

Supplementary file

The relevance of EPC labels in the Spanish residential market: the perspective of real estate agents

Objective of this file: This document contains appendix A including a complementary multivariate analysis.

Appendix A

Table A1 contains the results of a multivariate analysis aimed at exploring the relationship among a selected number of questions in the survey. The analysis is based on a principal component analysis. This technique allows identifying the latent dimensions by analyzing the most correlated original variables. As a result, principal components or “latent variables” are identified. Principal components (PC) are orthogonal; it implies that no correlation is found between them. In this study, the original variables used are the ordinal responses regarding: a) the perceived effects that EPC ratings portray in housing marketing, b) the potential effectiveness that an information campaign explaining the background of the EPC scheme would have in fostering efficient homes and c) the potential effectiveness of EPC companion policies. The analysis also includes the categorisation of respondents according to their knowledge level regarding the EPC scheme as it has been detailed in the main paper, as well as the categorisation of the region where realtors deliver their professional intermediating services.

According to the KMO test, the factorial model found in the analysis is valid: PC correctly represents the variance of the original variables. In total five PCs are found, as usual PC are those resulting components depicting an eigenvalue larger than one. These five PCs do capture up to 76% of the information contained in the eighteen original variables introduced in the analysis. In order to maximise the differences in the affiliation between original variables and principal components, a Varimax procedure has been conducted. The resulting matrix reported in the table accounts for the factorial scores, the greater the score from zero, the stronger the relationship between original variables and principal components. The score sign accounts for the direction of the relationship.

Discussed conclusions regarding the multivariate analysis

PC 1 captures the opinion of realtors supporting the potential effectiveness of an information campaign in fostering energy-efficient homes. It also captures, to a lesser extent, the relative effectiveness of such a campaign in relation to other policies based on financial incentives. Interestingly, this component is also somehow positively correlated with the perceived effect of EPC ratings and home marketing (speed to market, price-fixing, and negotiation).

PC 2 captures the opinion of realtors supporting the potential effectiveness of financial-related policies aimed at fostering efficient homes. Interestingly, this PC appears as inversed correlated with high knowledgeable EPC realtors, implying that realtors unaware of the aim of the EPC scheme are more enthusiastic to see energy-performance fueled by public money as well as green finances. The correlation with the Group of Regions A is also slightly negative, which suggests that these realtors are somehow delivering their services in regions where housing is cheaper. In addition, the repercussion of energy expenditure in family budgets is smaller as well as the ratio of energy expenditure to housing prices.

Table A1 Multivariate response analysis

KMO % Bartlett test Kaiser-Meyer-Olkin sampling adequacy index 0.89 Bartlett's sphericity test Aprox. Chi-cu 5757.049 gl 153 Sig. 0.000						
Principal component	Initial eigenvalues			Rotated squared factor loads		
	Total	% variance	% accumulated	Total	% variance	% accumulated
1	7.3	40.6	40.6	4.7	26.0	26.0
2	2.6	14.5	55.1	3.7	20.3	46.4
3	1.6	8.9	64.0	2.5	13.8	60.2
4	1.2	6.5	70.5	1.8	10.2	70.4
5	1.0	5.7	76.1	1.0	5.8	76.1
Rotated Varimax component matrix						
EPC Ratings impact on housing marketing	Principal components					
	1	2	3	4	5	
	Speed to market	.138	.014	.854	.115	-.027
	Price fixing	.235	.051	.889	.025	.020
Price negotiation		.199	.019	.883	.055	-.015
Impact of an EPC information campaign on the housing marketing						
Sales argument	.826	.225	.144	.032	.083	
Consumers would give more importance to the energy ranking when choosing a house	.839	.169	.117	.160	-.036	
Consumers would be willing to pay more for efficient houses	.827	.142	.143	.126	-.027	
Efficient houses would sell faster	.849	.113	.158	.173	-.005	
The price negotiation margin would be smaller for efficient homes	.806	.111	.233	.149	.027	
Realtors could explain better the economic and environmental implications of energy rankings	.726	.303	.088	.161	.015	
Impact of companion policies aimed to foster energy efficiency in homes						
Green mortgages	.250	.827	.045	-.027	-.014	
Subsidies to buy or rent efficient homes	.266	.863	.022	.036	.011	
Information campaigns	.463	.465	.131	.423	.020	
Property tax reduction for efficient homes	.155	.855	.037	.222	.008	
Reduced VAT for efficient homes	.106	.886	-.015	.173	-.014	
Thermal comfort information	.348	.365	.086	.748	.117	
Passive thermal conditioning information	.315	.333	.077	.793	.105	
Region where realtors deliver their services and EPC awareness level						
Group of Regions A (expensive housing, small repercussion of energy expenditure in family budget and small ratio of energy expenditure to housing price)	.028	-.063	.001	.032	.932	
Realtors with high EPC knowledge	.031	-.186	.081	.500	-.362	

Source: Own elaboration

PC 3 captures the opinion of a few realtors that clearly think that EPC ratings actually exert an effect on time-to-market, price determination and price negotiation. Consistently, it appears positively correlated with the positive effect of an EPC information campaign on price negotiation and somehow with the EPC knowledge level of the realtor.

PC 4 captures the supporting opinion on the potential effectiveness of an information campaign intended to diffuse the implications of energy performance in terms of comfort and the benefits of architectural passive attributes. As expected, there is a greater correlation with the positive effect of general information campaigns instead of financial-based ones. Interestingly, it is the most correlated with the knowledge level of realtors

regarding the EPC scheme. This points out that competences on sustainability might foster the use of passive elements in the promotion of efficient homes.

Finally, **PC 5** highlights the inverse correlation between the realtors' awareness of the EPC scheme and the region where they deliver their services. Interestingly, according to this PC, knowledgeable realtors deliver their services in regions where housing prices are expensive, energy bills repercussion in family budgets is small as well as the ratio of energy expenditure to housing prices. This finding has paramount repercussions in energy policy spatial diffusion and stresses the need to reinforce it in less dynamic real estate regions, which in turn are the regions where energy bills have larger importance to family budgets.



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