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EUROSISTEMA

Questioni di Economia e Finanza

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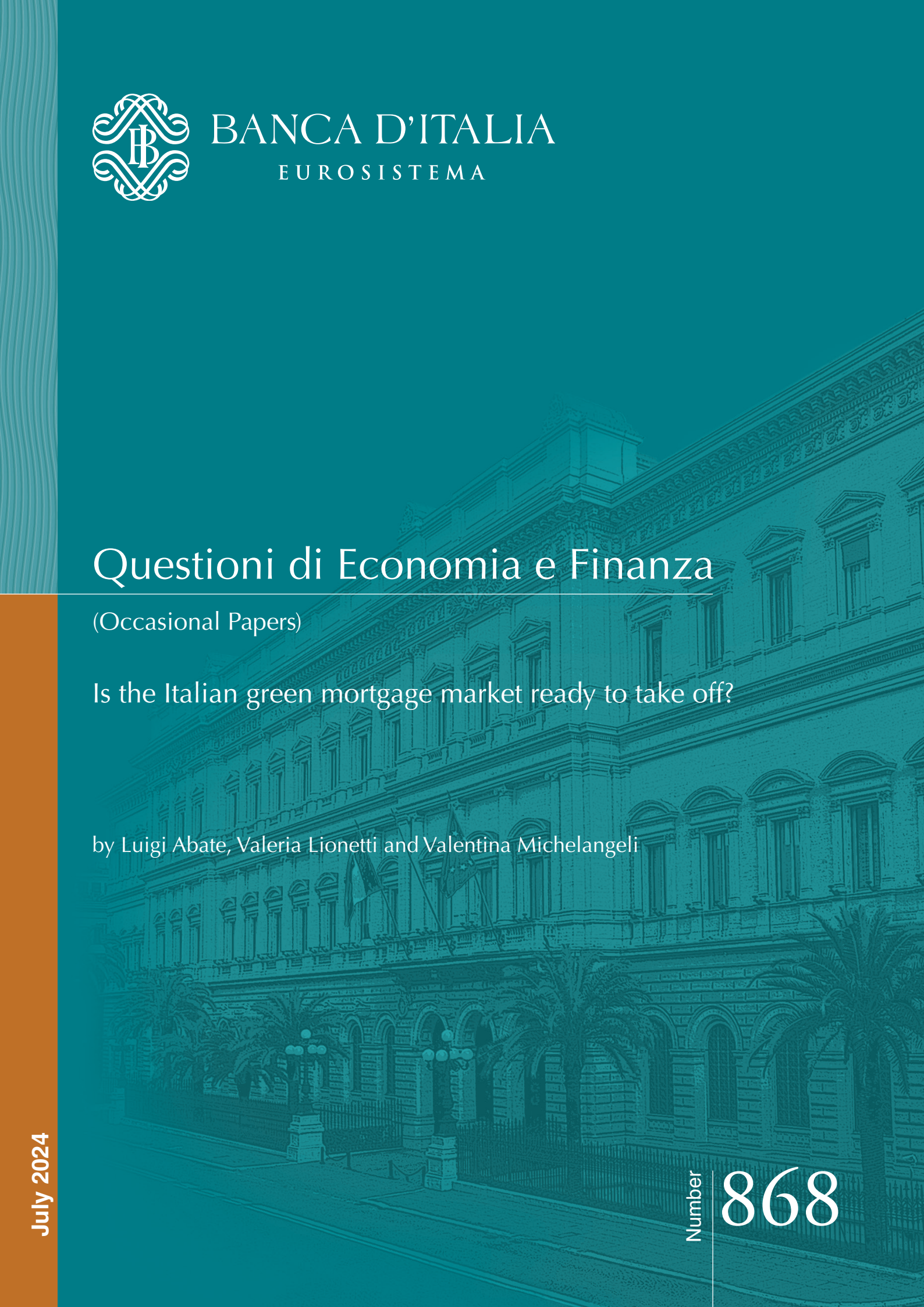

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The series is available online at www.bancaditalia.it .

ISSN 1972-6643 (online)

Designed by the Printing and Publishing Division of the Bank of Italy

IS THE ITALIAN GREEN MORTGAGE MARKET READY TO TAKE OFF?

by Luigi Abate*, Valeria Lionetti** and Valentina Michelangeli*

Abstract

The nascent green mortgage market in Italy appears set for takeoff, with several promising indicators now in evidence. In 2022, the green mortgages issued by banks, accounting for over 50 per cent of total assets in the *Regional Bank Lending Survey*, reached over 6 per cent of the total volume of household mortgages, reflecting the growth in both demand and supply. Significant institutions (SIs), which are also the banks that grant the vast majority of green loans, are more aware of the energy efficiency of the collateral of loans. Given that SIs, the dominant players in the market for household loans, are already in the green mortgage market or are planning to enter it in the next few years, this segment could expand much further. An econometric analysis based on mortgage offers data provided by the main Italian mortgage broker indicates that, in the period from September 2022 to June 2023, the interest rate differential between non-green and green mortgages (green mortgage discount) was about 7 basis points on average.

JEL Classification: C60, E50, G32, Q40, D58.

Keywords: green mortgages, pricing, banking.

DOI: 10.32057/0.QEF.2024.0868

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1. Introduction and main findings[1]

The real estate sector plays a key role in decarbonizing the economy and achieving the Paris Agreement goals established in 2015. In the EU, activities related to buildings (heating, cooling, lighting, and so on) are responsible for 40 per cent of energy consumption and 36 per cent of CO2 emissions. Between 75 and 90 per cent of the EU building stock is expected to still be standing in 2050, making energy efficiency refurbishment and financing a priority. Meeting the EU's energy efficiency targets, indeed, requires very high investments. Consequently, the role of private finance has become paramount in the shift towards a more sustainable economy and future. According to the European Commission, the EU's financial sector can significantly foster sustainable finance, positioning itself as a global leader in this domain. Such a transformation is expected to yield positive repercussions for economic growth and employment opportunities (EC, 2020a).

Aligned with the 'renovation wave' strategy introduced in 2020 (EC, 2020b)[2], the EU Parliament took a significant step in 2024 by adopting a recast version of the Energy Performance of Buildings Directive (EP, 2024). This directive aims at establishing precise targets and criteria for national building renovation plans across EU countries. Notably, it foresees the involvement of financial institutions, encouraging Member States to introduce incentives to mobilize necessary funds, beyond public financial schemes, with special attention to supporting vulnerable households. Moreover, specific provisions are assigned to sustainable bank loans, particularly to households, in order to facilitating their access to products such as green loans and green mortgages. In this work we present the first overview of the Italian green mortgage market, discussing what players are involved and providing preliminary evidence of the pricing of energy efficient mortgages. In this context, the green mortgage market in the Italy looks ready to take off.

Our contribution is based on a comprehensive analysis of two data sources: a) a bank survey conducted by the Bank of Italy (the *Regional Bank Lending Survey*, RBLS); b) data from an online platform (MutuiOnline, MO) containing information on the features of mortgages supplied by banks, including whether they are 'green' or not and their prices. Our analysis offers fresh insights into both the market share of banks active in this sector and the pricing.

The RBLS conducted in the first semester of 2023 contains, for the first time, three questions on new mortgages to consumer households in conjunction with information on the properties' energy

[1] We thank Paolo Angelini, Laura Cerami, Emilia Bonaccorsi di Patti, Alessio De Vincenzo, Antonio Di Cesare, Ivan Faiella, Pietro Gugliotta, Patrizio Pagano, Ludovico Ridi, Federico Maria Signoretti for their useful comments. Any views expressed in this paper are solely those of the authors.

[2] In 2020, the EU Commission published the 'renovation wave' strategy (EC, 2020b), aligned with the European Green Deal (EC, 2020a), alongside an ambitious investment plan to achieve the 2050 targets within the building sector.

efficiency. In the survey, green mortgages are defined as those for the purchase of high-energy performance homes (i.e., class A and B), as well as for improving by least two classes the energy efficiency of a property already owned. These definitions are consistent with banks' emerging practices. 244 individual intermediaries participated in the survey and, in particular provided answers to this segment of the survey, out of the total 438 banks operating in Italy. The banks that responded to that part of the survey represent more than 80 per cent of the Italian banking system in terms of total assets.

The first question assesses whether banks have information on the energy efficiency of the buildings that constitute the collateral for their loans, i.e. the focus of the question is on banks' awareness of the energy performance of their collateral portfolios. Despite the fact that 80 per cent of banks indicated that they had extended loans for the acquisition of residential properties falling within energy efficiency classes A to E (i.e. they were aware about the energy performance of the buildings given as collateral), only about 15 per cent of the banks in the sample provided information on the loan amounts.

The second question refers to the actual issuance of green mortgages. Only 29 banks, which account for about 54 per cent of total assets of the RBLS sample, provided the precise amount of green mortgages they disbursed in 2022. That amount totaled more than 3,5 billion euros, which constitutes about 12 per cent of their overall loan originations in 2022 and approximately 6 per cent of the total new mortgages granted by the banks in our sample.

As we strive to assess the growth of the green mortgage market, the third question delves into the banks' plans to introduce, in the 2023-2025 period, more favorable terms for loans targeting properties with higher energy efficiency ratings or for renovation projects aimed at enhancing energy efficiency. Banks that are already issuing green mortgages or are planning to do so in the next few years account for over 90 per cent of total assets of the RBLS sample; in terms of loan amount the Significant Institutions represent the lion's share.

After examining the diffusion of green mortgages, our final step involves evaluating the extent of the interest rate differential with respect to other mortgages, referred to as the 'green mortgage discount', reflecting the favorable conditions applied by banks (e.g. lower interest rate or lower fixed charges).

Quantifying the green mortgage discount is particularly difficult by the lack of appropriate data. On the one hand, central credit register data do not specifically identify green mortgages and the related loan conditions, so it cannot be used for evaluating developments in this market. On the other hand, to estimate whether banks charge lower rates to green mortgages, it is critical to disentangle demand and supply and control for the non-random matching between banks and borrowers. Information from administrative sources reflects, however, the equilibrium between the two components of the market, leading to a possible bias in the estimates due to the correlation between the characteristics of

mortgage applicants and those of the banks. For example, banks that offer green mortgages may lend mostly to safer borrowers or applicants with higher income may have a preference for green loans (Michelangeli and Sette, 2016).

To overcome the identification challenges, we use a unique dataset of mortgage applications and contract offers obtained through Italy's main online mortgage broker (MutuiOnline), which works with banks representing over 90 per cent of mortgages granted by banks in Italy in 2022. The dataset is unique as it is constructed as a randomized experiment on the offers of green and other mortgages. In particular, we posted randomized mortgage applications on the online platform, varying household and contract characteristics: for the mortgage we consider the type (non-green vs green mortgage for first house), rate type (fixed vs variable), amount and duration; for the house we take into account the value and the location; finally, we consider the applicant's age, job type, and income. The combination of all these characteristics defines a specific loan-borrower profile. Importantly, via the online brokerage platform, all participating banks receive identical mortgage applications, characterized by the same borrower and loan attributes. For each application, the platform displays the list of banks willing to grant the loan along with the financial terms they offer: net mortgage interest rate (hereinafter, named interest rate), annual percentage rate of charge (APR), monthly instalment, and commercial name of the contract. This is the pre-approval stage of the process. Finalization of the mortgage occurs at the bank's branch, or online if the bank does not have any physical branch. At this stage, for each given product, modification of the rate is no longer possible, unless information provided by the household proves to be inaccurate.

Using the microeconomic data available from the online platform, we first identify green mortgages that are compliant with the Energy Efficient Mortgages Initiative (EEMI)[3]. According to this initiative, loans are tagged as 'green' when they provide more favorable financing conditions and/or higher loan amount at origination (as compared to non-green mortgages) for borrowers who purchase high energy efficiency properties (from class B upwards) or intend to improve the energy efficiency of existing buildings (by at least 30 per cent of the Energy Performance Certificate level). We carry out a set of regressions to quantify the green mortgage discount, i.e. the financial advantage associate to these loans compared to other loans for house purchase.

Our econometric results show that, upon controlling for time, bank, household and contract characteristics, green mortgages are associated with interest rates lower (green mortgage discount), on average, by about 7 basis points (8 basis points for the APR) in the period September 2022-June 2023. To provide an idea of the magnitude of the discount, it is worth less than 6 euros for the monthly

[3] EEMI is a market-led initiative, with the aim of designing a pan-European energy efficient mortgage in consultation with key market stakeholders, such as mortgage lenders, covered bond issuers, consumer representatives, investors, rating agencies, insurance companies, academics, property valuers, building and energy efficiency experts, utilities companies, IT providers, European and International institutions and organizations, national authorities (https://energyefficientmortgages.eu). In the MutuiOnline portal, the EEMI definition is used to identify green mortgages.

instalment of a 20 year fixed-rate mortgage for the purchase of a house worth 200,000 euro with a loan-to-value (LTV) equal to 80 per cent. If, instead, we consider the issue from the bank perspective, the green mortgage discount of 7 basis points is equal to one tenth of the average spread between the rates on new mortgages and their reference rates.

We also find that the green mortgage discount is smaller for loans with a longer maturity, likely reflecting uncertainty over future environmental regulation and the related benefits of owing a green house. A role could also be played by a lack of granular data, that makes it harder the pricing of these loans for banks. Instead, we do not find any differentiation at a province level. While provinces are not the optimal proxy for physical climate risk, this result is consistent with the claim that energy efficient homes are exposed to the risks of natural disasters (e.g. wildfires, cyclones, hurricanes, floods) like non-green ones. This may also reflect the fact that insurance contracts, which are mandatory upon house purchase, take into account the physical risk associated to the geographical area.

To our knowledge, our analysis is the first one that quantifies, in a clean experimental setup that perfectly disentangles demand and supply, the price discount offered by banks on loans for the purchase of energy efficient buildings.

The structure of this paper is as follows. Section 2 describes the related literature. Section 3 provides an overview of the regulatory framework. Section 4 describes the emerging market practices on green mortgage in Europe. Section 5 presents the data. Section 6 shows the results from the survey and the online data. Section 7 concludes.

1. Related literature

The importance of assessing the impact of climate-related risk factors on banks' balance sheets and, specifically, on the existing traditional categories of financial risks (credit, market, liquidity, operational and reputational) has been certified by the vast involvement of standard setters and regulators at an international and European level (BCBS, 2021; NGFS, 2020; EBA, 2021). The academic literature has further contributed by providing evidences of the impact of energy efficiency on risks for the financial system.

In this market opportunities for lenders are massive. To achieve the EU sustainability targets, significant capital flows are expected to be redirected towards the green mortgage market in the coming years. Risks linked to the issuance of green loans are assessed not to be higher than those associated with other types of loans. Numerous studies have presented evidence indicating that higher energy efficiency is associated with lower default risk (EC, 2021a; Guinn and Korhonen, 2020; Billio et al., 2020; Billio et al., 2021; An and Pivo, 2018; Zancanella et al., 2018; Kaza et al, 2014). One

channel at work is that green homes have lower operating costs and therefore are less exposed to changes in energy prices. This attenuates the impact on borrowers' income of energy price fluctuations, reducing the risk of payment arrears. Another channel reflects the lower transition risk associated to future regulation. As mortgage maturity can be up to 30 years, new mortgage lending can be exposed to transition risk from climate policies aimed at reducing gas emissions and transition to renewable energy. The nature, speed and focus of these changes is, however, still unknown. Owners of highly efficient houses might face lower upfront costs of complying with future regulation should higher energy efficiency standards become mandatory, for example, investments in more efficient boilers or better-insulated windows (Burlinson et al., 2018). As these borrowers' income is subject to less fluctuations due to climate policy, their credit risk is lower and their default less likely.

Other studies found that higher energy efficiency can reduce the loss given default (LGD) via house prices (EC, 2021; Reusen et al., 2023; Kahn et al., 2014). The value of the property used as collateral when the loan is granted may not fully incorporate the value of the energy improvement made afterwards: for example, a recent assessment finds that in Italy, other things being equal, price of more energy efficient houses is about 25 per cent higher than that of the least energy efficient (Loberto et al., 2023). There are two cases: a) for green mortgages for restructuring, the final value of the property after the improvement is usually higher than the one assessed before the restructuring; b) for green mortgages to purchase (already) highly energy efficient houses, while the value of these properties in principle already incorporates the higher value, it is nonetheless less exposed to transition risk, i.e. the risk that the value of the house falls in the future due to the introduction of new regulations with the objective of discouraging greenhouse gases emissions (such as a carbon tax or an excise duty increase on fossil fuel used for the building's energy services). This should further affect credit risk as, ceteris paribus, losses against mortgages on energy efficient properties in a default event would be lower than losses against energy inefficient properties if they had to be repossessed and sold by the bank (Bell et al., 2023). Changes in regulatory standards on the energy efficiency of buildings could lead to a deterioration in the value of those less energy efficient and make it more difficult to sell them for the recovery of the credit guaranteed by these properties, thus impacting the LGD. The transition risk could also affect the value of properties due to the change in consumer preferences (RICS, 2022) or changes in the demand and prices of more energy efficient properties especially in the context of rising energy prices such as those we've been experiencing since mid-2021 (EC, 2021; Loberto et al., 2023; Reusen et al., 2023; Kahn et al., 2014).

Green loans may provide material or non-material benefits to the bank (as compared to non-green loans). Some motives that can explain the lenders' engagement in supporting the greening of the economy are the following: strategic choice, green reputation, altruism, greenwashing (Xi et al, 2022; Wu and Chen, 2016). Moreover, developing sustainable products as green mortgage may contribute to align bank's strategy to climate-related objectives and to reduce the impact of transition risks on mortgage portfolio fulfilling supervisory expectations (ECB, 2020).

Despite the potential importance of greening the building stocks, the pricing associate to higher home energy efficiency in credit markets has been investigated to a limited extent. Giraudet et al. (2021) have considered a range of energy-using assets that are important in the market for personal loans in France; they find that greener automobile projects carry lower interest rates, while greener home retrofits do not. Bell at al. (2023) estimate standard mortgage pricing models using mortgages originated in the United Kingdom before 2018 and find no conclusive evidence that lenders took energy efficiency into account when setting interest rates prior to regulatory interventions.

Although the possible benefits associated with the entry in the green mortgage segment are numerous, significant challenges remain for the banks. Lack of data on energy efficiency of the houses used as collateral or limited demand from homeowners in pursuing energy efficient retrofits for their properties in absence of large fiscal incentives stand out as two important hurdles.

We contribute to this vast literature by presenting an in-depth analysis of the Italian mortgage market. Our study identifies the banks engaged in green lending and explores the potential for future market development. Additionally, exploiting a dataset that allows to disentangle between demand and supply of green mortgages, we offer the initial evaluation of the mortgage discount associated with green loans.

2. Regulatory framework

In the 2020 EU Green Deal (EC, 2020a), the EU Commission set out an ambitious program – including initiatives in the building and renovation area – with the goal of becoming the first climate neutral continent by 2050. An intermediate target was set to reduce net greenhouse gas (GHG) emissions by at least 55 per cent by 2030, compared to the 1990 levels. This objective was made legally binding for the EU institutions and the EU Member States by the European Climate Law (EC, 2021c), published in 2021. In the same year, the EU Commission launched the 'Renovation wave' strategy and proposed a review of the Energy Efficiency Performance of Buildings Directive (EPBD), adopted in 2024, with the aim of achieving a highly energy efficient and decarbonized building stock by 2050 (EP, 2024). The Directive seeks to increase the annual energy renovation rate of residential and non-residential buildings, particularly for the worst-performing ones in terms of energy efficiency. Each Member State will define the national Building Renovation plan to set up its long-term renovation strategy, taking into account the local existing building stock. Member States shall introduce appropriate financing and support measures in order to facilitate private lending for renovation, such as promoting green loans and mortgages, as well as 'mortgage portfolio standards'. These standards are mechanism aiming at incentivizing mortgage lenders to establish a path to increase the median energy performance of their real estate portfolios.

Following the publication of the EU Green Deal, the EU legislators have issued a set of regulations related to the financial system that cover two aspects: i) identifying sustainable economic activities, including the energy performance standards allowing to classify mortgages as 'green'; ii) mitigating the impact of transition risks in the portfolio of mortgage lenders.

3.1 Identifying sustainable economic activities for funding transition

To redirect capital flows necessary to finance transition pathway and avoid the risk of greenwashing practices, in 2020 the European Commission issued the Taxonomy Regulation, aimed at establishing criteria for classifying economic activities as sustainable, and accordingly related financial assets are "taxonomy aligned". Taxonomy Regulation applies to financial market participants that offer financial products in the European market and provides a science-based tool to companies, financial institutions and consumers for reorienting capital towards environmental objectives.[4] In 2021, EU Commission (EC, 2021b) adopted the technical screening criteria (TSC) for determining activities qualified as substantially contributing to climate change adaptation and mitigation objectives of EU Taxonomy Regulation. The relevant criteria for real estate activities are based on the energy efficiency rating or score of a building as a proxy of its contribution to taxonomy objectives. The criteria are the following:

(i) for construction of new buildings, the primary energy demand (PED; i.e. the amount of energy needed for power and for heating and cooking) is at least 10 per cent lower than the energy demand implied in the national nearly zero-energy buildings (NZEB) definitions;

(ii) for renovation of existing buildings, the primary energy demand or carbon emission is reduced at least 30 per cent compared to pre-renovation levels; this criterion holds when other requirements for major renovations (as set by national and regional regulations) are not applicable;

(iii) for acquisition and ownership, an Energy Performance Certificate (EPC) of at least class A[5] if the building was built before 31 December 2020. For buildings built after 31 December 2020, the building meets the criteria specified in new building (mentioned above) that are relevant at the time of the acquisition.

[4] In the Taxonomy Regulation, an activity is deemed as sustainable if the activity: i) substantially contributes to one or more of the six environmental objectives; ii) does not significantly harm (DNSH) to the other objectives, and iii) meets minimum social safeguard standards, iv) complies with technical screening criteria that have been established by the Commission. The six environmental objectives identified by the legislator are i) climate change mitigation; ii) climate change adaptation; iii) sustainable use and protection of water and marine resources; iv) Transition to a circular economy; v) Pollution prevention and control and vi) Protection and restoration of biodiversity and ecosystems.

[5] If the EPC is not available, the building is within the top 15 per cent of the national or regional building stock expressed as operational PED.

In 2023, European Commission published a recommendation (EC, 2023) addressed to financial market participants (undertakings, financial intermediaries, investors), Member States and financial supervisory authorities. The recommendation aims to provide an inclusive approach to sustainable finance regardless of sectors, geographies, actors and the different starting points in the transition, by offering practical suggestions on how to approach transition finance. Moreover, the EC clarify the role that market participants can play by voluntarily using EU sustainable finance tools, for example Taxonomy Regulation when they classify green loans (or mortgages).

3.2 Prudential framework and regulatory development

The inclusion of climate-related and environmental risks in the prudential regulatory framework and the supervisory ongoing activities is a priority in the agenda of international standard setters, regulators, and supervisors in light of their potential impact on the financial stability of supervised institutions and the whole system.

To assess the impact of transition risk in a mortgage portfolio, EPC ratings play a pivotal role in the prudential aspects of collateral management and risk mitigation practices within EU banks. The use of EPC rating indeed is recommended for developing sustainable products aimed at enhancing the level of portfolio's greenness and at reducing its exposure to climate-related transition risk (EBA, 2021). In 2020, the EBA issued the "Guideline on loan origination and monitoring" (EBA LOM) that recommends the inclusion of Environmental, Social and Governance (ESG) factors in credit policies and procedures, in the assessment of borrowers' creditworthiness and of the value of the collateral (for example, via energy efficiency performance and EPC label).[6] In February 2022, the EBA published an implementing technical standard (ITS) on prudential disclosure of ESG risk to broaden the Pillar 3 framework and enforce market transparency. The technical standard applies to listed large institutions[7] and requires the publication from 2023 of qualitative and quantitative information on ESG risks, with a specific focus on climate risks, including the "Green Asset Ratio"[8] (GAR, which is the proportion of company activities aligned to taxonomy objectives on total assets) and Banking Book Taxonomy Alignment Ratio (BTAR). In template 2 of the ITS, banks should disclose

[6] The EBA LOM apply to new credit originated from 30 June 2021 (a transitional regime for existing credit stock is foreseen until 2024). The Guidelines aim to establish harmonized criteria, based on bank's best practices, at all stages of credit risk management process and to ensuring adequate credit quality of new performing loans. Bank of Italy transposed the EBA LOM as supervisory guidelines for banks and intermediaries ex art. 106 TUB in July 2021.

[7] In the CRR3 proposals (published by European Commission in 2021) the application of this ITS could be extended to all European banks.

[8] The Taxonomy Regulation also sets out disclosure requirements for financial and non-financial companies under the Corporate Sustainability Reporting Directive (CSRD, art. 8) that includes from 2024 the GAR. The CSRD was adopted in November 2022 by European Commission. The CSRD applies to all large companies (whether listed or unlisted) and all listed companies, with the exception of micro-listed companies (about 49.000 companies in the EU). A detailed overview of ESG disclosure requirements for banks in Loizzo and Schimperna (2022).

information on loans collateralized by immovable property, detailing energy consumption and the EPC of the collateral.

From the supervision side, while the definition of an appropriate regulatory framework is in progress, supervision authorities may contribute to raising awareness of the impact of climate and environmental risks on banks' activities and stimulate their inclusion in banks' practices and policies by setting their expectations (NGFS, 2020). In November 2020, the European Central Bank published a "Guide on climate-related and environmental risks" for Significant Institutions (ECB, 2020), setting out 13 supervisory expectations regarding how climate and environmental risk could be integrated into the strategy, business model, governance, risk management framework and disclosure under the current regulatory framework. In expectation 8 of the Guide ("Credit risk management"), the ECB explicitly refers to the holistic approach in the integration of climate and environmental risks at all stages of the credit process as envisaged in the EBA LOM. In collateral management, the ECB Guide requires that the impact of climate and environmental risks in the collateral assessment considers the physical location and energy efficiency of residential and non-residential buildings. These aspects should be integrated both in the process of establishing the value of the collateral and in the review process provided for by the applicable regulation. The policy on credit mitigation tools should be reviewed to take into account the assessment of these climate-related metrics. Along the same line, Bank of Italy published in 2022, its supervisory expectations (BI, 2022) on climate-related and environmental risks for all banks it supervises directly (i.e. the less significant banks, LSIs) and other intermediaries.

4 Emerging market practices on green mortgage in Europe

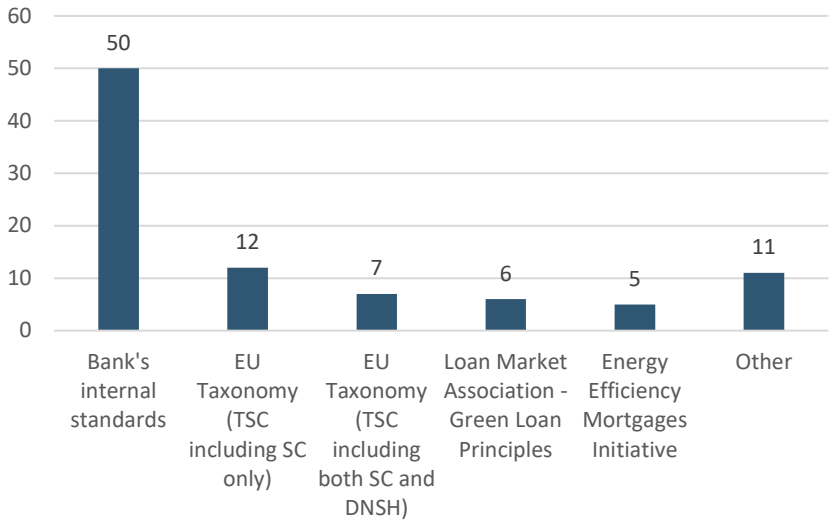
In the Strategy for Financing the Transition to a Sustainable Economy (EC, 2021d), published in 2021, the European Commission considered the access of households and SMEs to sustainable finance as a critical policy area. Accordingly, the EBA received a call for advice from the EC with the aim to provide an opinion on the definition and possible supporting tools for green retail loans and green mortgages also in the view of the Mortgage Credit Directive Review.

In December 2023, the EBA published a report (EBA, 2023) on EU market practices in the area of green loans and green mortgage, built on a survey involving 83 credit institutions on voluntary basis across 27 countries, which covers about 52 per cent of total assets in the EU banking sector. The report shows that green loans and advances were still limited in size in 2022, with an average of 4.5 per cent of the total loans of the involved credit institutions and with significant variability in the different asset classes. In the subset of loans to households, the share of green loans is 11 per cent. Almost all (98 per cent) of those green loans were used for the purchase of buildings or for renovation.

According to the same EBA survey, most banks rely on internal standards to identify green mortgages (Fig. 1). The EU taxonomy and its technical screening criteria are used to define a loan as green by credit institutions only to some extent. The limited adoption of the EU Taxonomy as a benchmark for green loans can be attributed to its recent introduction, along with potential challenges related to data and usability. Both credit institutions and their borrowers may, in fact, encounter difficulties in applying the associated criteria. Bank's internal standard, however, reflect in some cases the EU Taxonomy criteria or may be based on industry initiative, such as the Loan Market Association-Green Loan Principles or the EEMI.

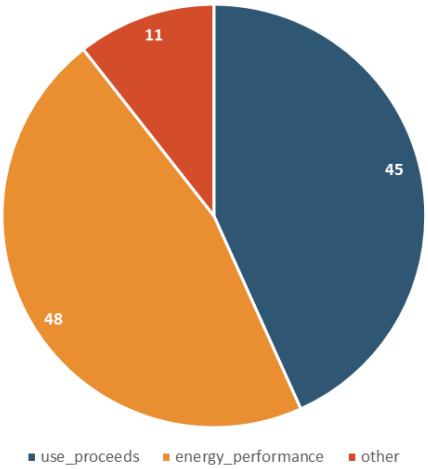
With respect to defining their green residential real estate loans to households, the most common approaches used by credit institutions for classifying green exposures are the use of proceeds (i.e. credit institutions provide green loans for designated purposes, with the proceeds allocated to a specific sector and economic activity) as well as the energy performance of assets (Fig. 2).

Figure 1: Standards for identifying green loans
(number of credit institutions by standards)



Source: EBA (2023). Sample of 83 institutions. In the EBA Survey, institutions could select more than one criterion for identifying green loans.

Figure 2: Approach used for defining green residential real estate loans
(number of institutions)



Source: EBA (2023). Sample of 60 institutions. In the EBA Survey, institutions could select more than one criterion for identifying green residential real estate loans.

5 Data

To gain insight into the role of the Italian banking system in facilitating the transition towards sustainability in the mortgage market, we analyze two datasets: the *Regional Bank Lending Survey* and MutuiOnline.

5.1 The RBLS

The RBLS conducted by the Bank of Italy largely replicates the questions contained in the *Bank Lending Survey* conducted by the Eurosystem. However, it distinguishes itself through its territorial and sectoral detail, a different temporal profile (semi-annual instead of quarterly), and a higher number of participating banks. Specifically, it gathers information on the trends in credit demand, credit supply, and banking collection across various geographical areas.[9]

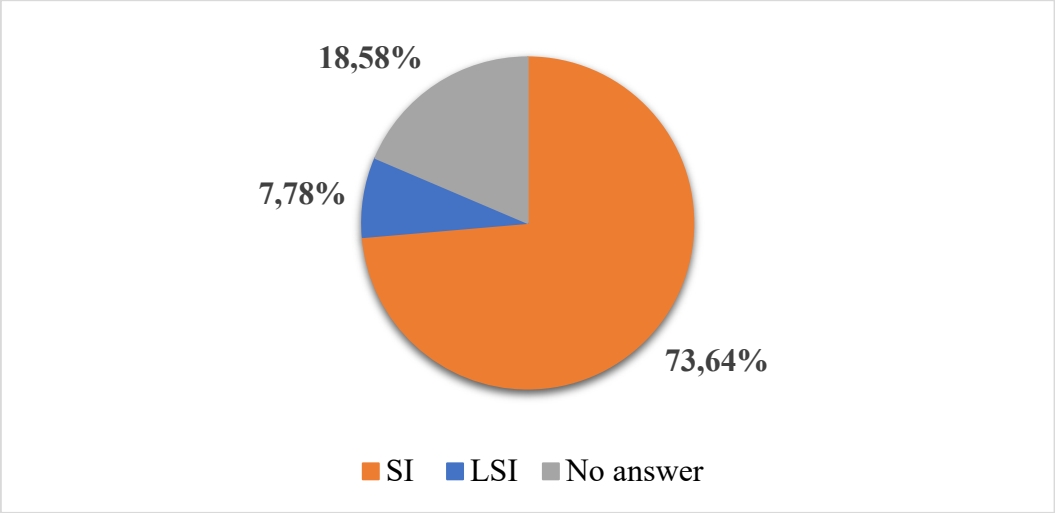
The survey conducted in the first quarter of 2023 contains, for the first time, questions on new mortgages to households in conjunction with information on the energy efficiency of their properties. In particular, the questions explored three areas: 1) the availability for banks of information on the energy efficiency of the buildings used as collateral for the new loans; 2) banks' granting of new subsidized energy efficient mortgages (defined as those for the purchase of a house with an energy efficiency rating EPC equal to A or B or those for a renovation that will improve the building energy efficiency by at least two classes[10]); 3) banks' intention to apply, in the period 2023-2025, favorable

[9] More in-depth information about the sample and methodological notes are available in Bank of Italy (2023).
[10] This definition is aligned to bank's practices more widespread across the European market.

term conditions on loans aimed at improving the energy efficiency of the buildings (see the Appendix for details on the questions).

This section of the survey involved over 244 intermediaries at individual level out of 438 in Italy, which account for 81 per cent of total assets of the Italian banking system (Fig. 3). Significant banks (SIs) represent 74 per cent of total assets of the Italian banking system (including 7.1 per cent from cooperative banks); less significant banks (LSIs) account approximately for 8 per cent of total assets (with 0.37 per cent from cooperative banks); banks not involved in the survey account for about 19 per cent of the total assets of the Italian banking system ('no answer' in the figure).

Figure 3. Composition of Italian banks by their involvement in the RBLS sample
(share of total assets in the Italian banking system)



Source: The figure shows the composition in terms of total assets of banks involved in the RBLS survey. The 244 banks involved in the RBLS sample are differentiated between SIs and LSIs and account for 81 per cent of total assets of the Italian banking system.

5.2 MutuiOnline

We complement the RBLS information with data from the main Italian mortgage broker (MO), which is affiliated with banks accounting for about 90 per cent of total assets in the Italian system in 2022. In particular, we exploit two sets of data. The first set refers to aggregated data of actual green mortgage originations, which allow to disentangle between demand and supply. The second set refers to simulated data, which allow to study the mortgage supply. More in detail, on the basis of an agreement with MO, the Bank of Italy has been granted access to monthly data of mortgage offers to 'fictitious' customers who have submitted applications through the portal. Customers differ by age (30- or 40-year-old), localization (110 provinces), type of job (self-employed, permanent job, temporary job), monthly income (4,000 or 2,000 euro), type of mortgage requested (first home purchase, renegotiation, green mortgage for first home purchase), type of mortgage rate requested (fixed or variable), mortgage maturity (10, 15, 20, 30 years) and loan-to-value ratio (50, 60, 80, 85

per cent). The combination of those characteristics generates 126,000 different profiles, which capture the mortgage demand. All affiliated banks receive the same applications through the portal and can decide whether to grant a mortgage and, if so, the conditions (see Carella et al. 2020, for a description of the dataset). We restrict our analysis to mortgages for first house purchase (green or other).

According to the EEMI definition, which is used by MO for classifying loans, green mortgages are those that satisfy the energy efficiency requirements (i.e. house with energy class above or equal to B or leading to the increase of the energy class) and are characterized by favorable financing conditions. We focus on the period from September 2022 to June 2023, with an average of 650,000 monthly simulation-data points (each data point corresponds to an acceptance of a mortgage application by a bank, which thus supplies information on loan conditions, i.e. on interest rate, APR, monthly instalment, name of the product.).

6 Results on green mortgage lending

In this section, we present the main evidences obtained from our analyses.

6.1 Banks' awareness of the energy efficiency of the buildings

Enhancing energy efficiency in buildings has the potential to boost the property's collateral value by providing protection not just against rising energy costs, but also against the possible loss of value of a building not compliant with stricter environmental regulations in the future. Consequently, information on the energy efficiency of houses used as collateral for loans may become crucial for assessing potential transition risks in banks' mortgage portfolios. Insights from the first RBLS question highlight how well banks are informed about the energy efficiency of properties used as collateral for new loans.

Out of the 244 banks that responded to this section of the questionnaire, 36 banks (accounting for 64 per cent of total assets of the RBLS sample) reported the precise amount of mortgages they granted for acquiring residential properties falling within energy efficiency classes A to E. Meanwhile, 167 banks (accounting for 28 per cent of total assets) acknowledged offering this type of loans but refrained from specifying the mortgage amounts. 20 banks (accounting for about 2 per cent of total assets) stated they did not offer such products, and 21 banks (accounting for 6 per cent of total assets) did not respond to the inquiry (Table 1). The loans extended by the 36 banks providing data totaled over 12.1 billion euros. This sum represents roughly 36 per cent of the total value of the household mortgages for home purchase they extended and approximately 21 per cent of the aggregate value of new loans issued by all banks in the RBLS sample.

Among SIs, banks representing 62 per cent of the RBLS sample total assets provided detailed information on the amount of new mortgages falling within energy efficiency classes A to E, while

banks with 24 per cent of total assets offered these loans but didn't specify amounts. Among LSIs, banks reporting the value of such mortgages hold 2 per cent of total assets, and those offering them without specifying amounts account for 5 per cent (Table 2). If instead of the distribution by total assets, we were to consider that by household mortgages, the picture would have been qualitatively similar: most SIs have information on the amount of mortgages for houses falling within energy efficiency classes A to E, while many LSIs do not.

Table 1: Banks' awareness of energy efficiency of buildings

	a) Individual banks *(number)*	**b) Share of total assets** *(per cent)*
Yes	36	63.7
Yes, but amount not available	167	28.2
No	20	2.5
No answer	21	5.6
Total	244	100
of whom		
SI	*173*	*90.4*
LSI	*71*	*9.6*

Source: RBLS. The table shows the distribution of banks' responses to the survey question on the total amount disbursed for mortgages secured by homes in energy classes from A to E. The answer "Yes" indicates that the bank provided the information of the amount of mortgages issued; the answer "Yes, but amount not available" implies that the bank offered these mortgages, but did not provide the information on the amount issued; the answer "No" indicates that the bank did not offer the product. The table reports the number of individual banks (panel a) and the share of total assets of banks in the RBLS sample (panel b).

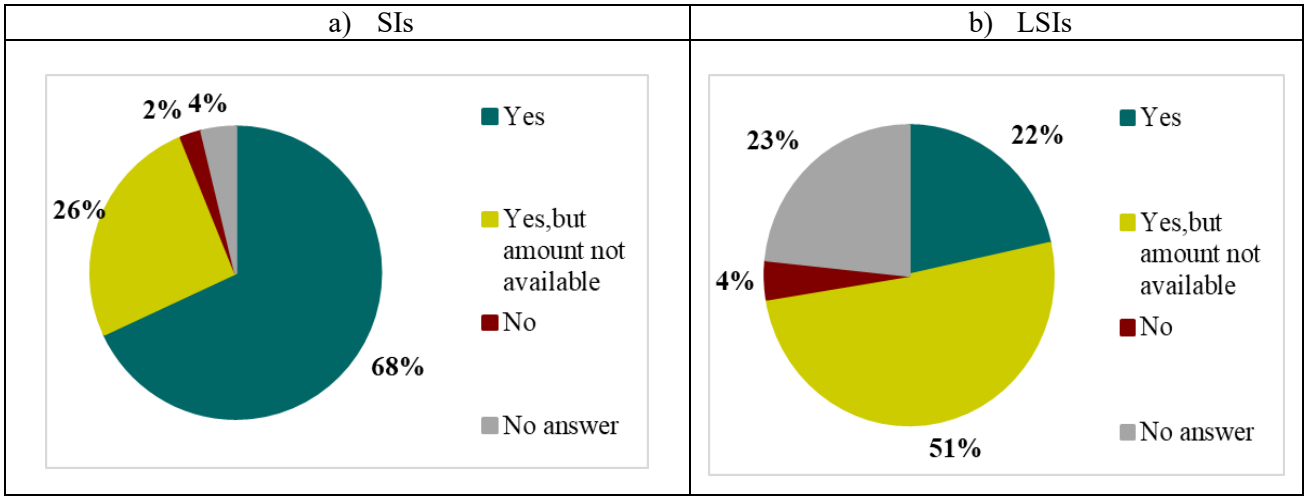
Table 2: Banks' awareness of energy efficiency of buildings by bank category
(share of total assets in the RBLS sample; per cent)

	a) SIs	**b) LSIs**
Yes	61.6	2.1
Yes, but amount not available	23.3	4.9
No	2.1	0.4
No answer	3.4	2.2
Total	*90.4*	*9.6*

Source: RBLS. The table shows the distribution of banks' responses to the survey question on the total amount disbursed for mortgages secured by homes in energy classes from A to E, by bank category. The answer "Yes" indicates that the bank provided the information of the amount of mortgages issued; the answer "Yes, but amount not available" implies that the bank offered these mortgages but did not provide the information on the amount issued; the answer "No" indicates that the bank did not offer the product. The table reports the share of total assets for SIs (panel a) and for LSIs (panel b).

If we analyze bank awareness within each bank category, SIs holding information on the energy efficiency of collateralized buildings account for 68 per cent of total assets in their category, whereas this figure drops to 22 per cent for LSIs (Fig. 4).

Figure 4: Banks' awareness of energy efficiency of buildings within each bank category
(share of total assets within the bank category)



Source: RBLS. The figures show the distribution of banks' responses to the survey question on the total amount disbursed for mortgages secured by homes in energy classes from A to E. The answer "Yes" indicates that the bank provided the information of the amount of mortgages issued; the answer "Yes, but amount not available" implies that the bank offered these mortgages but did not provide the information on the amount issued; the answer "No" indicates that the bank did not offer the product. The distribution is by total assets within the category of SIs (panel a) and LSIs (panel b).

This evidence highlights the fact that many banks are aware of the energy efficiency of the collateral of their loans, but the information on disbursements is not promptly available when filling the provided templates, especially for LSIs. Moreover, these evidences could be explained considering the lack of availability of public information (De Blasio et al. 2024) and accordingly the higher cost of acquiring information from private sources on buildings' energy efficiency in Italy and different supervisory requirements (i.e. disclosure or supervisory expectations as mentioned in Section 3.2) for SIs and LSIs.

6.2 Banks' granting of green mortgages

The examination of the data related to the issuance of green mortgages provides valuable insights into the market share of this product. Among the 244 banks in the RBLS sample involved in the survey section on energy efficient mortgages, 29 banks reported the precise amount of home efficiency mortgages they had disbursed in 2022; these banks account for about 54 per cent of total assets of the RBLS sample. Meanwhile, 154 banks, accounting for 37 per cent of total assets, acknowledged offering energy efficiency mortgages but refrained from specifying the loan amounts,[11] 42 banks stated they did not offer such loans, and 19 banks did not respond to the question. (Table 3). Analyzing banks that provide information on green mortgages reveals a link between their ability to offer such loans and their awareness of property energy efficiency. To evaluate this link,

[11] These responses are probably due to different definition of green mortgage using by banks respecting the definition proposed in the question. These banks' answer to the question was "ND", i.e. an estimate of the requested values is not available.

we constructed an indicator by calculating the ratio between the number of banks issuing home efficiency loans and the number of banks with information on the energy class of the collateral (Issuance/Awareness). The high value of this indicator suggests that banks informed about property's energy efficiency are the most likely to declare to have issued green mortgages.

Table 3: Banks' issuance of green mortgages

	a) Individual banks *(number)*	**b) Share of total assets** *(per cent)*	**c) Issuance/Awareness** *(per cent)*
Yes	29	54.0	80.6
Yes, but amount not available	154	37.3	92.2
No	42	3.6	n.a.
No answer	19	5.1	n.a.
Total	244	100	
of whom			
SI	*173*	*90.4*	
LSI	*71*	*9.6*	

Source: RBLS. The table shows the distribution of banks' responses to the survey question on the total amount disbursed for green mortgages in 2022. The answer "Yes" indicates that the bank provided the information of the amount of mortgages issued; the answer "Yes, but amount not available" implies that the bank offered these mortgages but did not provide the information on the amount issued; the answer "No" indicates that the bank did not offer the product. The table reports the number of individual banks (panel a), the share of total assets in the RBLS sample (panel b), and the ratio between the number of banks that issue green mortgages and the number of those that declare do use information on the energy efficiency of the buildings (Issuance/Awareness; panel c).

An analysis by bank category indicates that, in the subset of SIs, banks representing 52 per cent of the RBLS sample total assets provided detailed information on the amount of new energy efficient mortgages, while banks with 33 per cent of total assets offered these loans but didn't specify amounts. Among LSIs, banks reporting the value of such mortgages hold 2 per cent of total assets, and those offering them without specifying amounts account for 4 per cent (Table 4).

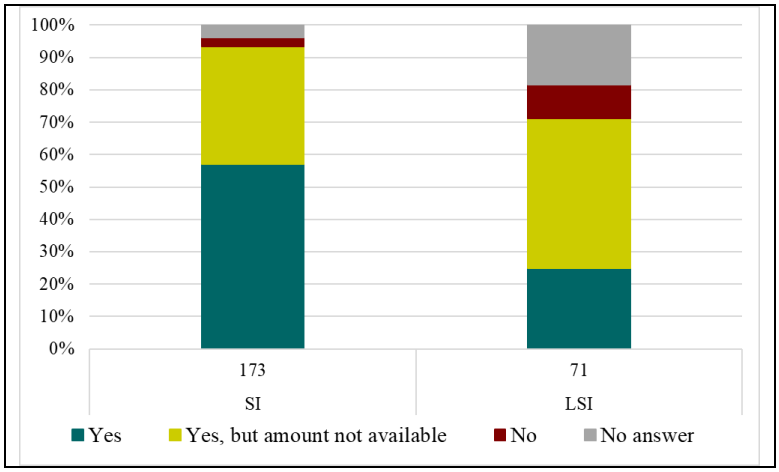
Table 4: Banks' issuance of green mortgages by bank category
(share of total assets in the RBLS sample; per cent)

	a) SIs	**b) LSIs**
Yes	51.7	2.4
Yes, but amount not available	32.9	4.4
No	2.6	1.0
No answer	3.4	1.7
Total	*90.4*	*9.6*

Source: RBLS. The table shows the distribution of banks' responses to the survey question on the total amount disbursed for green mortgages in 2022, by bank category. The answer "Yes" indicates that the bank provided the information of the amount of mortgages issued; the answer "Yes, but amount not available" implies that the bank offered these mortgages but did not provide the information on the amount issued; the answer "No" indicates that the bank did not offer the product. The table reports the share of total assets for SIs (panel a) and for LSIs (panel b).

If we analyze within bank category, we find that banks that provide information on the amount of green mortgages issued account for almost 60 per cent of total assets of SIs, while this percentage drops to 25 per cent for LSIs (Fig. 5, panel a).

Figure 5: Green mortgages within each bank category
(share of total assets within the bank category)

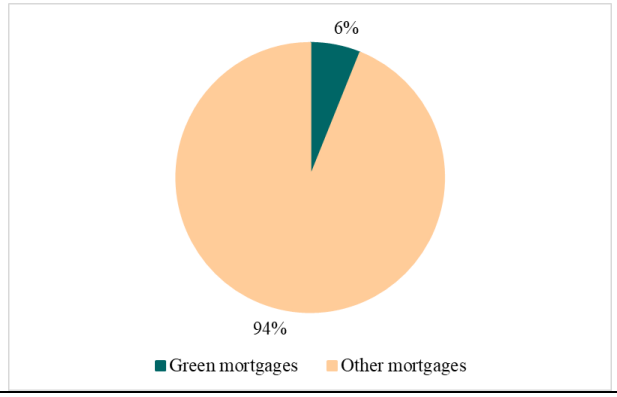


Source: RBLS. Panel a) The figure shows the distribution of banks' responses to the survey question on the total amount disbursed for green mortgages in 2022. The distribution is by total assets within the category of SIs and LSIs.

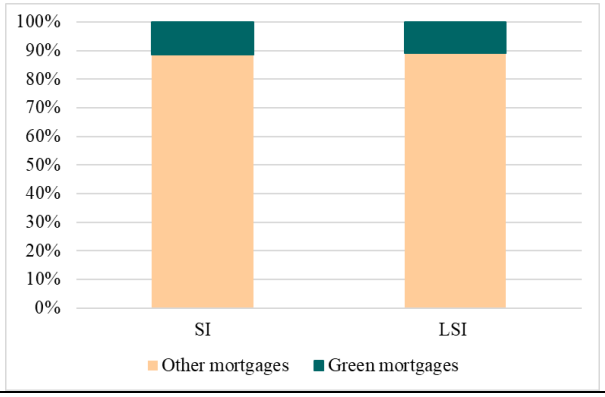
The energy efficient mortgages extended by the 29 banks providing data totaled more than 3.5 billion euros, which constitutes about 12 per cent of their overall loan originations in 2022 and approximately 6 per cent of the total new mortgages granted by the banks in our sample (Fig. 6, panel a). Distinguishing by bank category, we find that energy efficient mortgages represent 11,5 per cent of overall mortgage originations for SIs (in line with the 2023 EBA Report in Section 4), and around 11 per cent for LSIs (Fig. 6, panel b). Although roughly half of the 29 are SIs and the other half are LSIs, SIs accounted for 97 per cent of the total amount of energy efficient mortgages granted, whereas LSIs extended only 3 per cent (of which 2 per cent from cooperative banks) of these loans. We also observe that for cooperative banks in LSI category, home efficiency mortgages account for 68 per cent on average of their total loans. This data illustrates that, while their presence in the broader financial landscape might be relatively modest, some credit cooperative banks exhibit a strong commitment to the provision of this particular product.

Figure 6: Banks' granting green mortgages

a) Composition of mortgages in RBLS sample



b) Composition of mortgages in 2022 within bank category



Source: RBLS. Panel a) The figure shows the composition of mortgages (differentiating between green and others) for banks that reported the mortgage amounts of green mortgages issued in 2022 across the whole RBLS sample (244 responses). The composition reflects the total amount of granted mortgages. Panel b) The figure shows the composition of mortgages (differentiating between green and others) for banks that reported the mortgage amounts of green mortgages issued in 2022 (29 responses), split by bank category. The composition reflects the total amount of granted mortgages.

6.3 Banks' view on the outlook for the green mortgage market

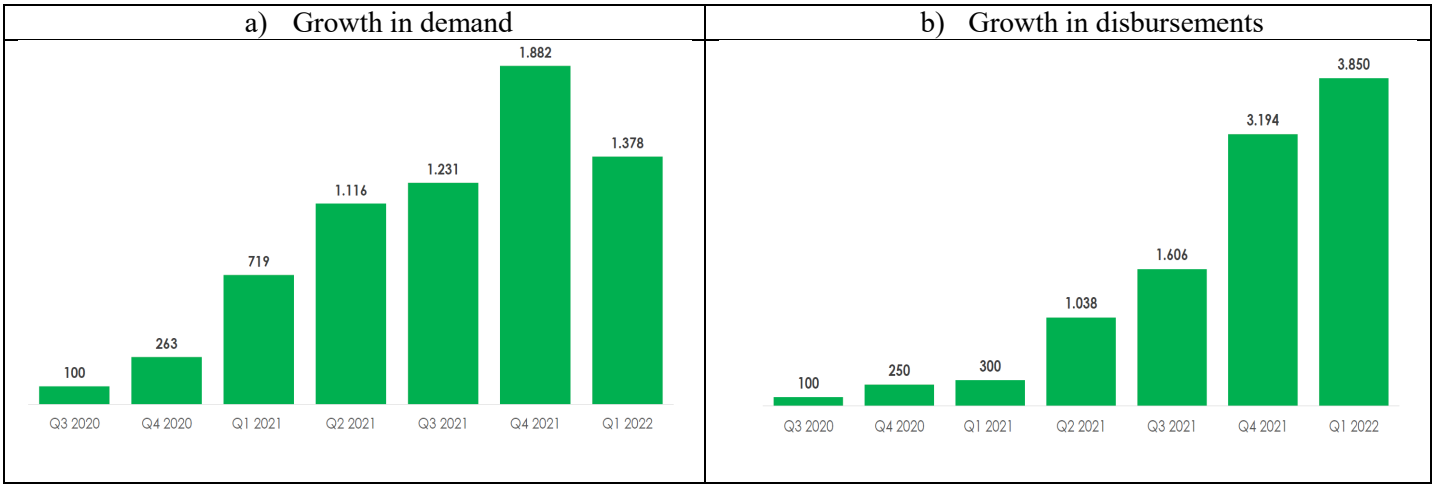
In our endeavor to gauge the expansion of the green mortgage market, we investigate the banks' intentions to offer those loans in the period 2023-2025. The dataset offers a glimpse into the future trajectory of green mortgages. We categorize banks into four groups: those that have already introduced energy efficient mortgages (both banks that provided the exact loan amount and banks that did not, as shown in the previous section), those planning to offer more favorable conditions for mortgages with energy efficient houses as a collateral from 2023 to 2025, those with no such intentions, and those who did not answer. Here we assume implicitly that banks in the first group will continue to offer these products to households; these banks account for over 90 per cent of total assets. We then assess the number of banks of the last three groups and we find that banks that intends to start offering green mortgage are 1 per cent of RBLS sample in terms of total assets (19 responses). 27 banks declare, instead, to have no intention to enter into the efficient mortgage market (totaled 3 per cent of total assets) and the remaining 5 per cent in terms of total assets do no provide response to this question.

Given the expected regulatory boosts on real estate energy efficiency (i.e. for example EPBD Italian transposition) and the decision by prominent banks to embrace these sustainable products, which also allows them to improve their 'greenness' in the mortgage portfolio, it is clear that the energy efficient mortgage market is poised to emerge as a significant sector within the broader mortgage market.

6.4 Disentangling demand and supply of green mortgages

We expand the analysis of the green mortgage market in Italy by relying on the MutuiOnline dataset, which enable us to disentangle the role of demand and supply. Looking at aggregated data on the effective issuance of green mortgages, we find that the demand for these products has increased significantly since 2020, but the growth in disbursements has been even more pronounced (Fig. 7).

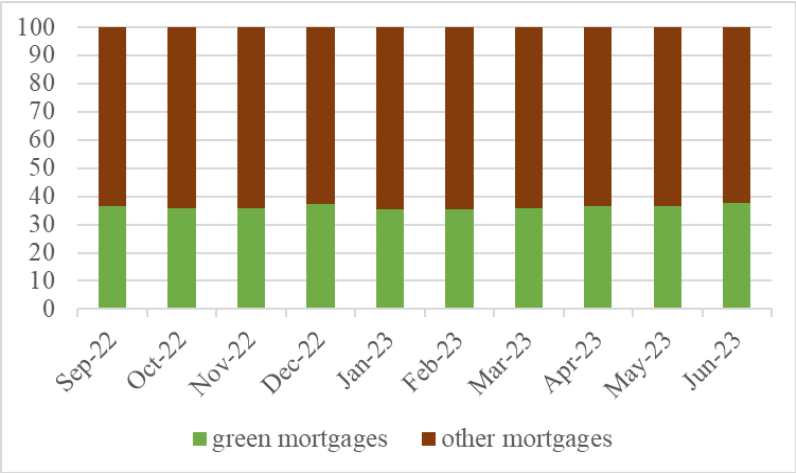
Figure 7: Demand and Supply in the green mortgage market



Source: MutuiOnline. Panel a) shows the green mortgage quotes (indexed to 100 in Q3 2020) by request date; Panel b) shows the green mortgage disbursements (indexed to 100 in Q3 2020) by disbursement date.

Focusing on granular data on the offers of green mortgages, we notice that at the beginning of 2020 these products were not available through the portal. In the period from September 2022 to June 2023, among the 21 banks featured on the portal providing mortgages for first-home purchases, 12 offered at least one green mortgage, while the remaining 9 provided only other types of mortgages. On average, 36 per cent of mortgage offers related to green mortgages, with limited monthly variation (Fig. 8).

Figure 8: Evolution of the share of green mortgages among total first house mortgages
(per cent)



Source: MutuiOnline.

It is noteworthy that the banks participating in green mortgage offerings are the major financial institutions in the country. Indeed, banks with more household loans and greater values of total assets are more inclined to offer green mortgages. This underscores our earlier findings from the RBLS, which indicate that larger financial institutions play a substantial role in introducing this innovative product.

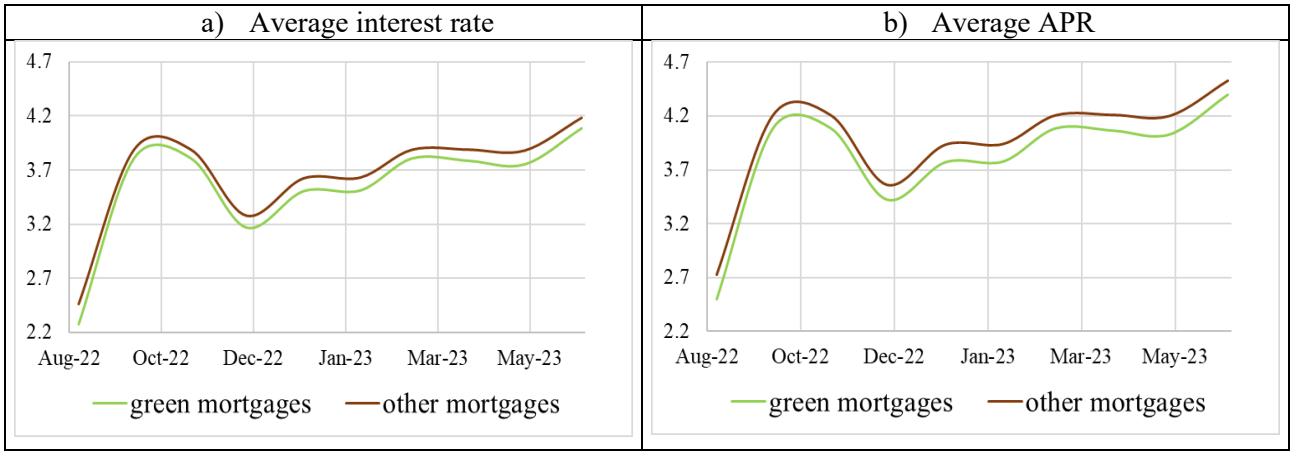
6.5 Green mortgage pricing

MutuiOnline data allows an evaluation of the dynamics in the average (net and gross) mortgage rates provided by banks through this online platform during the specified period.

The average mortgage rate is computed across all mortgage offers in a given month, distinguishing between green and other mortgages. Fig. 9 shows that, over the entire period, the average mortgage rate associated to green mortgages is always below that associated to brown mortgages. This visual evidence points to the existence of a green mortgage discount.

Figure 9: Average interest rate offered by banks, by energy efficiency type

(per cent)



Source: MutuiOnline.

In order to verify that the green mortgage discount is not the result of confounding factors (e.g. contract or borrower characteristics), we estimate the following model specification using an OLS regression:

$$i_{c,b,t} = \beta_0 + \beta_1 Green_{c,b,t} + \gamma_c + \gamma_b + \gamma_t + \varepsilon_{c,b,t} \quad (1)$$

where $i_{c,b}$ is the interest rate (net or gross) offered by bank *b* to household-contract *c,* defined by the set of contract and borrower characteristics (duration, type of rate, loan-to-value ratio of the loan; age, income, job position of the loan applicant; province of the property). $Green_{c,b,t}$ is a dummy variable equal to 1 if the first home loan is classified as green and to 0 otherwise. γ_c and γ_b and γ_t are fixed effects for contract, bank and time respectively. $\varepsilon_{c,b,t}$ is the error term.

Regression results are shown in Table 5, with various combinations of households-contract, time and bank fixed effects. The dependent variables considered are the interest rate and the APR, which – in the period considered – averaged 3.73 and 3.98 per cent, respectively. The coefficient for the Green dummy is always negative and significant, confirming the existence of a green mortgage discount.

Even when all various controls are included the discount remains negative and statistically different from zero at 1 per cent confidence level, although its magnitude in absolute terms is somewhat smaller than in other cases. In that most stringent specification (Column 4), the estimated green discount is about 7 basis points for the interest rate (Panel A) and 8 basis points for the APR (Panel B).

Table 5: Regression results

	(1)	(2)	(3)	(4)
		A. INTEREST RATE		
Green	-0.110***	-0.097***	-0.095***	-0.068***
	(0.000)	(0.000)	(0.000)	(0.000)
R-squared	0.006	0.763	0.625	0.749
		B. APR (gross interest rate)		
Green	-0.154***	-0.138***	-0.137***	-0.081***
	(0.001)	(0.000)	(0.000)	(0.000)
R-squared	0.010	0.754	0.622	0.755
FE HH-Contract	N	Y	Y	Y
FE Time	N	N	Y	Y
FE Banca	N	N	N	Y
Obs	4,468,220	4,468,204	4,468,220	4,468,220

Source: MutuiOnline
Standard errors in parentheses clusterized at HH-contract*time level
*** p<0.1, ** p<0.05, * p<0.01

We then test whether longer green mortgages (i.e. those with higher uncertainty) have a lower discount than shorter green ones. Table 6 shows the results. The coefficients of the interaction terms between longer *Maturity (30 years)* and *Green* are positive, statistically significant at 1 per cent confidence level, and larger than the coefficients for the other interaction terms that include different maturities (Columns 1 and 2). These results are consistent with the fact that longer mortgages are characterized by higher uncertainty, associated with possible future changes in regulation; this higher uncertainty over the benefits of having a green building as a collateral could reduce the financial advantage.

We also check whether there is any relationship between the LTV and the mortgage rate differential. The interaction terms *LTV 60#Green* and *LTV 80#Green* are positive, statistically different from zero, and smaller that the interaction terms for LTV equal to 85 per cent (Columns 3 and 4, Table 6). For this latter category of mortgages, the green discount becomes very contained when we consider the APR and disappears for the gross interest rate. Among green mortgages, thus, the financial advantage (in terms of lower rate) increases when loans are little exposed to other risks which raise the probability of default or the loss given default, as proxied by higher LTV. For instance, a change in

regulation could lead to a decline in the property value and a rise in the LTV, with an increase in the probability of default on the mortgage that would be stronger for loans already characterized by a high LTV.

Then, we look at whether the mortgage rate differential depends on the rate type (variable vs fixed). The coefficient for the interaction *Variable rate#Green* is statistically significant and negative, indicating that green mortgages variable rates are lower than green mortgages fixed rate, although by just 2 basis points. The financial advantage for the borrower is thus greater when the loans are safer for the banks (Columns 5 and 6, Table 6), as in variable rate mortgages the interest rate risk is borne by households.

Finally, we consider the heterogeneity across the Italian provinces, which are our more granular geographical unit. We run a regression of the interest rate (APR) on dummies representing the Italian provinces, restricting the sample to green mortgages. We find that the property location does not affect the mortgage rate for green loans (Table 7), showing that banks are not differentiating by risks measured at a province level in their setup of the green mortgage discount. As Italian provinces are characterized by a different exposure to natural events they can be considered a measure of physical risk, although somewhat rough (Meucci and Rinaldi, 2022). Our result is thus consistent with physical risk not being priced in green mortgages, possibly because energy efficient homes are exposed to the risks of natural disasters (e.g. wildfires, cyclones, hurricanes, floods) like any other non-green home. Moreover, physical risks might matter less for mortgage pricing as they are explicitly taken account in the mandatory insurance contracts that borrowers have to subscribe upon buying a property. In any case, further analyses are needed to exclude that physical risk is not taken into account for the pricing of green mortgages.

Table 6: Heterogeneity by contract characteristics

	Maturity		LTV		Rate type	
	Interest rate	APR	Interest rate	APR	Interest rate	APR
	(1)	(2)	(3)	(4)	(5)	(6)
Green = 1	-0.085***	-0.110***	-0.073***	-0.090***	-0.055***	-0.070***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Maturity = 15 years	0.000	-0.093***				
	(0.001)	(0.001)				
Maturity = 20 years	-0.016***	-0.154***				
	(0.001)	(0.001)				
Maturity = 30 years	0.020***	-0.166***				
	(0.001)	(0.001)				
Maturity 15y#Green	0.010***	0.022***				
	(0.000)	(0.000)				
Maturity 20y#Green	0.031***	0.043***				
	(0.000)	(0.000)				
Maturity 30y#Green	0.040***	0.062***				
	(0.000)	(0.001)				
Ltv = 60			0.034***	0.033***		
			(0.001)	(0.001)		
Ltv = 80			0.111***	0.107***		
			(0.001)	(0.001)		
Ltv = 85			0.670***	0.705***		
			(0.001)	(0.001)		
Ltv 60#Green			0.006***	0.011***		
			(0.000)	(0.000)		
Ltv 80#Green			0.005***	0.018***		
			(0.000)	(0.000)		
Ltv 85#Green			0.060***	0.049***		
			(0.001)	(0.001)		
Variabile rate					-0.348***	-0.351***
					(0.001)	(0.001)
Variable rate#Green					-0.016***	-0.012***
					(0.000)	(0.000)
Observations	4,468,220	4,468,220	4,468,220	4,468,220	4,468,220	4,468,220
R-squared	0.589	0.601	0.658	0.660	0.645	0.644
FE HH-Contract	Y	Y	Y	Y	Y	Y
FE Time	Y	Y	Y	Y	Y	Y
FE Banca	Y	Y	Y	Y	Y	Y

Source: MutuiOnline

Standard errors in parentheses clusterized at HH-contract*time level

*** p<0.1, ** p<0.05, * p<0.01

FE HH-Contract includes all HH and contract variables except maturity (in Columns 1 and 2), LTV (in Colums 3 and 4), rate type (in Columns 5 and 6)

Table 7: Green mortgages and Italian provinces

Provinces	Interest rate	APR	Provinces	Interest rate	APR	Provinces	Interest rate	APR	Provinces	Interest rate	APR	Provinces	Interest rate	APR
	(1)	(2)		(1)	(2)		(1)	(2)		(1)	(2)		(1)	(2)
Alessandria			Catanzaro	(0.009)	(0.010)	Livorno	(0.009)	(0.009)	Perugia	(0.009)	(0.009)	Taranto	(0.009)	(0.009)
	0.000	-0.000		-0.000	0.000		0.000	0.000		0.000	0.000		-0.000	-0.000
Ancona	(0.009)	(0.009)	Chieti	(0.009)	(0.010)	Lodi	(0.009)	(0.009)	Pesaro e U	(0.009)	(0.009)	Teramo	(0.009)	(0.010)
	-0.006	-0.006		-0.000	0.000		0.000	-0.000		0.000	-0.000		-0.000	0.000
Aosta	(0.009)	(0.009)	Como	(0.009)	(0.010)	Lucca	(0.009)	(0.009)	Pescara	(0.009)	(0.009)	Terni	(0.009)	(0.010)
	-0.000	-0.000		-0.000	-0.000		0.000	0.000		0.000	0.000		-0.002	-0.002
Arezzo	(0.009)	(0.009)	Cosenza	(0.009)	(0.009)	LC□B4Aquil	(0.009)	(0.009)	Piacenza	(0.009)	(0.010)	Torino	(0.009)	(0.010)
	-0.000	-0.000		-0.000	0.000		-0.000	0.000		0.000	-0.000		-0.006	-0.006
Ascoli Piceno	(0.009)	(0.009)	Cremona	(0.009)	(0.010)	Macerata	(0.009)	(0.010)	Pisa	(0.009)	(0.009)	Trapani	(0.009)	(0.010)
	0.000	0.000		0.000	0.000		-0.000	-0.000		0.000	0.000		0.001	0.000
Asti	(0.009)	(0.009)	Crotone	(0.009)	(0.009)	Mantova	(0.009)	(0.009)	Pistoia	(0.009)	(0.009)	Trento	(0.010)	(0.010)
	0.000	0.000		-0.000	0.000		0.000	0.000		0.000	-0.000		-0.001	-0.001
Avellino	(0.009)	(0.009)	Cuneo	(0.009)	(0.010)	Massa Carra	(0.009)	(0.009)	Pordenone	(0.009)	(0.009)	Treviso	(0.009)	(0.010)
	0.000	0.000		-0.000	-0.000		0.000	0.000		0.003	0.003		-0.003	-0.004
Bari	(0.009)	(0.010)	Enna	(0.009)	(0.009)	Matera	(0.009)	(0.009)	Potenza	(0.009)	(0.009)	Trieste	(0.009)	(0.009)
	-0.007	-0.007		0.000	0.000		-0.000	0.000		0.000	0.000		0.002	0.002
Barletta Andr	(0.009)	(0.010)	Fermo	(0.009)	(0.010)	Medio Camp	(0.009)	(0.010)	Prato	(0.009)	(0.010)	Udine	(0.009)	(0.009)
	-0.004	-0.005		-0.005	-0.005		-0.003	-0.004		0.000	0.000		0.002	0.002
Belluno	(0.010)	(0.010)	Ferrara	(0.009)	(0.010)	Messina	(0.009)	(0.010)	Ragusa	(0.009)	(0.009)	Varese	(0.009)	(0.010)
	0.003	0.003		-0.000	-0.000		0.000	0.000		0.000	0.000		-0.006	-0.006
Benevento	(0.009)	(0.009)	Firenze	(0.009)	(0.009)	Milano	(0.009)	(0.010)	Ravenna	(0.009)	(0.010)	Venezia	(0.009)	(0.010)
	0.000	0.000		-0.005	-0.006		-0.005	-0.006		0.000	-0.000		-0.013	-0.013
Bergamo	(0.009)	(0.010)	Foggia	(0.009)	(0.009)	Modena	(0.009)	(0.009)	Reggio Cal	(0.009)	(0.009)	Verbania	(0.009)	(0.009)
	-0.005	-0.006		0.000	0.000		-0.000	-0.000		0.000	0.000		-0.008	-0.008
Biella	(0.009)	(0.009)	ForlC□B	(0.009)	(0.010)	Monza e Bria	(0.009)	(0.009)	Reggio Em	(0.009)	(0.010)	Vercelli	(0.009)	(0.010)
	-0.000	-0.000		0.000	0.000		-0.008	-0.008		0.000	-0.000		-0.007	-0.007
Bologna	(0.009)	(0.009)	Frosinone	(0.009)	(0.009)	Napoli	(0.010)	(0.010)	Rieti	(0.009)	(0.009)	Verona	(0.009)	(0.010)
	-0.005	-0.006		0.000	0.000		-0.007	-0.007		-0.000	-0.000		-0.013	-0.014
Bolzano	(0.009)	(0.009)	Genova	(0.009)	(0.009)	Novara	(0.009)	(0.010)	Rimini	(0.009)	(0.009)	Vibo Valent	(0.010)	(0.010)
	0.000	0.000		-0.005	-0.006		-0.000	-0.000		0.000	-0.000		0.000	-0.001
Brescia	(0.009)	(0.009)	Gorizia	(0.009)	(0.009)	Nuoro	(0.009)	(0.009)	Roma	(0.009)	(0.009)	Vicenza	(0.010)	(0.010)
	-0.005	-0.006		0.004	0.003		0.001	0.001		-0.005	-0.006		-0.009	-0.009
Brindisi	(0.009)	(0.009)	Grosseto	(0.009)	(0.009)	Ogliastra	(0.009)	(0.009)	Rovigo	(0.009)	(0.009)	Viterbo	(0.009)	(0.010)
	-0.000	-0.000		-0.000	-0.000		-0.005	-0.006		0.003	0.003		-0.005	-0.005
Cagliari	(0.009)	(0.010)	Imperia	(0.009)	(0.009)	Olbia Tempi	(0.009)	(0.010)	Salerno	(0.009)	(0.009)		(0.009)	(0.010)
	0.000	0.000		0.000	-0.000		-0.008	-0.009		-0.000	-0.000			
Caltanissetta	(0.009)	(0.010)	Isernia	(0.009)	(0.009)	Oristano	(0.009)	(0.010)	Sassari	(0.009)	(0.010)			
	0.000	0.000		0.000	0.000		0.001	0.001		0.000	0.000			
Campobasso	(0.009)	(0.010)	La Spezia	(0.009)	(0.010)	Padova	(0.009)	(0.009)	Savona	(0.009)	(0.010)			
	-0.000	0.000		-0.005	-0.006		-0.005	-0.006		-0.000	-0.000			
Carbonia Igle	(0.009)	(0.010)	Latina	(0.009)	(0.009)	Palermo	(0.009)	(0.009)	Siena	(0.009)	(0.009)			
	-0.005	-0.006		0.000	0.000		-0.000	-0.000		-0.000	-0.000			
Caserta	(0.009)	(0.010)	Lecce	(0.009)	(0.009)	Parma	(0.009)	(0.010)	Siracusa	(0.009)	(0.009)			
	-0.000	-0.000		-0.000	-0.000		0.000	-0.000		0.000	0.000			
Catania	(0.009)	(0.010)	Lecco	(0.009)	(0.010)	Pavia	(0.009)	(0.009)	Sondrio	(0.009)	(0.010)			
	-0.000	-0.000		0.000	-0.000		0.000	0.000		0.000	0.000			
Obs.	1,621,660													
R-squared	0.581													
FE Time	Y													
FE Banca	Y													

Source: MutuiOnline
Standard errors in parentheses clusterized at HH-contract*time level
*** p<0.1, ** p<0.05, * p<0.01

7 Conclusion

Transitioning to a lower-carbon economy may entail extensive policy, legal, technology and market changes to address mitigation and adaptation requirements related to climate change (TFCD, 2017); examples of such changes are the introduction of energy efficiency policies,[12] taxes on fossil-related emissions or incentives for the use of eco-sustainable sources.

[12] In the UK since 1 April 2018, for example, a domestic private property needs to have a certain minimum EPC grade/energy efficiency label (minimum rating E, with exemptions) to be allowed to be rented out. A similar prescription

In the real estate sector, energy consumption and energy prices affect the property value through their impact on climate-related transition risk. Energy consumption estimates are indeed linked to the energy-efficient class[13] of a building, which is also used as a proxy for the building's GHG emissions and, thus, is crucial to assess emissions' reduction.

In this context, mortgages can have a strategic importance in contributing to the energy requalification of buildings.

Green mortgages may represent an opportunity for both borrowers and lenders. On the one hand, borrowers, benefiting from favorable conditions, might use their greater purchasing power to buy better quality property, as energy, repair and health costs, as well as monthly total expenses, will be lower. On the other hand, lenders might take advantage of a potential lower impact of transition risks on the mortgage collateral portfolio, which could be important also for meeting supervisory expectations, expand market share and improve the green asset ratios.

In this work, we provide a first assessment of the size of the Italian green mortgage market; we also quantify in an experimental setup (i.e. by using ad hoc data that allow to disentangle demand and supply) the green discount offered by Italian banks. We show that the market is expanding, reflecting an increase in both demand and supply. Our price estimates indicate that, between September 2022 and June 2023, the green mortgage discount has been equal to about 7 basis points, on average. While for the time being the discount does not seem large, it is also true that banks have still limited information on the impact of the higher efficiency of the collateral on the overall riskiness of their balance sheet. From this perspective, more information might favor higher differentiation in the prices offered by financial intermediaries.

Given that the major Italian players are already in the green mortgage segment or are planning to enter in the next few years, we can infer that green mortgages are appealing to consumers, also due to their lower costs. This attractiveness, in turn, could result in an expansion of the market shares of banks that provide such financial products.

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is in force in the Netherlands for corporate real estate from 2023. In EU, the recast of Performance of Buildings Directive (EPBD) recently adopted introduces an ambitious plan of renovation in EU countries to achieve a highly energy efficient and decarbonized building stock by 2050.

[13] The energy class identifies the energy performance of a building, i.e. the amount of energy required to meet the requirements related to the standard use of a building, annually, for heating, cooling, ventilation, production of domestic hot water and, in non-residential buildings, lighting, elevators and escalators. There are ten energy classes, ranging from A4 for the most efficient building to G for the least efficient. This classification was introduced in Italy by Decreto interministeriale 162/15 following the transposition of the European Directive 2012/27. The energy performance certificate (EPC) is known in Italian as "Attestato di Prestazione energetica" or APE.

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Annex

RBLS Questionnaire

Mortgages to consumer households and energy efficiency of properties.	
With reference to the new loans made during 2022, please indicate the total amount disbursed for mortgages secured by homes in energy classes from A to E. (Please indicate "0" if you did not offer any contracts or "ND" if an estimate of the requested values is not available.)	Amount granted (in thousands of euro)
With reference to the new loans made during 2022, please specify the amount disbursed for subsidized mortgages for the purchase of high-energy performance homes (i.e., class A and B), as well as for improving the energy efficiency of a property already own, with at least a two-class energy efficiency improvement. Note: The amounts should also include the component aimed at financing renovation. (Please indicate "0" if you did not offer any contracts or "ND" if an estimate of the requested values is not available.)	Amount granted (in thousands of euro)
Do you plan to apply more favourable conditions (e.g., interest rate discount, more favourable Loan-to-Value ratio, or other forms of concessions) in the 2023-2025 period based on the energy classes of the purchased property or the expected energy improvement?	Write 0=No; 1=Yes