TITLE

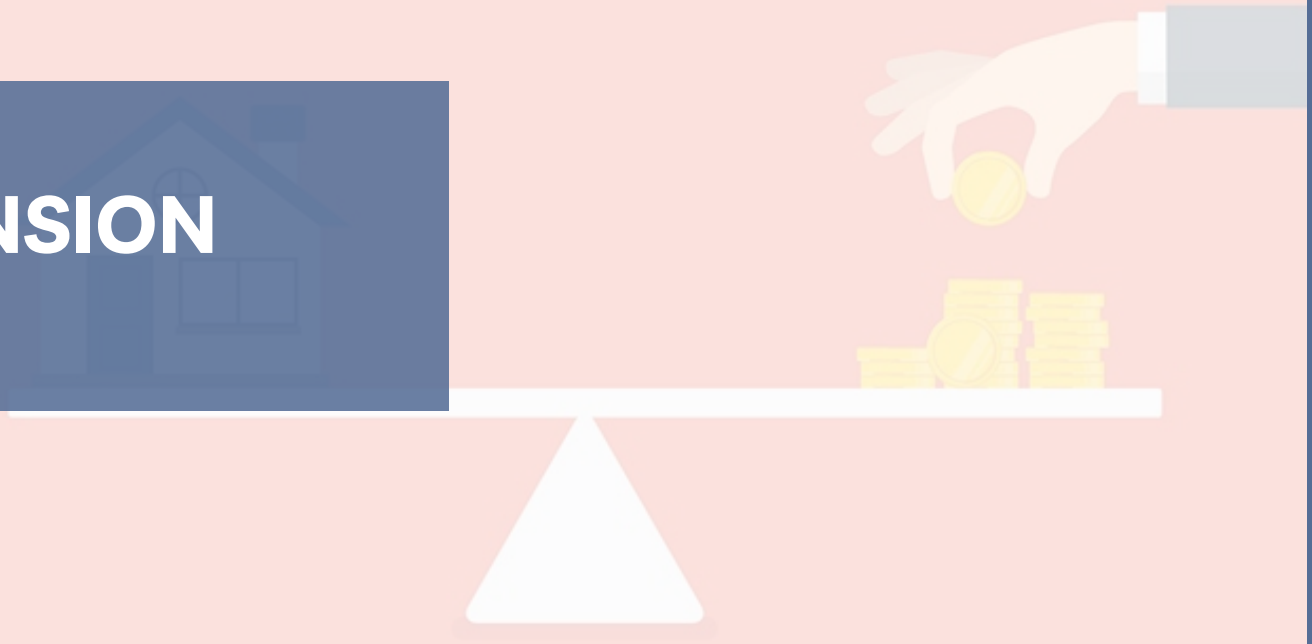
Group XX:
NAMES

REPLICATION

01

Replication slides – Introduction – Max 4-5 slides

EXTENSION



02

Motivation & Research Question

Main Findings:

- **Significant price discontinuities** at band thresholds suggesting inattention to the SAP rating
- Sellers are **more likely to make an EE investment** if they are right below a threshold

The Gap:

There are **no evidences against strategical minimal upgrades** («minimum investment needed to jump over the next band»)

*Do property owners **strategically** make minimal energy efficiency **investments** just sufficient **to cross** EPC rating band **thresholds and capture** potential price **premiums**?*

Data & Sample Overview

Source

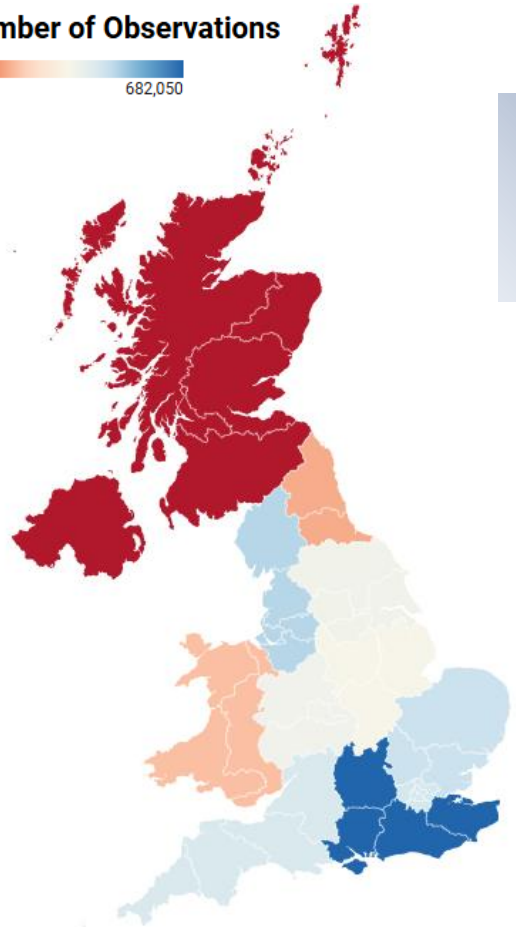
Same novel administrative dataset of UK property sale transactions as Sejas-Portillo et al. (~7M obs.)

Sample

Properties that underwent pre-sale retrofitting and excluding transaction after Apr 2018 (due to policy changes)

Starting Variables

SAP (energy efficiency) score before and after retrofit, property characteristics (type, size, rooms), location (region, urban/rural) and sale date (year, month)



Hypothesis

Sellers whose **initial EPC score** is **just below a** rating band **threshold** are **more likely to make *an investment*** (confirmed by the authors' findings)

Sellers whose initial EPC score is just below a rating band threshold are **more likely to make an investment that just crosses the threshold**, rather than exceeding it by a large margin (i.e., a **"strategic upgrade"**)

Specifically, the **closer a property's initial SAP score** is **to** a **threshold** from below, the **higher the probability of** observing a **"strategic upgrade"**

Running and Outcome Variables

What a «strategic upgrade» is ?

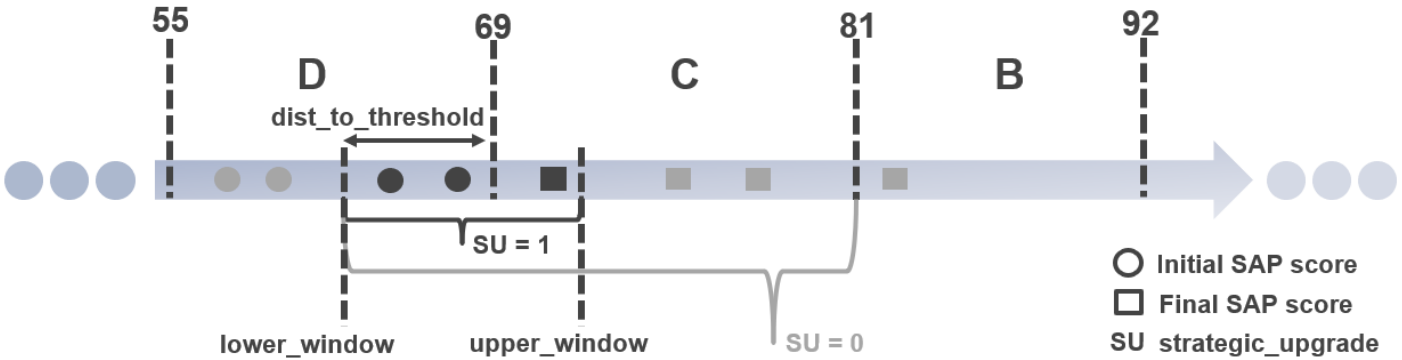
It is the **outcome variable** representing an energy efficiency investment improving the SAP score **just enough** to cross into the next EPC rating band

How is it identified?

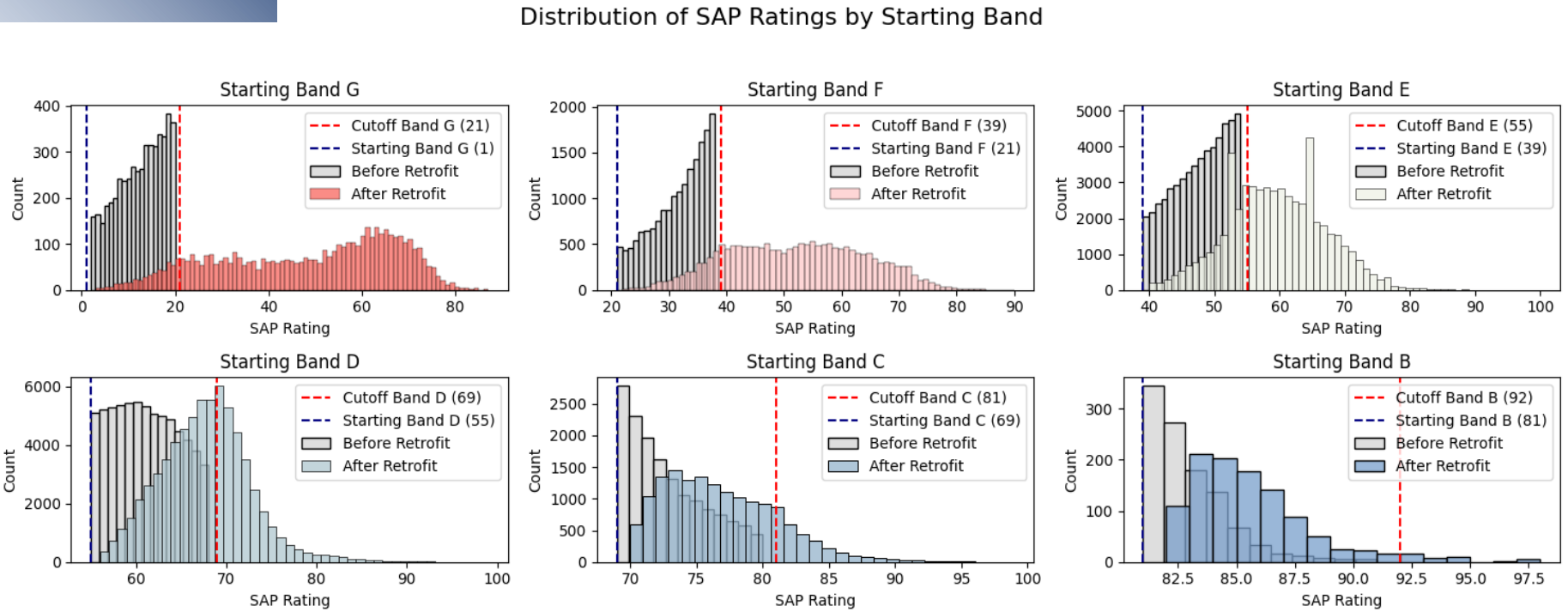
It is binary variable: 1 If the property's initial SAP score is **just below** a threshold, and the final SAP score is **just above** it. 0 otherwise

What «distance to threshold» is?

It is the **running variable** measuring how many SAP points the initial score is below the next SAP rating band



Descriptive Distributions



Low starting band (G & F) tend to **overshoot** and invest aiming at jumping more than one band

Middle starting band (E & D) **retrofit** mostly to the **next SAP band**

High starting band (C & B) invest lightly. They **do not jump bands** (on average)

Regression Framework

Estimate whether properties that start closer to an EPC threshold are more likely to *strategically upgrade*

$$StrategicUpgrade_i = \alpha + \beta \cdot DistToThreshold_i + \gamma' X_i + \epsilon_i$$

X_i: covariates (property type, region, sale date…)
ϵ_i: error term

Looping in each band including only observation starting 1 – k point below the threshold, ensuring focus on a local decision margin

Expected Result?

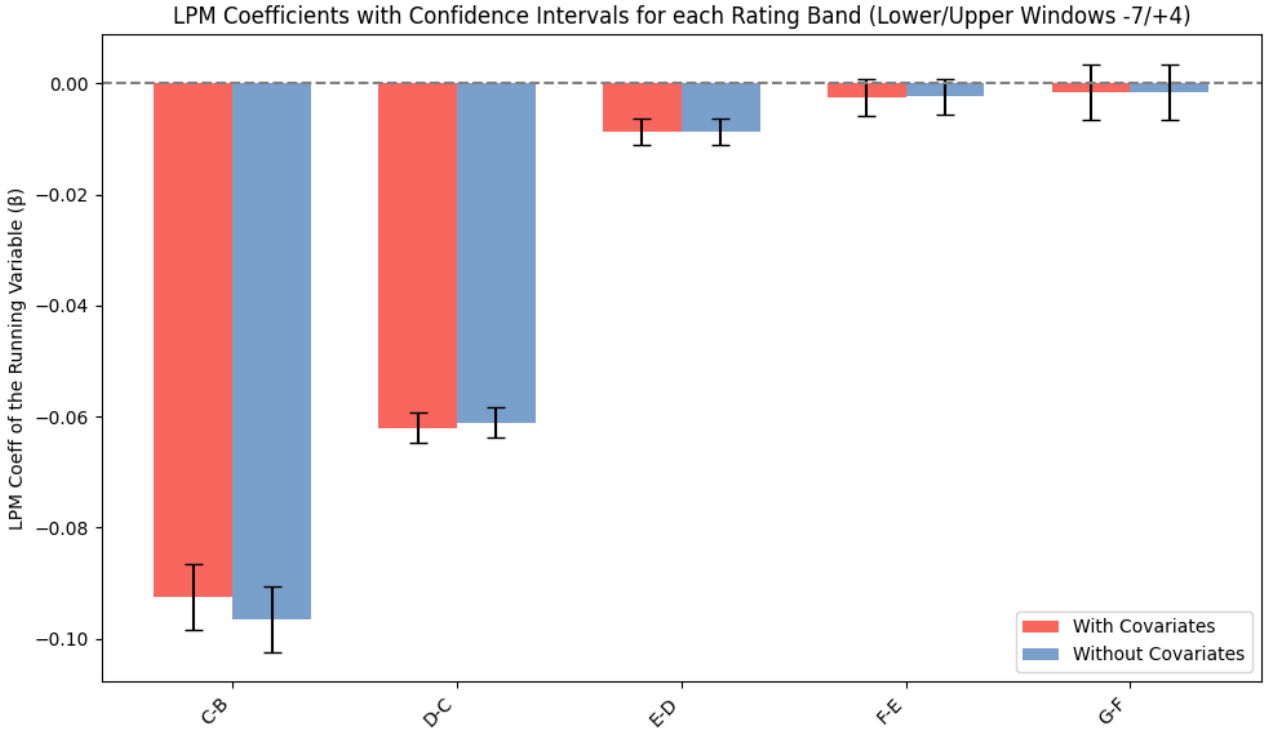
β < 0**: the closer a seller start to the threshold the **higher the probability of a strategic upgrade

Effect of Proximity to Threshold on Strategic Upgrades

β
→ Estimated effect of being 1 SAP point closer to the threshold on the probability of upgrading strategically

C-B & D-C
→ Strong and significant results (1-point reduction in dist_to_threshold increases the change of strategic_upgrade by 6-9%

F-E & G-F
→ Weak results, mostly because of the higher jumps not captured by our sliding window

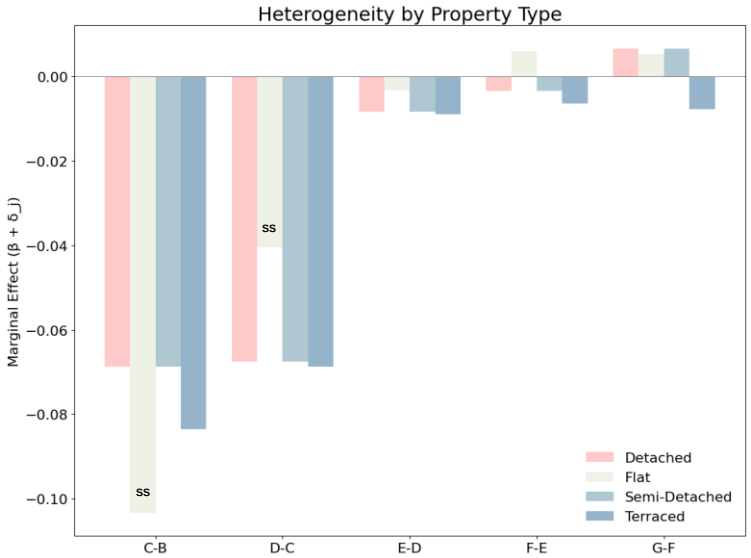


B – A exluded due to low no. obs

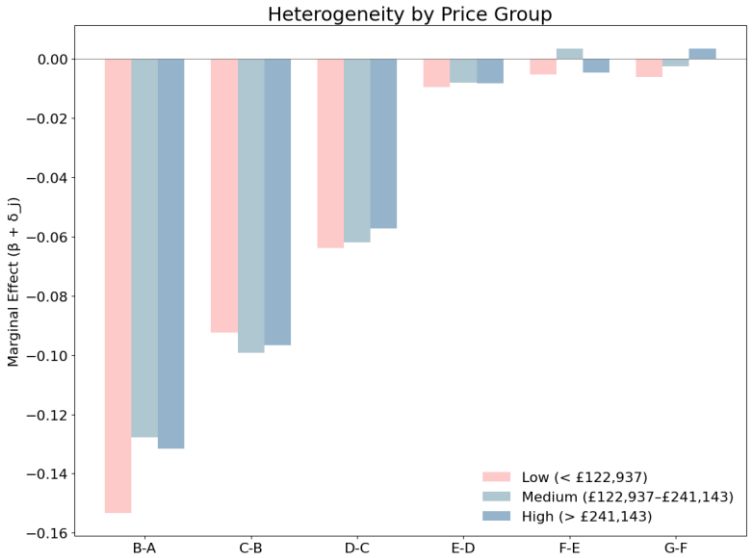
Heterogeneity Analysis

$$StrategicUpgrade_i = \alpha + \beta \cdot DistToThreshold_i + \sum_j \delta_j \cdot DistToThreshold_i \times \mathbf{1}[Interacted_i = j] + \gamma' X_i + \epsilon_i$$

$$Interacted_i = PropertyType_i \; or \; PriceGroup_i$$



Flats are more likely to be strategically retrofit in band C-B and less in D-C. The other resutls are non-significant at 95% CI.



Property prices do not present statistically significnat heterogeneities.

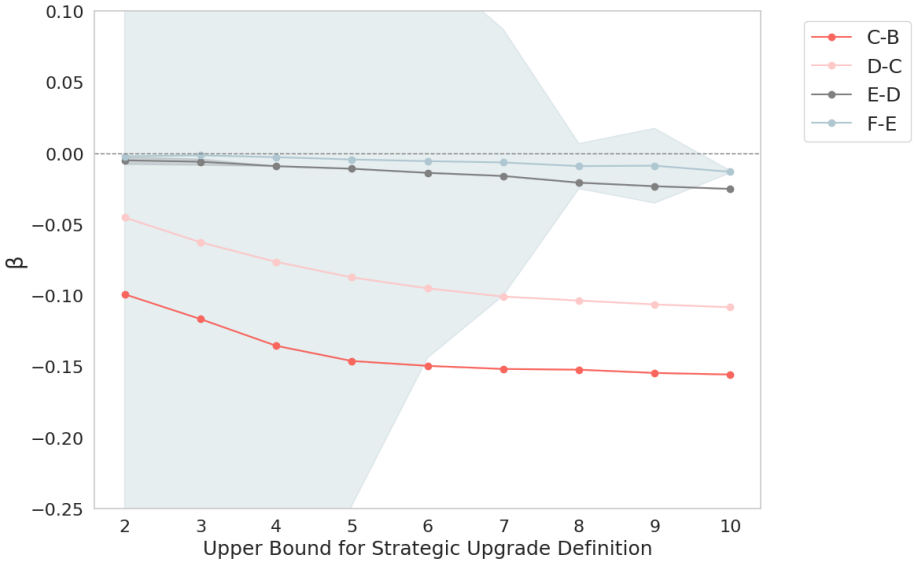
*Price groups defined as tertiles of log_price
** SS indicates statistically significant bars

Sensitivity Analysis

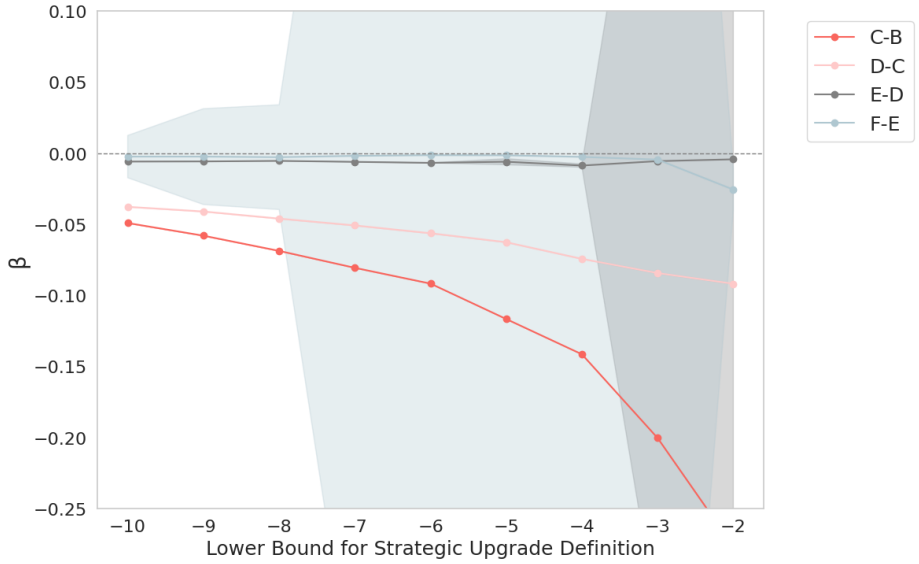
What happens when we widen what counts as a “just above threshold” retrofit?

How far below the threshold does a property need to start dist_to_threshold starts to matter?

Effect of Increasing the Right Window (Baseline Upper Bound = 4)



Effect of Incresing the Left Window (Baseline Lower Bound = -7)



Running and Outcome Variables

Key Findings

Sellers closer to the threshold are more likely to retrofit just to cross the next band ($\beta < 0$)

There is no storng evidence of heterogeneity amount the tester regressors

Widening the «strategic interval» reduces the effect, mosly whne shifiting towars properties starting far from the next cutoff

Driver Mechanism

Buyers focus on letter bands hihgligting partial inattention

Sellers target cheap and mimimal upgrades hoping to «fool» the buyers

EPCs do not just inform market partecipans but shape their behaviour, specially closer to cut off points

Policy Implications

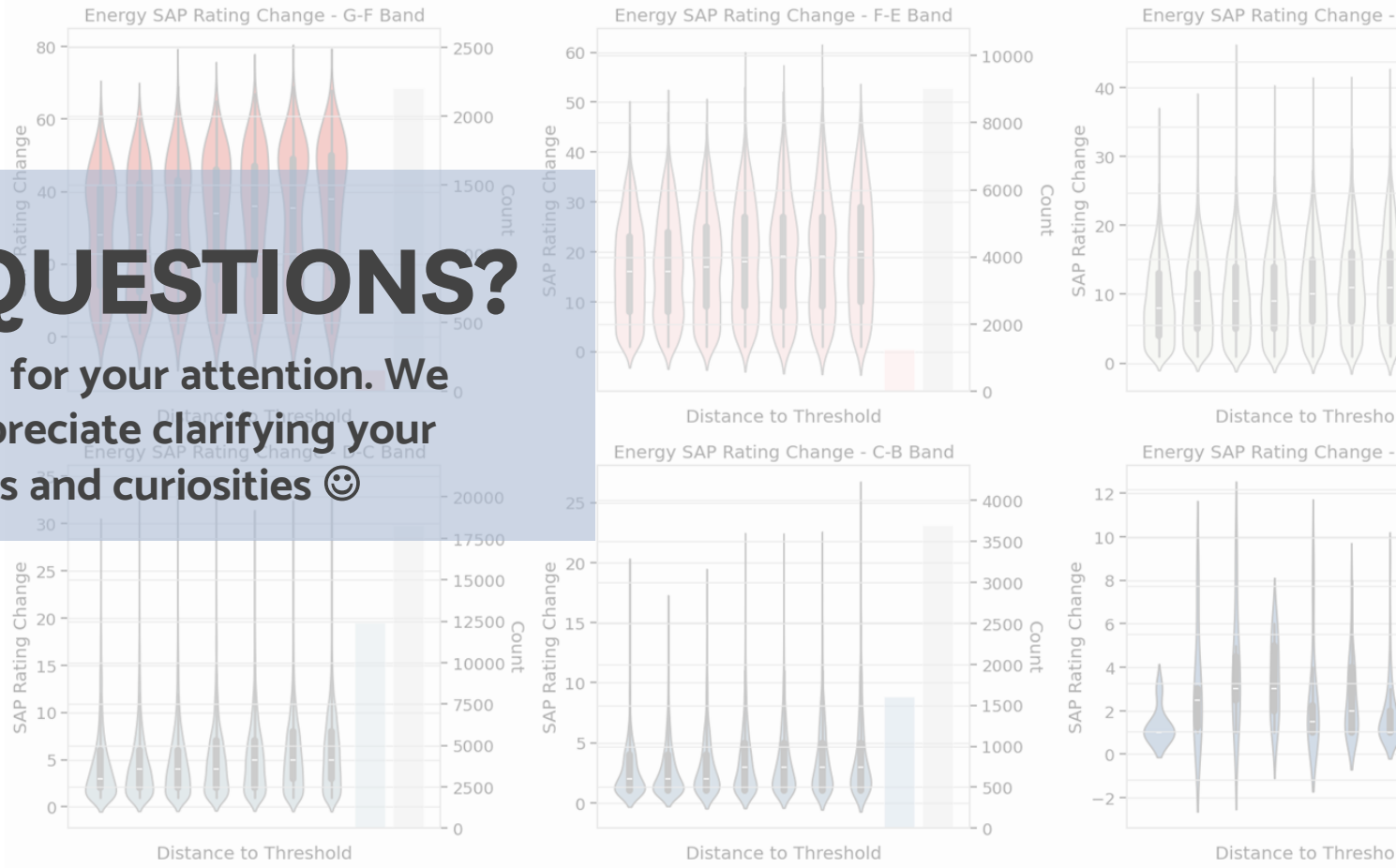
Focus on defining a more granular bands to minimize partial inattention

Be aware of superficial compliance as the absence of long-term energy savings and deep retrofit harms optimal environmental outcome

Introduce SAP progress bars or upgrade potential indicators to reduce the market “cutoff obsession” encouraging holistic improvements

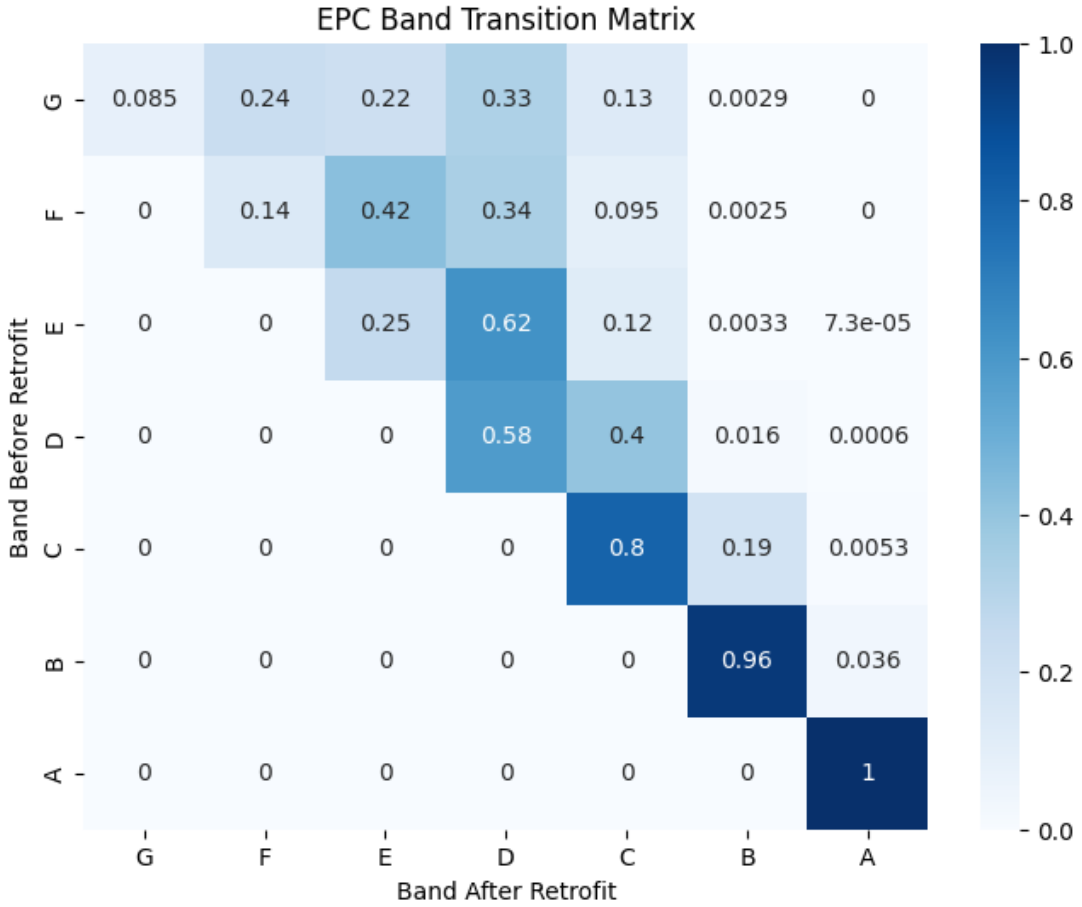
ANY QUESTIONS?

Thank you for your attention. We would appreciate clarifying your doubts and curiosities ☺

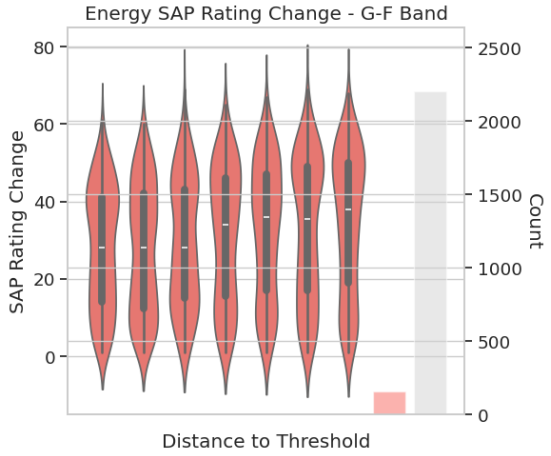


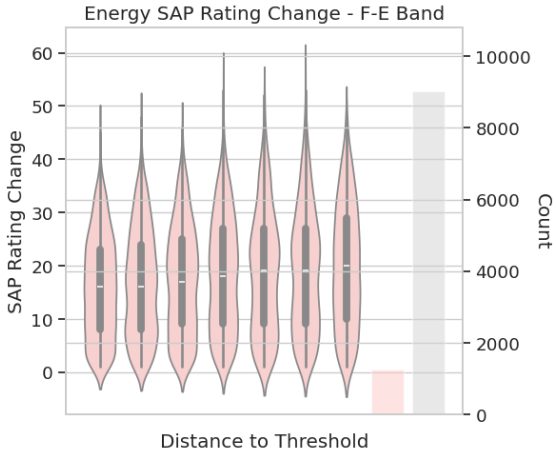
BACK UP SLIDES …

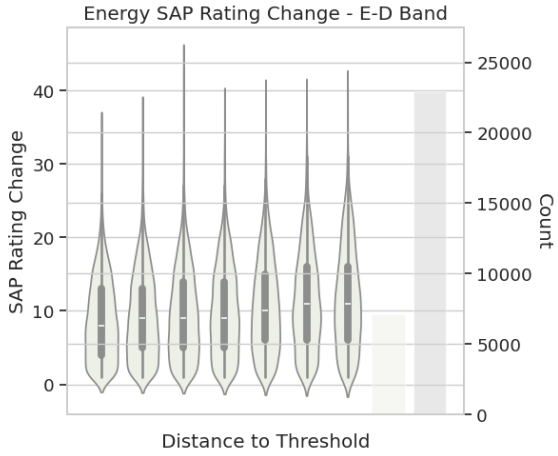
Why G-F and F-E have negligible results...?

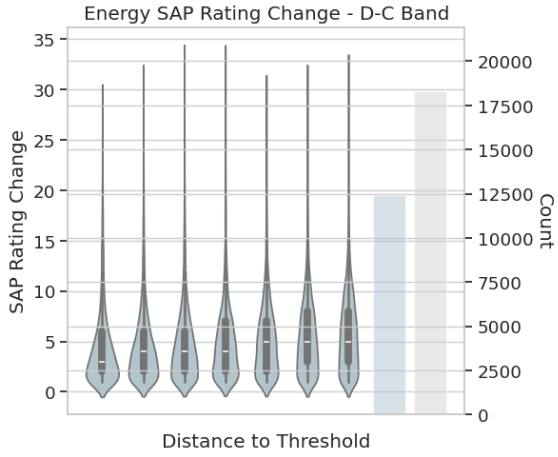


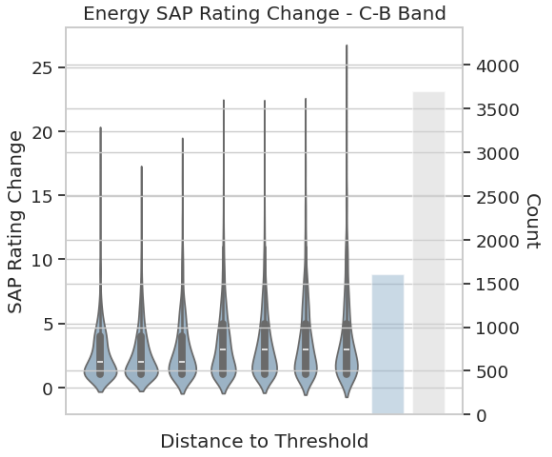
More distributions :)

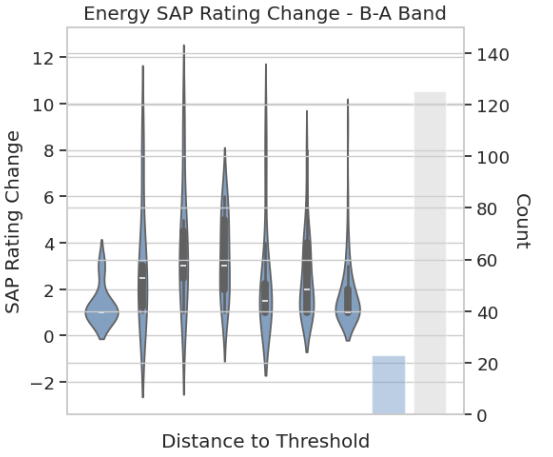












LPM/Logit Base Results

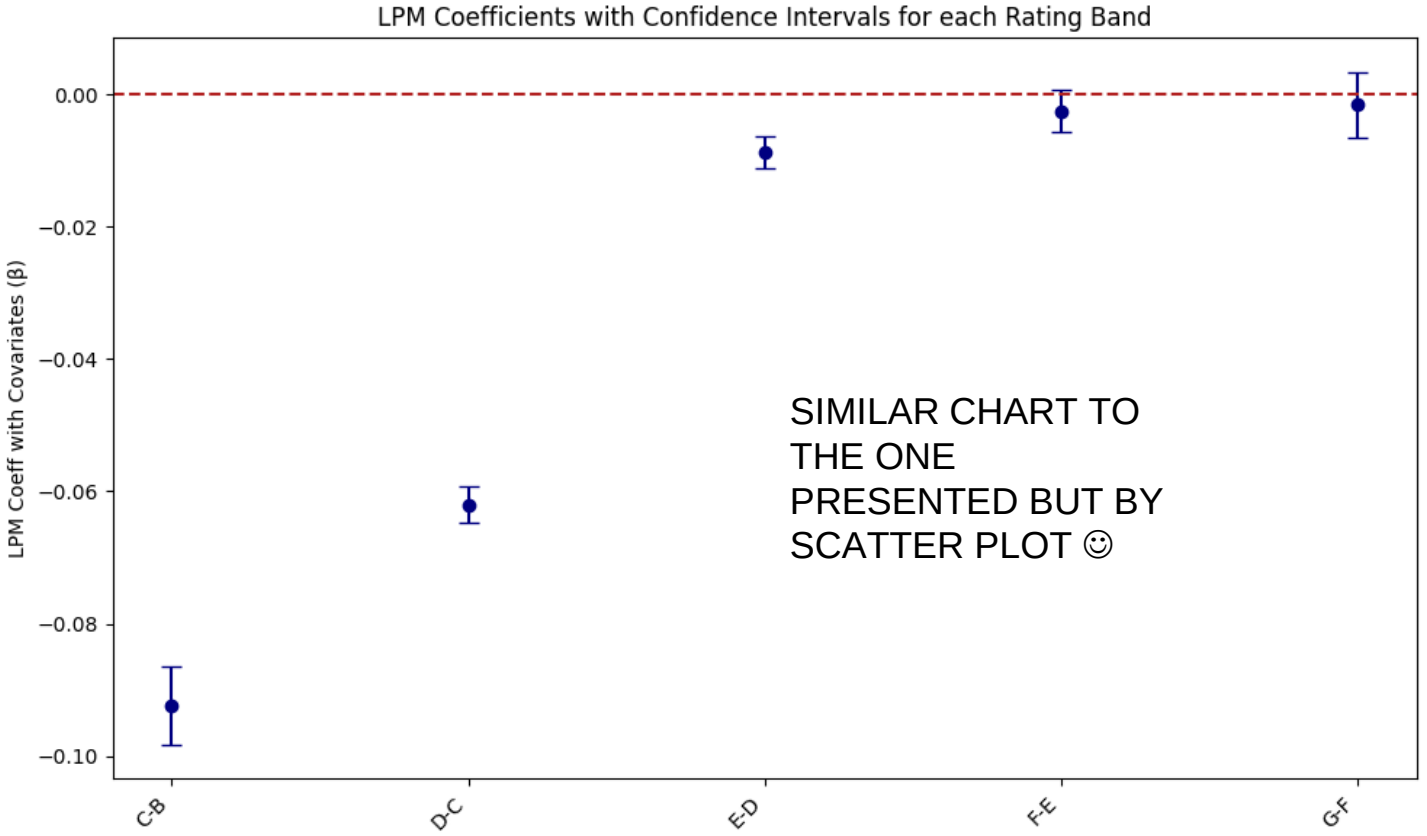
	Band	N_obs	Class_Share	LPM_coef	LPM_pval	Logit_coef (logodds)	Logit_coef (odds)	Logit_pval	LPM_lower_ci	LPM_upper_ci
5	B-A	148	0.155405	-0.136335	2.252289e-18	-1.032883	0.355979	2.509209e-08	-0.163159	-0.109511
4	C-B	5300	0.303208	-0.096475	7.670924e-208	-0.494277	0.610012	2.566629e-166	-0.102350	-0.090601
3	D-C	30677	0.404342	-0.061085	0.000000e+00	-0.261578	0.769836	0.000000e+00	-0.063808	-0.058361
2	E-D	30039	0.237058	-0.008668	2.063676e-12	-0.048160	0.952981	2.183871e-12	-0.011084	-0.006252
1	F-E	10257	0.121381	-0.002284	1.622122e-01	-0.021507	0.978722	1.622509e-01	-0.005487	0.000919
0	G-F	2359	0.066978	-0.001528	5.516726e-01	-0.024513	0.975785	5.515702e-01	-0.006561	0.003505

LPM with Covariates Results

	Band	N_obs	Class_Share	LPM_coef_cov	LPM_pval_cov	LPM_lower_ci_cov	LPM_upper_ci_cov
5	B-A	147	0.149660	-0.144395	4.708053e-16	-0.175215	-0.113575
4	C-B	5255	0.302569	-0.092474	3.166049e-190	-0.098384	-0.086565
3	D-C	30644	0.404484	-0.062024	0.000000e+00	-0.064748	-0.059301
2	E-D	30025	0.237102	-0.008695	1.799099e-12	-0.011112	-0.006278
1	F-E	10244	0.121535	-0.002524	1.237144e-01	-0.005738	0.000690
0	G-F	2356	0.067063	-0.001579	5.394356e-01	-0.006623	0.003465

```
# === LPM ===
formula = """
    strategic_upgrade ~ dist_to_threshold + leasehold +
    total_floor_area + number_habitable_rooms + urban +
    C(region) + sale_year + sale_quarter + C(property_type)
"""
```

LPM with Covariates Results



Het Anal on property type

	Band	N_obs	Class_Share	LPM_coef_cov	LPM_pval_cov	dist_to_threshold:C(property_type)[T.Flat]_coef	dist_to_threshold:C(property_type)[T.Flat]_pval
5	B-A	147	0.149660	-0.112531	4.191119e-05	0.065637	1.785200e-01
4	C-B	5255	0.302569	-0.068805	1.758797e-17	-0.034556	1.054789e-04
3	D-C	30644	0.404484	-0.067478	1.183343e-113	0.027020	3.304629e-10
2	E-D	30025	0.237102	-0.008390	1.238195e-03	0.005143	2.633243e-01
1	F-E	10244	0.121535	-0.003326	2.691888e-01	0.009377	1.017407e-01
0	G-F	2356	0.067063	0.006625	1.680234e-01	-0.001281	8.772397e-01

dist_to_threshold:C(property_type)[T.Semi-detached]_coef	dist_to_threshold:C(property_type)[T.Semi-detached]_pval	dist_to_threshold:C(property_type)[T.Terraced]_coef	dist_to_threshold:C(property_type)[T.Terraced]_pval
-0.054999	0.210103	-0.027802	0.478864
0.004157	0.752775	-0.014687	0.184990
0.000266	0.946897	-0.001236	0.748768
-0.002430	0.473758	-0.000542	0.870650
0.003128	0.468916	-0.003064	0.465886
-0.012658	0.082652	-0.014293	0.027561

Het Anal on log_price

	Band	N_obs	Class_Share	dtt_coef_cov	dtt_pval_cov
5	B-A	147	0.149660	-0.153209	1.146198e-08
4	C-B	5255	0.302569	-0.092509	2.325254e-70
3	D-C	30644	0.404484	-0.063891	9.281777e-155
2	E-D	30025	0.237102	-0.009610	7.218192e-06
1	F-E	10244	0.121535	-0.005259	6.023754e-02
0	G-F	2356	0.067063	-0.006246	1.674930e-01

dist_to_threshold:C(price_group)[T.medium]_coef	dist_to_threshold:C(price_group)[T.medium]_pval	dist_to_threshold:C(price_group)[T.high]_coef	dist_to_threshold:C(price_group)[T.high]_pval
0.025533	0.436380	0.021521	0.548592
-0.006791	0.354977	-0.004098	0.577474
0.001829	0.591841	0.006556	0.053181
0.001558	0.607139	0.001357	0.652608
0.008630	0.031485	0.000564	0.887261
0.003762	0.549531	0.009579	0.133203