Estimation of a Hedonic House Price Model with Bargaining: Evidence from the Italian Housing Market

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This empirical paper tests the role of bargaining in the formation process of housing prices in Italy. Housing markets are "thin", local and decentralized, and thus buyers and sellers may have some market power. Hence, the selling price is influenced both by the characteristics of the product as well as by the bargaining power of the buyers and sellers. Furthermore, the bargaining power of the seller (buyer) can also be viewed as the cost of incomplete information imposed on the buyer (seller). The empirical results derived from multiple regression analysis support our theoretical assumptions. In fact, the variables created as proxies of bargaining power of the parties, and incorporated into the hedonic price function, are statistically significant and help to improve the performance of the hedonic model, thus reducing the differences between predicted and observed selling prices.

Key words: *Hedonic price theory, bargaining power, asymmetric and incomplete information, multiple regression analysis*

1. Introduction

The hedonic price theory, traced back to the papers of Lancaster (1966), Rosen (1974), and Epple (1987), is the theory of reference for the housing market. According to this theory, the price of a composite good, such as a home, depends on its intrinsic and extrinsic characteristics, whose prices (being implicit or hedonic) are not readily observable but can be revealed to economic agents through the observed selling prices of houses and the specific amounts of attributes associated with them (for an exhaustive overview see Sheppard, 1999 and Malpezzi, 2003). Hence, in the standard hedonic price model, only the heterogeneous nature of real estate goods is taken into account, since the selling price is a function of the housing characteristics.

According to the price dispersion literature (for a review see Leung, Leong and Wong, 2006), an important part of price volatility cannot be attributed to the heterogeneous nature of real estate goods. In fact, two similar houses (namely, two houses with the same attributes and located close to each other) can be valued differently at the same time (Maury and Tripier, 2010). Thus, remaining price differentials may be caused by the heterogeneity of the parties (tastes, preferences, patience, search costs, asymmetric information, etc.).[1]

* This work is connected to the experimentation activity (year 2011) conducted by the Territorial Agency, Head Office of Real Estate Market Observatory and Appraisal Services, Real Estate

Measuring the heterogeneity of the parties is not an easy task. Nevertheless, tastes, preferences, patience, search costs and asymmetric information are all factors which affect the bargaining power of the parties (Maury and Tripier, 2010). Hence, we use the bargaining power of the buyer and seller as a proxy of the heterogeneity of the parties.

Furthermore, contrary to the previous empirical bargaining papers which focus mainly on socioeconomic characteristics of the bargaining parties (Ayres and Siegelman 1995; Harding et al., 2003a, 2003b; Cotteleer e Gardebroek, 2006), we introduce bargaining into the hedonic price model by exploiting the available information regarding the characteristics of real estate units, thus avoiding the important problem of correlation between (omitted) housing-characteristics and buyer-seller attributes, which leads to biased estimates. The insight behind our empirical strategy is straightforward: in markets for heterogeneous goods, such as a home, standard market situations take place when the property with higher (lower) quality/quantity of attributes is sold at a higher (lower) price; otherwise, the selling price is probably affected by the bargaining power of the parties. Therefore, we constructed two dummy variables to take standard and non-standard market situations into account. The multiple regression analysis is then applied to obtain the hedonic prices for Italian residential properties that were sold during the years 2009 and 2010.

The empirical results provide support for the key role of bargaining in the Italian housing market. In fact, the variables created as proxies of bargaining power of the parties, and incorporated into the hedonic price function, are statistically significant and help to improve the performance of the hedonic model, thus reducing the differences between predicted and observed selling prices.

The rest of this paper is organised as follows: section 2 contains a brief review of the related literature; section 3 presents the benchmark theoretical model; section 4 develops the empirical analysis, whereas section 5 shows the results; finally, section 6 concludes the work.

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[1] In addition to the heterogeneity of buyers and sellers, the housing price dispersion literature provides another explanation for the variance in prices. Price differentials may also be caused by the length of time for which a house has been on the market. This is the concept of market liquidity or the liquidity assumption: prices are affected by the length of time that a property has been on the market (Merlo and Ortalo-Magne, 2004; Diaz and Jerez, 2009; Maury and Tripier, 2010). *Ceteris paribus*, the longer a property remains on the market, the lower the sale price. However, Merlo and Ortalo-Magne (2004) show that properties with higher listed prices will take longer to sell, but will be sold at a higher price than properties with lower listed prices. Hence, in this case, the price volatility crucially depends on the (different) sellers' "listing price strategies". Since the selling price and the listed price are positively correlated, we would expect a positive correlation also between the listed price and the bargaining power of the seller. Furthermore, the fact that the length of time required for the sale changes over time is indicative of the existence of search frictions in housing markets (Díaz and Jerez, 2009).

2. Related literature

A major drawback of the standard hedonic pricing theory is the assumption of competitive markets.[2] Precisely, two key assumptions are usually adopted: 1) buyers and sellers, acting alone, cannot influence market prices; 2) buyers and sellers have full information regarding the market prices. However, in the actual housing markets this is hardly true. Housing markets are "thin" (i.e., markets with an insufficient amount of trading), local and decentralized, and thus buyers and sellers may have some market power. Furthermore, the process of gathering information, even when it is publicly available, is costly and time consuming, thus buyers and sellers may enter the market with insufficient or incomplete information.

Indeed, there are two strands of literature which have just removed the assumption of pure competition from the hedonic pricing models. The first strand of literature relies on the key role of bargaining in the price formation process (Quan and Quigley, 1991; King and Sinden 1994; Harding et al., 2003a, 2003b; Cotteleer e Gardebroek, 2006; Habito et al., 2010); the second strand of literature focuses on the crucial effect of asymmetric and incomplete information (Garmaise and Moskowitz, 2004; Pope, 2006; 2008a; 2008b; Kumbhakar and Parmeter, 2008).

In this empirical paper we present a model of bargaining which is compatible with the presence of asymmetric information. In fact, the bargaining power of the seller (buyer) can be seen as the cost of incomplete information imposed on a buyer (seller). Indeed, asymmetric and incomplete information can have a significant impact on housing prices (Pope, 2006; 2008a; 2008b; Kumbhakar and Parmeter, 2008).[3] In fact, if buyers are not fully informed of the lowest price available in the market, they end up paying an incomplete information "tax" which raises the price they pay. Similarly, if sellers are not fully informed about the highest price they could charge, they too suffer an incomplete information "tax" that lowers the price they receive (Kumbhakar and Parmeter, 2008).

3. The benchmark theoretical model: search, matching and bargaining in housing markets

Following the bulk of the existing literature which considers the selling prices of housing as the outcome of pair wise negotiations (Quan and Quigley, 1991; Harding et al., 2003a, 2003b; Cotteleer e Gardebroek, 2006; Habito *et al.*, 2010), we derive our benchmark theoretical model from the bargaining between a seller and a buyer. In particular, the proposed theoretical framework is a short version of the

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[2] We talk about competitive markets rather than perfect competition (or perfectly competitive markets), since housing markets are always missing one important condition which identifies the perfect competition, namely, the homogeneity of the product.

[3] This type of market failure has been well studied in the economic literature since Akerlof 's (1970) seminal paper.

search and matching model developed by Lisi (2011). Theoretical models are in fact critical in determining an accurate and consistent econometric model (Can, 1992; Brown and Ethridge, 1995).

Let the selling price be P and the buyer's subjective evaluation of the good be X. As in Lisi (2011) and Habito *et al.* (2010), X depends positively on the housing characteristics, C. Hence, the first derivative is $\partial X / \partial C > 0$.

For risk-neutral buyers and sellers, the selling price can be expressed as the (generalized) Nash bargaining solution for given bargaining parameters (see the seminal paper by Binmore and Dasgupta, 1987). Using this result, the selling price can be expressed as the weighted average of the seller and buyer payoffs. Formally, the equilibrium price solves the following maximization:

$$P = \arg\max \left\{ P^{\Gamma} \cdot \left(X - P \right)^{\Omega} \right\}$$

where Γ and Ω represent a (positive) measure of the bargaining power of the seller and buyer, respectively. The first order condition is thus the following:

$$\frac{\partial \left\{ P^{\Gamma} \cdot \left(X - P \right)^{\Omega} \right\}}{\partial P} = 0$$

$$\Rightarrow \Gamma \cdot P^{\Gamma - 1} \cdot \left(X - P \right)^{\Omega} + P^{\Gamma} \cdot \Omega \cdot \left(-1 \right) \cdot \left(X - P \right)^{\Omega - 1} = 0$$

Simple manipulations thus yield:

$$P = \frac{\Gamma}{\Gamma + \Omega} \cdot X \tag{1}$$

Since and , the empirical counterpart of [1], namely the "extended" hedonic price function, is given by:

$$P = f \left(\underbrace{\Gamma}_{\substack{\text{expected sign} \\ + }}, \underbrace{\Omega}_{\substack{\text{expected sign} \\ - }}, \underbrace{C}_{\substack{\text{expected sign} \\ + }} \right) \tag{1'}$$

The solution for shows the main testable propositions of the model: namely, the selling price depends not only (positively) on the housing characteristics, since, but also (positively) on the bargaining power of the seller as well as (negatively) on the bargaining power of the buyer.

Furthermore, following the imperfect information approach, and can also be viewed as the incomplete information cost imposed on a buyer and a seller, respectively. In fact, the bargaining power of the seller (buyer) may arise from the information deficiency of the buyer (seller).

4. The empirical analysis

4.1. Choice of functional form for the hedonic price function

The hedonic price theory provides little guidance on the appropriate functional relationship between prices and attributes in the hedonic price function (see Malpezzi, 2003; Taylor, 2003).

However, there are three kinds of functional forms frequently adopted in the empirical estimation of hedonic price models: linear, logarithm and logarithm-linear (Chin and Chau, 2003; Wen *et al.*, 2005).

Empirical applications typically rely on an influential simulation study by Cropper *et al.* (1988) which found that, when some characteristics are unobserved or are replaced by proxies, linear function performs best (i.e., it estimates the marginal attribute prices most accurately).[4] Nevertheless, the log-linear form has a number of advantages over the linear form (see Malpezzi, 2003); in particular, 1) the semi-log model allows the value added by a particular characteristic to vary proportionally with the size and quality of the home; 2) the semi-log form often mitigates the common statistical problem known as heteroscedasticity, or changing variance of the error term.[5] Hence, in this empirical work, we tested a linear functional form, as well as a log-linear specification. In fact, in housing markets, it makes no sense to speak of log-log models, since the only continuous variable for which it is possible to take the natural logarithm is the floor area.

An alternative specification of functional form for the hedonic price function is to adopt a non-parametric or semi-parametric approach to estimation which attempts to infer attribute prices directly from the data without the benefit of an assumed functional relationship. The difficulty in the application of these techniques is the extremely large amounts of data they require (see Sheppard, 1999).

In order to choose the most suitable functional form, we follow the strategy summarised in Iacobini and Lisi (2011). In particular, we compared the two specifications using three methods of comparison: the so-called *PE test* suggested by MacKinnon, White e Davidson (1983); the Box-Cox transformation suggested by Davidson e MacKinnon (1981); and the partial regression analysis used by Brown and Ethridge (1995).

Regardless of the chosen model, once the regression was performed, some important tests – beyond the usual *t-tests* and *F-test* – had to be implemented in or-

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[4] The study by Cropper *et al.* (1988) was updated by Kuminoff *et al.* (2008). Kuminoff *et al.* (2008) find that the increase of the sample size from 200 to 2000 observations changes the relative performance of different specifications. However, such a large sample may be representative for the U.S. housing market but not for the Italian housing market.

[5] Recall that only in the linear model the estimated coefficient coincides with the marginal price. In the log-linear model, in order to obtain the average marginal price of a square foot of a lot, i.e. the derivative of selling price with respect to the lot size, we must multiple the estimated coefficient by the mean value of price.

der to guarantee the reliability of the estimates, namely: i) correct specification of the model, ii) normality of residuals distribution; iii) homoscedasticity (or absence of heteroscedasticity); iv) absence of multicollinearity; and v) absence of outliers.[6] Obviously, these tests should confirm the goodness of fit of the chosen model.

4.2. Empirical strategy

Unlike the previous works which estimate the bargaining power from the characteristics of buyers and sellers (Harding *et al.*, 2003a; Harding *et al.*, 2003b; Cotteleer e Gardebroek, 2006), we introduce bargaining power into the hedonic price model by exploiting the available information regarding real estate units. Indeed, if important housing characteristics are omitted from the regression, correlation between those characteristics and buyer-seller attributes will lead to biased estimates of the effect of bargaining power.

Hence, our strategy is the following. First of all, we calculated the unit price of each real estate unit (in order to compare real property with different floor areas) and the simple average of the unit price. Successively, we calculated the difference between the unit price of each real estate unit and the average unit price of the sample. This (positive or negative) difference is not necessarily an excess surplus due to the bargaining power.[7] Indeed,

- if the real property had obvious advantages (namely, two or more characteristics with the maximum degree or intensity)[8] and the unit price paid was lower than the average of the sample, it was assumed that this negative difference was due to the bargaining power of the buyer (we call this dummy *"buyer"*).
- If the real property had no obvious advantages (none or at most a single feature showing maximum degree or intensity) and the unit price paid was higher than the average of the sample, it was assumed that this positive difference was due to the bargaining power of the seller (we call this dummy *"seller"*).
- In markets for heterogeneous goods, such as a home, standard market situations take place when the property with higher quality/quantity is sold at a higher unit price and vice versa (we call this dummy *"no bargaining power"*).

The insight behind this empirical strategy is straightforward: in the housing markets there is in fact evidence that strong buyers pay lower prices and strong sellers receive higher prices for their homes (Harding *et al.*, 2003b).

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[6] Since for cross-section observations there is no natural ordering, autocorrelation is not a major problem (Verbeek, 2004).

[7] We assume small differences, namely equal to or lower than 50 euro, to be non-significant.

[8] Indeed, in the samples analyzed, given the number of "advantages" (i.e. attributes with maximum degree or intensity) for each real estate units, we find that the mean value coincides with the median value and is equal to one. Hence, the number two is a suitable value to identify the real estate unit with obvious advantages. This calculation does not include the attributes with maximum degree but present in homogenous manner in the sample.

Therefore, we constructed a dummy for each category and included the first two dummies (namely, *"buyer"* and *"seller"*) in the estimation of the hedonic price model for the Italian housing market (obviously, the *"no bargaining power"* reference dummy was excluded from the analysis).Hence, for each real estate unit we take the following econometric model(s) into account:

$$P = \alpha + \beta_1 \cdot \underbrace{\Gamma}_{\substack{\text{bargaining power of seller} \\ \text{or information cost imposed on buyer}}} - \beta_2 \cdot \underbrace{\Omega}_{\substack{\text{bargaining power of buyer} \\ \text{or information cost imposed on seller}}} + \beta_i \cdot C_j + \varepsilon \tag{2a}$$

$$ln(P) = \alpha + \beta_1 \cdot \underbrace{\Gamma}_{\substack{\text{bargaining power of seller} \\ \text{or information cost imposed on buyer}}} - \beta_2 \cdot \underbrace{\Omega}_{\substack{\text{bargaining power of buyer} \\ \text{or information cost imposed on seller}}} + \beta_i \cdot C_j + \varepsilon \tag{2b}$$

where P is the house price in euro, $ln(P)$ is its natural logarithm, α is the constant, Γ and Ω are the dummy variables for bargaining power of the parties, β are the hedonic prices to estimate (with $i = 3, \ldots, n$), are the housing characteristics (with $j = 1, \ldots, m$) and is the stochastic error term (with zero mean and constant variance). The additional terms Γ and Ω reflect the direct impact of bargaining on the price negotiation: in fact, if the variables take the expected sign, positive values of Γ imply higher selling prices compared to those obtained in the absence of bargaining and negative values of Ω imply lower selling prices.[9]

4.3. Dataset

In this empirical analysis, we use information regarding the market survey conducted by the Provincial Offices of the Territorial Agency. This market survey concerned the Italian residential properties that were sold during the years 2009 and 2010. In particular, for each real estate units, the Provincial Offices reported:

1. The selling price (as indicated in the bills of sale);
2. The housing characteristics considered most influential in the price formation process (as suggested by our preliminary analyses)[10] and the corresponding

[9] The difficulty in identifying exogenous measures of information limits the empirical analysis that tests the direct effects of asymmetric information on prices (Garmaise and Moskowitz, 2004). According to Pope (2006), an (impossible) test of the impact of asymmetric information on housing prices could be conducted with two ideal datasets. The first dataset would be comprised of detailed housing characteristics. The second dataset would be comprised of information on what buyers and sellers knew before a transaction occurred.

[10] Expert judgments, correlations and multiple regression analysis. Deciding which attributes should be included in the hedonic price function specification is an important question. Indeed, price differentials may also be caused by missing variables (unobserved good heterogeneity). In this sense, the qualitative improvement of housing databases allows the omitted variable bias to be avoided (Pope, 2006).

score or unit of measure. In particular, the housing characteristics (C) initially included in the regression analysis are the following:

- *Floor area* (continuous quantitative variable);
- *Number of bathrooms* (discrete quantitative variable);
- *Number of balconies* (discrete quantitative variable)
- *Floor level with elevator* (interaction variable);
- *State of building* (ordinal qualitative variable);
- *Location* (ordinal qualitative variable);
- *Architectural style* (ordinal qualitative variable);
- *Prevailing orientation* (ordinal qualitative variable);
- *Quality of view* (ordinal qualitative variable);
- *New construction* (dummy variable).

We use the stepwise method in order to confirm the statistical significance of this variables list.

The choice of the sample for the analysis depended on the availability of sufficient observations.[11] Hence, our empirical work focused on the following 7 cities and 12 OMI zones:

City – Zone OMI	Number of cross-section observations (real estate units)
Alessandria – B1	100
Cosenza – B1	60
Cosenza – D1	61
Crotone – D1	64
Genova – D43	60
Taranto – B1	62
Taranto – C1	89
Taranto – D1	63
Taranto – E2	65
Venezia Mestre – E23	79
Vercelli – B1	100
Vercelli – B2	80

The Italian acronym OMI stands for "Osservatorio Mercato Immobiliare" and it refers to the Italian Real Estate Market Observatory. The Italian Real Estate Market Observatory (OMI) provides more than 180.000 real estate quotations relative

[11] The minimum number of observations required for multiple regression analysis is two more than the number of explanatory variables, to allow for an estimate of the error variance (see Lipscomb and Gray, 1995, p. 176).

to 31.000 homogeneous surveying zones (the so-called zone OMI), quotations for 17 building typologies and concerning all the municipalities (about 8100) over the entire national territory.

5. Results of the analysis

5.1. Comparison between the models

The regressions were performed using Ordinary Least Squares (OLS).[12] The empirical results support our theoretical assumptions. In fact, the two dummies created as a proxy of the bargaining power of seller and buyer, and incorporated into the hedonic price function, are statistically significant and help to improve the performance of the hedonic model, thus reducing the differences between predicted and observed selling prices. In particular,

- the signs of the dummy variables are as expected, namely negative for the dummy *"buyer"* and positive for the dummy *"seller"*. Precisely, the bargaining power of the seller is always significant and its effect on the selling price is stronger than the buyer's (see *Table 1*). According to the incomplete information approach, this result may be viewed as an explanation as to why buyers are often less informed than sellers with regards to various housing attributes;[13]
- The adjusted R-squared is significantly higher than a traditional hedonic model without such proxies; whereas the standard deviation of the prediction error (i.e. the percentage difference between predicted and observed selling prices) is significantly lower (see *Table 2*). Hence, the hedonic model with bargaining explains a greater proportion of the variability of selling price and, at the same time, is able to take into account the price dispersion which exists in the housing market.

A higher adjusted-R^2, a lower standard deviation of the prediction error, and the statistical significance of additional variables for bargaining power, clearly show the prevalence of the less constrained model. In a nutshell, the hedonic model with bargaining performs better than the standard hedonic pricing model. Therefore, we find empirical evidence for bargaining power in the Italian housing market.[14]

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[12] The software used for the OLS estimates was STATA (version 11).

[13] According to Pope (2008a), the recent proliferation of seller disclosure laws in the U.S. housing market suggests that policymakers perceive buyers to be less than "fully informed", presumably since they face higher information acquisition costs than sellers.

[14] Cotteleer and Gardebroek (2006) find empirical evidence for the key role of bargaining in the Netherlands housing market, whereas Harding *et al.* (2003a, 2003b) find empirical evidence for bargaining in the U.S. housing market.

Table 1. Role of bargaining in the formation process of housing prices in Italy.

Cities / zones OMI	Dummy "seller"		Dummy "buyer"	
	Expected sign	significant	Expected sign	significant
Alessandria – B1	Yes	Yes	No	No
Cosenza – B1	Yes	Yes	Yes	Yes
Cosenza – D1	Yes	Yes	Yes	No
Crotone – D1	Yes	Yes	Yes	Yes
Genova – D43	Yes	Yes	Yes	Yes
Taranto – B1	Yes	Yes	Yes	Yes
Taranto – C1	Yes	Yes	Yes	Yes
Taranto – D1	Yes	Yes	No	No
Taranto – E2	Yes	Yes	Yes	Yes
Venezia Mestre – E23	Yes	Yes	Yes	Yes
Vercelli – B1	Yes	Yes	Yes	No
Vercelli – B2	Yes	Yes	Yes	No

Table 2. Comparison between models.

Cities / zones OMI	Model with bargaining		Model without bargaining	
	R2-adjusted	Standard deviation of PE (*)	R2-adjusted	Standard deviation of PE (*)
Alessandria – B1	85,22%	21,31%	72,88%	29,35%
Cosenza – B1	76,51%	32,31%	67,66%	37,41%
Cosenza – D1	90,02%	15,03%	81,06%	21,96%
Crotone – D1	82,19%	11,06%	73,06%	12,96%
Genova – D43	69,94%	17,47%	56,80%	22,98%
Taranto – B1	96,01%	11,61%	91,32%	17,90%
Taranto – C1	91,63%	8,00%	85,55%	10,69%
Taranto – D1	93,63%	5,93%	84,99%	8,30%
Taranto – E2	85,55%	6,49%	79,94%	7,85%
Venezia Mestre – E23	75,17%	19,68%	65,16%	24,65%
Vercelli – B1	94,96%	10,10%	89,93%	14,24%
Vercelli – B2	85,83%	18,67%	78,74%	23,86%

(*) PE = prediction error = (predicted selling price – observed selling price) / observed selling price.

5.2. Marginal prices

In equation [2a] and [2b], the marginal prices implicitly reflect the effects of bargaining, in the sense that the estimated coefficients are different (or equal by coincidence) to those predicted in the absence of Γ and Ω. This consideration is very important for property valuation where estimation of the marginal value of an attribute is commonly used to adjust comparable sales data. Therefore, if the estimated regression coefficients are used as marginal prices in real estate appraisals (for example, by the *Sales Comparison Approach*), the price correction will be different using the standard hedonic model rather than the hedonic model with bargaining.

Indeed, as regards the variables "location" and "state of building" and with reference to the city of Taranto, a somewhat surprising result emerges: the hedonic prices are systematically overestimated in the standard hedonic model (see *Table 3*).

Table 3.

a) "Location"

City – zone OMI	Model with bargaining		Model without bargaining	
	Marginal price	p-value	Marginal price	p-value
Taranto – B1	€ 9.603,85	0.001	€ 12.766,47	0.002
Taranto – C1	€ 11.463,41	0.000	€ 17.416,52	0.000
Taranto – D1	€ 20.538,28	0.000	€ 29.548,34	0.000
Taranto – E2	€ 5.311,70	0.113 (*)	€ 7.352,90	0.060

b) "State of building"

City – zone OMI	Model with bargaining		Model without bargaining	
	Marginal price	p-value	Marginal price	p-value
Taranto – B1	€ 8.340,49	0.000	€ 10.216,55	0.002
Taranto – C1	€ 6.959,62	0.248 (*)	€ 12.507,79	0.108 (*)
Taranto – D1	€ 15.764,46	0.000	€ 17.403,33	0.000
Taranto – E2	€ 14.109,49	0.008	€ 28.117,67	0.000

(*) It means that the marginal price is not significant at the confidence level of 10%.

As regards the estimated marginal prices, with the exception of the floor area, the very significant characteristics vary depending on the city and area considered, thus confirming the "local" character of housing markets (see *Table 4*). Furthermore, note that the prevailing orientation is the only variable that is never statistically significant.

Table 4. Hedonic prices.

City – zone OMI	Characteristics statistically significant (level of confidence 10%)
Alessandria – B1	5: Floor area, Number of balconies, New construction, Architectural style, Quality of view
Cosenza – B1	2: Floor area, Number of bathrooms
Cosenza – D1	3: Floor area, Architectural style, Quality of view
Crotone – D1	4: Floor area, Location, Architectural style, Number of balconies
Genova – D43	4: Floor area, Location, Floor level with elevator, Number of balconies
Taranto – B1	6: Floor area, Location, New construction, Quality of view, State of building, Floor level with elevator
Taranto – C1	5: Floor area, Number of bathrooms, Number of balconies, Location, Quality of view
Taranto – D1	4: Floor area, Location, New construction, State of building
Taranto – E2	6: Floor area, Number of bathrooms, Number of balconies, New construction, Architectural style, State of building
Venezia Mestre – E23	3: Floor area, Quality of view, Number of bathrooms
Vercelli B1	7: Floor area, Location, Floor level with elevator, Number of balconies, Architectural style, State of building, Location
Vercelli B2	2: Floor area, State of building

6. Conclusions

Bargaining is an important part of the price formation process for heterogeneous goods, such as a home. In fact, housing markets are not perfectly competitive and consequently the "true" market price is not readily observable. Under these conditions, the selling price is influenced both by the characteristics of the product as well as by the heterogeneity of the parties. Indeed, the bargaining power of the buyers and sellers is a good proxy of the heterogeneity of the parties. Furthermore, the bargaining power of the seller (buyer) can also be viewed as the "tax" or cost imposed on the buyer (seller) for having incomplete information.

In this paper we find empirical evidence for our theoretical assumptions in the Italian housing market. This result has two main consequences:

- First, ignoring bargaining may lead to omitted variable bias on estimated implicit prices in hedonic pricing models. This question is significant for property valuation where estimation of the marginal value of an attribute is commonly used to adjust comparable sales data.
- Second, bargaining helps improve the performance of the hedonic model, thus reducing the differences between predicted and observed selling prices. This issue is significant in making correct predictions regarding housing sale prices.

Furthermore, this model may be useful for selecting the comparables most suitable for the Sales Comparison Approach. In fact, it is quite clear that the residential property affected by the bargaining power should be eliminated.

Finally, since the socioeconomic characteristics of the parties may affect the price differences (the negative or positive difference between the unit price and the average unit), an area for further investigation is the determinants of the bargaining power (income, education, age, sex, race, etc). To do this, the data of real estate units needs to be matched with those of their owners.

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