DETERMINANTS OF REGIONAL HOUSING MARKET IN CROATIA

Paper prepared for the
45th Congress of the European Regional Science Association,
Amsterdam, Netherlands, August 23-27th, 2005.

Valerija Botrić
Institute of Economics, Zagreb, Trg. J.F. Kennedy 7, Croatia.
E-mail address: vbotric@eizg.hr

Željka Kordej De Villa
Institute of Economics, Zagreb, Trg. J.F. Kennedy 7, Croatia.
E-mail address: zkordej@eizg.hr

Abstract

This paper investigates regional differences in the housing market in Croatia. Housing market in Croatia is still relatively undeveloped, but highly regionally dispersed. Regions characterized by excessive demand on the housing and real estate markets are concentrated in the capital city and recently in the tourist areas. Regions characterized by the excessive supply are those in the economically depressed areas. At the same time, Croatian labour market lacks significant geographical mobility, which contributes to the differences on the housing market as well.

Croatian housing market had to experience the phase of price liberalization, as well as other markets in the transition process. This specific liberalization, though, was not considered as a priority during the process. Price developments and turnover dynamics are still bounded by underdeveloped and not updated cadastre, purchasing power of the Croatian residents, newly discovered and soon surpassed credit liabilities, and at this moment still limited possibilities of non-residents real estate purchases. Within the prospect of becoming an EU member, Croatian housing market is expected to gone through significant changes.

The main purpose of our paper is to quantitatively assess the situation prior to the EU accession. We apply principles of hedonic price methods in order to estimate the determinants of housing prices, taking account of regional differences. Our database consists of the detailed spatial data. Since the database is relatively new, the time dimension of housing market developments is not assessed in this paper.

Key words: housing markets, hedonic prices, regional differences, Croatia.
JEL: R31, R32.

Acknowledgments: The authors would like to thank *Filipović business advisory*, organizer of the First Annual International Conference on the Real Estate Market in Croatia who kindly allow us to use the material and presentations from the Conference.

1. Introduction

During the last few years, housing market in Croatia has witnessed most prominent increase. According to the available information, demand is increasing, prices are rising, and new dwellings are being placed on the market as the construction activity has resumed its path after the prolonged period of stagnation. In recent years, even the legal system in Croatia is opting for consolidation of the ill state of the cadastre, not updated for many years. This has contributed to the increased number of real estate agents on the market, and it seems that the business is flourishing at the moment.

In spite of the growing interest in purchasing new real estate properties, so far the interest for quantitative analysis of the developments on the housing market, in particularly on the regional level, did not increase with the same rate. There are just few published researches dealing with the Croatian housing market.[1] However, since this part of the market is expected to grow in the future as well, we expect that it will attract additional attention.

In this paper, we have analyzed the characteristics of the housing market in Croatia using the hedonic regression method. In doing so, we have put special emphasis on the regional diversity. Although common knowledge implies that regional diversities on the housing market exist, they are, besides obvious ones, difficult to include in the empirical analysis, because they might depend on a vast array of factors. Besides the usual factors influencing regional differences, which usually depend on the economic attractiveness of the region, Croatia has additional factor. Specifically, tourism activity, which gained momentum after the war, has contributed significantly to the revival of the housing market on the coast. Although most of the new dwellings on the coast are for vacation purposes, they nevertheless influence the overall dynamics on the market. This impact is expected to be even more pronounced in the years to come.

The paper is organized as follows. The following section discusses the characteristics of the housing market in Croatia. Section 3 briefly presents data and the methodology used in empirical estimation. Section 4 presents the results, and the final section concludes.

[1] Mihaljek (2005), Bežovan (2004), Tica (2002, 2004), Fröhlich (2003).

2. Some characteristics of the housing market in Croatia

Croatian housing market is relatively small and real estate industry is relatively young. Croatian property market[2] represents around 13 percent of GDP, compared to 20-25 percent in other more mature market economies. It started to develop more intensely in second half of the 1990s when most of the housing stock, inherited from the previous system, has been privatized.[3] In rural parts of Croatia, even in the socialist system, there was a large share of private ownership. However, the situation was different in urban areas. Although houses (mostly located in suburbs) usually were also privately owned, most of the apartments were in the so-called social ownership – not private and not state-owned. Privatization was a complex process and resulted in high share of owner occupied housing. According to Census 2001, 96 percent of permanently occupied dwellings (1.4 million) are owned by private persons, and 83 percent are owner-occupied dwellings.

What is the state of the housing stock in Croatia? When comparing total number of households (1474298) and permanently occupied dwellings (1421623) it turns out that in 2001 there was a deficit of more than 52 thousands dwellings. But if we in our calculation include temporarily unoccupied dwellings, as it is shown in the Table 1, the number of dwellings exceeds the number of households in all counties, regardless of urban, mostly urban or rural features of the specific county.[4]

The indicator of relative excess of supply and demand as presented in Table 1 is far from being accurate. According to the census methodology, a house could be occupied with more than one household. If there is sufficient space in such a house, there is no explicit need why should each household own its separate dwelling. Since there are regional differences in architecture as well, thus constructed indicator of excess supply cannot be considered as an exact measure of supply or demand surpluses.

[2] Construction and real estate industry. Mihaljek (2005).
[3] Fröhlich (2003) and Mihaljek (2005).
[4] Although, according to Ministry of Enviornmental Protection and Physical Planning (MEPPP) regional distribution of housing stock is uneven with substantial lack of dwellings in big cities and surplus in smaller towns. See Mihaljek (2005) and Tica (2004).

Table 1. Population, households and dwellings in Croatian Counties in 2001

County	Population	Households	Dwellings (permanently occupied, temporarily unoccupied, abandon)	Vacation houses
Zagrebačka	314887	94447	103297	16528
Krapinsko-zagorska	144928	43904	48780	9916
Sisačko--moslavačka	188961	65134	79582	4900
Karlovačka	146340	49701	58339	4691
Varaždinska	187628	56344	59951	5055
Koprivničko-Križevačka	126539	39693	43163	4668
Bjelovarsko-bilogorska	134864	44159	51092	3239
Primorsko-goranska	315761	111705	125475	28271
Ličko-senjska	53899	19576	27694	7096
Virovitičko-podravska	95059	31682	35708	581
Požeško-slavonska	86644	27308	30683	414
Brodsko-posavska	179181	54767	58759	1175
Zadarska	165593	52145	63692	25305
Osječko-baranjska	341180	113697	124115	5340
Šibensko-kninska	116159	39332	48036	14468
Vukovarsko-srijemska	203228	64754	68086	938
Splitsko-dalmatinska	467899	142982	162337	22498
Istarska	210026	72967	84559	14696
Dubrovačko-neretvanska	125033	39149	45279	5559
Međimurska	121544	35743	37859	2332
City of Zagreb	809701	275109	304163	4843
Total	4535054	1474298	1660649	182513

Source: Census 2001.

Housing supply is usually judged as tight, both on the "primary" and "secondary market".[5] In 2001, 12580 dwellings were completed, which is 2.8 dwellings per 1000 inhabitants.[6] In addition, situation on secondary market is rather unfavorable. First, there are some

[5] At least according to Mihaljek (2005) and Fröhlich (2002). Housing supply is defined as the sum of flow of new housing units ("primary market") and sales of existing houses ("secondary market").

[6] In 1996-2001 period it was 3 dwellings per 1000 inhabitants. When comparing to EU members this is relatively low, but it is similar to other transition countries. In 2000, in Ireland there were 13.2 newly completed dwellings per 1000 inhabitants, in Portugal 10.8, in Spain 8.2, in Slovenia 3.0, in Hungary 2.0, in Slovakia 1.4, in Romania 1.1 and Bulgaria 0.8. OECD (2002).

institutional and legislature constraints[7] and second, housing stock is rather old and/or of poor quality due to low construction standard, so many of these housing units are not successful on the market.

Financial aspects of the housing market could be assessed by the purchasing power of resident population. When comparing annual earnings with average price of m^2 of new apartment affordability index is calculated. From the table below it can be noticed that index of housing affordability in Croatia is low – average annual income in 2003 was sufficient to buy 5.2 m^2 of new apartment.

Table 2. Index of housing affordability in 1995-2003

Year	Real average net wage (2000 prices)	Real average price of m^2 of new apartment (kn) 2000 prices	Affordability index
1995	2397	8671	3.3
1996	2567	8894	3.5
1997	2884	8824	3.9
1998	3058	8577	4.3
1999	3367	9922	4.1
2000	3411	8914	4.6
2001	3541	8306	5.1
2002	3625	8154	5.3
2003	3753	8627	5.2

Source: Central Bureau of Statistics and authors' calculation.

Affordability of housing is determined by housing finance and public housing policy. Commercial loans are the main source of housing finance in Croatia. In 2000 housing loans amounted to 8257 million kuna (1082 million euro) and in 2004, 21397 million kuna (2830 million euro), which makes up to 19 percent of banks' total loans.[8] Croatian households are relatively highly indebted[9] and this hinders housing affordability additionally. Besides

[7] According to Mihaljek (2005) and Tica (2004), cadastral books are not transparent, and some of the housing units do not have property titles. Lack of enforcement of building regulations is evident in day-to-day transactions attempts.

[8] Croatian National Bank, Bulletin (2005). Housing loans are still relatively expensive and access to loans is difficult for average Croatian family, although loan terms became more favorable for citizens in past few years.

[9] Debt to income ratio is about 84 percent. Mihaljek (2005, p. 205).

commercial housing loans there are also contractual savings[10] and subsidized housing schemes, but their role in total housing finance is still relatively unimportant in Croatia. [11]

In addition to legislative constraints removal dynamics, trends in household incomes, availability of favorable housing finance and public housing schemes, situation on local housing market also depends on trends in building and construction industries. According to Tica (2004) the share of the construction cost in the price of m^2 is the indicator of efficiency in the housing system. In Croatia this indicator has been deteriorating last 20 years due to the inefficiency of the public sector and non-transparent relations between investors and local authorities.

Accession of Croatia to the EU is also seen as one of the most important determinants of the development of local housing market. Harmonization of national legislation to *acquis communitaire* is seen as a challenge and opportunity to acquire higher standards in functioning of local housing market, including enhancing efficiency of institutions on the market as well as more comprehensive enforcement of regulations (legal uncertainties will be removed, cadastral books with property titles will be regulated). The right of EU residents to acquire real estate in Croatia will influence national housing market. There is a growing concern that increased foreign demand would distort local housing markets and lead to even less affordability of housing to Croatian citizens.[12]

The following figure shows prices for dwellings in Croatia on secondary market in period 1996-2004. In analyzed period prices have been rising in Croatia on average, as well as in two most dynamic segments of market - the City of Zagreb and Adriatic coast with islands. When

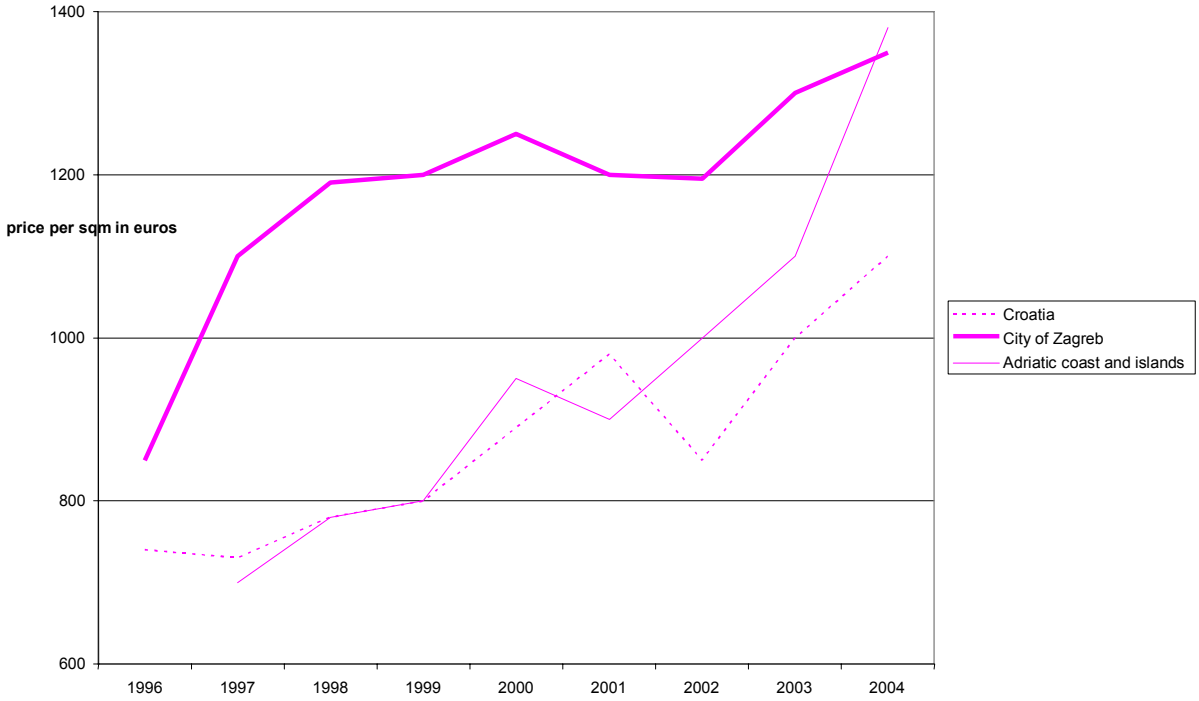
[10] First housing savings banks were founded in 1999 and total value of housing loans extended so far is 60 million euros.

[11] In Croatia there were two such models. First provides a fund for handicapped veterans of the Homeland War and the second one provides public subsidies for housing construction (the so-called POS). Under the first model since 1997, 4400 apartments have been built. Under the second scheme, since 2000, 1500 apartments have been constructed. According to Tica (2002) the main drawback of this model is inadequate beneficiary targeting, so public funds are used to assist the relatively better-off households. Even though the credits are subsidized, many poor households are not able to compete for these funds due to high down payments and debt servicing costs.

[12] This discussion will be outside the scope of this work, but for detailed insights of this subject refer to Mihaljek (2005).

interpreting the following figure one should be aware that data are from commercial database so it doesn't include all performed transactions and it shows only data for dwellings.[13]

Figure 1. Prices on secondary market in Croatia, City of Zagreb and Adriatic coast and islands in 1996-2004



Source: Ranilović (2005).

The specific case which attracts the most attention of the public is area of Adriatic coast. Adriatic coast and islands are considered as very attractive locations[14] for buying real estate due to unique landscapes and high environmental quality. Croatian housing market was opened to the foreigners in 1996. Procedure of acquiring real estate property by foreigners is long primarily due to inefficient administration in different government bodies. In period 1996-2004 there were 3553 transactions performed by foreigners (Germany accounts for almost 60 percent of these transactions, and Austria about 20 percent). Additional investment in this area represents an opportunity for Croatian tourism, but in the same time it poses

[13] According to news media prices of houses and construction lands have risen by 20 to 30 percent in last two years and even more in the most attractive locations. Litvan (2005) available from www.filipovic-savjetovanje.hr.

[14] According to Ranilović (2005) in 2004 more than 30 percent of all transactions on the housing market were located on coastal area and islands.

additional threat to coastal space and environment. The key prerequisite for their protection is enforcement of building regulations.[15]

On the coast we can distinguish a few local markets with focal points in the cities: Dubrovnik, Split and Zadar. The special case is Middle Dalmatian islands where prices of houses in period 1995-2000 have increased by a large factor.[16] The most attractive counties are Istarska (35 percent of all transactions) and Primorsko-Goranska (29 percent of all transactions)[17] where there are local markets with their specificities – Opatija, Rijeka, Crikvenica (coastal towns), islands Krk, Cres, Lošinj and Rab and hinterlands of Gorski Kotar.

In the next section more elaborated insights related to price determinants which accounts for regional differences are presented.

3. Data and methodology

Our data comes from the Internet address of the association of Croatian real estate agents. The data contains information on the total price of the property, some of the most relevant characteristics, as well as the detailed location. In order to address the regional diversity, we have aggregated the data into 21 counties.

We have collected the data on real estate in a specific point in time. Therefore, the data actually represents the supply on the housing market, and at the same time incomplete measure of supply. There are few reasons behind this assessment:

- First of all, the intermediation on the housing market in Croatia is rather limited indicator of the overall transactions on the housing market. There is a long lasting tradition of direct trading, without intermediators, which is more evident for the transactions in rural areas, especially for houses and for older items. The advertising of those items is not centrally

[15] To prevent further deterioration of the coastline Croatian government passed in September 2004 «Regulation on the protection of the coastal public domain». Illegal construction is severe threat in all national territory, but especial on coastal area. For more detailed insights in physical planning see Kranjčević (2005).
[16] Just for illustration – prices of houses in Stari Grad (island of Hvar) in 2000 were five times higher than in 1995 according to www.berlin-immobilien.hr.
[17] Ranilović (2005).

conducted, but rather through various specialized or general newspapers, magazines, and Internet portals. Consequently, our sample is biased towards urban areas and newer items.

- Secondly, this specific association of real estate agents does not consist of all the agents there are on the market. This is a voluntary association, and the inclusion of items on the list is not obligatory for the members of the association. It could be assumed that the real estate agents will include the item on the list if they believe that there is a demand for this type of real estate by the buyers who have Internet access. This is another reason why our sample might be biased towards the urban areas.

Since these are the asking prices of the real estates on the market, one could pose a question as to whether these prices could deviate significantly from the actual transaction prices, which are the result of the supply and demand interactions on the market. This could be the issue, particularly so in the low demand areas. However, on the Croatian housing market the demand is usually not met by the supply. This could be argued in particular for the urban areas, which are the main attractors of labour supply. A common statement is that there is a shortage of housing units, for at least two reasons – destruction during the war, and slow economic recovery.

The second point is that we are looking on the data in the specific point in time, which could influence our results. There were attempts to collect the data on several points in time, and to at least compare the results in two points in time. However, due to the Internet-page redesign, it was not possible to collect all the characteristics of the items. Therefore, the analysis is not extended to the time dimension.

The third point is that there are many still not resolved issues which pose an obstacle to the development of the housing market in Croatia. One of the most pronounced is the fact that cadastre data is not reliable. Although this was to some extent neglected during the transactions made in previous years[18], the emphasis on the so called "clear real estate papers" is more pronounced on the demand side of the market. It can be assumed that real estate agents take this into consideration, at least for those items included in the publicly available list, and our sample could again be biased towards "cleaner" transactions.

[18] This is part of the heritage of the previous economic system, where private ownership was limited and therefore not important. However, privatization and denationalization led to the increased significance of the ownership issue, which exposed untidy cadastre to pressure.

Once we have listed the possible biases in our data, we proceed with explaining the methodology. In order to investigate what determines the price of the real estate on the Croatian market we have applied hedonic regression method. Hedonic regressions can be viewed as reduced form of the economic model, attempting to explain the influence that varying consumer tastes and preferences, different technologies and even companies' product differentiation strategies, may exert on market prices[19]. The main concept forming the basis on which hedonic regressions are applied is the assumption that consumers, when deciding to purchase a product, will compare the characteristics of similar products. Hedonic regressions basically represent an analytical method used to determine to what extent an improvement of a certain characteristic may explain the price difference between two similar products.

The crucial questions when applying hedonic regression method are the following:

- Which are the characteristics of the product relevant for the price determination?
- What is the functional form of the relationship between the price of the product and its characteristics?

In terms of products characteristics, we have used a rather pragmatic approach and chosen the available characteristics listed in Table 3 below. However, those are the main characteristics usually relevant for finding the desirable new housing unit. When it comes to the functional form, we have consulted the recommendations from the hedonic regressions method literature. Therefore we did not choose the linear model, as Diewert (2003) advocates that this functional form, while often applied in practice, should in fact not be applied since it is not derived from the theoretical model it is supposed to be based on. Instead, we have used the exponential model, in which dependent variable is expressed as a product of multiplication of the exponential values of independent variables, or put into an equation:

$$p = \beta_0 \prod_{k=1}^{K} e^{\beta_k x_k} \qquad (1)$$

This model may be transformed into a linear one by converting the equation into logarithmic form:

$$\ln p = \ln \beta_0 + \beta_1 x_1 + \beta_2 x_2 + ... + \beta_k x_k \qquad (2)$$

[19] Schultze and Mackie (2002, p. 149).

In that case, hedonic prices may be presented as follows:

$$\frac{\partial p}{\partial x_i} = \beta_i p \qquad (3)$$

The estimated coefficient appearing alongside the product characteristic x_i is therefore to be interpreted as the rate of price growth. In practice, this form of a hedonic function is often called semi-logarithmic since the dependent variable in the linear function has been turned into a logarithm, while independent variables have not.

In addition to those questions, there is also the problem of the method of estimation. Since we are dealing with regionally diverse data, we present here two different methods of estimation – OLS method with dummy variables for specific region, and cross section heteroscedastically adjusted GLS[20]. When applying GLS, it was assumed that common coefficient exists, which should capture other characteristics of the housing market in Croatia.

4. Empirical Results

We begin our empirical analysis with general presentation of the data in our sample. In May 2004[21], there were 1305 items in the database. Descriptive statistics for the data can be found in the following table.

[20] According to Anselin (2003, p. 311), most of the methodological issues related to spatial heterogeneity can be tackled by means of the standard econometric toolbox. Therefore, we have used only standard methods in dealing with heteroscedasticity.
[21] Data actually refers to the items supplied on May 18th, 2004.

Table 3. Descriptive statistics of the real estate database

	Number of items	Average price	Average size	Average number of rooms	Average age
Houses	**532**	**990,26**	**224**	**5,4**	**29**
terrace	41	964,90	129	4,5	64
semi-detached	70	1.107,27	187	5,2	31
detached	421	973,27	239	5,5	25
Business-residential objects	**26**	**965,58**	**449**		**22**
Apartments	**531**	**1.395,33**	**84**	**3,0**	**26**
in house	26	1.352,96	87	3,3	53
in the building	446	1.401,69	78	2,8	25
on more levels	59	1.365,92	126	4,3	23
Land	**216**	**96,21**	**10068**		
building lot	197	102,84	9441		
agricultural	13	20,54	23465		
other	6	42,33	1616		

Source: Real estate data base.
Prices are in Euro/m^2, average size in m^2 and average age in years. Average number of rooms is not reported for business-residential objects, due to the fact that only 10 items have reported this information for the specified object.

As can be seen from the data in Table 3, there was almost equal amount of apartments and houses supplied on the market at that point in time. Average price per m^2 is higher for the apartments, and lower for the houses. At the same time, average size (measured either by the m^2 or the number of rooms) is higher for the houses, than for the apartments. There is a usual explanation for this price difference – apartments are more concentrated in the urban areas, while houses are more often in rural areas. Beside the geographical differences, the other reason for this price difference stems from household budget constraint. Specifically, due to the fact that Croatia is not a high-income country[22], and that the bank loans supply for buying a real-estate offered with at least manageable interest rates is relatively new in Croatia[23], the demand for more living space is highly limited with disposable budget. As houses on average tend to have more space than apartments, they tend to be more expensive.

Only the data on apartments and houses were analysed on the regional level. There are two main reasons for this. First of all, only those objects could be identified with the housing

[22] GDP p.c. in Euro for the year 2003 was 5747.
[23] An analysis of the available housing financing models, together with the information on the average market interest rates could be found in Tepuš (2005).

needs of the population. The other, being the fact that those are the most frequent data in the sample. Regional characteristics are presented in the following table.

Table 4. Regional characteristics of the sample

Counties	Houses					Apartments				
	Number	Average size	Euro/m2	Nr. of rooms	Average age	Number	Average size	Euro/m2	Nr. of rooms	Average age
I. Zagrebačka	66	226	687,55	5,1	19	7	101	927,00	3,4	10
II. Krapinsko-zagorska	19	171	542,58	4,1	20	1	28	614,00	1,0	29
III. Sisačko-moslavačka	1	120	208,00	6,0	53	1	45	690,00	2,0	33
IV. Karlovačka	1	140	913,00	7,0	18					
V. Varaždinska	1	150	239,00	4,0	18					
VI. Koprivničko-križevačka	4	288	614,75	6,5	17					
VII. Bjelovarsko-bilogorska	2	223	464,50	5,3	11					
VIII. Primorsko-goranska	74	213	1.033,93	6,8	33	59	65	1.531,34	2,8	11
IX. Ličko - senjska	5	286	658,60	6,6	67	4	54	1.021,50	2,3	2
X. Virovitičko-podravska										
XI. Požeško-slavonska										
XII. Brodsko-posavska										
XIII. Zadarska	26	150	1.018,38	5,3	16	48	57	1.224,58	2,6	7
XIV. Osječko - baranjska	18	138	367,28	3,2	30	1	67	597,00	3,0	15
XV. Šibensko - kninska	37	194	1.240,57	5,8	19	3	71	1.263,33	2,3	1
XVI. Vukovarsko-srijemska	1	184	-							
XVII. Splitsko-dalmatinska	90	221	869,93	4,9	24	19	76	1.125,11	2,5	22
XVIII. Istarska	27	233	947,52	5,2	79	33	56	1.689,58	2,3	48
XIX. Dubrovačko-neretvanska	7	268	806,00	4,7	174	1	93	806,00	3,0	15
XX. Međimurska										
City of Zagreb	153	261	1.293,36	5,6	26	354	94	1.405,61	3,2	31

Source: Real estate data base.
Prices are in Euro/m^2, average size in m^2 and average age in years.

As can be seen in the previous table, our sample is regionally much diversified. The diversification can be identified by a number of criteria:

1. Quantity supplied on the market

   As expected, most of the supply is concentrated in the capital, the city of Zagreb, which is also the major economic centre of Croatia.[24] However, the dominance is rather more expressed when it comes to apartments.

   In both types of properties, there are counties without items supplied. For the overall sample, those are (Virovitičko-podravska, Požeško-slavonska, Brodsko-posavska and Međimurska) the counties in the eastern (and northern) part of Croatia, severely affected during the war, and lagging behind in economic recovery. In addition, when it comes to apartments, four more counties disappear from the sample (Karlovačka, Varaždinska, Koprivničko-križevačka and Bjelovarsko-bilogorska). These are more centrally located counties, in which strong gravitation towards the city of Zagreb is expressed. Besides Zagreb, most of the supply is concentrated on the coastline – specifically, in counties Primorsko-goranska, Splitsko-dalmatinska, Zadarska and Istarska. The increased supply in those areas is obviously connected with recommencing tourism activity.

2. Price of the property

   When it comes to the average prices, it can be noticed that the counties with stronger supply, at the same time are those in which prices are on average higher. Specifically, both on the houses and apartments markets, prices are higher in Zagreb and at the coastline, then in the other parts of the country. This finding can be compared with the Central Bureau of Statistics data, which publishes data on average prices of new apartments sold in Zagreb and other towns. Since our data includes also older items, the results on average price might differ. According to the CBS data, average price in the second quarter of 2004 (to which our data relates) for Zagreb was 1.415,64 Euro which is only 10 Euro higher than the average price for the apartments in our sample. However, the differences are more pronounced in other counties. The CBS average price for the Croatia is Euro 1.138,51 which is lower than our estimate presented in Table 3. One of the explanations is that our sample is more biased towards Zagreb since in our sample 67

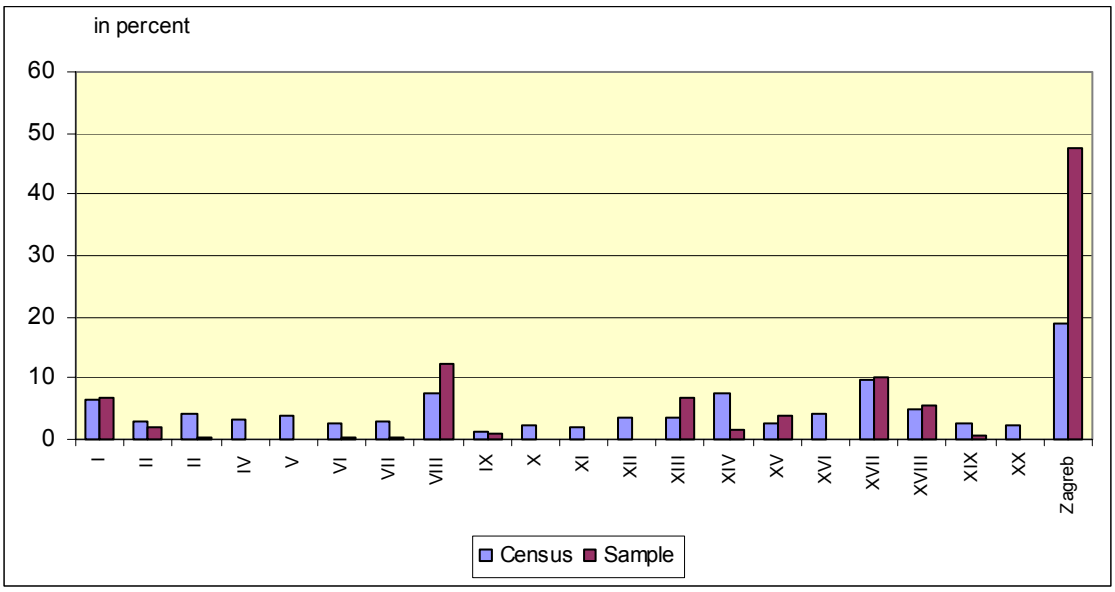
[24] Central Bureau of Statistics (2004).

percent of all apartments are in Zagreb. In the CBS data, nearly 72 percent are in other counties, leaving only 28 percent of the total in Zagreb.

There are also noticeable regional differences in other characteristics of the items. Those differences stem from the local tradition (when it comes to the living conditions – size of the family, whether more generations live in the same house, etc.) and also reveal the difference in the past regional economic growth - the periods of economic growth in the region, are usually accompanied by the growth of the construction activity, which results in "younger" properties on the market.

Regional structure of our sample is compared with the structure obtained from the Central Bureau of Statistics census data for the year 2001. For the comparison purposes, we have used only the number of items used for living, whether or not they are occupied by owners or tenants. We have excluded the collective housing units as well as parts of the privately owned units used by tenants.

Figure 2. Sample characteristics relative to census data



Sources: Central Bureau of Statistics, real estate database.
Numbers indicate the number of the county, as presented in Table 4.

Even though one cannot directly compare the stock of the real estate with the supply (which is actually presented in the previous figure), it serves to confirm that the results we can obtain from our analysis might be considered representative.

After presenting the descriptive statistics for our sample, we proceed with the regression analysis. We have separated the total sample into the sample for houses and sample for apartments, as both the average price and the regional structure differ. In order to avoid dealing with outliers, we have decided to exclude those counties in which the total number of observations is less than 10. We consider that those observations would not add significantly to the explanation power of our model. Consequently, the regression analysis for the houses data is applied only to the data from following 9 counties:

- I – Zagrebačka
- II – Krapinsko-zagorska
- VIII – Primorsko-goranska
- XIII - Zadarska
- XIV – Osječko-baranjska
- XV – Šibensko-kninska
- XVII – Splitsko-dalmatinska
- XVIII - Istarska
- City of Zagreb

Results of the regression analysis are presented in Table 5.

Table 5. Determinants of the prices of houses

Dependent varijable - log(price)	OLS method	GLS method
Constant	6,994***	6,657***
	(77,67)	(103,00)
Age	-0,001	-0,000
	(-0,99)	(-0,59)
Size	0,000	0,000*
	(0,12)	(1,73)
Rooms	0,012	0,007
	(0,66)	(1,60)
Terrace	0,098	0,249**
	(0,97)	(2,46)
Semi-detached	0,043	0,253***
	(0,59)	(3,77)
Istarska	-0,053	
	(-0,39)	
Krapinsko – zagorska	-0,788***	
	(-8,42)	
Osječko – baranjska	-1,175***	
	(-10,75)	
Primorsko – goranska	-0,191**	
	(-2,28)	
Splitsko – dalmatinska	-0,394***	
	(-3,53)	
Šibensko – kninska	0,004	
	(0,04)	
Zadarska	-0,164	
	(-0,68)	
Zagrebačka	-0,629***	
	(-6,60)	
Adjusted R^2	0,30	0,78
Number of observations	349	349

Source: author's calculation.
Notes: Coefficients marked *** are significant at a level of 1%, ** at a level of 5%, * at a level of 10%, while t-values are presented in brackets below the regression coefficients. In OLS, standard errors and covariances are White heteroskedasticity consistent.

Results presented in Table 5 can provide some insight into the Croatian housing market. First of all, it can be noticed that the OLS method results in relatively low explanation power of the available set of characteristics for the housing price differences. The most significant explanation is in the constant, which captures other common influences, not included in this set of explanatory variables. Regional dummy variables contribute to the explanation of the price differences, even though not all of them are significant. However, most of them do seem to indicate lower than average price in other areas than the capital of Croatia, as intuitively expected.

GLS method does not implicate different results. One point worth noting is that now it seems that dummy variables for the type of the house turned to be significant and exert positive influence on price. However, the strongest influence comes from the common characteristics of the market. On the other hand, age and size of the item do not have impact on the unit price.

As can be seen in the Table 4, sample for the apartments is concentrated in less number of counties. The regression analysis for the apartment data is applied only to the data from following 5 counties:

- VIII – Primorsko-goranska
- XIII - Zadarska
- XVII – Splitsko-dalmatinska
- XVIII - Istarska
- City of Zagreb

Results are presented in Table 6.

Table 6. Determinants of the prices of apartments

Dependent varijable - log(price)	OLS method	GLS method
Constant	7,148***	7,115***
	(211,53)	(314,19)
Age	0,000	0,000
	(0,65)	(0,51)
Size	0,002***	0,001***
	(3,48)	(4,84)
Rooms	-0,028*	-0,001
	(-1,67)	(-1,38)
On more levels	-0,052	-0,072**
	(-1,60)	(-2,26)
In a house	-0,059	-0,056
	(-1,05)	(-1,10)
Istarska	0,190***	
	(3,17)	
Primorsko - goranska	0,122***	
	(3,19)	
Splitsko – dalmatinska	-0,199***	
	(-4,22)	
Zadarska	-0,063**	
	(-2,35)	
Adjusted R^2	0,11	0,97
Number of observations	512	354

Source: author's calculation.
Notes: Coefficients marked *** are significant at a level of 1%, ** at a level of 5%, * at a level of 10%, while t-values are presented in brackets below the regression coefficients. In OLS, standard errors and covariances are White heteroskedasticity consistent.

In general, the results do not differ much from those for the houses, in the sense that other influences, not specified here are most important. However, one could notice that in this case, dummy variable for Istarska county is significant and exerts positive influence in comparison with the overall sample dominated by the city of Zagreb. It can be explained with the fact that there is a growing demand for holiday apartments on the coastline, specifically in those areas closest to the EU-member countries such as Italy, Austria and Slovenia.

Other characteristics of the apartments, such as number of rooms or the type of the apartment, have turned to exert negative impact on the price (whether or not they have been significant). At the same time, the age of the apartment did not have any influence on the price.

Judging from our regression results, both in the case of houses and in the case of apartments, characteristics of the dwellings put little or no pressure on the market prices.

5. Conclusions

In this paper we have analyzed regional housing market data in Croatia using hedonic price method. The intuition behind this method is that the price depends on the set of characteristics of the product. In addition to the characteristics of houses or apartments, we have also included regional dummies as explanatory variables. Although some of the explanatory variables specified in this way did seem to be significant, our results indicate that in all of the cases the most significant explanatory variable is constant. Therefore, we conclude that our results have indirectly confirmed that other characteristics of the Croatian economy – such as households' disposable income, loans availability, economic activity in the region, regional unemployment rate or population mobility issues and probably in the near future liberalization of the domestic housing market – should play more important role in determining the price of the property than the characteristics of the property itself.

Since our results have confirmed that the main determinants of the prices on the housing market in Croatia could not be attributed to the characteristics of the items themselves, further step in analysis should be investigating other socio-economic factors. Among such factors, most relevant are labour market differences, regional disparities in income distribution, and other. However, in the context of further liberalization of housing market towards foreign competition, one should also expect that at least some of the product characteristics (specifically location and environmental quality) should continue to play significant role in price determination.

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