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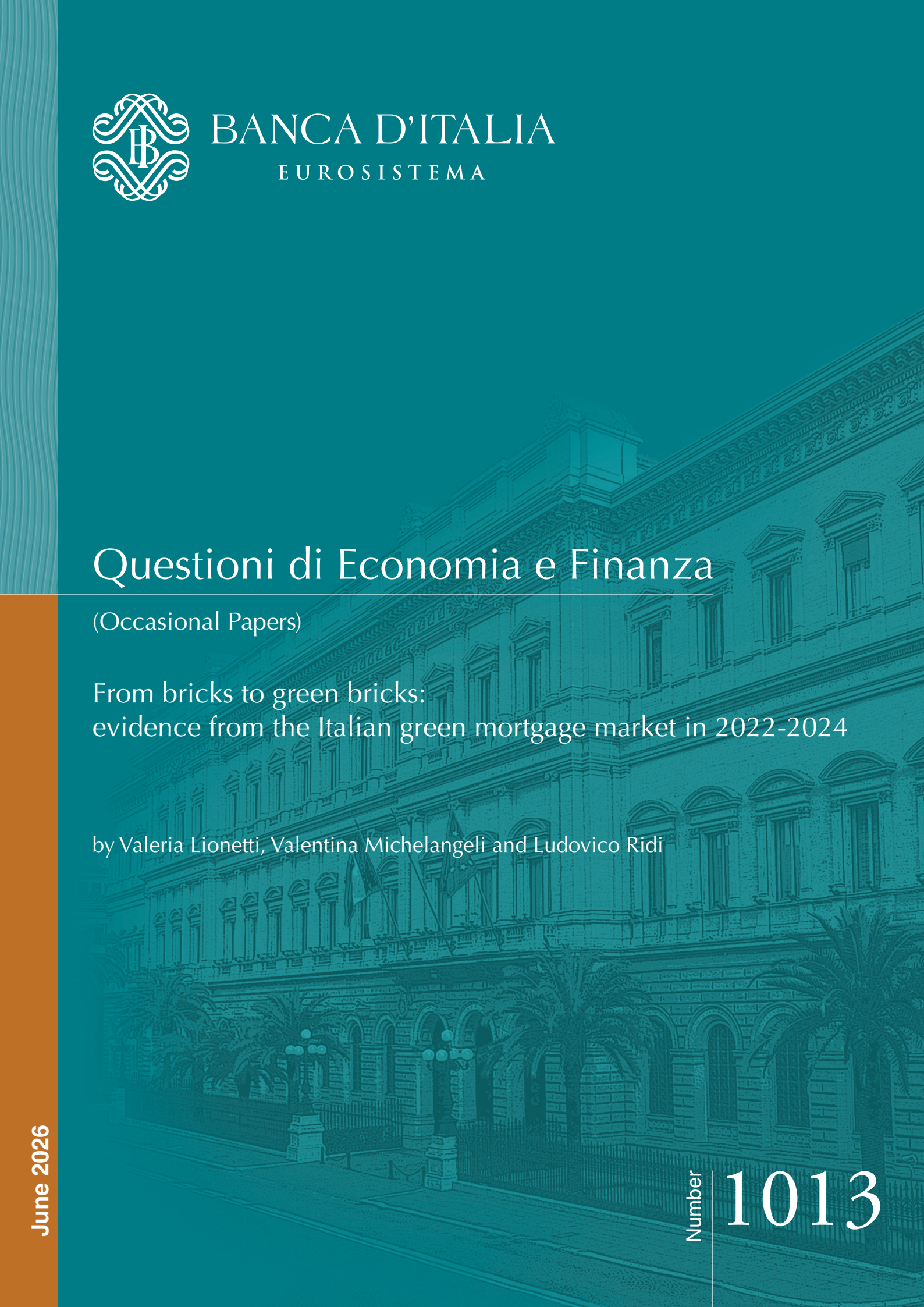

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FROM BRICKS TO GREEN BRICKS: EVIDENCE FROM THE ITALIAN GREEN MORTGAGE MARKET IN 2022–2024

by Valeria Lionetti*, Valentina Michelangeli** and Ludovico Ridi*

Abstract

This paper analyses the development of the green mortgage market in Italy between 2022 and 2024. Drawing on bank survey data and granular information on mortgage offers, it documents the rapid expansion of green mortgage lending. The evidence indicates that an increasing number of banks have entered this market, progressively integrating green mortgages into their lending activity and monitoring the relevant risks. While green mortgages still represent a small share of the overall mortgage market, the trend shows that they are gaining momentum and are well-positioned for further expansion. The paper also finds that green mortgages are offered at more favourable conditions: the estimated interest rate discount compared with non-green mortgages is economically and statistically significant. Overall, the findings provide new evidence that green mortgage lending in Italy is in the early stages, though its growth is accelerating.

JEL Classification: C50, G51, D58.

Keywords: banking, sustainable finance, green mortgages, pricing.

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1 Introduction[1]

In recent years, green mortgages have emerged as an important instrument at the intersection of housing finance and climate policies. By linking mortgage conditions to the energy efficiency of residential properties, these products are intended to support the decarbonisation of the housing stock, incentivise energy-efficient investments, and potentially mitigate climate-related risks for lenders. Their development requires both adequate informational infrastructure—most notably reliable data on the energy performance of real estate collateral—and sufficient supply-side commitment by banks to design and distribute dedicated products. Across Europe, policy initiatives and supervisory expectations have increasingly encouraged financial institutions to integrate energy efficiency considerations into mortgage lending (see ECB, 2020; BI, 2022; EBA, 2025).

In Italy, this process has gained momentum in recent years. Italian banks have undertaken significant efforts to improve the collection of information on the energy efficiency of residential properties used as collateral for mortgage loans (see Loizzo et al., 2025). Building on Abate et al. (2024), this paper contributes to the discussion on green mortgages by providing a comprehensive overview of the development of the Italian market between 2022 and 2024. Drawing on bank-level survey evidence from the *Regional Bank Lending Survey* (RBLS), first it investigates whether the Italian market for green mortgages expanded in the reference period and discusses whether observed dynamics are mostly driven by incumbents or new entrants. Second, this paper uses granular data on simulated mortgage offers from MutuiOnline (MO) to quantify the average interest rate discount associated with green offers relative to traditional offers, controlling for a wide set of fixed effects. It also explores the evolution of the rate discount over time and the possible heterogeneity across borrower profiles based on their risk characteristics.

The analysis complements the results presented in Abate et al. (2024) with new evidence. First, it includes data spanning over a longer time horizon. This allows to explore the evolution of the Italian market for green mortgages. Second, it features new findings on the energy efficiency of new mortgage originations for a relevant portion of the Italian banking industry, including both larger and smaller banks. Finally, it includes novel evidence on the lending conditions associated with green mortgages. Overall, the analysis shows that the Italian market for green mortgages experienced a rapid expansion during the reference period, mostly driven by increasing supply-side engagement. It also confirms that green mortgages are commercialised at more favourable lending conditions relative to traditional mortgages, with the average discount on the yearly interest rate widening during the reference period.

Descriptive evidence from the RBLS sample shows a steady increase in the number of banks able to report information for new mortgage originations guaranteed by properties with energy efficiency labels from A to E. Between 2022 and 2024, the number of banks reporting this

[1] We would like to thank Alessio Anzuini, Enrico Bernardini, Alessio De Vincenzo, Ivan Faiella, Luciano Lavecchia and Patrizio Pagano for their useful comments and reviews. All errors are our own.

information increased from 36 to 124, covering around 40% of new mortgage originations in Italy. Of these, approximately 100 banks also provided detailed information on the distribution of energy efficiency classes of the properties used as collateral. Also, the number of Italian banks developing and commercialising green mortgages increased between 2022 and 2024. Despite a macroeconomic environment characterised by rising interest rates and a tightening of the credit cycle, green mortgage originations doubled relative to 2022. In 2024, green mortgages in Italy reached euros 5.4 billion, accounting for 12 per cent of total new mortgage lending. Among banks offering green mortgages, this product accounted for approximately 15 per cent of total new originations.

Micro-level evidence from simulated mortgage offers based on MutuiOnline (MO) further documents the expansion of the green mortgage market. In this simulation exercise, mortgage demand and supply are identified through monthly offers to a fixed number of fictitious customers representing different borrower profiles, whose characteristics remain constant over time. Banks determine product availability and lending conditions for each fictitious borrower. Evidence suggests that most banks began offering green mortgage products to borrowers whose observable characteristics do not differ systematically from those receiving non-green mortgage offers, pointing to the absence of bank-side sorting. Hence, the specific design of this simulation allows green offers to be treated as effectively randomised across borrower types, which helps mitigate concerns related to borrower risk selection when analysing pricing differences.

Green mortgage offers are associated with more favourable pricing conditions than conventional mortgages. On average, both the net interest rate and the annual percentage rate (APR) are lower for green offers, with the discount becoming more pronounced from the second half of 2023. Econometric estimates provide robust statistical evidence that green mortgages in Italy are priced more favourably than comparable non-green mortgage products. The average discount ranges between 17 and 19 basis points in the case of the net interest rate, and between 22 and 26 basis points in the case of the APR. For a mortgage with a nominal value of euros 130,000 and a fixed rate amortisation scheme, a 0.18 basis points discount on the average yearly net interest rate results in interest savings of approximately euros 12 on monthly installments.

Several motivations could help interpret these findings. On the one hand, a relevant portion of the Italian banking system identifies green lending as key to support long-term decarbonisation objectives in credit portfolios, while promoting sound risk management practices and ensuring a competitive positioning in the market. On the other hand, banks may offer green mortgages to mitigate potential transition risks in their risk management practices, while meeting supervisory expectations and signalling responsible lending practices to investors (see Abate et al., 2023; Angelico et al., 2025).

Datasets used for the purposes of this study do not allow to investigate the relationship between credit risk and the energy efficiency of the property serving as collateral for the mortgage. We leave it for future research.

The work is organized as follows. Section 2 discusses the potential of the green mortgage markets. Section 3 describes the data. Section 4 presents the analysis based on the RBLS dataset. Section 5 shows the results from MO simulations. Section 6 concludes.

2 What future for green mortgages?

Emerging economic and regulatory context – In the European Union (EU), buildings account for 42% of final energy consumption and are responsible for over a third of energy-related greenhouse gas emissions (see European Commission, 2020). Also, energy costs related to electricity and heating are a relevant component of households' consumption expenditures. In Italy, such costs rose by 0.7 percentage points between 1997 and 2024, mostly driven by rising energy prices. Low-income families are particularly vulnerable, with approximately 9.1% of Italian households being in energy poverty in 2024 (see OIPE, 2025).

Energy prices are expected to increase further as a result of the ongoing energy transition and increasing energy demand. Over the next decades, electricity prices in the EU – amongst the highest in the world – may be rising as a result of both the energy transition and of the dynamics on the international markets (see IEA, 2017; European Commission, 2025b). Even under scenarios where the electrification of the energy systems loses momentum, electricity demand is projected to increase because of artificial intelligence (AI), with geopolitical risks representing additional drivers of unforeseen hikes in energy prices (see IEA, 2025). This exposes households to upward pressures on energy expenditures and may increase households' financial vulnerability due to lower disposable income, especially among younger individuals (see Faiella et al., 2022). Therefore, energy efficiency remains a key lever to reduce energy consumption and mitigate the effects of energy price shocks, contributing to the competitiveness of the economy and fostering energy security and affordability.

Also, it shall be recalled that information on the energy efficiency of properties has become relevant to the real estate markets. On the one hand, such information is priced in market valuations, with the most energy-efficient houses selling on average at a 25 per cent premium over the least efficient ones in Italy (see Loberto et al., 2023). On the other hand, energy performance ranks – after location and property type – among the key criteria for choosing a home, and the number of transactions involving properties with higher energy efficiency classes has been recently growing (see FIAIP, 2025).

Against this background, the EU Energy Performance of Buildings Directive (EPBD) aims at increasing the rate of building renovations. Specifically, it requires Member States to improve the energy efficiency of their public and private building stock according to national renovation plans. [2] Given the fiscal constraints at the national levels, private finance plays a fundamental role in meeting the financial resources required for building renovations. Indeed, the EPBD requires Member States to design incentive schemes promoting the use of private finance for energy renovations while ensuring the inclusion of vulnerable households and focusing on the

[2] The Directive of the European Parliament and of the Council of 24 April 2024 on the energy performance of buildings (Directive (EU) 2024/1275) is expected to be transposed into national law by 29 May 2026.

worst-performing buildings. Green loans and green mortgages are among the forms of private finance that such schemes may target. Moreover, the Commission is tasked with establishing a "mortgage portfolio standard" (MPS), a voluntary portfolio framework designed to guide financial intermediaries in increasing renovation-related lending in line with the EU decarbonisation objectives. The MPS is a voluntary regulatory tool aimed at ensuring that banks and other mortgage lenders increase the median energy performance of their real estate portfolio while encouraging borrowers to improve the energy efficiency of their properties (see European Commission, 2024b).

Green mortgages in the sustainable finance framework – Green mortgages are loans secured by residential properties, intended to finance the construction or purchase of buildings with high energy efficiency standards, or the renovation of existing buildings to improve their energy performance. The EU Taxonomy Regulation provides a relevant regulatory benchmark to identify real estate assets contributing to the European objectives of climate change mitigation and adaptation. [3] Nevertheless, the usability of the Taxonomy Regulation is often hindered by complexities in the applicability of its technical criteria and by limited data availability at the national levels (see Annex 1) (see EU Platform on Sustainable Finance, 2025). [4] Furthermore, these shortcomings may bias the signalling value of regulatory metrics for sustainability disclosures – such as the Green Asset Ratio (GAR) (see Loizzo et al., 2025) – and hinder the ability of the banking system to effectively communicate to stakeholders and investors the efforts undertaken when offering lending products which contribute to the European environmental objectives.

To overcome such challenges, industry standards and market initiatives provide streamlined frameworks building on a simplified and standardised application of the criteria and definitions of the Taxonomy Regulation. Specifically, banks often rely on internal standards to classify mortgages as green by leveraging relevant market initiatives such as the "Green Loan Principles" of the *Loan Market Association* or the "EEMI standard" of the *Energy Efficient Mortgages Initiative* (EEMI) (see EBA, 2023; Abate et al., 2024). With the aim to limiting fragmented practices and improving transparency in the market, in 2023 the European Banking Authority (EBA) issued an Opinion to the European Commission, highlighting the importance of bridging solutions supporting the development of markets for green loans and green mortgages (see EBA, 2023).

Potential role of green mortgages in the future – The uptake of markets for green mortgages still faces relevant barriers and obstacles that hinder the possibility of achieving their full potential. Not only do barriers and obstacles include structural factors (e.g. limited number of energy efficient buildings, high upfront costs, or limited awareness of the financial benefits of energy efficiency), they also reflect regulatory frictions and limited data availability.

[3] A more detailed overview of the technical criteria of the Taxonomy Regulation is included in Abate et al. (2024).
[4] The EU Platform on Sustainable Finance has been developing evidence-based reports to improve the usability and applicability of the Taxonomy Regulation and of its Delegated Acts. In February 2025, the Platform published the "Report Simplifying the EU Taxonomy to foster sustainable finance", containing, *inter alia*, recommendations on green retail lending, specifically referring to mortgages financing energy efficiency of buildings.

At the current stage, the European Commission has undertaken meaningful policy actions for the implementation of its Sustainable Finance Framework. However, a conceptual framework specifically devoted to green mortgages, including a definition, process, and transparency rules for credit institutions, may play a pivotal role in supporting the development of green lending markets in the short- and medium-term (see EBA, 2023). In 2025, the European Commission announced a new strategic plan to boost the competitiveness of the EU (see European Commission, 2025). The plan includes substantial regulatory simplification, including a review of the Taxonomy Regulation as part of the Omnibus Package. Given the relevance of the Taxonomy Regulation in the design of green lending policies, it remains essential to guarantee regulatory certainty to such markets, also in light of other intertwined policy initiatives.

Reducing regulatory uncertainty could provide several benefits. First, it could support the simplification efforts recently undertaken by the European Commission, while promoting energy efficiency among households and firms. These are regarded as relevant policy levers to promote the competitiveness of the EU economic system while preserving its resilience and financial soundness (see Draghi, 2025; Letta, 2025). Second, this policy initiative would promote a capital and banking union by ensuring a level-playing field among European banks, which may leverage green loans and mortgages financing energy efficiency of buildings as an effective asset class to raise funds or re-allocate risks in the financial system. Third, this initiative could help supervisory authorities in applying relevant prudential and supervisory provisions descending from the EU regulatory framework, while reducing risks of greenwashing and ensuring adequate consumer protection. Finally, this initiative could support the implementation of other relevant policy actions at the EU level (e.g. those outlined by the EBA in the abovementioned Opinion and the MPS) and at the national level and provide a relevant basis for the development of schemes of public finance supporting energy renovation of buildings (see Annex 2).

3 Data and sample

The analysis of the Italian market of green mortgages leverages information from two different data sources: the *Regional Bank Lending Survey* (RBLS) and MutuiOnline (MO).

In this analysis, we refer to mortgage contracts for home acquisition or renovation, either green or other (hereafter, non-green mortgages). The datasets consistently classify mortgages as green when proceeds finance the acquisition or renovation of properties with high energy performance (i.e. energy class at least equal to B or higher), as well as the improvement of the energy efficiency of existing buildings by at least two classes. [5]

[5] This classification is consistent with the criteria of the Energy Efficient Mortgages Initiative (EEMI), a market-led initiative which includes major credit institutions in Italy and in Europe. Therefore, it is assumed to be representative of relevant practices in the Italian banking sector. MutuiOnline publicly refers to such a definition on its website. Yet, available data does not allow to specifically verify the contractual conditions offered by banks, implying that banks may classify as green mortgage offers financing properties with energy class other than A and B.

3.1 The Regional Bank Lending Survey

The Bank of Italy runs the RBLS on a semi-annual frequency to collect non-regulatory information on the main drivers of credit demand and supply. The survey involves the Italian banking sector, including subsidiaries of national and foreign banking groups. Participation is voluntary (see BI, 2025).

Since 2023 (with reference year 2022), the survey has been featuring a section dedicated to mortgages financing the acquisition or renovation of residential properties with high energy efficiency. Specifically, the section investigates the following areas: i) availability of information on the energy efficiency of residential properties used as collateral at the origination; ii) yearly new flows of green mortgage originations to households; iii) banks' expectations on the green mortgage market. In 2025 (with reference year 2024), the survey included for the first time detailed information on the energy efficiency classes of residential mortgage originations and on the type of favourable lending conditions applied (see Annex 3.1 for additional details on the survey questions).

Table 1: Representativeness of the RBLS sample (2022 – 2024)

	a) 2022		b) 2023		c) 2024	
	No. of institutions	Share of total assets (per-cent)	No. of institutions	Share of total assets (per-cent)	No. of institutions	Share of total assets (per-cent)
RBLS Sample	244	81.42	243	80.14	237	79.10
of which: SIs	173	73.64	174	72.54	170	71.58
of which: LSIs	71	7.78	69	7.60	67	7.52
Total market	438	100	428	100	420	100

Source: RBLS. The Table reports the number of banks responding to the RBLS survey and their representativeness of the Italian banking industry in terms of share of total assets, differentiating entity-level responses between Significant Institutions (SIs) and Less Significant Institutions (LSIs). It also reports the total number of banks in the Italian banking industry based on the Annual Reports of the Bank of Italy.

The RBLS provides entity-level information for a relevant portion of the Italian banking sector, including Significant Institutions (SIs) and Less Significant Institutions (LSIs) (see Table 1). On average, more than half of the banks in the Italian banking industry responds to the RBLS, covering approximately 80 per cent of total assets. [6] Yet, quantitative figures may be affected by data reporting issues due to the non-regulatory nature of the information requested. Validation rules were applied to ensure consistency and robustness across quantitative answers.

[6] Total assets in the Italian banking industry were worth euros 3.28 trillion in 2022, 3.18 trillion in 2023, and 3.14 trillion in 2024.

3.2 Data on mortgage offers: MutuiOnline dataset

Data on the interest rate associated with mortgage offers is retrieved from the online mortgage platform of the broker MO, which was affiliated with 25 different banks between September 2022 and December 2024. Among such banks, 16 are included in this analysis as information on offered contracts is available on a continuous basis. [7]

According to an *ad-hoc* agreement with MO, the Bank of Italy can leverage simulated data to analyse the evolution of the mortgage market in Italy. Specifically, demand and supply of mortgages can be disentangled based on monthly offers to fictitious customers (see Carella et al., 2020). Total demand consists of a constant number of fictitious customers submitting mortgage requests with a monthly frequency. Fictitious customers are representative of different borrower types, whose characteristics are held constant over time. Banks always receive applications from the fictitious customers. Then, they can decide whether to offer a specific mortgage product and the associated lending conditions (i.e. net interest rate, annual percentage rate, monthly instalment). This ensures that estimates are not biased by self-selection of borrowers into banks (see Michelangeli et al., 2021).

Specifically, each borrower type reflects a combination of different risk and contractual characteristics. A total of 42,240 profiles can be generated by combining available criteria for: i) age (30-years or 40 years-old), job type (self-employed, permanent job, temporary job), and monthly gross income (2,000 or 4,000 euros); ii) province where the property is located (110 provinces); iii) type of mortgage rate demanded (fixed or variable), mortgage maturity (10, 15, 20 or 30 years), and loan-to-value ratio (50, 60, 80 and 85 per cent) (see Annex 3.2 for further details on the fictitious borrowers in the MO dataset). Each borrower profile is eligible to be served with a mortgage offer by each bank. Mortgage offers to a specific borrower profile can be classified by the bank either as green or as non-green. Property valuation is held constant at euros 200,000 at each point in time.

The analysis refers to the time horizon between June 2022 and December 2024. Observations are reported monthly. Each observation in the dataset corresponds to a mortgage offer by a credit institution to a fictitious customer. [8]

4 An analysis based on the RBLS dataset

This Section presents the main evidence from the RBLS dataset on the evolution of the market for green mortgages in Italy between 2022 and 2024. First, it provides descriptive evidence of the increased awareness of the Italian banking sector on the energy efficiency characteristics of residential properties used as collateral for their mortgage portfolios, specifically investigating what energy classes are financed by mortgage proceeds (Section 4.1). Second, it

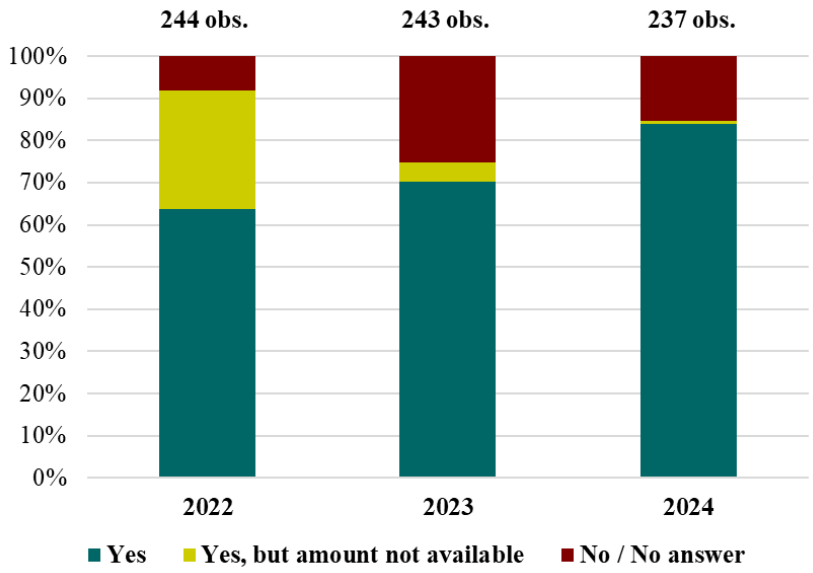
[7] In this analysis, banks affiliated to the MO portal included 13 Significant Institutions (SIs) and 3 Less Significant Institutions (LSIs). Most of such banks also respond to the relevant section of the RBLS.
[8] Observations in July 2023, August 2023, March 2024, and April 2024 are removed from the sample due to low numerosity issues. Mortgage offers with negative credit spreads are removed to ensure robustness of results.

quantifies the relevance of the green mortgage market in Italy and shows how it has evolved in the reference period (Section 4.2).

4.1 Banks' awareness of the energy efficiency of secured residential properties

Energy efficiency of residential properties plays a relevant role in the price dynamics of the real estate market. At the European and at the Italian levels, studies provide evidence for statistically significant price discrimination across Energy Performance Certificates (EPC) classes of residential properties (see Loberto et al., 2023; Ou et al., 2025). Accordingly, information on the energy efficiency of collateral is relevant for banks when assessing and monitoring credit risks in their mortgage portfolios. This finds appropriate regulatory and supervisory recognition in the European Union, with banks required to account for energy efficiency in the valuation and re-valuation of immovable properties (see ECB, 2020; BI, 2022; European Commission, 2024c; EBA, 2025).

Figure 1: Banks' awareness of the energy efficiency of new mortgage originations (2022 – 2024)
(Share of total assets in the RBLS sample by year)

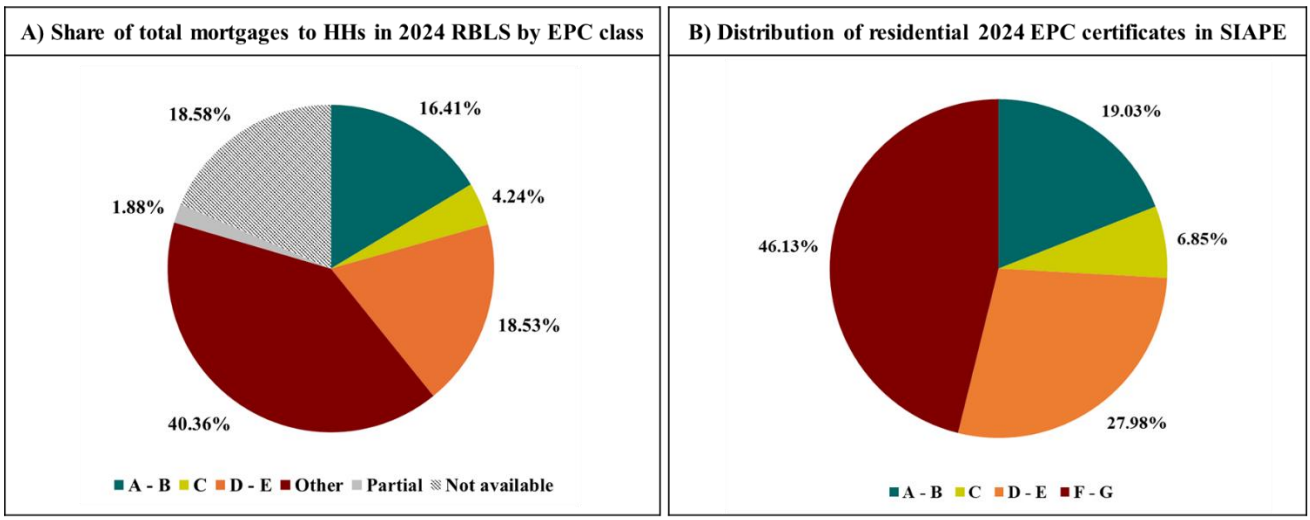


Against this background, Italian banks have been undertaking significant efforts to collect information on the energy efficiency of residential properties serving as collateral in their mortgage portfolios (see Loizzo et al., 2025). Descriptive evidence from the RBLS sample further confirms this finding (see Figure 1). Between 2022 and 2024, the number of banks reporting information on the energy efficiency of residential properties for new mortgage originations increased steadily, passing from 36 banks (representing 64 per cent of total assets) in 2022 to 124 banks (representing 84 per cent of total assets) in 2024 (see Table A4.2.1 in Annex 4). This trend is mostly driven by those banks which in 2022 were not able to report the requested information but declared to have started collecting it. In the reference period, no clear pattern emerges for the responses of those banks declaring not to be able to report requested information, declaring not to have such information available, or not providing an answer to

the RBLS question. This seems connected to data reporting issues, also reflecting potential sample attrition due to changes in the composition of respondents over time.

The analysis investigates further the energy efficiency of new mortgage originations at the system-wide level in Italy (see Panel A of Figure 2). In 2024, banks were requested to report disbursed amounts of new mortgage originations by energy efficiency buckets, including mortgages with EPC label A or B, and those with EPC label C. A relevant portion of the Italian industry provided the information requested, encompassing 100 banks that cover approximately 83 per cent of total assets in the 2024 RBLS sample. The remaining banks either did not respond to the section (*Not available*) or provided incomplete information, which does not allow to fully reconstruct the energy efficiency of their mortgage originations (*Partial*).

Figure 2: Insights on the energy efficiency of new mortgage originations in Italy (2024)



Source: Authors' calculation based on RBLS and SIAPE. The Figure reports (in per cent values) descriptive statistics on the distribution of Energy Performance Certificates (EPC) in 2024 and refers to residential properties in Italy. Panel A) reports the share of mortgage proceeds financing secured residential properties by EPC classes, focusing on new mortgage originations. Mortgage proceeds are classified as follows: i) *"A – B"*, *"C"* and *"D – E"* respectively refer to mortgage proceeds financing residential properties with EPC label in energy buckets A or B, C, and D or E; ii) *"Other"* refers to mortgage proceeds financing residential properties with EPC label in energy buckets different from A – E or for which banks may not be aware of the energy bucket; iii) *"Partial"* refers to mortgage proceeds granted by banks which do not allow to fully reconstruct the energy efficiency of their portfolio as providing partial information; iv) *"Not available"* refers mortgage proceeds for which information on the energy performance of secured residential properties is not available at all. Panel B) reports the distribution by energy bucket of EPCs referring to purchase agreements for residential properties reported to the SIAPE portal in 2024. In 2024, the SIAPE portal did not report information on Campania and Sardinia.

In 2024, loans secured by residential properties with high energy efficiency covered a limited portion of mortgage originations in Italy (see Panel A of Figure 2). According to the RBLS evidence, approximately 20 per cent of mortgage proceeds financed residential properties with an energy efficiency class equal to C or higher, even though data reporting issues resulting from incomplete or partial information may distort the EPC distribution downwards. To account for this issue, information is benchmarked against the EPC distribution as per the SIAPE portal, specifically referring to sales agreements for residential properties registered in 2024 (see Panel B of Figure 2). Albeit no direct relation can be established between the two datasets, Panel B of Figure 2 confirms the RBLS findings, and it shows how the limited number

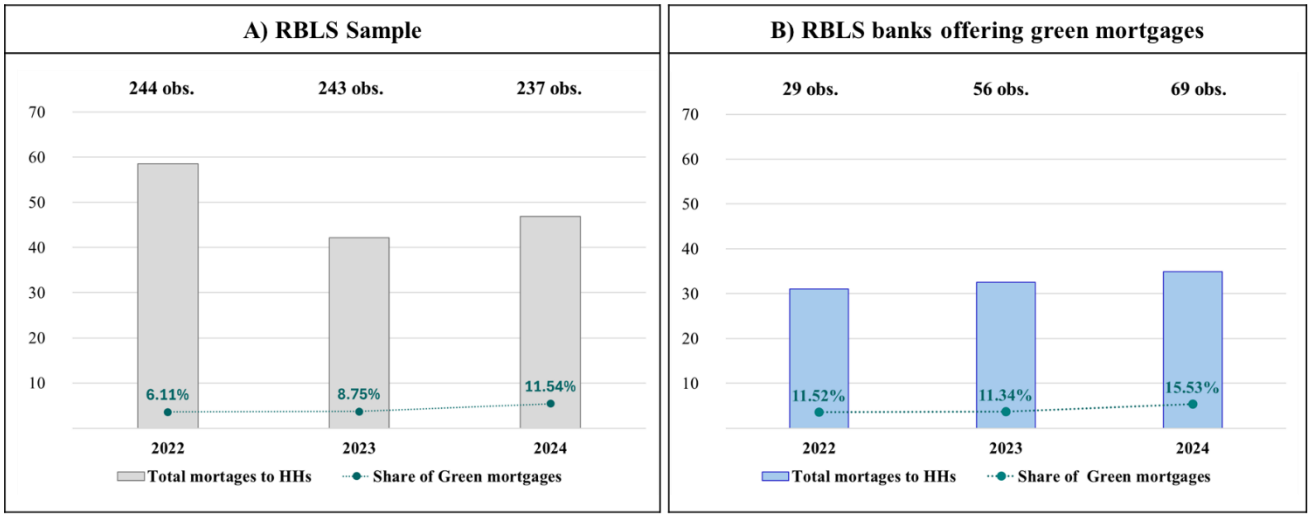
of energy-efficient buildings may represent a structural barrier for the development of green segments in the Italian mortgage market.

4.2 Evolution of the market for green mortgages in Italy

Figure 3 reports descriptive evidence for the relevance of the Italian market for green mortgages between 2022 and 2024. It evaluates the green segment against the contemporaneous dynamics of the Italian mortgage market.

In Italy, an increasing number of banks developed and commercialised green mortgages between 2022 and 2024 (see Figure 3, Panel B). Specifically, 69 banks declared to offer such lending products in 2024 and reported disbursed amounts. These are major players in the Italian banking market, worth approximately 75 per cent of total assets in the 2024 RBLS sample and granting 74 per cent of disbursed amounts in the same year. Specifically, those reporting information for the first time in 2022 are regarded as incumbents, while the remaining as new entrants. [9]

Figure 3: System-wide analysis of the Italian market for green mortgages (2022 – 2024)
(euros billion)



Source: Authors' calculations based on RBLS. The figure reports (in euros billion) descriptive statistics for the Italian mortgage market. Panel A) reports: total amount of mortgages to households (grey column); total amount of mortgages to households with an energy efficiency certificate (EPC) in classes A – E (blue dots); total amount of green mortgages to households (green dots). Percentage values are reported as a share of overall new mortgage originations from banks in the RBLS sample. Panel b) reports: total amount of mortgages to households (blue column); total amount of green mortgages to households (green dots). Percentage values are reported as a share of new mortgage originations from banks in the RBLS sample which reported information on green mortgages. Panels A) Panel B) are based on the observations reported in the headings.

Between 2022 and 2024, volumes of green mortgages to households expanded in a macroeconomic context characterised by rising interest rates and the tightening of the credit

[9] In the RBLS analysis, it is to be noted that pictures may be distorted by data reporting issues during the reference period. Accordingly, some of the banks that are classified as new entrants may have started offering green mortgages prior to the year indicated in this analysis, but they may have not been able to report such information as part of the RBLS data collection exercise. Specifically, 16 banks consistently reported information on green mortgages in the reference period, while 30 banks, which in 2022 declared to offer green mortgages but did not report disbursed amounts, started doing so in 2024.

cycle. Yet, green mortgages remain small in the Italian mortgage market (see Panel A in Figure 3). In 2024, disbursed amounts of green mortgages totalled euros 5.4 billion, covering 15.5 per cent of new originations from the 69 banks in the market for green mortgages and 11.5 per cent of the overall new mortgage originations from banks in the RBLS sample (see Figure 3). This finding is of relevance when compared to 2022 and to 2023, when volumes of green mortgages in Italy were worth approximately euros 3.5 billion and represented a lower share of new mortgage originations compared to 2024. Green mortgages are usually offered at a reduced interest rate or at reduced fixed expenses, albeit less frequently (see Table A4.3.1 in Annex 4).

The expansion of the green mortgage market in Italy was supported by new entrants (see Figure A4.1.1 in Annex 4). Based on the RBLS sample, disbursed amounts of green mortgages increased by 52 per cent between 2022 and 2024, with new entrants explaining approximately 90% of such variation. Accordingly, observed increases in the volume of green mortgages mostly reflect more banks commercialising green mortgages among their clients.

5 An analysis based on the MO dataset

The MO dataset allows to investigate the dynamics of mortgage rates offered by banks on the online platform between September 2022 and December 2024. This Section analyses the pricing of mortgage offers by distinguishing between green and non-green contracts. First, it presents descriptive evidence on the market for green mortgages in Italy, showing its evolution in the reference period (Section 5.1). Then, it provides quantitative evidence for the average rate discount associated with green mortgage offers on the MO platform, also investigating its dynamics and its heterogeneity across borrower types (Section 5.2 – 5.3).

5.1 Descriptive evidence on the markets for green mortgages in Italy

Between September 2022 and December 2024, the Italian market for green mortgages expanded (see also Section 4.2). Based on the specific nature of the MO dataset, supply-driven effects are to be regarded as relevant in explaining this trend. First, an increasing number of banks started offering green mortgages in the reference period (see Figure A5.1.1 in Annex 5). Second, an increasing number of borrower types were served with green mortgage offers in the same period (see Figure A5.1.2 in Annex 5). Overall, the dataset reports an increasing number of mortgage contracts offered to the borrower types in the reference period, with those classified as green representing slightly less than 50 per cent of total simulated offers by the end of 2024.

Between September 2022 and December 2024, the MO dataset reports a total of 10.9 million mortgage contracts offered to finance residential property acquisitions (see Table A5.2.1 in Annex 5). Mortgage offers can be divided according to their classification as green or non-green. On average, the net interest rate and the APR of green mortgage offers were lower than those of non-green mortgage offers (see Figure 4). Specifically, the rate discount associated with green offers increased starting from the second half of 2023 (see Figure A5.3.1 in Annex 5).

Figure 4: Average rate by mortgage type
(Per cent - %)

As the banks included in the MO sample do not vary over time and the characteristics of demand are held constant, these findings are likely to reflect the progressive easing of the credit cycle in Italy and the contemporaneous shifts in banks' commercial practices. Indeed, between September 2022 and December 2024, the dynamics of mortgage offers in the MO dataset are in line with the evolution of the relevant benchmark rates for the Italian mortgage market (see Figure A6.1.1 in Annex 6). At the same time, in 2023 a relevant portion of the Italian banking industry indicated that green mortgages are key in building reliable decarbonisation strategies for their credit portfolios, as well as in meeting relevant supervisory expectations and regulatory provisions (see Angelico et al., 2025).

Furthermore, the rate discount associated with green mortgage offers is correctly identified if the MO sample is well-balanced. Table 5.2.1 in Annex 5 shows that the baseline individual and contractual characteristics of the borrower types in the MO dataset do not systematically differ between green and non-green offers. On average, borrower profiles receiving green offers do not have baseline characteristics differing from those of the borrower types receiving non-green offers. Accordingly, the simulation design of the MO dataset allows to consider green offers as randomised across the different borrower types. On the one hand, this is of importance to wash out the effects of potential confounding factors which may bias the estimation of the rate discount associated with green mortgages, such as the risk characteristics of the borrowers. On the other hand, the MO dataset may not be representative of the actual distribution of mortgage offers among the borrower types in Italy.

5.2 How do institutions price green mortgages?

5.2.1 Analytical framework

In this analysis, each type *'i'* reflects borrower profiles in Italian provinces with differing baseline risk characteristics (as per the different combinations of age, job type, monthly gross income, maturity, rate type, LTV). Each type *'i'* can be offered a mortgage contract *'c'* which can be labelled as green or non-green by a credit institution *'b'*. To estimate the average rate discount associated with green mortgage offers and test its statistical significance, the following econometric specification is used based on Abate et al. (2024):

$$Spread_{c,i,b,t} = \beta_0 + \varphi_t + \varphi_i + \varphi_b + \beta \cdot Green_{c,i,b,t} + \varepsilon_{c,i,b,t} \qquad (1)$$

where: i) $Spread_{c,i,b,t}$ is the credit spread of contract *'c'* charged by institution *'b'* to borrower type *'i'* at time (month) *'t'*, relative to the maturity-matched risk-free rate in the same month[10]; ii) $Green_{c,i,b,t}$ is a binary variable taking value 1 if contract *'c'* offered by institution *'b'* to borrower type *'i'* at time *'t'* is labelled as green, 0 otherwise; iii) φ_t, φ_i, φ_b are respectively fixed effects at the time-, at the borrower- and at the institution-level. The intercept is indicated by β_0, and the idiosyncratic error term is indicated by $\varepsilon_{c,i,b,t}$.

The econometric specification (1) is used to estimate the parameter β. If negative, it can be interpreted as the average rate discount of green mortgage offers relative to non-green mortgage offers during the reference period (September 2022 - December 2024). Based on the specific characteristics of the MO dataset, the OLS estimator $\hat{\beta}$ provides an unbiased estimation of the parameter β. First, the estimator $\hat{\beta}$ does not suffer from endogeneity issues resulting from the demand side, as it allows to fully isolate supply changes by artificially maintaining demand constant over time (see Section 3.2). Second, the estimator $\hat{\beta}$ is not distorted by differences in the baseline risk characteristics of borrower types receiving green and non-green offers, nor is it affected by self-selection of banks into contract offers to borrower types with specific risk profiles (see Section 5.1).

In the estimation, one fixed effect at the time- and at the institution-levels is omitted to avoid collinearity among explanatory variables. Standard errors are clustered at the bank-time level to account for intra-cluster correlations among borrower types due to banks' pricing systems.

5.2.2 The green rate discount

Table 2 shows the results of Regression (1), reporting the estimated average rate discount associated with green mortgage offers between September 2022 and December 2024. Results refer to the yearly net interest rate (Panel A) and to the yearly APR (Panel B) for offered contracts. During the reference period, yearly rates offered to borrower types averaged 3.91 per cent and 4.23 per cent, respectively for the net interest rate and the APR.

[10] Mortgage contract offers with an adjustable rate are matched with the 3-month EURIBOR rate. Mortgage contract offers with a fixed rate are matched with the corresponding Interest Rate Swap (IRS).

Table 2: Average green rate discount (Sep 2022 – Dec 2024)

VARIABLES	(1)	(2)	(3)	(4)
	A) Credit Spread on Interest Rate			
Green	-0.189***	-0.172***	-0.174***	-0.180***
	(0.015)	(0.014)	(0.013)	(0.011)
R-squared	0.029	0.288	0.339	0.528
	B) Credit Spread on APR			
Green	-0.255***	-0.236***	-0.219***	-0.227***
	(0.017)	(0.015)	(0.014)	(0.013)
R-squared	0.046	0.306	0.381	0.549
Borrower Type FE	No	Yes	Yes	Yes
Institution FE	No	No	Yes	Yes
Year-Month FE	No	No	No	Yes
Observations	10,966,449	10,966,449	10,966,449	10,966,449

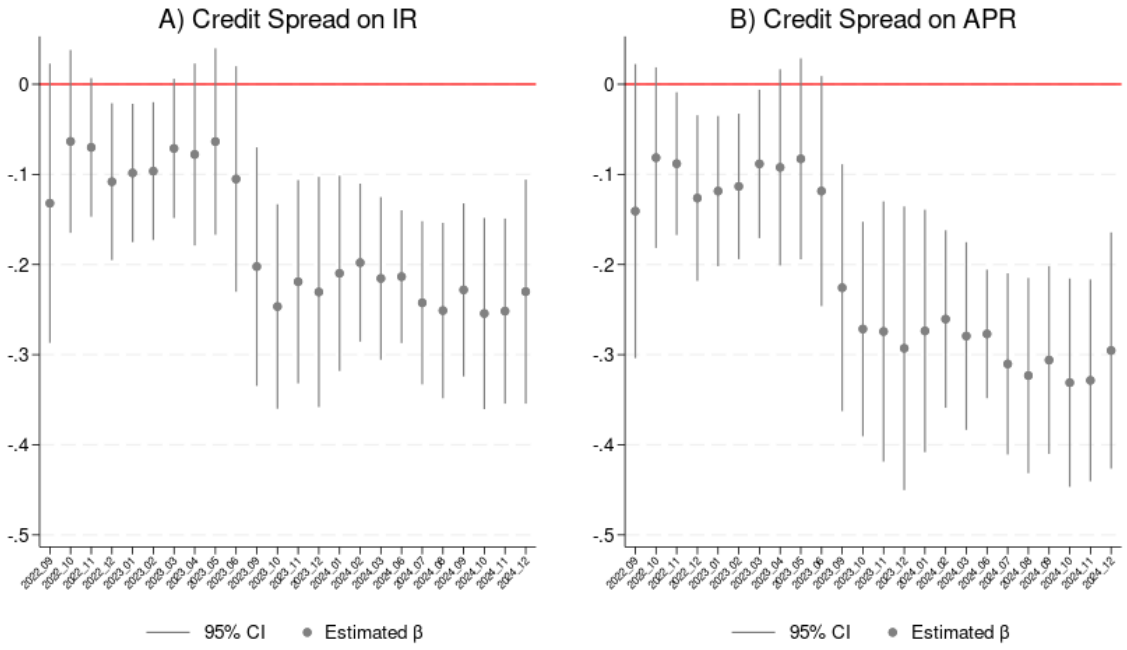
Standard errors in parenthesis clustered at bank-time level.
*** p<0.01, ** p<0.05, * p<0.1
In the estimation, one fixed effect at the time-level and at the institution-level is omitted to avoid multicollinearity. Observations in July 2023, August 2023, March 2024, and April 2024 are removed due to low numerosity. Observations with negative spreads are removed to ensure robustness of results.

The analysis confirms that green mortgages are offered at more favourable lending conditions relative to non-green offers. Controlling for different sets of fixed effects, the estimated green rate discount is consistently negative and statistically significant at the 1 per cent level. The average green rate discount ranges between 17 and 19 basis points in the case of the net interest rate, and between 22 and 26 basis points in the case of the APR.

The magnitude of the estimated average green rate discount on mortgage offers remains contained in financial terms. In the MO dataset, the average mortgage offer has a nominal value of euros 130,000 and a 20-year maturity. [11] Assuming a monthly and fixed-rate amortisation scheme, a 0.18 per cent discount on the average yearly net interest rate for fixed-rate offers will result in interest savings for approximately euros 2,900 throughout the lifecycle of the mortgage, with a saving rate of approximately 2 per cent on the monthly instalments (see Annex 3.3 for additional details on the calculation of the mortgage's monthly instalments). [12]

[11] In the MO dataset, between September 2022 and December 2024, the average loan-to-value (LTV) was 65 per cent and property valuation is held constant at euros 200,000.
[12] In the MO dataset, between September 2022 and December 2024, the yearly net interest rate for fixed-rate mortgage offers was on average 3.58 per cent, and the yearly APR was on average 3.88 per cent.

Figure 3: Dynamics of the average green rate discount by month-year (Sep 22 – Dec 24)
(Per cent - %)



Source: Authors' calculations based on MutuiOnline. The Figure plots the estimated interaction coefficients based on an expanded version of Regression (1) to allow for the interaction between time fixed-effects and the green dummy: $Spread_{c,i,b,t} = \beta_0 + \varphi_t + \varphi_i + \varphi_b + \sum_{t=2022/09}^{2024/12} \beta_t \cdot (Green_{c,i,b,t} \times \varphi_t) + \varepsilon_{c,i,b,t}$. The Figure displays point estimation of the coefficients and 95 per cent confidence intervals.
Panel A) reports the average green rate discount on the yearly net interest rate by month-year. Panel B) reports the average green rate discount on the yearly APR by month-year.
Observations in July 2023, August 2023, March 2024, and September 2024 were removed due to low numerosity. Observations with negative credit spreads were removed to ensure robustness of results.
One fixed-effect at the time- and at the institution-levels is omitted to avoid multicollinearity in estimation. Standard errors are clustered at the bank-time level.

Furthermore, the econometric analysis confirms the descriptive evidence that the rate discount increased during the reference period. Figure 3 plots the evolution of the estimated average rate spread for green mortgage offers between September 2022 and December 2024 (respectively, for the yearly net interest rate in Panel A and the yearly APR in Panel B). The rate spread offered monthly remains consistently negative during the reference period, but it appears to mature starting from the second half of 2023, when the estimated discount consistently becomes statistically significant at the 5 per cent level (see Table A5.3.1 in Annex 5).

At the current stage, it remains challenging to quantitatively identify the drivers that may help explain the dynamics of the average rate discount. These may reflect a variety of hypotheses which require to be adequately tested and verified. First, the dynamics of the green rate discount may reflect mature lending practices in the Italian market, with banks' increased ability to price the energy efficiency of properties in mortgage offers. Second, the dynamics may represent a strategic response to actual or expected policy initiatives, which may provide banks with relevant business opportunities, such as those connected with the implementation of the EPBD

(see European Commission, 2024b). Accordingly, banks may be using mortgage pricing as a lever for their competitive positioning and to gain a competitive advantage in the national market. Third, changes in banks' pricing behaviour may be a strategic response to increased competition in the Italian green lending market – as suggested by the larger number of banks commercialising green mortgages in the reference period – as well as a possible consequence of potential changes in net interest margins in an evolving macroeconomic environment.

Table 3: Heterogeneity in green rate discount by contractual characteristics (Sep 22 – Dec 24)

VARIABLES	(1) Spread on IR	(2) Spread on APR	(3) Spread on IR	(4) Spread on APR	(5) Spread on IR	(6) Spread on APR
Green	-0.200***	-0.274***	-0.170***	-0.214***	-0.191***	-0.238***
	(0.013)	(0.016)	(0.012)	(0.013)	(0.015)	(0.017)
Maturity = 15Y	0.025***	-0.122***				
	(0.004)	(0.004)				
Maturity = 20Y	0.003	-0.145***				
	(0.005)	(0.006)				
Maturity = 30Y	0.157***	-0.040***				
	(0.010)	(0.011)				
Maturity = 15Y#Green	0.022***	0.047***				
	(0.004)	(0.005)				
Maturity = 20Y#Green	0.034***	0.066***				
	(0.005)	(0.007)				
Maturity = 30Y#Green	0.017**	0.064***				
	(0.007)	(0.009)				
LTV = 60			0.030***	0.029***		
			(0.002)	(0.003)		
LTV = 80			0.109***	0.108***		
			(0.005)	(0.005)		
LTV = 85			0.642***	0.673***		
			(0.025)	(0.028)		
LTV = 60#Green			-0.004*	-0.004*		
			(0.002)	(0.002)		
LTV = 80#Green			-0.016***	-0.014***		
			(0.004)	(0.004)		
LTV = 85#Green			-0.006	-0.040		
			(0.021)	(0.025)		
Variable rate					0.199***	0.239***
					(0.038)	(0.040)
Variable rate#Green					0.023	0.023
					(0.019)	(0.020)
Borrower Type FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Institution FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,966,449	10,966,449	10,966,449	10,966,449	10,966,449	10,966,449
R-squared	0.523	0.545	0.482	0.501	0.505	0.526

Standard errors in parenthesis clustered at the bank-time level.
*** p<0.01, ** p<0.05, * p<0.1
In the estimation, one fixed effect at the time-level and at the institution-level is omitted to avoid multicollinearity. Observations in July 2023, August 2023, March 2024, and April 2024 are removed due to low numerosity. Observations with negative spreads are removed to ensure robustness of results.
In columns (1) and (2), Borrower Type FE do not include Maturity to avoid multicollinearity. In columns (3) and (4), Borrower Type FE do not include loan-to-value (LTV) to avoid multicollinearity. In columns (5) and (6), Borrower Type FE do not include rate type to avoid multicollinearity.

5.3 Heterogeneity by contractual characteristics

The analysis investigates further how the green rate discount interacts with respect to some of the risk characteristics of offered mortgage contracts, including their duration, loan-to-value

(LTV) and rate type. Results are reported in Table 3 by differentiating between the yearly net interest rate and APR.

Table 4: Green mortgages and Italian Provinces (Sep 22 – Dec 24)

VARIABLES	(1) Spread IR	(2) Spread APR		(1) Spread IR	(2) Spread APR		(1) Spread IR	(2) Spread APR		(1) Spread IR	(2) Spread APR		(1) Spread IR	(2) Spread APR
Alessandria	-0.001	-0.000	Catanzaro	0.001	0.001	Lecco	-0.001	0.000	Perugia	-0.000	-0.000	Taranto	0.002	-0.003
	(0.002)	(0.002)		(0.003)	(0.003)		(0.002)	(0.002)		(0.002)	(0.003)		(0.003)	(0.003)
Ancona	-0.015***	-0.015***	Chieti	-0.000	-0.000	Livorno	-0.001	-0.001	Pesaro Urbin	-0.002	-0.001	Teramo	0.001	0.001
	(0.002)	(0.003)		(0.003)	(0.003)		(0.002)	(0.003)		(0.002)	(0.002)		(0.003)	(0.003)
Aosta	0.001	0.004	Como	-0.001	-0.002	Lodi	-0.001	0.000	Pescara	-0.001	-0.001	Terni	-0.000	-0.000
	(0.003)	(0.003)		(0.002)	(0.002)		(0.002)	(0.002)		(0.003)	(0.003)		(0.002)	(0.003)
Arezzo	-0.000	-0.001	Cosenza	0.001	0.001	Lucca	0.002	0.003	Piacenza	-0.002	0.000	Torino	-0.014***	-0.015***
	(0.002)	(0.002)		(0.003)	(0.003)		(0.002)	(0.002)		(0.002)	(0.002)		(0.002)	(0.002)
Ascoli Piceno	-0.001	0.002	Cremona	0.000	0.000	Macerata	-0.001	0.002	Pisa	0.002	0.003	Trapani	-0.002	-0.002
	(0.002)	(0.003)		(0.002)	(0.003)		(0.002)	(0.003)		(0.002)	(0.002)		(0.003)	(0.003)
Asti	-0.000	-0.000	Crotone	0.001	0.001	Mantova	-0.000	0.000	Pistoia	-0.002	-0.001	Trento	-0.000	-0.001
	(0.002)	(0.003)		(0.003)	(0.003)		(0.002)	(0.003)		(0.002)	(0.003)		(0.002)	(0.003)
Avellino	0.000	0.000	Cuneo	-0.001	-0.001	Massa Carrara	0.002	0.002	Pordenone	-0.002	0.000	Treviso	-0.014***	-0.014***
	(0.003)	(0.003)		(0.002)	(0.002)		(0.002)	(0.002)		(0.002)	(0.003)		(0.002)	(0.002)
Bari	-0.016***	-0.017***	Enna	0.003	0.003	Matera	-0.000	-0.000	Potenza	0.001	0.001	Trieste	-0.001	-0.001
	(0.003)	(0.003)		(0.003)	(0.003)		(0.003)	(0.003)		(0.003)	(0.003)		(0.002)	(0.003)
Barletta Andri	-0.002	0.001	Fermo	-0.003	-0.003	Medio Campid	-0.006**	-0.006**	Prato	0.000	0.001	Udine	-0.002	-0.003
	(0.003)	(0.003)		(0.002)	(0.003)		(0.003)	(0.003)		(0.002)	(0.003)		(0.002)	(0.003)
Belluno	-0.000	-0.000	Ferrara	-0.000	-0.001	Messina	-0.000	-0.000	Ragusa	0.002	0.002	Varese	-0.013***	-0.014***
	(0.002)	(0.003)		(0.002)	(0.003)		(0.003)	(0.003)		(0.003)	(0.003)		(0.002)	(0.002)
Benevento	0.000	0.000	Firenze	-0.014***	-0.015***	Milano	-0.014***	-0.014***	Ravenna	-0.002	0.001	Venezia	-0.017***	-0.017***
	(0.003)	(0.003)		(0.002)	(0.002)		(0.002)	(0.002)		(0.002)	(0.003)		(0.002)	(0.003)
Bergamo	-0.015***	-0.012***	Foggia	0.000	0.000	Modena	-0.000	-0.001	Reggio Emil	-0.002	0.001	Verbania	-0.002	-0.002
	(0.002)	(0.002)		(0.003)	(0.003)		(0.002)	(0.002)		(0.002)	(0.002)		(0.002)	(0.003)
Biella	-0.001	-0.002	Forli Cesena	0.000	0.003	Monza Brianz	-0.003	-0.003	Reggio Calab	0.001	0.001	Vercelli	-0.002	-0.003
	(0.002)	(0.002)		(0.002)	(0.003)		(0.002)	(0.003)		(0.003)	(0.003)		(0.002)	(0.003)
Bologna	-0.014***	-0.015***	Frosinone	-0.001	-0.000	Napoli	-0.017***	-0.015***	Rieti	-0.000	0.000	Verona	-0.016***	-0.016***
	(0.002)	(0.002)		(0.002)	(0.003)		(0.002)	(0.003)		(0.002)	(0.003)		(0.002)	(0.003)
Bolzano	-0.002	-0.002	Genova	-0.012***	-0.013***	Novara	-0.002	-0.002	Rimini	-0.002	0.001	Vibo Valent	0.000	0.000
	(0.002)	(0.003)		(0.002)	(0.002)		(0.002)	(0.002)		(0.002)	(0.002)		(0.003)	(0.003)
Brescia	-0.015***	-0.012***	Gorizia	-0.001	-0.002	Nuoro	-0.002	-0.002	Roma	-0.014***	-0.014***	Vicenza	-0.005**	-0.002
	(0.002)	(0.002)		(0.003)	(0.003)		(0.003)	(0.003)		(0.002)	(0.002)		(0.002)	(0.003)
Brindisi	0.001	-0.000	Grosseto	-0.000	-0.001	Ogliastra	-0.006**	-0.007**	Rovigo	-0.000	-0.000	Viterbo	0.001	0.000
	(0.003)	(0.003)		(0.002)	(0.003)		(0.003)	(0.003)		(0.002)	(0.003)		(0.002)	(0.003)
Cagliari	-0.002	-0.003	Imperia	-0.001	0.002	Olbia Tempio	-0.008***	-0.007***	Salerno	-0.002	-0.002			
	(0.002)	(0.003)		(0.002)	(0.002)		(0.003)	(0.003)		(0.002)	(0.003)			
Caltanissetta	-0.000	-0.001	Isernia	-0.001	-0.001	Oristano	-0.001	-0.001	Sassari	-0.002	-0.003			
	(0.003)	(0.003)		(0.003)	(0.003)		(0.003)	(0.003)		(0.002)	(0.003)			
Campobassoa	0.001	-0.003	L'Aquila	0.001	0.001	Padova	-0.014***	-0.015***	Savona	0.003	0.002			
	(0.003)	(0.003)		(0.003)	(0.003)		(0.002)	(0.002)		(0.002)	(0.002)			
Carbonia Igles	-0.006**	-0.006**	La Spezia	-0.010***	-0.010***	Palermo	-0.001	0.000	Siena	-0.000	-0.001			
	(0.003)	(0.003)		(0.002)	(0.002)		(0.002)	(0.003)		(0.002)	(0.002)			
Caserta	-0.002	-0.001	Latina	0.002	0.002	Parma	-0.001	-0.000	Siracusa	0.001	0.001			
	(0.002)	(0.003)		(0.002)	(0.002)		(0.002)	(0.002)		(0.003)	(0.003)			
Catania	-0.002	-0.001	Lecce	-0.001	-0.001	Pavia	0.000	0.003	Sondrio	0.000	0.000			
	(0.002)	(0.003)		(0.003)	(0.003)		(0.002)	(0.002)		(0.002)	(0.003)			
Observations	4,660,214	4,660,214												
R-squared	0.520	0.523												

*** p<0.01, ** p<0.05, * p<0.1
In the estimation, one fixed effect at the time-level and at the institution-level is omitted to avoid multicollinearity. Observations in July 2023, August 2023, March 2024, and April 2024 are removed due to low numerosity. Observations with negative spreads are removed to ensure robustness of results.
In columns (1) and (2), Borrower Type FE do not include Provinces to avoid multicollinearity. The province of Agrigento is used as reference for the estimation of differences.

First, the rate discount associated with mortgage offers with longer maturity is on average lower than that associated with mortgages with 10-years duration. Estimated interaction terms between dummies for green contracts and different maturities are all positive and statistically significant at the one per cent level. As noted in Abate et al. (2024), this may be reflecting the higher uncertainty on the financial benefits of green buildings over longer time horizons. On the contrary, no clear interpretation emerges for the pricing of green mortgage offers with higher LTV or with variable rate, with some of the estimated coefficients being statistically insignificant. This suggests that, at the current juncture, maturity can be regarded as relevant when pricing financial risks in the green mortgage markets.

Finally, the analysis explores heterogeneity in the pricing of green mortgage offers among Italian provinces. By restricting the sample only to green mortgage offers, credit spreads on

referenced yearly rates (i.e. the net interest rate and the APR) are regressed onto a set of dummies representing Italian provinces. Table 4 shows that the location of the property does not consistently affect the rate associated with green offers, in line with the previous results of Abate et al. (2024).

6 Conclusions

This paper documents the rapid emergence of the green mortgage market in Italy between 2022 and 2024, highlighting a growing supply of green mortgage products and more favourable pricing conditions relative to conventional mortgages. While green mortgages still account for a limited share of the overall mortgage lending, this evidence suggests that the market is gaining momentum and is on a trajectory of further expansion.

Information on the energy efficiency of buildings has become central for the banking sector, both for risk management in residential mortgage lending and for the development of business strategies aimed at promoting energy efficiency. RBLS evidence indicates that banks have greater awareness of such information and are also more likely to offer green mortgages. In 2024, these instruments reached a total volume of euros 5.4 billion, accounting for 12% of new mortgage originations and doubling their share compared to 2022. At the same time, the discount on green mortgages has widened starting from the second half of 2023, and – on average – it was equal to 18 basis points in the case of the net interest rate.

Upcoming policy initiatives at both the European and national levels may be drivers for the further expansion of the green mortgage market. By reducing policy uncertainty, such initiatives could support energy efficiency, strengthen EU competitiveness and financial resilience, foster the development of a harmonised green asset class to support capital and banking union, and facilitate effective prudential supervision while limiting greenwashing risks and ensuring consumer protection.

Future research could assess whether the observed pricing advantages reflect differences in *ex post* credit risk, energy-related cost savings for households, or strategic pricing by banks. Further analysis could also explore borrower take-up, the effectiveness of green mortgages in promoting energy-efficient housing investment, and the implications for banks' risk profiles and financial stability as the market matures.

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Appendix to:

From Bricks to Green Bricks: How the green mortgage market is transforming in Italy

Annex 1. Energy efficiency of the stock of existing buildings in Italy

In Italy, the major challenges in the application of the relevant Technical Screening Criteria (TSC) to the stock of existing buildings, both for residential and commercial real estate, mostly depend on limited data availability.

The Energy Performance Certificate Information System (SIAPE), managed by ENEA, is the Italian national database for energy performance certificates (EPC) of residential and commercial buildings. Established by the 2015 decree on energy certification, it aggregates regional data to monitor buildings' energy efficiency and CO_2 emissions, supporting policy evaluation and planning through public statistics and administrative data with restricted access. It has been collecting EPC information since 2016, albeit information at the most granular level is not publicly available. Indeed, the SIAPE portal reports aggregated information on the distribution of EPC ratings (from G to A4) at the national, regional, and provincial levels, but it does not provide similar information for the distribution of the Primary Energy Demand (PED). Furthermore, data on the energy efficiency of buildings may be incomplete, as regional cadastral registries started reporting information to the SIAPE at different points in time (see Lavecchia et al., 2022).

Accordingly, statistics on energy efficiency solely based on the SIAPE portal cannot be regarded as sufficiently representative of the stock of buildings in Italy, as information is collected only for property acquisition or renting from 2016. At the current stage, the 2011 census of the Italian Institute of Statistics (ISTAT) is the only publicly available data source containing information representative for the stock of residential buildings in Italy. However, it only contains information on the surface and year of construction of residential properties, but not on their energy efficiency.

In late 2022, Italy's Ministry of Economy and Finance created a Sustainable Finance Platform in line with the European Green Deal, the G20 Roadmap on Sustainable Finance, and the National Recovery and Resilience Plan. The platform brings together key national institutions—including the Ministry of the Environment and Energy Security, the Bank of Italy, CONSOB, IVASS, and COVIP—to support the mobilisation of private capital for the country's sustainable transition. Through coordination among supervisory authorities, sharing of best practices, and joint analytical work, the Platform aims to identify practical solutions that facilitate private investment in sustainable projects. It also serves as a forum for open dialogue between public and private stakeholders. In 2023, the Platform set three priority areas of work, including a key initiative on improving access to public databases. Also, the High-Level Forum for Sustainable Building Renovations, promoted by the Italian Banking Federation (ABI), gathers representatives from the public and private sectors to exchange on ongoing policy discussions about the energy efficiency of buildings in Italy.

Annex 2. Public lending instruments for energy efficiency renovations in the French residential sector.

The French policy framework for energy renovations of private housing integrates a set of financial instruments designed to overcome liquidity constraints and incentivise households to undertake energy-efficient upgrades. Public instruments combine concessional lending, deferred repayment mechanisms, and complementary fiscal measures, thereby addressing both affordability and credit access challenges. Such framework does not envisage public support for the acquisition of buildings with high energy efficiency, leaving this segment of the real estate market in the realm of private initiative.

1. Éco-Prêt à Taux Zéro (Éco-PTZ)

The *Éco-PTZ* constitutes the cornerstone of France's green lending architecture for private housing. It is a zero-interest loan available without income conditions, targeting owners (occupants or landlords) and, – under specific modalities – homeowner associations (*syndicats de copropriétaires*). Eligible properties must serve as primary residences and must have been occupied for at least two years. Financing covers either single actions improving energy performance, comprehensive renovations achieving a minimum 35% reduction in primary energy consumption (validated through an energy audit), or the rehabilitation of non-collective sanitation systems meeting prescribed technical standards. Loan ceilings range from €15,000 for single actions to €50,000 for global renovations, with maturities extending up to 20 years. A complementary *Éco-PTZ* may be mobilized within five years of the initial loan. Distribution is restricted to credit institutions operating under State convention, ensuring compliance with regulatory and technical safeguards, including mandatory use of certified contractors.

Introduced in 2024, the *Éco-PTZ Prime Rénov'* combines the main features of the *Éco-PTZ* with those of *MaPrimeRénov'*, a public grant (aid) from the French State for energy-efficiency renovation works of residential buildings. This variant facilitates the financing of residual costs after deduction of *MaPrimeRénov'* subsidies. It retains the zero-interest feature and extends repayment up to 20 years, thereby reinforcing the affordability of deep renovation projects.

2. Prêt Avance Rénovation (PAR)

The PAR addresses structural credit access barriers for vulnerable households, notably elderly owners and low-income segments. It operates as a reverse mortgage instrument, enabling deferred repayment of principal and interest until property transfer through sale or succession. The facility is secured by a statutory mortgage and supplemented by a public guarantee covering 75% of the credit amount via the *Fonds de Garantie pour la Rénovation Énergétique* (FGRE). Operational since 2022, PAR is currently distributed by major banking networks, with a zero-interest sub-category for modest households scheduled for deployment from September 2024.

Annex 3. Methodological Background

Annex 3.1. *RBLS Survey – Section E*

E1a	**With reference to the loans to households originated in the reference year, please indicate the total disbursed amount for mortgages.** *(Please indicate "0" if you did not offer any contracts or "ND" if an estimate of the requested values is not available.)*	*Amount granted (euros thousands).*	RBLS 2023 RBLS 2024 RBLS 2025
E4a	**With reference to the loans originated in the reference year, please indicate the total disbursed amount 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 (euros thousands).*	RBLS 2023 RBLS 2024 RBLS 2025
E4a.a	**Of which:** morgages in energy classes A - B		RBLS 2025
E4a.b	**Of which:** morgages in energy classes C		RBLS 2025
E4b	**With reference to the loans originated in the reference year, please indicate the total disbursed amount for mortgages offered at favourable lending conditions for purchasing energy efficient homes (i.e. class A and B) and/or for renovations of existing buildings to improve their energy efficiency by at least two classes.** *(Please indicate "0" if you did not offer any contracts or "ND" if an estimate of the requested values is not available.)*	*Amount granted (euros thousands).*	RBLS 2023 RBLS 2024 RBLS 2025
E4c	**Are you planning to apply favourable lending conditions (e.g. interest rate discount, more favourable LTV, other forms of concessions) in the next three years based on the energy efficiency rating or improvements of properties?**	*0 = No* *1 = Yes*	
	With reference to the mortgages referred to in Question E4b, indicate what of the following favourable lending conditions were applied in the reference year.		RBLS 2025
E4d	Reduced interest rate	*0 = No* *1 = Yes*	
E4e	Reduced fixed expenses (e.g. cash-back schemes)		
E4f	Larger amount financed at the origination		
Additional comments regarding specific questions		*Open Text*	

Annex 3.2. Information available in the MutuiOnline dataset

Table A3.2.1: Borrower and contract characteristics in MutuiOnline

Characteristics of the borrower	
Age	*30, 40 years old*
Job Type	*Self-employed, permanent job, fixed-term contract*
Monthly gross income	*2000, 4000 euros*
Characteristics of the contract	
Purpose of the contract	*Residential property (first home) acquisition, subrogation*
LTV	*50, 60, 80, 85 per cent*
Rate type	*Fixed, adjustable*
Maturity	*10, 15, 20, 30 years*
Characteristics of the property	
Location	*110 provinces*
Characteristics of the mortgage offer	
Monthly instalment	
Interest rate and APR	
Contract name	

Annex 3.3. Interest Expenses Calculation

Consider a mortgage with the following characteristics:

- Mortgage amount (principal): P
- Total number of payments: n
- Yearly interest rate: r
- Fixed rate with monthly payments.

Monthly instalments can be calculated as:

$$M = P \cdot \frac{r(1+r)^n}{(1+r)^n - 1}$$

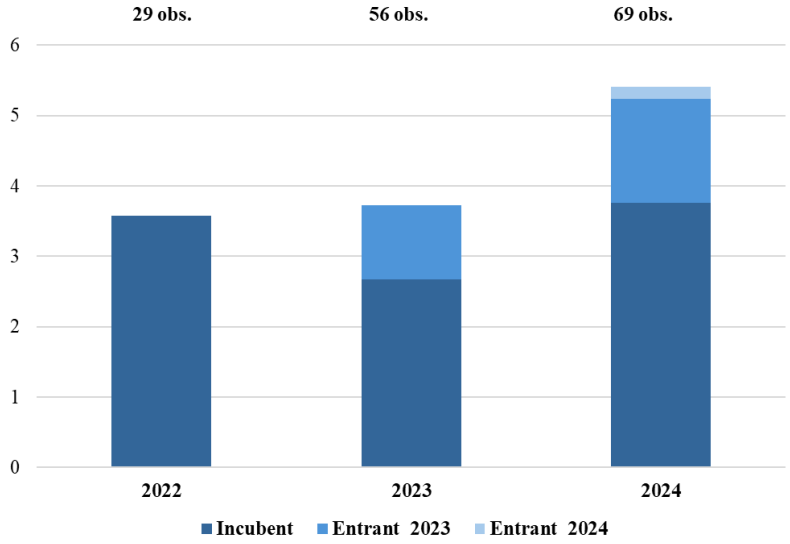
Total interest expenses are:

$$Interest\ Expenses = (M * n) - P$$

Annex 4: Additional analyses based on the RBLS sample

Annex 4.1. Isolating supply-driven effects

Figure A4.1.1: Green mortgage volumes by incumbents and new entrants (2022 – 2024)
(euro billion)



Annex 4.2. Awareness of energy information and issuance of green mortgages

Table A4.2.1: Awareness of energy information and issuance of green mortgages (2022 – 2024)

	Observations	Share of total assets (per cent)	Share of total mortgage originations (per cent)
A) Banks' awareness of energy information			
2022	36	63.65	20.76
2023	81	70.24	27.66
2024	124	83.87	39.91
B) Banks' issuance of green mortgages			
2022	29	54.04	6.11
2023	56	77.79	8.75
2024	69	75.81	11.54

Annex 4.3. Preferential lending conditions associated to green mortgages

Table A4.3.1: Favourable lending conditions associated to green mortgages (2024)

	Observations	Share of total assets (per cent)
A) Reduced Interest Rate		
Yes	110	86.49
No	77	5.35
No Answer	50	8.13
B) Reduced Fixed Expenses (e.g. cashback schemes)		
Yes	36	46.54
No	151	45.34
No Answer	50	8.13
C) Larger amount financed at origination		
Yes	12	3.49
No	174	88.11
No Answer	51	8.40

Annex 5: Additional analyses based on the MO dataset

Annex 5.1. Isolating supply-driven effects

Figure A5.1.1: Banks with a green mortgage offer (Sep 2022 – Dec 2024)
(No. of banks in the MO sample)

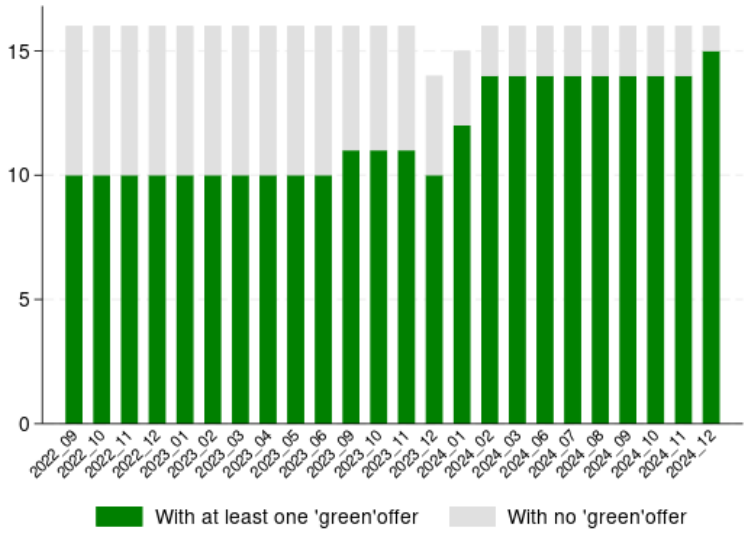


Figure A5.1.2: Expansion of green mortgage offers (Sep 2022 – Dec 2024)

Annex 5.2. Descriptive statistics on borrower types

Table A5.2.1. Individual and contractual characteristics of green and non-green mortgage offers

	Non-green Mortgages		Green Mortgages	
	Observations	Per cent (%)	Observations	Per cent (%)
Age (years)				
30	3,259,429	51.69	2,365,382	50.76
40	3,046,806	48.31	2,294,832	49.24
Job Type				
Fixed-term contract	719,238	11.41	705,514	15.14
Permanent-job	2,818,204	44.69	2,001,720	42.95
Self-employed	2,768,793	43.91	1,952,980	41.91
Monthly gross income (euro)				
2,000	2,840,529	45.04	2,142,279	45.97
4,000	3,465,706	54.96	2,517,935	54.03
Maturity (years)				
10	1,300,428	20.62	965,070	20.71
15	1,583,808	25.11	1,187,054	25.47
20	1,714,310	27.18	1,237,602	26.56
30	1,707,689	27.08	1,270,488	27.26
Rate Type				
Adjustable	3,103,406	49.21	2,277,344	48.87
Fixed	3,202,829	50.79	2,382,870	51.13
LTV (%)				
50	1,828,742	29	1,394,306	29.92
60	1,828,481	28.99	1,400,594	30.05
80	1,809,092	28.69	1,401,422	30.07
85	839,920	13.32	463,892	9.95
Sample size	6,306,235		4,660,214	

Source: Authors' calculations on MutuiOnline (MO). The table shows the distribution of mortgage offers for: i) individual characteristics (age, job type, and monthly gross income); ii) contractual characteristics (maturity, rate type, and loan-to-value ratio). All offers are to finance residential property acquisition. Mortgage offers are classified as green and non-green based on the information reported by MO. Column 'Observations' reports the number of mortgage contracts offered in the MO dataset. Column *'Per cent (%)'* reports the distribution of offers as a per cent value of total offers for each individual or contractual characteristic. Each observation corresponds to a mortgage contract offer between September 2022 and December 2024. Observations in July 2023, August 2023, March 2024, and April 2024 were removed due to low numerosity. Observations with negative credit spreads were removed to ensure robustness of results.

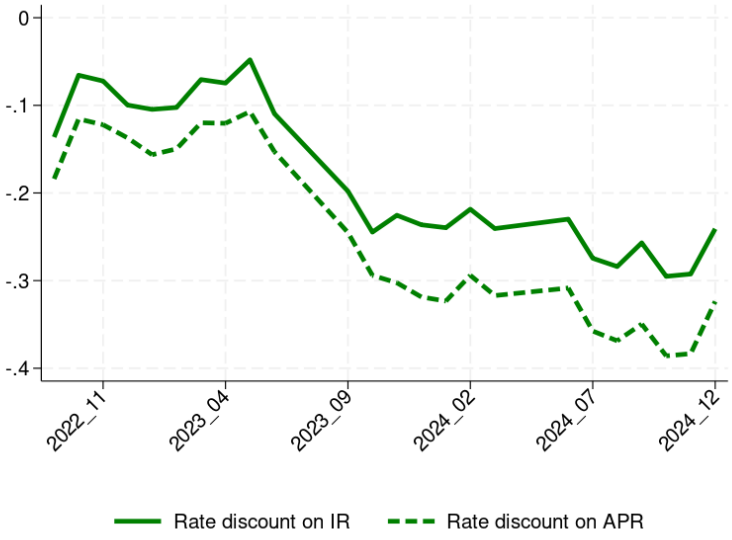
Annex 5.3. Time evolution of the rate discount on green mortgages

Table A5.3.1.: Estimated dynamics of the average rate premium of 'green' mortgage offers (Sep 22 – Dec 24)

	(1)	(2)
VARIABLES	Credit Spread on IR	Credit Spread on APR
2022_09#Green	-0.132*	-0.141*
	(0.079)	(0.083)
2022_10#Green	-0.063	-0.081
	(0.052)	(0.051)
2022_11#Green	-0.070*	-0.088**
	(0.039)	(0.040)
2022_12#Green	-0.108**	-0.126***
	(0.044)	(0.047)
2023_01#Green	-0.098**	-0.119***
	(0.039)	(0.042)
2023_02#Green	-0.096**	-0.113***
	(0.039)	(0.041)
2023_03#Green	-0.071*	-0.088**
	(0.039)	(0.042)
2023_04#Green	-0.078	-0.092*
	(0.051)	(0.055)
2023_05#Green	-0.064	-0.083
	(0.053)	(0.057)
2023_06#Green	-0.105*	-0.119*
	(0.064)	(0.065)
2023_09#Green	-0.202***	-0.226***
	(0.067)	(0.070)
2023_10#Green	-0.247***	-0.272***
	(0.058)	(0.061)
2023_11#Green	-0.219***	-0.274***
	(0.057)	(0.073)
2023_12#Green	-0.230***	-0.293***
	(0.065)	(0.080)
2024_01#Green	-0.210***	-0.274***
	(0.055)	(0.068)
2024_02#Green	-0.198***	-0.261***
	(0.045)	(0.050)
2024_05#Green	-0.215***	-0.279***
	(0.046)	(0.053)
2024_06#Green	-0.213***	-0.277***
	(0.037)	(0.036)
2024_07#Green	-0.242***	-0.310***
	(0.046)	(0.051)
2024_08#Green	-0.251***	-0.323***
	(0.049)	(0.055)
2024_09#Green	-0.228***	-0.306***
	(0.049)	(0.053)
2024_10#Green	-0.254***	-0.331***
	(0.054)	(0.059)
2024_11#Green	-0.252***	-0.329***
	(0.052)	(0.057)
2024_12#Green	-0.230***	-0.295***
	(0.063)	(0.067)
Borrower Type FE	Yes	Yes
Institution FE	Yes	Yes
Time FE	Yes	Yes
Observations	10,966,449	10,966,449
R-squared	0.532	0.555

Standard errors in parenthesis clustered at the contract offer-time level.
*** p<0.01, ** p<0.05, * p<0.1
In the estimation, one fixed effect at the time-level and at the institution-level is omitted to avoid multicollinearity. Observations in July 2023, August 2023, March 2024, and April 2024 are removed due to low numerosity. Observations with negative spreads are removed to ensure robustness of results.

Figure A5.3.1: Average rate discount for green mortgage offers (Sep 2022 – Dec 2024)
(Per cent - %)



Annex 6: Benchmark rates for the Italian mortgage market

Figure A6.1.1: Dynamics of the benchmark rates for the Italian mortgage market (Sep 22 – Dec 24)
(Per cent - %)