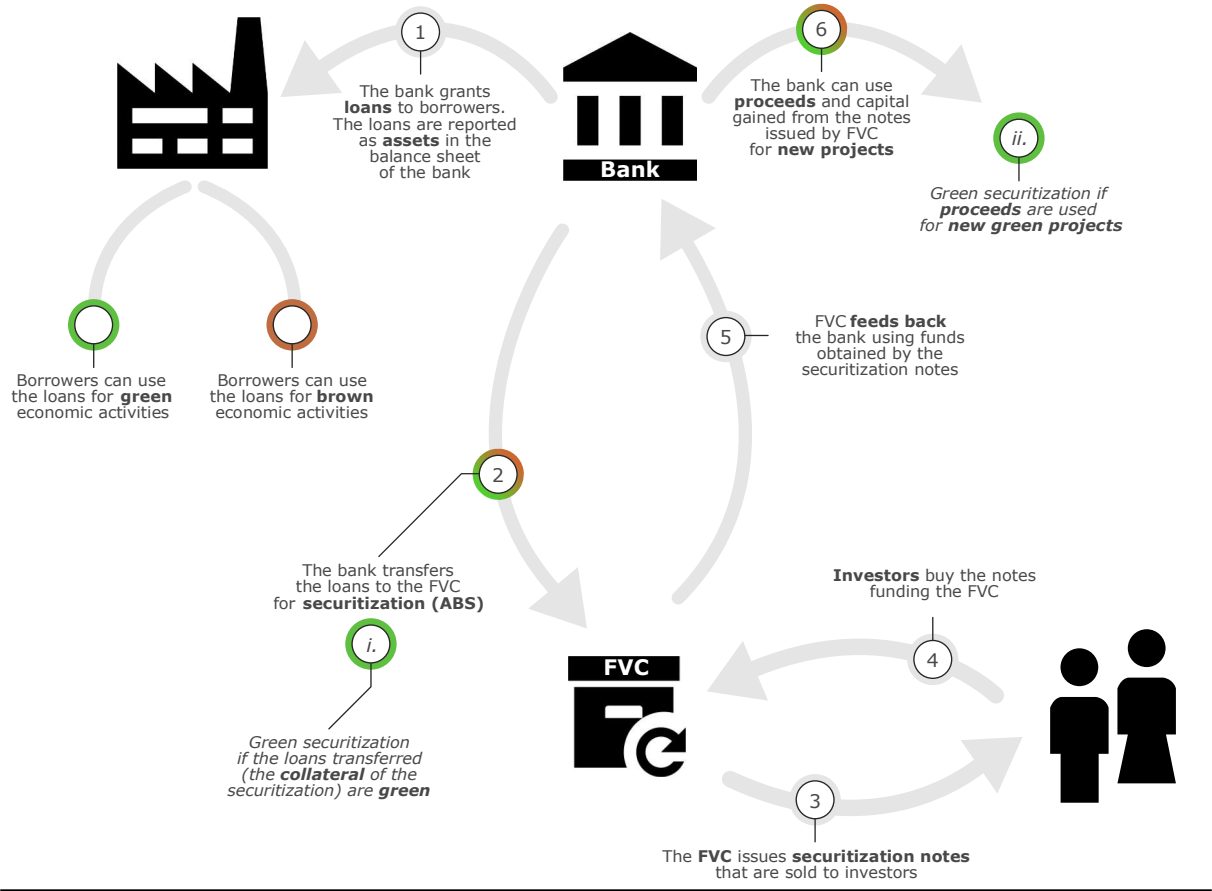
A complete picture of the criteria defining a green securitization, in the simplest case of an ABS, can be observed in Figure 1, which shows how many actors are involved in a green operation. Concerning condition *i.*, in the rest of the paper we will deal with securitizations

⁵ According to EBA (2022) a further type of green securitization can be defined: whether the key counterparties to the transactions (including the originator and the servicer) commit to achieving certain sustainability-related key performance indicators (KPI) including, for example, financial incentives for the originator upon meeting specified ESG targets.

⁶ It is straightforward to extend these criteria to define also social and sustainable securitizations.

whose collateral are loans to non-financial corporations. Securitizations identified by condition *ii.* are likely to be financial instruments more capable to fund sustainable initiatives and bring environmental improvements. When proceeds are used for new green projects or lending, the securitization process creates new resources available for sustainable projects and facilitates the access to the bond market by modifying banks' portfolios in favor of green assets. However, it is useful to notice that if only condition *ii.* applies, the collateral is not necessarily related to low-carbon sustainable activities: this distinction may affect the carbon content of the financed emissions indicators if derecognized loans are included in the computation (see section 6).

Figure 1. Criteria to define a green securitization



The identification of green securitizations as defined above requires the availability of specific micro and macro datasets. In particular, it is not always possible to assess if a certain securitization is backed by a green asset or translates into a green project. If identifying the securitization's collateral is difficult, even more difficult is to assess how the proceeds of the operation will be really used. Since there are not yet universally accepted definitions, a possible way out to provide some highlights is to consider as green a securitization that satisfies *at least one* criteria among *i.* and *ii.*. Green securitizations defined by condition *i.* may have a higher

ability to directly attract investors interested in green instruments, although those defined by condition *ii.* effectively translate either in new environmental projects or in new green lending. According to EBA (2022), the two criteria should not be considered separately. In fact, on the one hand, the loans involved in the green operations could not finance the transition towards a green economy since the assets already exist, implying no new green improvements; on the other, considering only the proceeds, the risk consists in classifying a securitization as green even if the collateral is brown. Recent analyses confirm that securitizations defined as “green” adhere to both criteria – *i.* and *ii.* – mentioned above (AFME, 2022).

In this respect, given the theoretical definitions provided above and, as we will see below, the existing available information at our disposal, not much can be actually done in order to identify green securitizations existing in the market. A possible way is trying to follow the same methodology used by AFME (2022) and exploiting a new set of information regarding the ESG profile of the securities collected in the European Central Bank *Centralised Securities Data Base* (CSDB).⁷ This database provides information on securities issued by EU residents and/or held and transacted by EU residents as well as securities denominated in euro. The ESG variables available in the CSDB are mainly taken from different commercial data providers.⁸ For each security reported in the CSDB, it is possible to distinguish the ESG profile (green, social, sustainable or sustainable linked) and if the bond is self-labelled or if it has a secondary part opinion (SPO) or a certification (it is also possible to identify the provider of the SPO).⁹ Therefore, by considering green securities and applying a filter for securitizations’ types such as ABS, MBS, and CDO, it is possible to identify instances of green securitizations. Nonetheless, it may be challenging to determine whether the green nature of these securities is primarily attributed to the underlying assets or the proceeds. In the following section we provide some evidence from CSDB data.

4. Some evidence on the market for green securitizations

Based on CSDB¹⁰, the green securitizations market increased over time. In 2022, 16 operations were reported, corresponding to a volume of €4.3 billion issued, against the unique

⁷ The ESG variables are available from the reference date of December 2020.

⁸ Currently, the main data providers are Refinitiv, ICE and WM Datenservice.

⁹ Based on the tightness and the scope of the validation, evaluations by independent external reviewers can be classified in different types. For instance “Certification” provides a stronger “flag” than “Second Party Opinion”.

¹⁰ The analyses are performed using the reference date of December 2022.

green securitization issued in 2017 (Table 1). ABS is the preferred type representing more than 50 per cent of the total issued volume from 2017 to 2022 (Table 2).

Table 1. Green securitizations by year of issuance
(millions of euro; data from 2017 to 2022) (1)

Year of issuance	Number of operations	Issued amount	Outstanding amount (2)
2017	1	5	2
2018	1	190	45
2019	4	748	732
2020	10	1,628	1,321
2021	9	3,903	3,869
2022	16	4,271	4,235

Source: European Central Bank, CSDB.

(1) For non-euro-denominated securities, the exchange rate at the issuance date is applied to the issued amount, while the exchange rate at December 2022 is applied to the outstanding amount. – (2) Outstanding amount at December 2022.

Table 2. Green securitizations by asset type
(millions of euro; cumulated data from 2017 to 2022) (1)

Year of issuance	Number of operations	Issued amount	Outstanding amount (2)
ABS	21	5,793	5,533
MBS	17	3,546	3,201
CDO	3	1,406	1,471

Source: European Central Bank, CSDB.

(1) For non-euro-denominated securities, the exchange rate at the issuance date is applied to the issued amount, while the exchange rate at December 2022 is applied to the outstanding amount. – (2) Outstanding amount at December 2022.

Table 3 shows that the United States (US) represents the main issuer country in our analysis¹¹, despite the fact that US securities are underestimated in the CSDB by its design, whereas, in the Euro Area, the Netherlands is the major issuer.

Finally, by looking at the quality profile we can observe that no green securitizations are certified and only half of the amount is verified by a SPO: in this respect the EU Taxonomy does not seem to be the main reference set of principles. Based on the self-declarations of the issuers, all green securitizations are connected to an own framework and about half of the total volume is aligned to the International Capital Market Association (ICMA) principles (Table 4).

¹¹ In the US securitizations market, the government-sponsored corporations Freddie Mac and Fannie Mae play an important role in sustaining the secondary market for mortgages. Recently, these institutions introduced new types of MBS that are connected to green building certifications and rental housing stock that is retrofit to become more energy- and water-efficient.

Table 3. Green securitizations by country
(millions of euro; cumulated data from 2017 to 2022) (1)

Issuer country	Number of operations	Issued amount	Outstanding amount (2)
United States (US)	5	2,408	2,374
Netherlands (NL)	4	2,300	2,300
Mexico (MX)	1	1,102	1,168
Cayman Islands (KY)	3	1,007	978
United Kingdom (GB)	1	746	625
Sweden (SE)	2	680	680
Indonesia (ID)	2	609	564
Australia (AU)	9	477	279
Spain (ES)	2	430	430
Ireland (IE)	3	429	425
Portugal (PT)	3	392	240
Russia (RU)	1	86	68
Hungary (HU)	3	66	60
Turkey (TR)	1	10	10
Luxembourg (LU)	1	4	3

Source: European Central Bank, CSDB.

(1) For non-euro-denominated securities, the exchange rate at the issuance date is applied to the issued amount, while the exchange rate at December 2022 is applied to the outstanding amount. – (2) Outstanding amount at December 2022.

Table 4. Green securitizations by type of certification: outstanding amount
(millions of euro; cumulated data from 2017 to 2022)

	Self-labelled	SPO	Certification
IOF	5,519	–	–
ICMA	–	909	–
IOF + ICMA	3,415	–	–
IOF + ICMA + ACMF	564	–	–
IOF + ICMA + EUGBS + EU	706	–	–
ICMA + ACMF	–	564	–
ICMA + EUGBS + EU	–	680	–
CBI	–	130	–
CBI + ICMA	–	2,506	–
CBI + ICMA + EUGBS + EU	–	26	–
None	–	5,389	10,204

Source: European Central Bank, CSDB.

IOF = Issuer's Own Framework; ICMA = International Capital Market Association Principles; ACMF = ASEAN Capital Markets Forum Standards; EUGBS = European Green Bond Standards; EU = EU Taxonomy; CBI = Climate Bond Initiative.

Some research reports refer to green securitizations originated by Italian banks. In particular, AFME (2022) reports that in 2021 one of the main Italian banks completed the first green securitization in Italy. Nevertheless, as for the Italian market, no green securitizations issued by Italian FVC are currently listed in the CSDB, while one securitization labelled as social is reported. This could depend on the lack of information about the structure of the operations (*issuance of ABS by a FVC, tranching cover scheme or unfunded guarantee*) for which no further details are provided and on the recent introduction of the “ESG” variables as fields in the CSDB. Given the limited number of reported operations, in the next section we decide to follow a different methodology to identify green securitizations operations operated by Italian banks in order to provide a comprehensive assessment of the Italian market.

5. The market for green securitizations in Italy

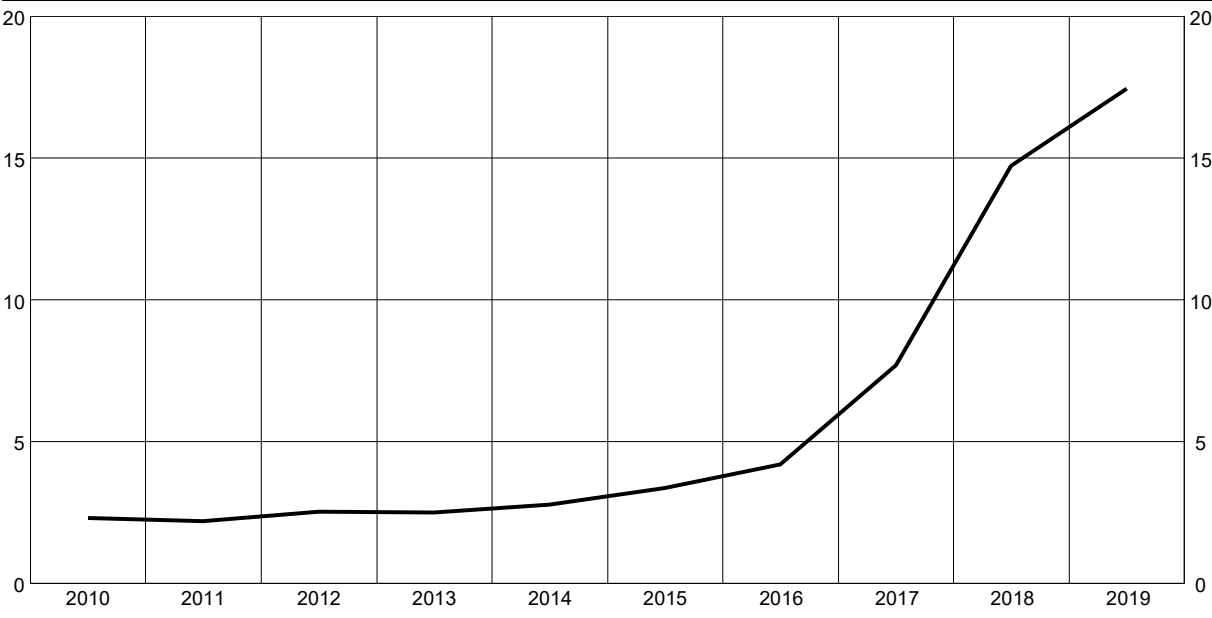
In this paragraph we report some evidence on the evolution of the market for green securitizations in Italy. As we will see, in this and in the following sections we employ Eurostat’s Environmental Accounts’ greenhouse gas (GHG) emissions data. Despite GHG emissions data for 2020 are available, we decided to not include that year in our analyses given its outlier nature. We indeed observe a drop in greenhouse gas emissions due to pandemic lockdowns that is totally unaligned with trends in standard periods of production activity. Therefore, our analysis covers the time span 2010 – 2019.

In the previous paragraphs we showed the various limitations in assessing the actual criteria defining a green securitization, in particular establishing if a certain securitization is backed by a green collateral and how the proceeds of the operation will be used. An alternative and feasible way to identify green loans’ securitizations is labelling those whose collateral are banks’ loans granted to green or sustainable economic activities, classified for our purposes at the level of NACE Rev. 2 divisions (Eurostat, 2008). Therefore, the issue of identifying green securitizations turns into the issue of establishing which NACE divisions can be labelled as “green” or “sustainable”. In this paragraph, we will also describe how we dealt with this.

Bank of Italy regularly produces statistics on the balance sheet items and securitized loans (derecognized from the balance sheet) originated by Italian banks (see Bank of Italy, “Banks and money: national data”). These statistics are produced at a monthly frequency with many details, for instance the ESA sector of the borrower, the type of loan (i.e., households’ mortgage or consumer credit), the NACE sector of the borrower when it is a non-financial corporation.

For the purpose of this work, we focus on the outstanding amount of total “loans securitized and derecognized from the banks’ balance sheet” to non-financial corporations. In Italy, the market for securitizations of loans increased during the period 2010 – 2019. Figure 2 shows the development of the ratio between the stock of loans to non-financial corporations securitized and derecognized from the banks’ balance sheet and the total stock of banks’ loans to non-financial corporations. While the securitization activity was not very relevant during the years 2010 – 2015, the phenomenon started to gain importance in 2016. It rapidly increased from 2016 to 2019, moving from 4.2 per cent in 2016 to 17.5 percent in 2019. It shows a slight deceleration only between 2018 and 2019.

Figure 2. Ratio of the stock of securitized loans to non-financial corporations over the stock of loans granted by Italian banks to non-financial corporations
(per cent annual data from 2010 to 2019)



Source: Bank of Italy, supervisory reports.

In order to identify the green securitizations segments of this market, we have to set up a methodology to identify sustainable NACE economic activities. To be consistent with the data on greenhouse gas emissions provided by Eurostat that we employ in section 5, we focus on data for the 63 NACE divisions (out of 88, some are grouped at section level; in the rest of the paper we will generally refer to “divisions”) present for Italy in the Eurostat’s Environmental Accounts.¹² In Table 5 we report the share of securitized loans by NACE activity of the borrower for the more relevant NACE divisions (two-digit numerical code) summing up to more than 80 per cent of the total outstanding amount of securitizations in 2019.¹³ The divisions

¹² In Table A1 of the Appendix the list of the 63 NACE divisions is reported.

¹³ The sections’ or divisions’ code and descriptions reported in Table 5 and in the rest of the paper are those present

are presented in a decreasing order of share based on 2019 data. During the ten years from 2010 to 2019, 14 NACE divisions of economic activities out of 63 accounted for about 80 per cent of the total banks' securitizations market. Despite the sharp increase in the total dimension of the market (in Figure 3 it is shown that the value of the market for the ten most relevant divisions increased from €15.22 billion in 2010 to €91.75 billion in 2019), the shares of NACE divisions appear to be quite stable over the decade, with no significant variations. It is a highly concentrated market, characterized by two sections and one division (F-Construction, L-Real estate activities, G46-Wholesale trade, except of motor vehicles and motorcycles) accounting for the half of the market and one single sector (F-Construction) accounting alone for one fourth of the market.

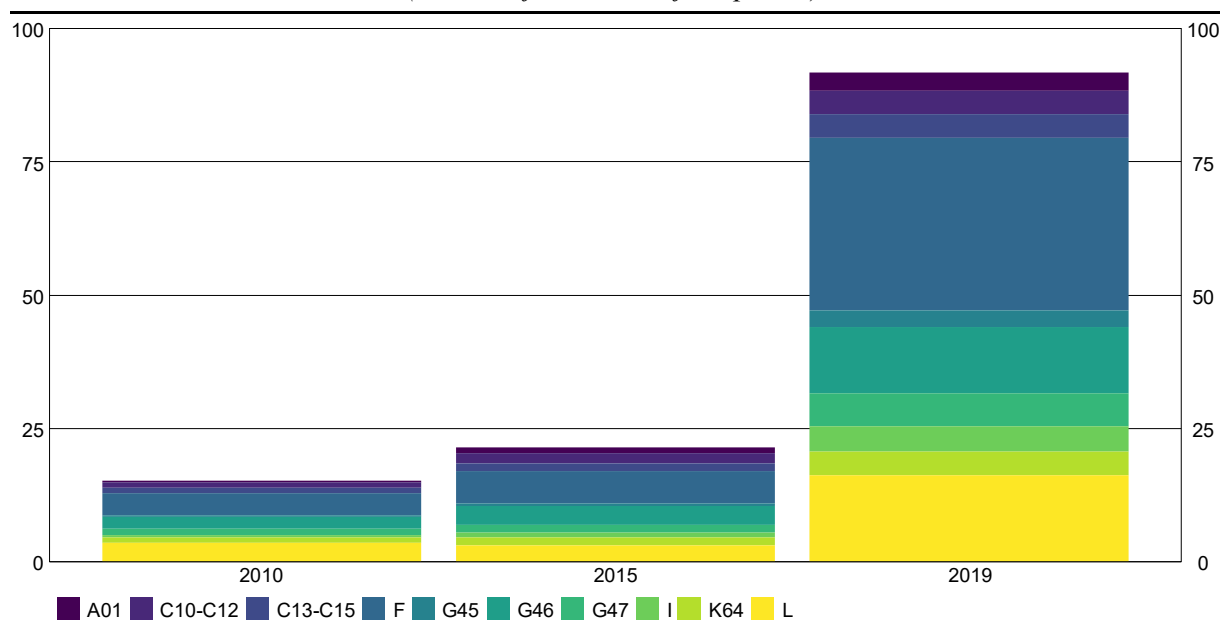
**Table 5. Share of securitized loans by NACE activity (division)
of the borrower non-financial corporation**
(percentage value at the end of the year)

NACE code	Description	2010	2015	2019
F	Construction	20.46	19.08	26.14
L	Real estate activities	10.25	16.07	13.17
G46	Wholesale trade, except of motor vehicles and motorcycles	11.76	9.65	9.95
G47	Retail trade, except of motor vehicles and motorcycles	4.94	5.53	5.08
I	Accommodation and food service activities	2.99	1.86	3.81
C10-C12	Manufacture of food products	6.13	4.26	3.62
C13-C15	Manufacture of textiles, wearing apparel, leather and related products	5.17	4.49	3.59
K64	Financial service activities, except insurance and pension funding	5.01	4.40	3.53
A01	Crop and animal production, hunting and related service activities	3.84	1.57	2.70
G45	Wholesale and retail trade, repair of motor vehicles and motorcycles	1.47	1.02	2.56
C25	Manuf. of fabricated metal products, except machinery and equipment	2.20	2.73	2.09
C23	Manufacture of other non-metallic mineral products	1.52	1.76	1.78
C31_C32	Manufacture of furniture	1.43	1.41	1.71
C28	Manufacture of machinery and equipment	2.29	2.54	1.64
	Total	79.46	76.39	81.38

Source: Bank of Italy, supervisory reports.

in the Eurostat's Environmental Accounts. Two NACE divisions that are grouped together are indicated with the subscript "_", for instance "C31_C32" means "division C31 and division C32". More than two subsequent divisions grouped together and indicated with the symbol "-", that is, "C13-C15" means "divisions C13, C14 and C15".

Figure 3. Outstanding amounts of loans securitized and derecognized from banks' balance sheets
(billions of euro; end of the period)



Source: Bank of Italy, supervisory reports.

Sustainability is a multidimensional concept involving environmental as well as economic and social aspects. Given the forward looking essence of the concept, it would not be appropriate to identify “green” and “brown” sector of economic activities by simply relying on direct and typically backward looking measures of pollutant emissions, for instance those available on Eurostat’s Environmental Accounts. Indeed, there are “intrinsically highly emitting” activities that nonetheless can be considered sustainable in terms of future “environmental objectives”. In this respect, to identify “green” or “sustainable” economic activities, it is more sensible and straightforward to look at the EU Taxonomy of sustainable activities.¹⁴ The EU Taxonomy is an official classification system, entered into force on 12 July 2020, which establishes a list of environmentally sustainable economic activities. In particular, the Regulation behind the Taxonomy establishes requirements that an economic activity has to meet in order to be qualified as environmentally sustainable.¹⁵ The employment of the EU Taxonomy in order to identify “green” economic activities for our purposes, faces the problem that the list of Taxonomy’s activities cannot be fully applicable at NACE division level. The sustainable economic activities listed in the EU Taxonomy Compass¹⁶ are very specific, and

¹⁴ See: https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en.

¹⁵ For the list of requirements and of the environmental objectives see the Taxonomy Regulation at <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32020R0852>.

¹⁶ The EU Taxonomy Compass at <https://ec.europa.eu/sustainable-finance-taxonomy/home> provides a visual representation of the contents of the EU Taxonomy in terms of Taxonomy-eligible activities, showing to which objectives they substantially contribute and what criteria have to be met for activities to be considered Taxonomy-aligned.

correspond very often to NACE groups or classes (sub-details of NACE divisions). In this respect, we cannot apply the sustainability condition of a group to the whole division (that can include other not sustainable groups). Moreover, single Taxonomy activities can be linked to more NACE groups. For this reason, in order to identify green NACE divisions we combine the information of the EU Taxonomy with those published by the Italian National Institute of Statistics (ISTAT) in its permanent census of enterprises. The census took place for the first time in 2019 with the goal of providing a detailed picture of the Italian economic system, by gathering information about emerging issues such as enterprises' organisation, competitiveness and environmental sustainability. The census involved a sample¹⁷ of about 280,000 enterprises employing more than 3 workers, representing about 24.0 per cent of Italian enterprises that produce 84.4 per cent of the National Added Value, employing 76.7 per cent of the workers (12.7 million) and 91.3 per cent of employees (ISTAT, 2020). The survey collected and disseminated information on the number and the percentage of firms, grouped at NACE division level that, during the three years 2016 – 2018, took actions to reduce environmental impact of their own activities. The survey is very detailed, providing also information at NACE division level of the type of actions taken by the companies to reduce the consumption of natural resources and to manage waste and emissions in a sustainable manner¹⁸ as well as the type of investment for an efficient and sustainable management of energy and transports.¹⁹ Table A1 in the Appendix reports the list of NACE division with the corresponding percentage of firms that took actions to reduce environmental impact. We decided to label as “sustainable” for the entire sample period those NACE divisions of economic activity that fulfil two conditions: first of all, the ISTAT's percentage of companies that took some actions to reduce environmental impact of their own activities in 2016 – 2018 has to be higher than 75 per cent for that division; second, these divisions have to cover at least one of the NACE subgroups listed in the EU Taxonomy as eligible activities.²⁰ The rationale is that some economic activities cannot be intrinsically

¹⁷ As reported on the ISTAT's data warehouse, “the permanent censuses do not involve all the citizens, enterprises and institutions, but only representative samples on a case-by-case basis. However, the country-wide provision of so produced data is of census type, hence it concerns the whole observation field”.

¹⁸ The type of actions are: a. containment of extractions and water consumption; b. wastewater treatment for the containment and control of pollutants; c. reuse and recycling of waste water; d. saving of material used in production processes; e. use of secondary raw material; f. separate collection and recycling of waste; g. waste management for the containment and control of pollutants; h. containment of atmospheric emissions; i. containment of noise and/or light pollution; j. use of suppliers who have already adopted processes to reduce the environmental impact of their own activities; k. other actions.

¹⁹ The type of investments are: a. installation of efficient machinery, equipment and/or appliances that reduce energy consumption; b. thermal insulation of buildings and/or construction of buildings with low energy consumption; c. installation of plants for the production of electricity from renewable sources; d. installation of plants for the production of thermal energy from renewable sources; e. installation of plants for cogeneration or trigeneration and/or for heat recovery; f. purchase of electric or hybrid vehicles; g. other investments.

²⁰ Four eligible activities of the Taxonomy do not have correspondence with any NACE code: “Restoration of

considered as “green” (i.e. mining and quarrying): therefore, if none of their groups of activity is listed in the EU Taxonomy, they must be excluded from the “green” sectors of economic activities. On the opposite we identify as “brown” the divisions with the ISTAT’s percentage of companies lower than 60 per cent²¹; the remaining NACE divisions are simply neither green nor brown. Table 6 shows the list of NACE divisions identified as “green” or “brown” on the base of these criteria.

Table 6. NACE Divisions labelled as “green” or “brown”

Brown NACE Divisions	ISTAT perc.	Green NACE Division	ISTAT perc.
H50. Water transport	50.30	C20. Manufacture of chemicals and chemical products	82.86
J58. Publishing activities	59.20	C22. Manufacture of rubber and plastic products	77.11
J61. Telecommunications	58.90	C24. Manufacture of basic metals	75.97
J62_J63. Computer programming, consultancy, and information serv.	50.91	C29. Manufacture of motor vehicles, trailers and semi-trailers	75.09
K64. Financial service activities, except insurance and pension funding	55.90	E36. Water collection, treatment and supply	78.65
L. Real estate activities	43.20	E37-E39. Sewerage, waste management, remediation activities	84.11
M69_M70. Legal and accounting activities	56.65	K.65 Insurance, reinsurance and pension funding, except compulsory social security	77.50
N78. Employment activities	58.80		
R90-R92. Creative, arts and entertainment activities	55.66		

Source: ISTAT, permanent census of companies; the selection of “green” NACE divisions make use of the list of EU Taxonomy of sustainable activities.

Figure 4 shows the ratio of the stock of securitized loans to non-financial corporations over the stock of loans granted by Italian banks to non-financial corporations for “brown” and “green” NACE divisions.²² It is straightforward how, on average, the market for banks’ securitized loans to “brown” economic activities grew much more rapidly with respect to “green” activities. This means that, especially in the very last years, banks have preferred – in

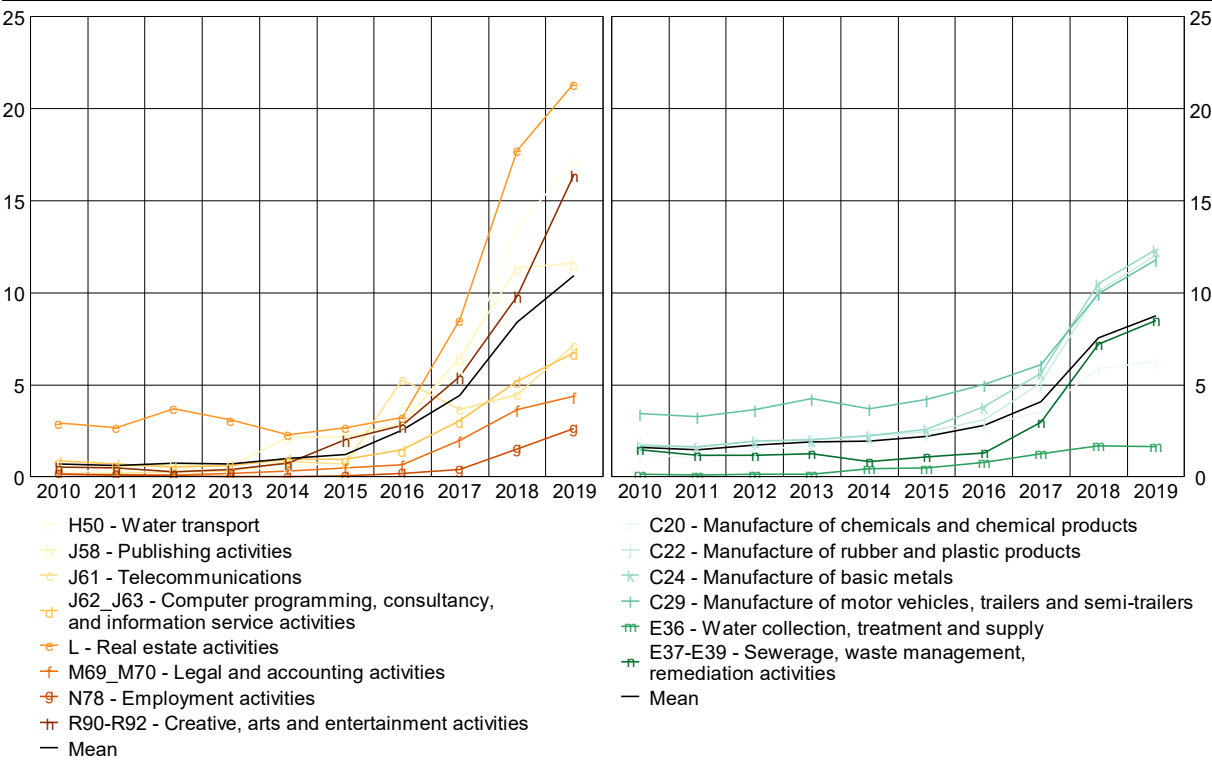
wetlands”, “Storage of electricity”, “Storage of thermal energy”, “Storage of hydrogen”.

²¹ We set these thresholds equal to the 0.2 and 0.8 percentiles of the distribution of the percentages rounded to nearest multiple of 5. Figure A1 in the Appendix shows the histograms of the percentages with the indication of the selected thresholds.

²² In Figure 4 divisions “K65. Insurance, reinsurance and pension funding, except compulsory social security” (green) and “K64. Financial service activities, except insurance and pension funding” (brown) were not reported since they are outliers (their ratio in 2019 is equal to 655 per cent and 93 per cent, respectively).

relative terms – to keep loans to “green” activities in their balance sheet and to derecognize loans to less sustainable ones.

Figure 4. Ratio of the stock of securitized loans to non-financial corporations over the stock of loans granted by Italian banks to non-financial corporations for “brown” and “green” NACE divisions (per cent annual data from 2010 to 2019)



Source: Bank of Italy, supervisory reports.

6. The impact of securitizations on the carbon content of loans

In this paragraph we analyse the impact of securitizations on the “carbon content” of banks’ loans to non-financial corporations. Our approach is based on the work by Faiella and Lavecchia (2020), which computes an annual Loan Carbon Intensity (LCI) indicator at NACE division level

$$LCI_{d,t} = \frac{E_{d,t}}{L_{d,t}} \tag{1}$$

where $E_{d,t}$ are the greenhouse gas emissions (measured in grams of carbon dioxide equivalent gCO_2e) for division d in year t provided by Eurostat, and $L_{d,t}$ is the outstanding amount of loans to division d in year t . The indicator (1) measures the amount of “financed emissions” to division d in year t by the financial intermediation sector, that is, the grams of GHG emitted

by d in year t for every borrowed euro. The goal of this paragraph is to show that securitization activity has an impact in the computation of LCI indicators. In particular, leaving apart the loans securitized from the analysis leads to an overestimation of the carbon content of loans: indeed, although the securitized loans were derecognized and do not appear in the banks' balance sheets, they had nonetheless financed emissions when they were originated and must, therefore, be included in (1).

In this section, we replicate the exercise of Faiella and Lavecchia (2020) but we include the stock of the loans securitized and derecognised from the banks' balance sheets to division d in year t ($S_{d,t}$) to compute an adjusted Loan Carbon Intensity indicator

$$LCI_{S_{d,t}} = \frac{E_{d,t}}{L_{d,t} + S_{d,t}} \quad (2)$$

We show that the inclusion of securitized loans changes both the temporal behaviour and the relative comparison between economic activities in terms of financed emission. Like Faiella and Lavecchia (2020) we focus on the ten highest emitting activities, in particular the largest divisions in terms of share of GHG emissions in 2019, representing 80 per cent of GHG emissions in 2019 (see Table 7).

Table 7. Share of GHG emissions by NACE activity (division)
(percentage value)

NACE code	Description	2010	2015	2019
D	Electricity, gas, steam and air conditioning supply	30.04	28.53	25.76
A01	Crop and animal prod., hunting and related service activities	9.67	11.39	12.04
E37-E39	Sewerage, waste management, remediation activities	6.79	7.17	7.54
C23	Manufacture of other non-metallic mineral products	9.27	7.88	7.12
H50	Water transport	3.88	4.13	5.68
H49	Land transport and transport via pipelines	4.60	4.87	5.24
C19	Manufacture of coke and refined petroleum products	6.23	5.34	5.03
C20	Manufacture of chemicals and chemical products	5.38	4.72	4.25
C24	Manufacture of basic metals	5.18	4.28	4.23
G46	Wholesale trade, except of motor vehicles and motorcycles	2.80	3.63	3.50
Total		83.83	81.93	80.39

Source: Eurostat, Environmental Accounts.

Differently from Faiella and Lavecchia (2020), who consider data from Bank of Italy's

Central Credit Register, we employ data on loans to non-financial corporations from Bank of Italy’s production of Monetary and Financial Institutions’ (MFI) Balance Sheet Items (BSI) statistics produced at NACE division level. The use of BSI data allows us to include loans securitized by banks (detailed by NACE division level) and all loans to non-financial corporations.²³ Moreover, we focus only on loans originated by the banking sector and not by other financial intermediaries (Table 8).

Table 8. Loan carbon intensity (LCI) and Loan carbon intensity corrected (LCI_S) per year
(grams of CO₂ equivalent; € billions; all NACE divisions)

	Emissions (10¹²gCO₂e)	Loans (10⁹€)	Securitized loans (10⁹€)	LCI (gCO₂e/€)	LCI_S (gCO₂e/€)
2010	402.2	966.2	22.4	416.3	406.9
2011	395.3	995.0	21.8	397.3	388.8
2012	378.3	962.7	24.4	392.9	383.2
2013	344.0	909.9	22.9	378.1	368.8
2014	327.7	900.9	25.0	363.7	353.9
2015	335.8	886.2	29.8	378.9	366.6
2016	334.0	865.6	36.4	385.9	370.3
2017	336.1	813.7	62.8	413.0	383.4
2018	329.8	759.7	111.8	434.1	378.4
2019	322.9	708.8	123.7	455.6	387.9

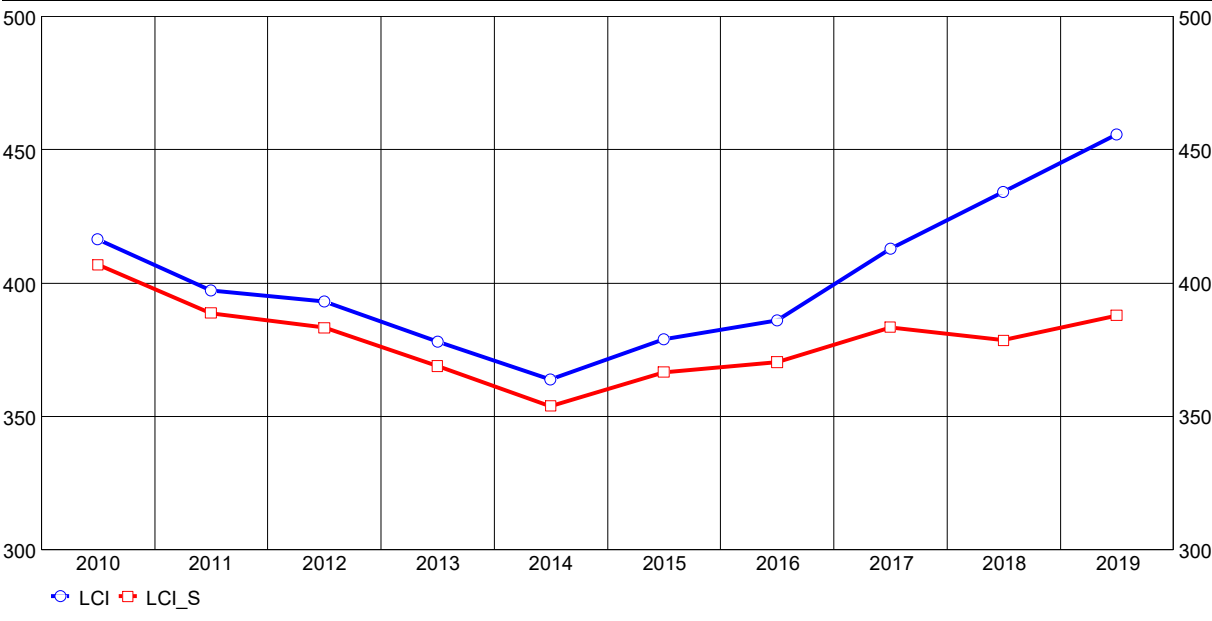
Source: Eurostat, Environmental Accounts; Bank of Italy, supervisory reports.

Figure 5 shows the temporal behaviour of the Loan Carbon Intensity indicators (LCI and the corrected LCI_S) for all NACE divisions in the period 2010 – 2019. Financed emissions decreased up to 2014 and increased from 2015 onward. The LCI indicator, that does not include securitized loans, shows a sharper increase and clearly overestimates the amount of financed emissions per borrowed euro, especially for the years after 2016 when securitization activity by banks became very relevant as we illustrated in section 5. Figure 6 shows the difference between LCI and LCI_S at NACE level. By definition, the LCI_S is lower than (or at least equal to) the LCI for all the divisions considered no matter the “green intensity” of the division. While for some divisions the two indicators produce similar results, for others, such as H50, E37-39, C19, C23, the difference is remarkable. In particular, for division “Water transport” (H50) the reduction of financed emissions is equal to 660 gCO₂e/€ when the securitized loans are

²³ Central Credit Register does not include loans below the threshold of €30,000. In addition, in the Central Credit Register it is not always possible to disentangle the originator of the loans reported by the SPV (banks vs other originators).

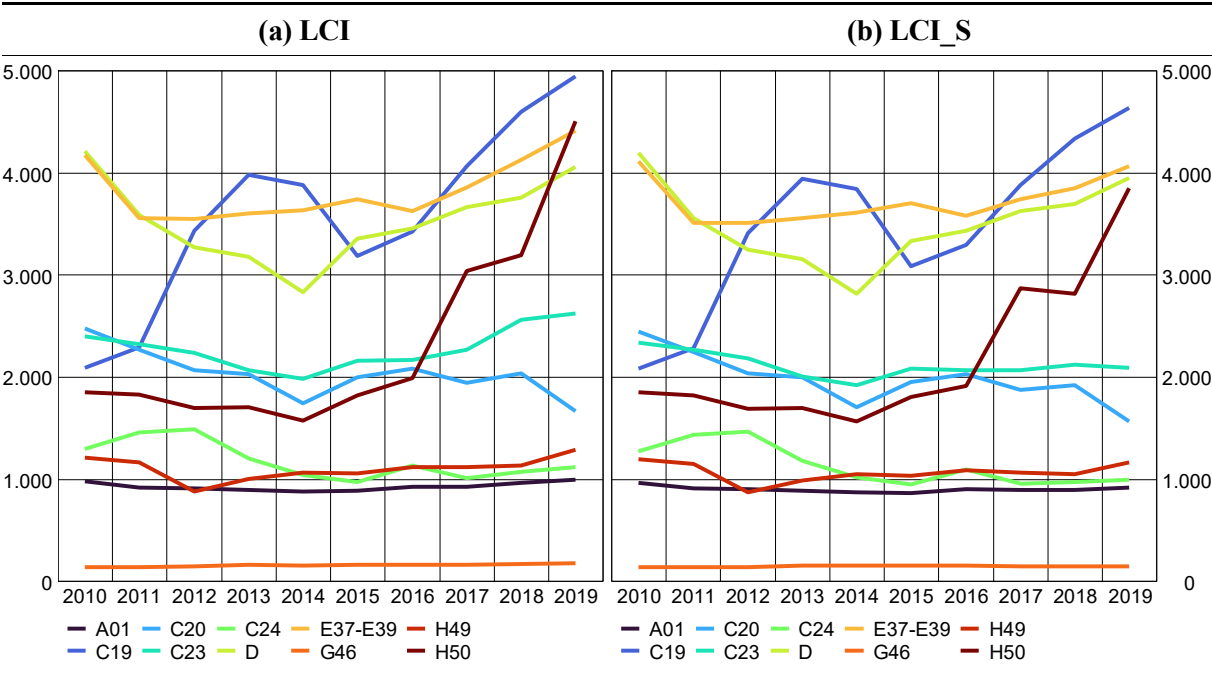
considered, causing the change in its relative position from the second to the fourth largest in loan carbon intensity in 2019. In addition to changes in their relative LCI positions, some differences in time series trends can also be observed. For example, for division C23 the adjustment for securitizations changes the trend of the LCI series from decreasing to flat.

Figure 5. Loan carbon intensity (LCI) and Loan carbon intensity corrected (LCI_S) per year
(gCO₂e/€; annual data from 2010 to 2019; all NACE divisions)



Source: Eurostat, Environmental Accounts; Bank of Italy, supervisory reports.

Figure 6. Loan carbon intensity indicators
(gCO₂e/€ annual data from 2010 to 2019)



Source: Eurostat, Environmental Accounts; Bank of Italy, supervisory reports.

The analysis shows that, despite the impact of securitization activity is not massive, not considering derecognised loans generally leads to an overestimation of the value of Loan Carbon Intensity indicators as measures of financed emissions by the banking sector. It follows that securitization activity should be considered to properly compute these indicators.

7. Conclusions

The development of the green financial market is one of the main driver to address financial resources to dedicated climate-friendly projects. To this aim, the promotion of new “green” instruments is a key point to generate more funding; this paper provides an overview on the “green securitizations” as a tool useful to reach this goal. In the absence of a unique and universally accepted definition, we firstly clarify the functioning and main criteria used to classify the green securitizations. From a theoretical point of view, a securitization can be labelled as “green” if either the securitization’s collateral is green or the proceeds originating from the operation are dedicated to green activities and projects. Assessing if a certain securitization is backed by a green collateral is not always feasible and assessing how the proceeds of the operation will be used in practice is even more difficult. For these reasons, for the time being and given the state of information available, the more feasible way to label a securitization as “green” and analyse the market for green securitizations is to assess the sustainability of the economic activity – in terms of NACE classification – of the borrower of the underlying securitized loans.

By using the evidence available in the ECB’s Centralised Securities Database, we show that although in Europe the market is still small, the volumes issued are increasing over time. Focusing on the Italian market, we find that banks’ securitized loans to “brown” economic activities grew much more rapidly than “green” activities suggesting that banks preferred to keep in their balance sheet loans to “green” activities and to derecognize loans to less sustainable ones.

Finally, we provide some evidence that that securitization activity has an impact in the computation of the loans’ carbon intensity indicators. Despite the impact of securitization activity is not massive, not considering securitized and derecognised loans overestimate the value of Loan Carbon Intensity indicators as measures of financed emissions by the banking sector. It follows that securitization activity must be necessarily considered to properly compute these indicators.

References

- Agliardi R. (2022), “Green securitisation”, *Journal of Sustainable Finance & Investment*, vol. 12(4), 1330-1345.
- Aramonte S. and Zabai A. (2021), “Sustainable finance: trends, valuations and exposures”, Bank for International Settlements, International banking and financial market developments, Box A, September 2021.
- Association for Financial Markets in Europe (2022), “European Green Securitisation Regulatory State of Play: Obstacles to growth and opportunities for leadership”, AMFE Finance for Europe, December 2022.
- Bachelet J. M., Becchetti L. and Manfredonia S. (2019), “The green bonds premium puzzle: the role of issuer characteristics and third-party verification”, *Sustainability*, 11(4).
- Baker M., Bergstresser D., Serafeim G. and Wurgler J. (2018), “Financing the Response to Climate Change: The Pricing and Ownership of U.S. Green Bonds, NBER Working Papers, No. 25194.
- Berrou R., Dessertine P. and Migliorelli M. (2019), “An Overview of Green Finance”, in Migliorelli M. and Dessertine P., *The Rise of Green Finance in Europe*, Palgrave Studies in Impact Finance, Palgrave Macmillan.
- Borio C., Claessens S. and Tarashev N. (2022), “Finance and climate change risk: managing expectations”, Bank for International Settlements speech.
- Climate Bond Initiative (2017), “Green Securitisation: unlocking finance for small-scale low carbon projects”, Briefing Paper.
- Climate Bond Initiative (2018), “Green securitisation: unlocking finance for small-scale low carbon projects”, Briefing Paper.
- Degryse H., Goncharenko R., Theunisz C. and Vadasz T. (2023), “When green meets green”, *Journal of Corporate Finance*, vol. 78, 102355.
- D’Orazio P. and Popoyan L. (2019), “Fostering green investments and tackling climate related financial risks: Which role for macroprudential policies?”, *Ecological Economics*, vol. 160, pp 25-37.
- Dursun-de Neef Ö, Ongena S. and Tsonkova G. (2022), “Green versus sustainable loans: The impact on firms’ ESG performance”, Swiss Finance Institute Research Paper Series, No. 22-42.

- European Banking Authority (2022), “Developing a Framework for Sustainable Securitisation”, EBA/REP/2022/06.
- European Investment Bank (2021), “Evaluation of the EIB’s Climate Awareness Bonds”, April 2021.
- Eurostat (2008), “NACE Rev. 2 Statistical classification of economic activities in the European Community”, Eurostat Methodologies and Working papers.
- EU Technical Expert Group on Sustainable Finance (2020), “Taxonomy Report: Technical Annex. Updated methodology & Updated Technical Screening Criteria”.
- Faiella I. and Lavecchia L. (2020), “The carbon footprint of Italian loans”, Bank of Italy, Occasional Papers, n. 557.
- Fitch Ratings (2021), “Green Securitisation: Developments and Challenges”, Special Report.
- Fitch Ratings (2022), “Green and Social Securitisation: Global Momentum to Continue”, Special Report.
- Flammer C. (2021), “Corporate green bonds”, *Journal of Financial Economics*, vol. 142, pp. 499-516.
- Gianfrate G. and Peri M. (2019), “The green advantage: Exploring the convenience of issuing green bonds”, *Journal of Cleaner Production*, vol. 219, pp. 127-135.
- ISTAT (2020), “Sostenibilità nelle imprese: aspetti ambientali e sociali”, Censimenti Permanenti Imprese.
- Jourde T. and Stalla-Bourdillon A. (2021), “Is there a bubble in “green” equities?”, Banque De France, post no. 235.
- Lehnert T. (2022), “The Green Stock Market Bubble”, *Circular Economy and Sustainability*.
- Liberati D. and Marinelli G. (2022), “Everything you always wanted to know about green bonds (but were afraid to ask)”, in Bank for International Settlements (ed.), *Statistics for Sustainable Finance*, vol. 56, Bank for International Settlements.
- Müller I., Nguyen H. and Nguyen T. (2022), “The Color of Corporate Loan Securitization”, IWH Discussion Paper, n. 22/2022, Halle Institute for Economic Research (IWH), Halle (Saale).

- Nguyen D., Ongena S., Qi S. and Sila V. (2022), “Climate change risk and the cost of mortgage credit”, *Review of Finance*, vol. 26(6), pp 1509-1549.
- Ouazad A. and Kahn M. E. (2022), “Mortgage finance and climate change: Securitization dynamics in the aftermath of natural disasters”, *The Review of Financial Studies*, vol. 35(8), pp. 3617–3665.
- Ozili P. K. (2022), “Green finance research around the world: a review of literature”, *International Journal of Green Economics*, vol. 16(1), pp 56 -75.
- Partnership for Carbon Accounting Financials (2022), “The Global GHG Accounting and Reporting Standard for the Financial Industry - Part A - Financed Emissions”, Second edition, December 2022.
- Petit C. and Schlosser P. (2020), “Rationale, Potential and Pitfalls of Green Securitization”, European University Institute, Robert Schuman Centre for Advanced Studies, EUI Working Papers, n. 2020/35.
- Riedl A. and Smeets P. (2017), “Why do investors hold socially responsible mutual funds?” *The Journal of Finance*, vol. 72(6), pp. 2505-2550.
- Sachs J. D., Thye Woo W. T., Yoshino N. and Taghizadeh-Hesary F. (2019), “Importance of Green Finance for Achieving Sustainable Development Goals and Energy Security” in *Handbook of Green Finance*, Springer.
- Sartzetakis E. S. (2021), “Green bonds as an instrument to finance low carbon transition”, *Economic Change and Restructuring*, vol. 54, 755-779.
- Tang D. Y. and Zhang Y. (2020), “Do shareholders benefit from green bonds?” *Journal of Corporate Finance*, vol. 61(C).
- Thomä J. and Gibhardt K. (2019), “Quantifying the potential impact of a green supporting factor or brown penalty on european banks and lending”, *Journal of Financial Regulation and Compliance*, vol. 27(3), pp. 380-394.
- Xiao C., Cheng J. and Ma W. (2021), “Motivation of Chinese commercial banks to issue green bonds: Financing costs or regulatory arbitrage?” *China Economic Review*, vol. 66, 101582.
- Zerbib O. D. (2019), “The effect of pro-environmental preferences on bond prices: evidence from green bonds”, *Journal of Banking and Finance*, vol. 98, pp. 39-60.
- Zhang M., Tang Y., Liu L., Jin J. and Zhou, D. (2023), “Is asset securitization an effective means of financing China’s renewable energy enterprises? A systematic overview”, *Energy Reports*, vol. 9, 859-872.

Appendix

Table A1. List of NACE sections, divisions and grouped divisions considered with the ISTAT percentage of non-financial corporations that undertook activities to reduce environmental impact in 2016-2018 and the indication if they cover sustainable activities included in the EU Taxonomy.

	NACE code	Description	ISTAT percentage	EU Taxonomy
1	A01	Crop and animal production, hunting and related service activities	NA	no
2	A02	Forestry and logging	NA	yes
3	A03	Fishing and aquaculture	NA	no
4	B	Mining and quarrying	78.99	no
5	C10-C12	Manufacture of food products	69.22	no
6	C13-C15	Manufacture of textiles, wearing apparel, leather and related products	63.54	no
7	C16	Manufacture of wood and of products of wood and cork, except furniture	72.06	yes
8	C17	Manufacture of paper and paper products	72.99	yes
9	C18	Printing and reproduction of recorded media	75.84	no
10	C19	Manufacture of coke and refined petroleum products	75.04	no
11	C20	Manufacture of chemicals and chemical products	82.86	yes
12	C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	80.06	no
13	C22	Manufacture of rubber and plastic products	77.11	yes
14	C23	Manufacture of other non-metallic mineral products	74.79	yes
15	C24	Manufacture of basic metals	75.97	yes
16	C25	Manufacture of fabricated metal products, except machinery and equipment	72.90	yes
17	C26	Manufacture of computer, electronic and optical products	70.49	yes
18	C27	Manufacture of electrical equipment	70.69	yes
19	C28	Manufacture of machinery and equipment n.e.c.	72.62	yes
20	C29	Manufacture of motor vehicles, trailers and semi-trailers	75.09	yes

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	NACE code	Description	ISTAT percentage	EU Taxonomy
21	C30	Manufacture of other transport equipment	70.09	yes
22	C31_C32	Manufacture of furniture	74.05	no
23	C33	Repair and installation of machinery and equipment	71.53	yes
24	D	Electricity, gas, steam and air conditioning supply	70.12	yes
25	E36	Water collection, treatment and supply	78.65	yes
26	E37-E39	Sewerage, waste management, remediation activities	84.11	yes
27	F	Construction	71.12	yes
28	G45	Wholesale and retail trade and repair of motor vehicles and motorcycles	76.40	no
29	G46	Wholesale trade, except of motor vehicles and motorcycles	64.05	no
30	G47	Retail trade, except of motor vehicles and motorcycles	62.82	no
31	H49	Land transport and transport via pipelines	69.10	yes
32	H50	Water transport	50.30	yes
33	H51	Air transport	76.90	no
34	H52	Warehousing and support activities for transportation	60.40	yes
35	H53	Postal and courier activities	67.60	yes
36	I	Accommodation and food service activities	68.90	no
37	J58	Publishing activities	59.20	no
38	J59_J60	Motion picture, video, television programme production	61.90	yes
39	J61	Telecommunications	58.90	yes
40	J62_J63	Computer programming, consultancy, and information service activities	50.91	yes
41	K64	Financial service activities, except insurance and pension funding	55.90	no
42	K65	Insurance, reinsurance and pension funding, except compulsory social security	77.50	yes

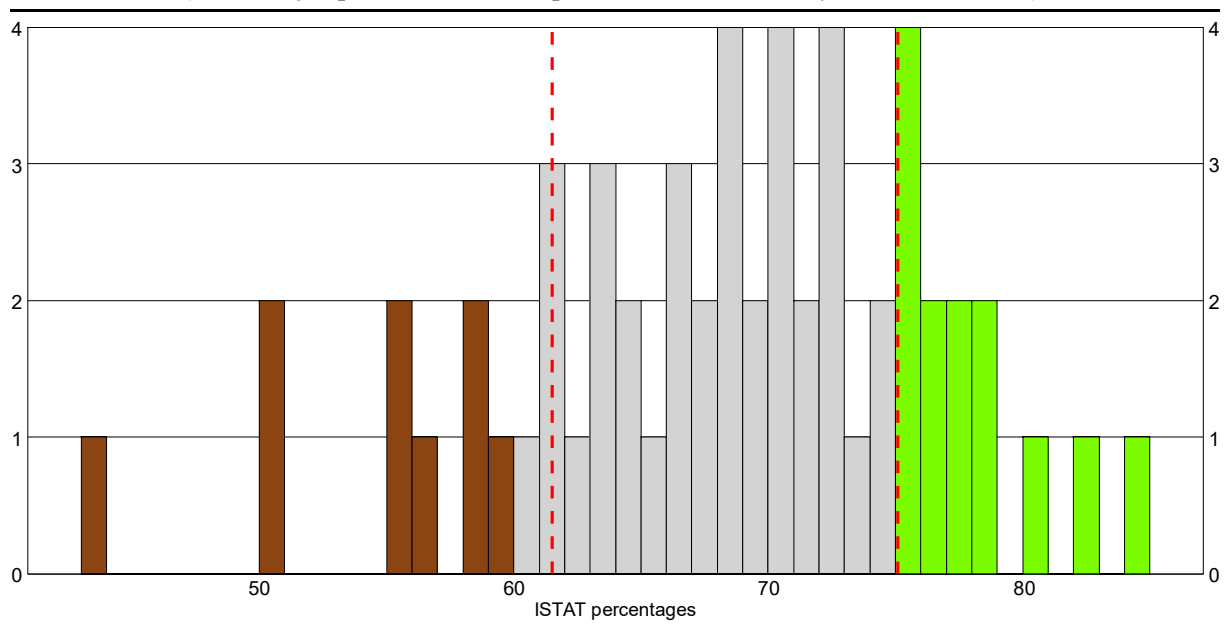
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	NACE code	Description	ISTAT percentage	EU Taxonomy
43	K66	Activities auxiliary to financial services and insurance activities	61.40	no
44	L	Real estate activities	43.20	yes
45	M69_M70	Legal and accounting activities	56.65	no
46	M71	Architectural and engineering activities	68.80	yes
47	M72	Scientific research and development	66.80	yes
48	M73	Advertising and market research	66.30	no
49	M74_M75	Other professional, scientific and technical activities	66.46	no
50	N77	Rental and leasing activities	67.70	yes
51	N78	Employment activities	58.80	no
52	N79	Travel agency, tour operator and other reservation service and related activities	61.10	no
53	N80-N82	Security, investigation, service and landscape, office admin. and support act.	64.43	no
54	O	Public administration and defence	NA	no
55	P	Education	63.50	yes
56	Q86	Human health activities	73.80	no
57	Q87_Q88	Residential care activities and social work activities without accommodation	68.31	yes
58	R90-R92	Creative, arts and entertainment activities	55.66	yes
59	R93	Sports activities and amusement and recreation activities	68.60	no
60	S94	Activities of membership organisations	NA	no
61	S95	Repair of computers and personal and household goods	65.70	yes
62	S96	Other personal service activities	63.40	no
63	T	Activities of households as employers	NA	no

Source: Eurostat, Environmental Accounts; ISTAT, Companies Census; European Commission, EU Taxonomy Compass.

Figure A1. Frequency histogram of ISTAT percentages of non-financial corporations by NACE that undertook activities to reduce environmental impact with selected percentiles
(absolute frequencies; selected percentiles indicated by dashed red lines)



Source: ISTAT, Companies Census.