

# *THE VALUE OF ENERGY EFFICIENCY IN THE REAL ESTATE MARKET OF NORTHERN ITALY*

*Pietro Bonifaci*, IUAV University of Venice  
PhD student in Regional Planning and Public Policy

*Sergio Copiello*, IUAV University of Venice  
Department of Design and Planning  
Researcher in real estate appraisal



ERES European Real Estate Society 21st Annual Conference 25th-28th June 2014

I  
- - -  
U  
- - -  
A  
- - -  
V



# *SUMMARY*

- 👉 Aims
- 👉 Literature review
- 👉 Methodology
- 👉 Sample
- 👉 Results
- 👉 Comparison with potential future savings
- 👉 Conclusions

I  
- - -  
U  
- - -  
A  
- - -  
V



# AIMS

Aim of the study is to assess the impact of energy labels on buildings market values

The study consider only residential buildings

The assumption is that selling prices will be higher for buildings with a better energy performance

I  
- - -  
U  
- - -  
A  
- - -  
V



# LITERATURE REVIEW

- 👉 Europe: Bio Intelligence Service, Lyons R. and IEEP, 2013, *Energy performance certificates in buildings and their impact on transaction prices and rents in selected EU countries*, Final report prepared for European Commission, DG Energy;
- 👉 Italy: Enea (National Agency of New Technologies, Energy and Sustainable Development, 2013, “Annual Report on Energy Efficiency 2011”;
- 👉 Italy: other sources, newspaper articles

I  
- - -  
U  
- - -  
A  
- - -  
V



Literature review

# **LITERATURE REVIEW (I)**

*annual report on energy efficiency 2011*

- ➔ Assess the premium price due to an improvement in the energy efficiency, capitalizing the future savings on the energy bill, on a 20 year period;
- ➔ From class G to A+ the premium price is 9%;
- ➔ Do not solve the issue of how the real estate market caught energy features of dwellings

I  
- - -  
U  
- - -  
A  
- - -  
V



Literature review

# LITERATURE REVIEW (II)

*others sources*

Il sole 24 Ore (Financial newspaper), based on data gathered from real estate professionals notes:

- ➡ For used dwellings, premium price between class G and class C buildings range from 4% in Florence, to 15% in Milan
- ➡ Premium price between used dwellings in class C and new ones in class A is 21,6% (they are incomparable)

I  
- - -  
U  
- - -  
A  
- - -  
V



Literature review

# METHODOLOGY

The model used to measure the extent of the single implicit prices of the dwelling's characteristics on final price is a Hedonic price model (Rosen, 1974).

$$y = f(X)$$

In which  $y$  represent the dwelling price and  $X$  his characteristics. Assuming a linear relationship

$$y = \alpha + \beta_1 L + \beta_2 P + \beta_i T$$

In which  $L$ ,  $P$  and  $T$  represent the characteristics levels, and  $\beta_1 - \beta_i$  are their weights.

I  
- - -  
U  
- - -  
A  
- - -  
V



Methodology

# *METHODOLOGY (I)*

For better represent the existing non linear relationships between price and some property characteristics, we used a log-linear functional form of the hedonic model

$$\ln UP = \alpha + \beta_1 L + \beta_2 P + \beta_i T$$

I  
- - -  
U  
- - -  
A  
- - -  
V



Methodology



## ***SAMPLE***

The sample used is composed of 951 residential properties advertisement listed on a website for property sales (*www.immobiliare.it*), and located in the municipality of Padua.

Data collection lasted from April to July 2013.

For every advertisement we gathered information about:

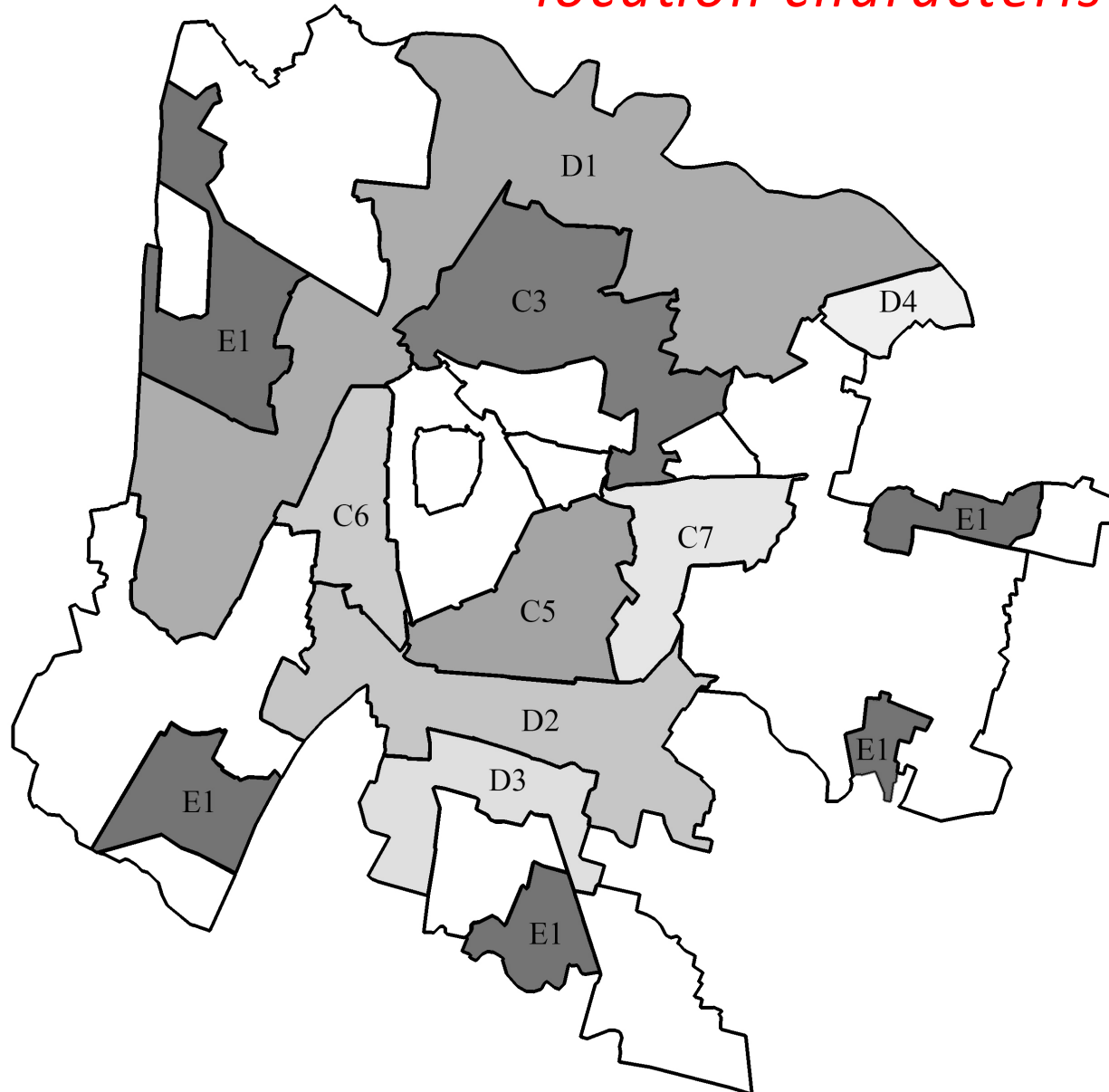
- 👉 Location characteristics (***L***)
- 👉 Property characteristics (***P***)
- 👉 Technological characteristics (***T***)

I  
- - -  
U  
- - -  
A  
- - -  
V



# ***SAMPLE (I)***

*location characteristics*



I  
- - -  
U  
- - -  
A  
- - -  
V



# **SAMPLE** *property characteristics*

- 👉 dwelling typology: 743 **flats** and 208 **detached houses**
- 👉 garages: 187 dwellings have a **double garage**, 665 have a **single garage**, 53 have a **car park**, and 46 have **no garage or car park**
- 👉 Bathrooms: 263 dwellings have **one bathroom**, 545 have **two**, 115 **three**, 27 **four** and 1 dwelling have **five bathrooms**
- 👉 Amenity: 916 dwellings have additional features such as **balcony or private gardens**
- 👉 Surface: The average **floor area** of dwellings is 125 sqm (max 400 sqm and min 40 sqm).

I  
- - -  
U  
- - -  
A  
- - -  
V



# **SAMPLE** *technological characteristics*

- 👉 Dwellings conditions: 308 dwellings are in **excellent conditions**, 347 in **good conditions** and 297 are **new**
- 👉 Energy labels: 64 properties have a **label A**, 183 **B**, 71 **C**, 82, **D**, 134 **E**, 150 **F** and 267 have a **label G**

I  
- - -  
U  
- - -  
A  
- - -  
V



# **RESULTS**

## *regression results*

$$\begin{aligned} \ln UP = & 7.547 + 0.472 * C5 + 0.424 * C6 + 0.232 * C7 - 0.008 * D1 + \\ & 0.114 * D2 + 0.079 * D3 - 0.056 * D4 - 0.012 * E1 - 0.269 * GOOD - \\ & 0.169 * EXC + 0.112 * SING + 0.099 * BATH - 0.005 * PARK + \\ & 0.026 * 1GAR + 0.123 * 2GAR + 0.198 * A + 0.184 * B + 0.160 * C + \\ & 0.158 * D + 0.091 * E + 0.023 * F + 0.018 * AME - 0.002 * SUR \end{aligned}$$

$R^2_{adj} = 70,22\%$

P-value is near to zero

I  
- - -  
U  
- - -  
A  
- - -  
V

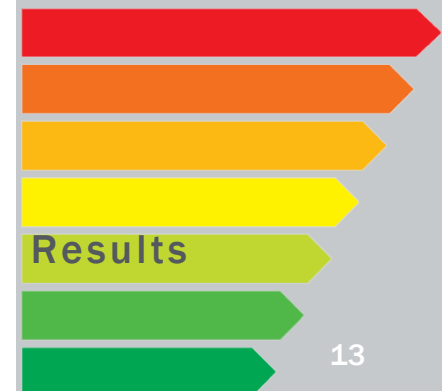


# RESULTS (I)

## variables' coefficients

	<i>variables</i>	<i>expected sign</i>	<i>sign</i>	<i>regression coefficients</i>	<i>variation [%]</i>	<i>significance level</i>
tax zones	default variable C3					
	C5	+	+	0,472	60,3%	*
	C6	+	+	0,424	52,8%	*
	C7	+	+	0,232	26,1%	*
	D1	+	-	0,008	-0,8%	***
	D2	+	+	0,114	12,1%	*
	D3	+	+	0,079	8,2%	*
	D4	-	-	0,056	-5,4%	***
	E1	+	-	0,012	-1,2%	***
maintenance conditions	default variable NEW					
	GOOD	-	-	0,269	-23,6%	*
	EXC	-	-	0,169	-15,5%	*
	SING	+	+	0,112	11,8%	*
	BATH	+	+	0,099	9,9%	*

I  
- - -  
U  
- - -  
A  
- - -  
V



# RESULTS (II)

## variables' coefficients

	<i>variables</i>	<i>expected sign</i>	<i>sign</i>	<i>regression coefficients</i>	<i>variation [%]</i>	<i>significance level</i>
car park and garages	default variable NOPARK					
	PARK	+	-	0,005	-0,5%	***
	1GAR	+	+	0,026	2,6%	***
	2GAR	+	+	0,123	13,1%	*
energy class	default variable G					
	A	+	+	0,198	21,9%	*
	B	+	+	0,184	20,2%	*
	C	+	+	0,160	17,4%	*
	D	+	+	0,158	17,1%	*
	E	+	+	0,091	9,5%	*
	F	+	+	0,023	2,3%	***
AME	+	+	0,018	1,8%	***	
SUR	-	-	0,002	-0,2%	*	

(\* = P-value ≤ 5%; \*\* = 5% < P- value < 10%; \*\*\* = P-value > 10%)

I  
- - -  
U  
- - -  
A  
- - -  
V



# RESULTS (III)

## control variables

zone	Real estate market observatory			model		significance level
	min	max	mean	variation [%] with reference to zone C3	variation [%] with reference to zone C3	
C3	1.450	2.000	1.725	-	-	-
C5	2.150	3.100	2.625	52,2%	60,3%	*
C6	2.000	3.000	2.500	44,9%	52,8%	*
C7	1.850	2.850	2.350	36,2%	26,1%	*
D1	1.750	2.100	1.925	11,6%	-0,8%	***
D2	1.600	2.200	1.900	10,1%	12,1%	*
D3	1.500	1.950	1.725	0,0%	8,2%	*
D4	1.400	1.800	1.600	-7,2%	-5,4%	***
E1	1.450	1.950	1.700	-1,4%	-1,2%	***

I  
- - -  
U  
- - -  
A  
- - -  
V



(\* = P-value ≤ 5%; \*\* = 5% < P- value < 10%; \*\*\* = P-value > 10%)



# RESULTS (IV)

*influence of energy label on market value*

	A	B	C	D	E	F	G
A	0,0%	1,7%	4,5%	4,8%	12,4%	0,0%	21,9%
B		0,0%	2,8%	3,1%	10,7%	0,0%	20,2%
C			0,0%	0,3%	7,9%	0,0%	17,4%
D				0,0%	7,6%	0,0%	17,1%
E					0,0%	0,0%	9,5%
F						0,0%	0,0%
G							0,0%

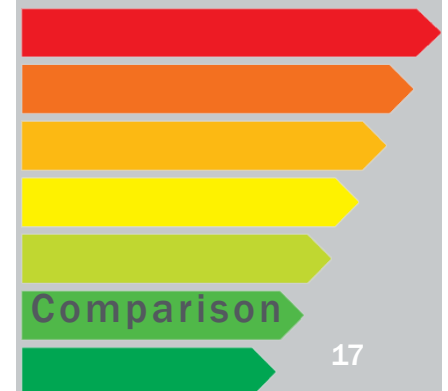
I  
- - -  
U  
- - -  
A  
- - -  
V



# COMPARISON WITH POTENTIAL FUTURE SAVINGS

- ➡ Aim: assess the convenience in purchasing a efficient property
- ➡ Methodology: income capitalization
$$V = I/r$$
- ➡ Data on energy savings from ENEA report
- ➡ Capitalization rate (r): 4,7%

I  
- - -  
U  
- - -  
A  
- - -  
V

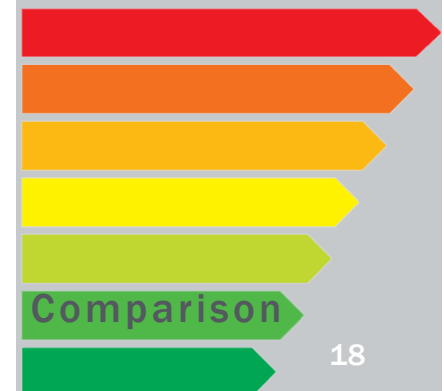


# COMPARISON WITH POTENTIAL FUTURE SAVINGS (I)

energy class	energy consumptions kW/sqm/year	savings €/sqm/year	savings with reference to class G €/sqm/year	capitalized savings V=R/r	incidence of capitalized savings on average market value for class G dwellings (1.600 €/sqm)
A	10	0,77	10,00	212,85	13,3%
B	23	1,77	9,00	191,56	12,0%
C	40	3,08	7,69	163,68	10,2%
D	60	4,61	6,16	131,11	8,2%
E	80	6,15	4,62	98,34	6,1%
F	105	8,07	2,70	57,47	3,6%
G	140	10,77	0,00	0	0,0%

energy class	market price premium for increase of energy class, with reference to class G	incidence of capitalized savings on average market value of class G dwellings
A	21,9%	13,3%
B	20,2%	12,0%
C	17,4%	10,2%
D	17,1%	8,2%
E	9,5%	6,1%
F	0,0%	3,6%
G	0,0%	0,0%

I  
- - -  
U  
- - -  
A  
- - -  
V



# CONCLUSIONS

- ➡ Analysis results are consistent with forecasts
- ➡ Statistical indicators verify the validity of the model
- ➡ Energy labels have a statistically significant impact on market prices
- ➡ Future savings are not able to justify the investment in efficient dwellings

I  
- - -  
U  
- - -  
A  
- - -  
V

