



EEFIG
ENERGY EFFICIENCY
FINANCIAL INSTITUTIONS GROUP

EEFIG Working Group on Risk assessment of energy efficiency loans

Presentation of main results and conclusions

16 November 2021



Scope of the EEFIG SR8 Working Group: Four Key Questions

Evaluate the evidence for a quantitative relationship between energy efficiency improvements and lower probability of default of associated loans and the increased value of the underlying assets.

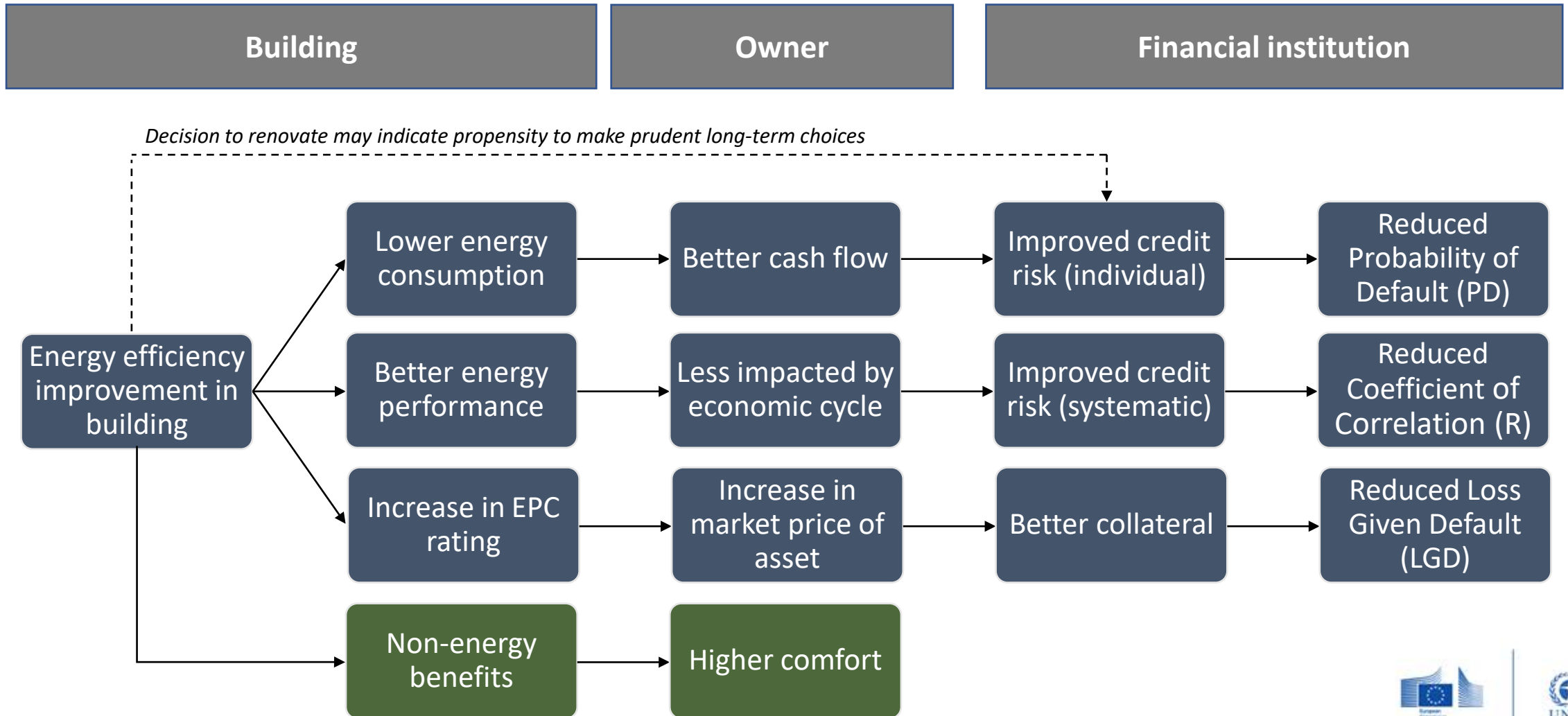
1 To what extent is asset energy performance **correlated** with credit risk & loan arrears?

2 How does this **vary by observed factors** such as asset owner income or employment/business status & wider macroeconomic conditions?

3 How does this vary within the **different EU Member States**?

4 Is there **evidence of a causal link** between improved asset energy performance & improved default risk?

Possible link between EE improvements, credit risk and asset value



The Working Group process

The working group recruited over 65 individual members and observers from across asset managers, banks, central banks, regulators, sector experts, statisticians and the EU Commission.

Over two years, working group members:

- contributed to and reviewed a reference library of evidence containing 120 documents,
- met eight times,
- launched national hubs, and
- produced new statistical work covering over 800,000 mortgages in four European countries.

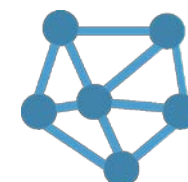
Knowledge library



Representatives of FIs in WG



Research Networks



Recommendations



Reports & Dissemination



Precise conclusions of the most thorough and numerous of the primary research studies from Nationwide Building Society (NBS)

- Customers that hold high energy efficient properties are ~20% less likely to default than customers that hold low energy efficient properties, “all other things being equal”;
- This relationship is stable and intuitive, after including control variables that might explain the relationship between EPC and default;
- The coefficients are statistically significant with p-value < 0.01 meaning that the probability of the results being random is less than 1%; and
- The results are also robust to the inclusion of a battery of control variables and with a large sample of more than 600k properties.

Cause of anomalies in the EPC-Default relationship

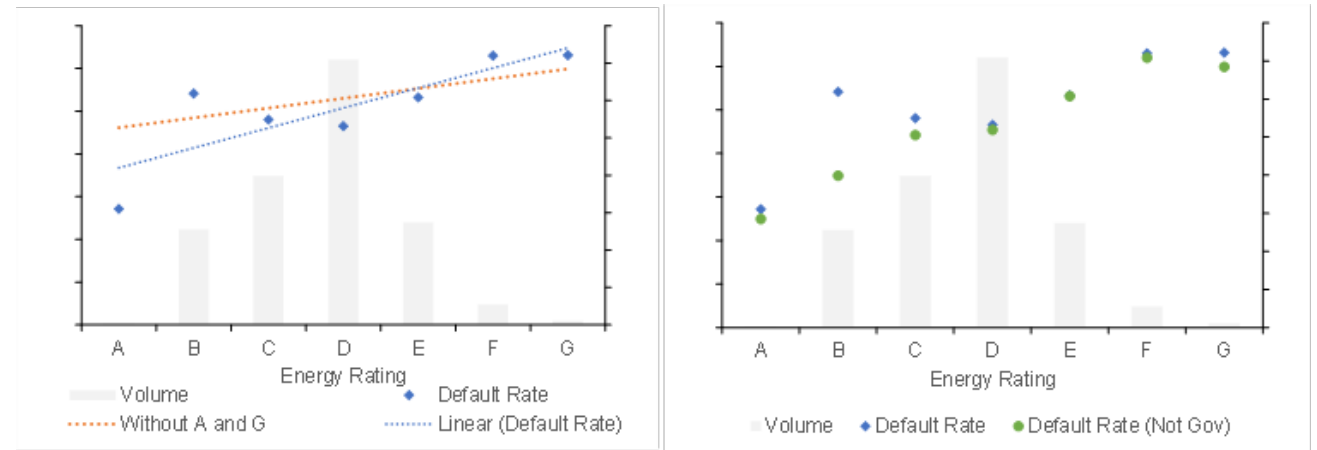
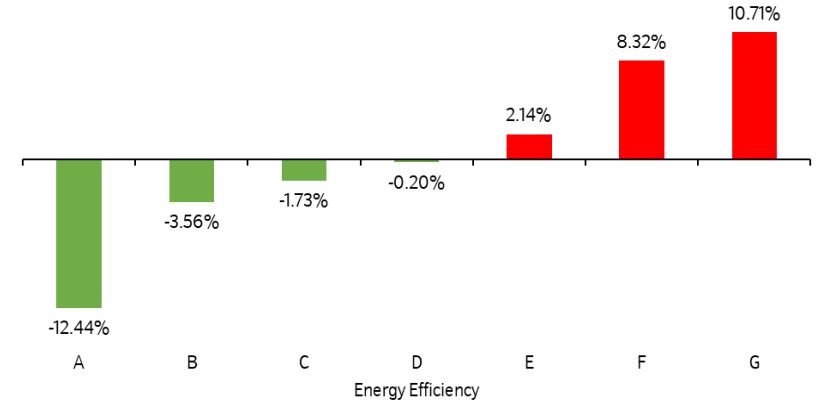


Figure: Analysing the proportion of defaults by each EPC band without the government schemes eliminates the anomaly in the default rate relationship and illustrates a clear negative relationship between energy efficiency and defaults (green dots on chart on the right). Each panel in this figure shows the relationship between Default and EPC level. The left panel includes Govt. schemes and shows no clear relationship. The right chart illustrates the source of bias – government schemes contained both high energy efficiency properties (EPC of B) and a higher proportion of defaulted accounts.

For Mortgage lenders the probability of default is critical in the allocation of capital

- For the very first time, the SR8 Working Group and its members from NBS, explored the feasibility of including energy efficiency into IRB models used for determining the regulatory capital requirements.
- The statistical relationship observed in the analysis (see previous slide) was robust enough to significantly improve the capability of the model differentiate between lower and higher risk loans, even on top of all the established credit risk factors present in that model.
- Test calculation showed that including energy efficiency in that model can lead to a more risk-sensitive allocation of capital (see figure).

Capital change by inclusion of energy efficiency rating



The NBS team studied the effect of using an IRB model which uses EPC classes as risk factor to calculate capital requirements as research purposes (information about energy efficiency has not been included in the regulatory NBS rating system, this exercise has been completed with research purposes only). The figure above demonstrates that whilst the overall capital requirement barely changed for the sample, the potential inclusion of EPC into the IRB rating system might allow for a better allocation of capital with lower capital requirements towards more efficient properties.

Conclusions on credit risk models by Allianz

- The Allianz study conducted tries to answer whether customers with the same credit rating differ in terms of their credit risk by the energy efficiency of the financed building.
- Statistically higher energy efficiency is associated with lower credit risk, and that it adds value to credit risk measurement even on top of well-established and powerful factors like credit scores.
- The results confirm a clear indication that energy efficiency label might be a relevant risk factor for mortgages.
- However, more in-depth investigations are required to further underpin the usefulness of the risk factor in credit risk models

Bivariate analysis based on energy efficiency and credit score together

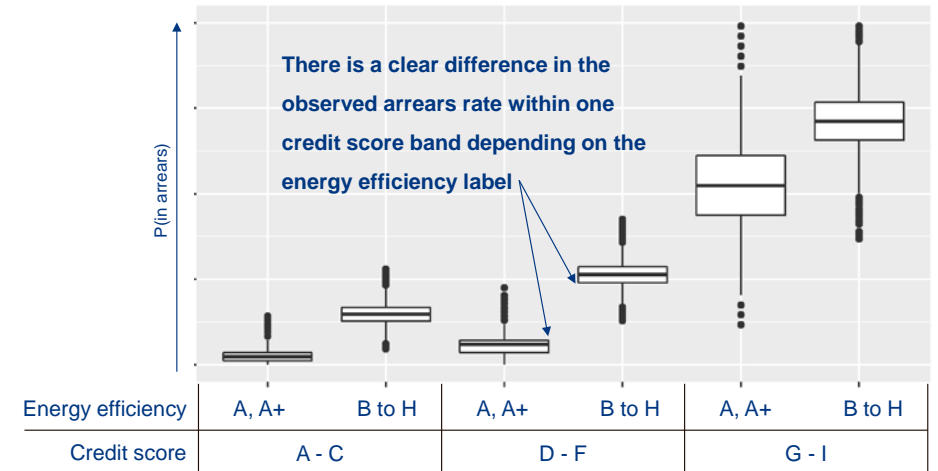


Figure: To assess whether the credit score is driving the effect of energy labels seen in the figure, this effect is assessed in bands of constant or similar credit scores. A clear effect of energy labels is observed, highlighting that there is indeed an effect, which goes beyond a simple credit score. In all of the different bands of credit scores, loans associated with buildings of higher energy efficiency show a lower probability of being in arrears. This result encourages a more elaborate analysis based on a stepwise logistic regression.

Conclusions on the relationship between EE and default risk for Finish residential mortgages by OP Financial Group

- Credit risk is cumulative over time, i.e. the longer the observation period, the more likely a credit risk event will be.
- The study is conducted through a range of logistic regression models, including a categorical measure of EPC along with additional control variables and a continuous measure of EPC.
- The OP results suggest that more energy efficient buildings have lower risk. In most model set-ups the results are statistically significant, however inclusion of additional controls does have a substantial effect on the EPC coefficients.
- Further ongoing work involves sourcing additional data as the sample is relatively small and due to its lower credit risk, on average is not representative of the overall Finnish building stock. Expanding the sample would potentially allow an analysis of defaults in addition to the analysis on arrears provided in this case-study.

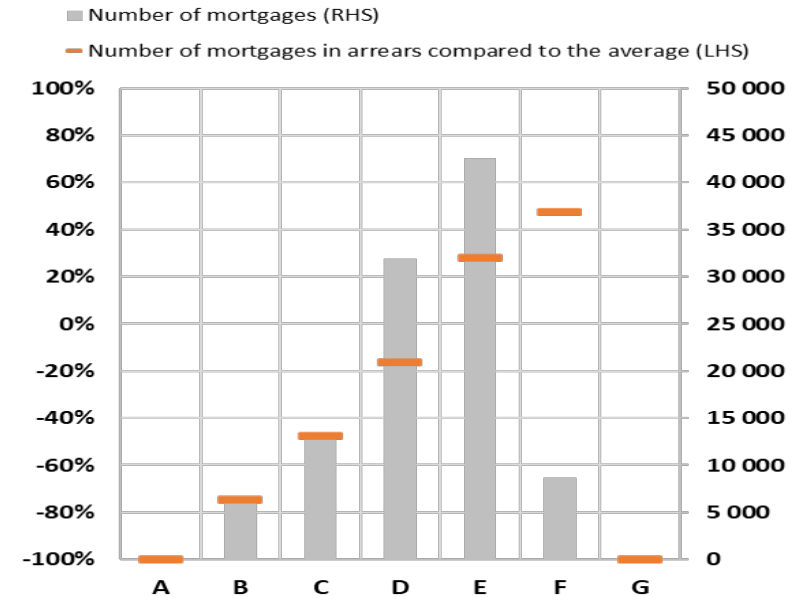


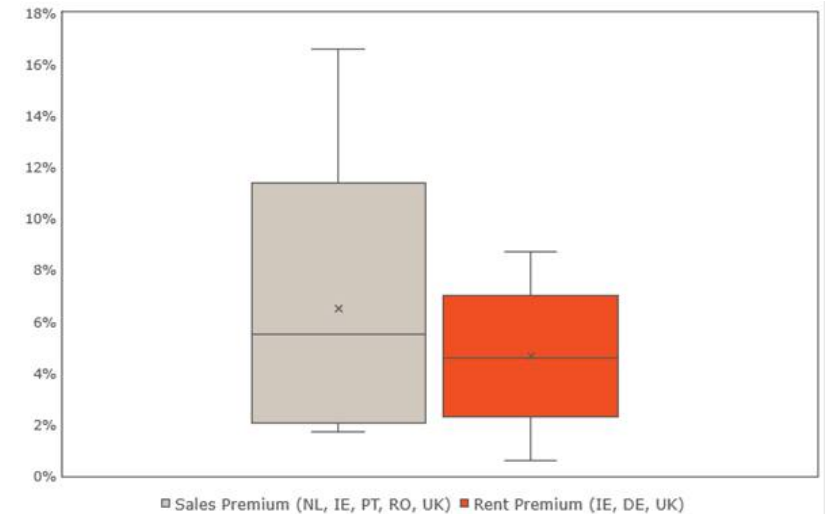
Figure: Preliminary descriptive statistics show a negative relationship between mortgage arrears and EPC level. The Figure compares arrears at high and low EPC labels to the average. Compared to a D-rated home, B-C have lower arrears while E-F have higher - over 40% more mortgages are in arrears for F rated houses, with around 20% less for D rated houses. Both A and G also have low arrears however low observations in both groups make inference unreliable for these categories.

WG8 research on green premium in real estate confirms positive trends

- Review and assessment of research-body on the relationship of energy performance with an asset’s market value:
- Data on green premium in real estate show that higher EE (indicated by EPC rating) increased the overall housing market prices and rental values.
- Most efficient properties can attract a **market price premium of up to 10% in value, and approx. 5% for rentals**, compared to equivalent least efficient or non-rated properties. Several studies also find **less liquidity for the lowest rated buildings**.
- Several recent studies (2019-2020) **confirm the JRC 2018 findings of an observed increase of 3-8% in the sale price of residential assets** resulting from EE improvements as well as an **increase of around 3-5% in residential rents compared to similar properties**.



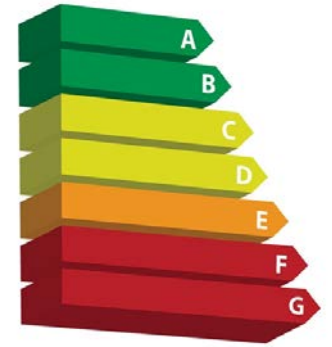
Green premium in real estate in Europe



Sources: Estimates retrieved from Brounen (2011), Hyland et al. (2013), Fuerst et al. (2015), Chegut (2016), Aydin et al. (2020), Nationwide Building Society (2020), Evangelista et al. (2019), Taltavull et al. (2020), Cajias et al. (2016) and Fuerst et al. (2016; 2020). The Y-axis is the percentage premium for EPC (A/B/C) over EPC (E/F). The Box charts show the range of estimates (lowest value, typical values, mean value and highest value).

EEFIG's recommendations for policymakers

- The EU regulatory framework should require National governments collect EPC data and ensure easy access to EPCs to financial institutions. This includes improving data quality and a stronger connection to real usage also where EPCs have been available over several years.
- The EU regulatory framework should ensure that lenders identify, record and maintain current the energy performance of their buildings' collateral including the assessment of energy efficiency as a risk factor in their IRB PD and LGD models.
- Energy efficiency should be assessed as a specific component of the EBA's 2023 report on a dedicated prudential treatment of exposures related to assets and activities associated substantially with environmental and/or social objectives.



EEFIG's recommendations for financial institutions

- Financial institutions should tag loan collateral and underlying assets based on their energy performance.
- Financial institutions should where possible replicate the WG's statistical approaches to analyse their own portfolios to better manage credit risks and capital allocations.
- Mortgage lenders running IRB models should consider energy efficiency as a risk factor in them and optimise their approaches based upon the work of this WG and subsequent evidence.
- Financial institutions should develop dedicated products to support clients' energy renovation of buildings.

Limitations, gaps and recommendations for further work

1. The EEFIG work demonstrated a statistically significant correlation between energy efficiency and credit risk in multiple geographies.
2. Additional work should continue to corroborate this relationship in additional EU Members States and to further assess the causality of the relationship.
3. Further work is also encouraged to advance the understanding of correlations between energy efficiency and creditworthiness in the unsecured loan sector. EEFIG's ability to address the unsecured segment was inhibited by the lack of coherent and long-term data sets that were statistically comparable with energy performance information.
4. Finally, further work on the causal relations between energy performance and an asset's market value is encouraged.

THANK YOU!