Energy labels and property values : a quasi-experimental analysis of the French residential market

In 2022, the building sector was responsible for 30% of total final energy consumption and 26% of global CO_2 emissions (IEA, 2023). Improving energy efficiency in this sector therefore seems essential to achieving climate targets (Loftus, et al., 2015). Especially since energy efficiency improvements (EEI) appear to offer a rare win-win opportunity through the reduction in consumption and emissions they promise (Fowlie, et al., 2018). Nevertheless, the economic literature highlights a persistent gap between the socially desirable level of renovation and the levels actually achieved. This phenomenon, known as the "energy efficiency gap", is explained by the consumer's inability to correctly project the benefits of EEI (Fowlie, et al., 2018), which justifies public intervention.

In the real estate sector, imperfect information and behavioral failures are widely recognized as a major obstacle to investment in EEI (Gerarden, et al., 2017). Those market failures have prompted many countries to introduce energy performance certificates (EPC)[1] used to inform market participants about a home energy performance. Although, the literature investigating the impact of EPC on buyers' willingness to pay (WTP) is growing, methodological limitations make it challenging to identify the causal impact of EPCs over housing valuation. Indeed, the introduction of EPC rarely allows for quasi-experimental studies (Sejas-Portillo, et al., Forthcoming), leading most paper to rely on hedonic pricing models (HPM), which are subject to omitted variable bias and measurement errors (Aydin, et al., 2020).

In this context, our article provides the first large-scale evidence of the value of energy efficiency letter grades using a natural experiment that exploits exogenous variation in the scale used to define these letters in France. Since 2012, home sellers have been required to provide potential buyers with a standardized report from a certified technical energy efficiency audit of their properties. This audit assigns an energy efficiency score based on predicted energy consumption ($kWh_{ep}/m^2/year$), which is then mapped into color-coded rating bands (A–G). While this system has been mandatory since 2012, the definition of the rating bands was revised in July 2021, causing some homes to gain or lose a letter grade without any actual change in their predicted energy consumption. This policy revision provides a unique empirical setting to investigate the causal impact of letter grades, enabling us to make several contributions to the literature.

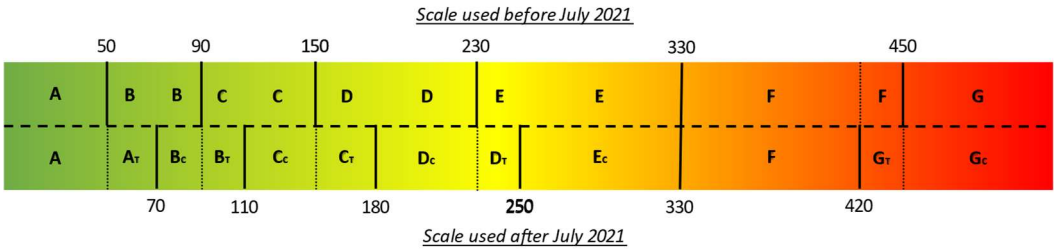
Using a dataset of approximately 1.5 million French homes sold between January 2013 and December 2023, we estimate the causal impact of letter grades on housing values based on a difference-in-differences (DiD) analysis. This strategy reveals that a change in letter grade is associated with a 3.4% increase in the price of single-family homes compared to the control group. The effect is heterogeneous across letter grades, with stronger impacts observed for the least energy-efficient categories. For instance, moving from class E to D leads to a 5% price increase relative to homes that remain E, while moving from class B to A results in a 2.75% increase in home value compared to homes that remain B.

We then employed a dynamic DiD, which reveals that the effect is non-significant the first six months following the reform but increases over time, becoming particularly important by 2023. We no more find significant impact for homes switching from class C to B and from class F to class G. These results are robust across multiple robustness checks, reinforcing the validity of our findings.

Beyond their influence on prices, letter grades also impact sellers' behavior. Anticipating the premiums associated with better classifications, sellers may strategically upgrade their property's energy rating before listing it for sale. Graphical analyses reveal spikes in transaction volumes just above grade thresholds and corresponding declines just below them, suggesting that the energy rating system incentivize strategic sorting among sellers.

[1] In France, EPC includes a continuous variable based on predicted energy consumption (in $kWh_{ep}/m^2/year$) associated to a color-coded rating band which ranges from A (green) to G (red).

Finally, we show that the design of the French EPC, based on traffic light colors and combined with a straight alphabetic letter marking, shapes consumer decision-making. In particular, we find that price differences between control and treated homes emerge precisely when a change in letter is accompanied by a change in color. This pattern suggests that EPC design acts as a nudge. Comparing the premium paid for letter changes with estimates of average renovation costs, we also find that the premium is often higher than these costs. This difference can be attributed to the indirect costs of renovations (such as the search for workers, lack of information on the renovation market) and the benefit of avoiding these search and coordination efforts by buying an already higher-rated home.



Notes: Figure 1 illustrates the change in scales that occurred in July 2021. The predicted energy consumption is shown in kWh_{ep}/m^2/year. Letters "A" to "G" denote the EPC categories, with subscripts "c" indicating control groups and "T" indicating treated groups. B_C refers to homes that were labeled as B and remained B, while A_T represents homes that moved from B to A after the reform.
Figure 1: EPC band range and associated label used before and after the implementation of the reform of July 2021.