

Dwellings' Prices in the City of Lublin. Tendencies and Determinants

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Abstract

The price of real estate is influenced by a number of factors that provoke huge discrepancies in the prices of separate dwellings. The aim of this study is to conduct a statistical analysis of transactions of the dwellings' prices on the secondary market in Lublin in the years 2002–2013. The focus is put on the process of transactions' changes depending on the following criteria: date of transaction, location, technical condition and floor area of dwellings. The relations between abovementioned factors were analyzed. On the basis of the INSPIRE Directive, the data on the sales and transaction prices of 1 m² of dwellings are presented using maps of deviations of the average price in the years 2003–2013 with the city's division into 677 hexagons with the surface of 0,25 ha each.

Keywords: housing market, transaction price, the city of Lublin

JEL: R3

Introduction

Housing environment displays diversification in terms of the organization of urban space as well as the dwelling stock structure. In Poland, there is no any register of property prices, only the register of transactions, therefore it is only possible to recognize the price of a given property by its date of sale. The number of concluded transaction depends on the level of society's wealth, availability of mortgage credits and the interest rates. Real estate is heterogeneous as there do not exist two similar properties, they have to differ at least by their location (Trojanek 2010). The observation of the dwellings is difficult taking into account their modernizations, improvements, technological advances — all this provokes both quantitative and qualitative changes.

The purpose of the study is to present the dynamics of the dwellings' prices changes in Lublin. The analysis has been conducted based on:

- location (geodesic precinct, distance from the city Centre, floor),
- time of transaction (year, month),
- floor area of the dwellings sold, the number of rooms, and
- the number of floors in a building, its year of construction.

Real estate market is a local market (Foryś 2010) related to a given geographical area. The location of the dwellings is the most significant factor (so-called “geospatial factor”). Research in this field seems to find its confirmation in the literature concerning the construction of spatiotemporal models (Zbyrowski 2012). The analysis of real estate in Szczecin (Foryś 2010), in Poznań (Trojanek 2012), and in Łódź (Żelazowski 2010) as well as in the studies showing the price fields and attributes influencing the price of dwellings in Olsztyn (Kuryj-Wysocka and Osiecka 2014; Kuryj and Kuryj 2009).

1 Research method

In order to carry out the analysis, information about transaction prices of separate residential units being the object of transactions in the years 2002–2013 has been collected. According to the

register of prices of the Lublin City Office about 9 400 of such transactions were concluded, the transactions with incomplete data have not been taken into consideration.

The following tests and statistical indicators have been used:

- Kruskal-Wallis test has been applied in order to verify whether between more than two groups there exist any statistically significant difference in terms of variable quotient which dispersion substantially diverges from the normal one. The data in the tables included: M —arithmetic mean, SD —standard deviation, Me —median value, n —group size, H —test value and a significance level p . Because of very strong deviations from the normal range of the variable unit price of 1 m² and because of outlier values of many observations, not only arithmetic mean but also median was used in analyses. It should be mentioned that from particular partial analyses, the ones with incomplete data have been removed, therefore the final results in tables differ. No multiple comparison tests have been conducted as in practice it turned out that almost all groups in case of all independent variables significantly vary.
- Spearman's rank correlation coefficient has been used in order to verify if there exist any statistically significant correlations between variable quotients which range substantially differs from a normal one. The Spearman's rank correlation coefficient takes the values from -1 to 1 . The further the ratio is from 0 , the stronger the correlation. The positive values indicate the fact that the value of one variable increases in parallel with the value of another variable. Similarly, the negative values indicate the decrease of one variable in parallel with the decrease of another variable.

2 Selected determinants of unit price of 1 m² of dwellings in the city of Lublin

At present, Polish real estate market (Kurowska, Kryszk, and Ogryzek 2014) is still not saturated as an average apartment's floor space per capita in the European Union is about 40 m² per person; in big Polish cities it is only 27 m². In Lublin, this number exceeded 25,3 m² per person.¹ Lublin is the city with a considerable number of students which leads to increased housing needs during the academic year. The most popular type of construction is multi-family housing with the dwellings purchased for rent or for own purposes of their owners.

The analysis proved that there exist significant statistical differences related to the dwellings unit price of 1 m² depending on the month of transaction. The highest average prices were recorded in the months from May to October (with medians exceeding PLN 3 900). However, the lowest prices were observed in February ($Me = PLN\ 3\ 559$) and in March ($Me = PLN\ 3\ 642$). In an

Tab. 1. Unit price of 1 m² of dwellings depending on the month of transaction in the years 2002–2013 (in PLN)

Month	n	M	SD	Me
January	718	3 590,64	1 641,31	3 760
February	584	3 388,85	1 542,21	3 559
March	832	3 462,03	1 552,28	3 642
April	805	3 560,29	1 511,07	3 802
May	697	3 726,50	1 510,02	3 955
June	839	3 768,89	1 725,15	3 975
July	901	3 631,00	1 569,26	3 902
August	846	3 727,37	1 442,90	3 935
September	907	3 665,05	1 503,60	3 947
October	805	3 699,82	1 506,14	3 940
November	638	3 646,85	1 465,38	3 841
December	790	3 389,04	1 559,85	3 574
Total	9 362	3 609,76	1 550,80	3 852
Kruskal-Wallis test: $H = 53,970$; $p < 0,001$				

1. [In the journal European practice of number notation is followed—for example, 36 333,33 (European style) = 36 333.33 (Canadian style) = 36,333.33 (US and British style).—Ed.]

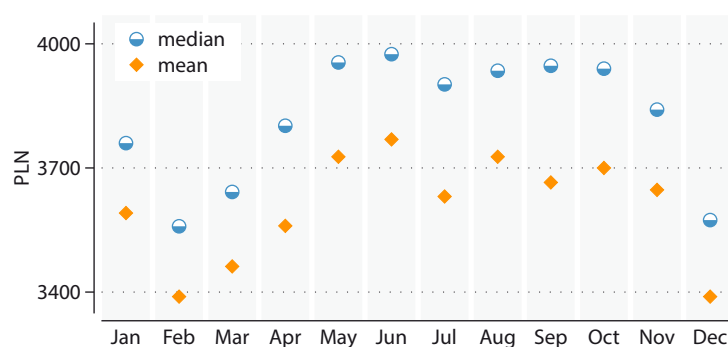


Fig. 1. Unit price of 1 m² of dwellings depending on the month of transaction in the years 2002–2013

academic city, such as Lublin, most of the real estate turnover on the secondary market is generated by the purchase of apartments or by the students who rent property.

The results of the analysis regarding unit price of 1 m² depending on the dwellings' floor were presented in table 2 and figure 2. So as to preserve the order in the analysis, two-floor dwellings were treated as the upper floor. As it turned out, the floor significantly influences the unit price of 1 m². The highest prices were observed for the dwellings on respectively fifth (Me = PLN 4 097) and sixth floors (Me = PLN 4 100). However, median values above PLN 4 000 were noted in case of third floor (Me = PLN 4 018), ninth floor (Me = PLN 4 051) and tenth floor (Me = PLN 4 061). By contrast, the lowest prices were noted in case of dwellings on the ground floor (Me = PLN 3 446).

Tab. 2. Unit price of 1 m² of dwellings depending on the dwellings' floor in the years 2002–2013 (in PLN)

Floor	<i>n</i>	M	SD	Me
0	1 798	3 414,27	1 669,48	3 446
1	2 055	3 496,14	1 646,72	3 693
2	1 757	3 709,82	1 505,54	3 972
3	1 572	3 775,05	1 550,83	4 018
4	946	3 603,40	1 416,62	3 876
5	307	3 868,38	1 381,28	4 097
6	184	3 981,05	1 370,52	4 100
7	170	3 809,26	1 110,02	3 991
8	147	3 805,04	1 075,44	3 892
9	107	3 804,38	1 119,39	4 051
10	104	3 960,72	899,05	4 061
11 or higher	15	4 096,93	714,94	3 923
Total	9 162	3 622,81	1 549,47	3 863

Kruskal-Wallis test: $H = 86,379$; $p < 0,001$

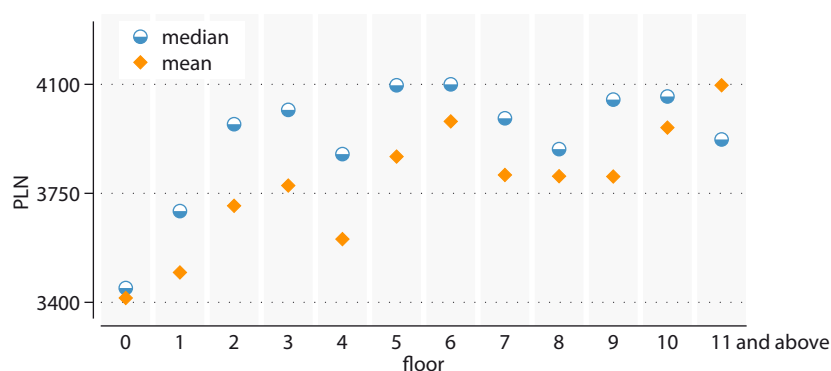


Fig. 2. Unit price of 1 m² of dwellings depending on the dwellings' floor in the years 2002–2013

The prices of dwellings located on the fourth floor are noticeably lower than on second and third floors which is the result of the availability of elevators. In new buildings, developers install elevators to all ground and underground floors with the entrance to the ground floor located on the 0 level. The interpretation of these findings seems to be very difficult due to various height of the buildings and their technical equipment (elevators) in the last 10 years. Developers install elevators available to all the floors, both ground and underground, which diminishes the role of the floor on which the dwellings is located.

In table 3 and figure 3 the results of analysis reflecting the unit price of 1 m² depending on the number of floors in a building have been shown. Substantial statistical differences were noted between the price of dwellings in the buildings of various numbers of floors. The dwellings located on top floor are the most popular. Interestingly, the highest prices were noted in seven-floor buildings (Me = PLN 5 208). The lowest prices were observed in one-floor buildings (Me = PLN 2 043) and two-floor buildings (Me = PLN 2 148).

Table 4 presents the results of the analysis regarding the unit price of 1 m² according to the precinct in which the dwellings is located. Precincts with less than ten transactions in the time examined were not taken into consideration in the study. Due to an important number of precincts, the figure was not prepared. Otherwise, it would be unclear. As it turned out, the highest prices of 1 m² were observed in the precinct of Rudnik (Me = PLN 5 160), Węglinek (Me = PLN 5 129), and Sławinek wieś (Me = PLN 5 082). Median value was close to PLN 5 000 in case of the following precincts: Czechów I (Me = PLN 4 927), Sławinek Helenów (Me = PLN 4 926), and Rury Bonifaterskie (Me = PLN 4 836). By far, the lowest prices were found in the Krochmalna

Tab. 3. Unit price of 1 m² of dwellings depending on the number of floors in a building in the years 2002–2013 (in PLN)

Number of floors	<i>n</i>	M	SD	Me
0	297	2 975,39	1 479,69	2 788
1	53	2 378,70	1 636,43	2 043
2	513	2 471,59	1 944,58	2 184
3	1 157	2 957,82	1 623,37	2 680
4	2 908	3 721,68	1 649,20	3 935
5	2 561	3 870,97	1 317,65	4 121
6	100	4 212,47	1 702,37	4 497
7	72	5 068,21	1 268,66	5 208
8	121	4 095,55	1 379,39	4 348
9	109	3 405,39	1 139,14	3 658
10	140	3 677,21	1 349,96	3 917
11	1 065	3 876,92	1 082,17	4 049
12	266	3 991,84	905,88	4 082
Total	9 362	3 609,76	1 550,80	3 851

Kruskal-Wallis test: $H=755,63$; $p<0,001$

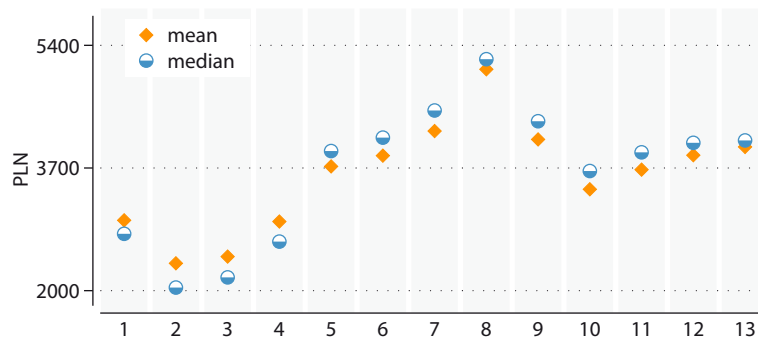


Fig. 3. Unit price of 1 m² of dwellings depending on the number of floors in a building in the years 2002–2013

precinct (Me = PLN 1 364). Medians below PLN 2 000 were noted in the precincts: Stare Miasto (Me = PLN 1 969), Hajdów (Me = PLN 1 935), and Bronowice (Me = PLN 1 855) as well as Felin (Me = PLN 1 706). The highest unit prices were noted in the north-western part of the city. These

Tab. 4. Unit price of 1 m² of dwellings depending on the precinct in the years 2002–2013 (in PLN)

Precinct	<i>n</i>	M	SD	Me
Abramowice	42	3 284,83	1 356,69	3 186
Bronowice	119	2 224,64	1 472,50	1 855
Czechów I	174	4 772,72	2 329,18	4 927
Czechów II	133	4 070,30	1 028,28	4 167
Czechówka Górna - wieś	201	3 870,30	1 004,71	4 089
Czechówka Górna - kolonia	319	4 155,01	876,97	4 213
Czwartek	222	2 737,64	1 431,18	2 450
Dzbenin	32	4 449,56	1 764,70	4 186
Dziesiąta II	236	3 070,30	1 215,26	3 057
Dziesiąta stara	391	2 701,70	1 464,60	2 548
Dziesiąta wieś	40	3 744,48	800,16	3 968
Felin	16	1 890,25	1 021,78	1 706
Hajdów	52	2 407,23	1 036,27	1 935
Kalinowszczyzna	530	3 707,78	1 136,18	3 934
Konstantynów	130	3 921,63	1 567,49	4 291
Kośminek	298	3 345,80	1 427,46	3 767
Krochmalna	72	1 595,01	1 007,36	1 364
Lemszczyzna	232	3 966,59	1 541,78	4 076
Majdan Tatarski	487	3 134,20	1 282,96	3 310
Osiedla LSM	180	4 485,38	978,53	4 622
Piaski	57	2 231,63	1 315,07	2 093
Ponikwoda	70	3 922,21	1 693,52	4 187
Rudnik	41	5 139,12	736,84	5 160
Rury A	67	3 446,04	1 424,48	3 274
Rury Brygibkowskie	731	3 690,31	1 494,80	4 000
Rury Bonifaterskie	597	4 598,07	1 301,88	4 836
Rury Jezuickie	252	4 522,68	1 261,21	4 654
Rury św, Ducha	417	3 469,32	1 461,66	3 776
Rury Wizytkowskie	375	4 252,97	964,98	4 379
Sławinek	123	3 541,50	1 488,47	3 589
Sławinek wieś	132	4 809,36	1 122,55	5 082
Sławinek Helenów	43	4 190,93	1 672,17	4 926
Stare miasto	371	2 506,82	1 556,94	1 969
Śródmieście	726	3 208,64	1 761,54	2 788
Tatary	501	2 871,44	1 210,10	3 105
Wieniawa	157	3 327,95	1 772,73	3 325
Wiktoryn	212	3 448,74	1 486,78	3 123
Wrotków	395	4 362,52	1 204,14	4 473
Węglinek	78	5 321,17	1 215,42	5 129
Sławin-Szerokie	75	4 264,24	1 333,77	4 213
Total	9 326	3 611,70	1 551,83	3 856

Kruskal-Wallis test: $H = 1997,86$; $p < 0,001$

Tab. 5. Unit price of 1 m² of dwellings depending on the distance from the city center in the years 2002–2013 (in PLN)

Zone	<i>n</i>	M	SD	Me
1	845	2 744,39	1 551,12	2 578
2	3 991	3 225,26	1 497,64	3 313
3	1 841	3 861,15	1 356,52	4 111
4	2 474	4 258,54	1 435,40	4 492
5	211	4 547,57	1 520,91	4 668
Total	9 362	3 609,76	1 550,80	3 852

Kruskal-Wallis test: $H = 1105,37$; $p < 0,001$

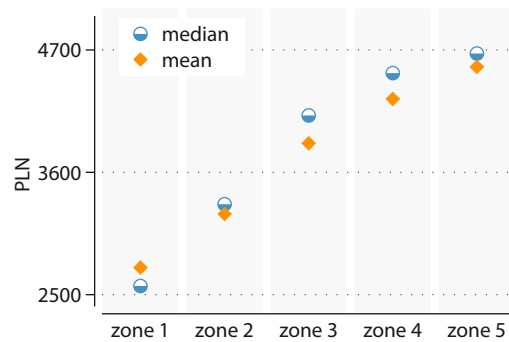


Fig. 4. Unit price of 1 m² of dwellings depending on the distance from the city center in the years 2002–2013

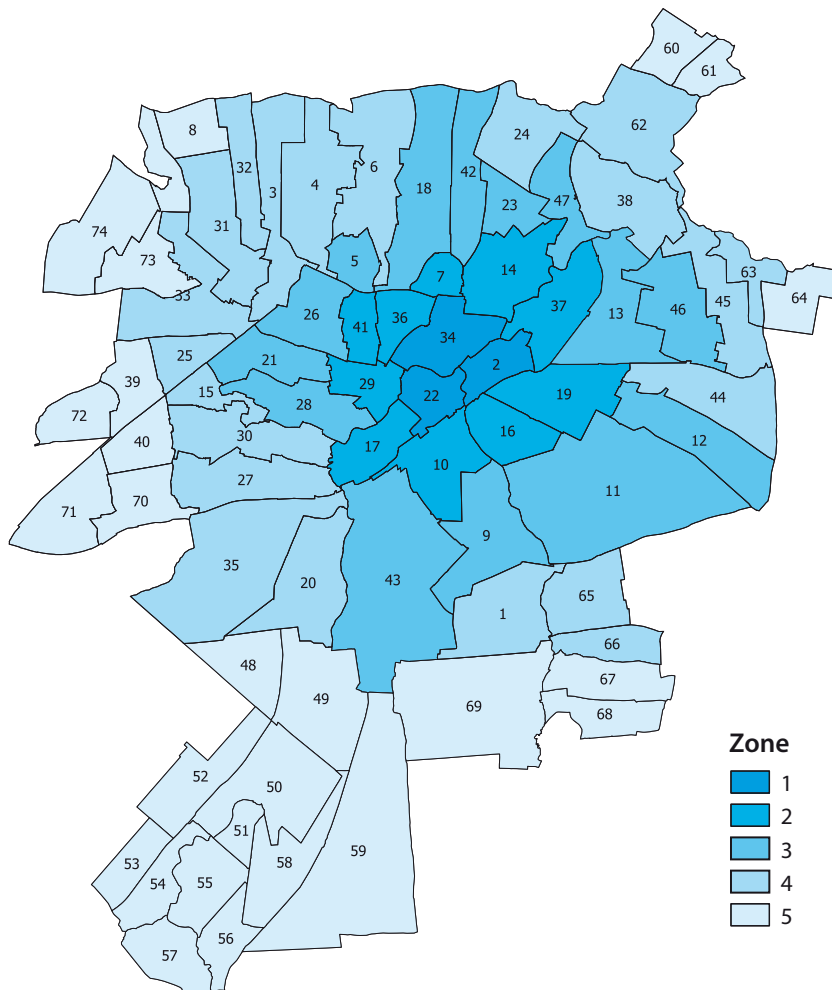


Fig. 5. The location of precincts from the city center

are the areas characterized with the following trend — the further it is from the center, the more expensive and newer are the buildings.

In table 5 and figure 4 the results of the analysis regarding the unit price of 1 m² depending on the distance from the city center have been presented with “zone 1” meaning the very center and “zone 5” — the suburbs. The higher the zone’s number, the further it is from the center. Kruskal-Wallis test clearly proved that the unit prices of 1 m² in each zone vary significantly in statistical terms. One can spot a very noticeable tendency — the further it is from the center, the higher the price is. After 2002, new residential buildings were constructed in the city suburbs enlarging the area of previous housing. In these areas, there is visible a significant increase in the number of inhabitants with a simultaneous creation of road networks, public transport, kindergartens and schools. In the next years, the buildings were constructed which increased the intensity of housing.

Optimal use of space is one of the main assumptions of the idea of a concise city. These assumptions were described in “Krajowa Polityka Miejska 2023.” As it is written: “When planning the development, local governments should act according to the idea of a concise city which — in compliance with the rules of sustainable development — promote a polycentric structure taking the form of dense and multifunctional dwellings supported by pedestrian communication, cycling paths and public transport, with a simultaneous increase in using car transport.”² The sustainable

Tab. 6. Unit price of 1 m² of dwellings depending on the dwellings’ usable floor area in the years 2002–2013 (in PLN)

Usable floor area (in m ²)	<i>n</i>	M	SD	Me
0–25	477	3 002,21	1 861,84	2 532
25,01–30	424	3 323,09	1 773,71	3 045
30,01–35	914	3 524,56	1 606,54	3 712
35,01–40	1 264	3 551,06	1 463,18	3 815
40,01–45	664	3 621,95	1 676,62	3 796
45,01–50	1 865	3 779,83	1 384,71	4 048
50,01–55	861	3 779,47	1 526,39	4 006
55,01–60	754	3 779,44	1 392,70	4 036
60,01–70	1 069	3 697,88	1 370,65	3 927
70,01–80	444	3 541,24	1 491,05	3 741
80,01–90	244	3 462,05	1 570,45	3 370
90,01–100	157	3 768,71	2 566,63	3 424
above 100	225	3 215,83	1 601,43	3 230
Total	9 362	3 609,76	1 550,80	3 852

Kruskal-Wallis test: $H = 146,66$; $p < 0,001$

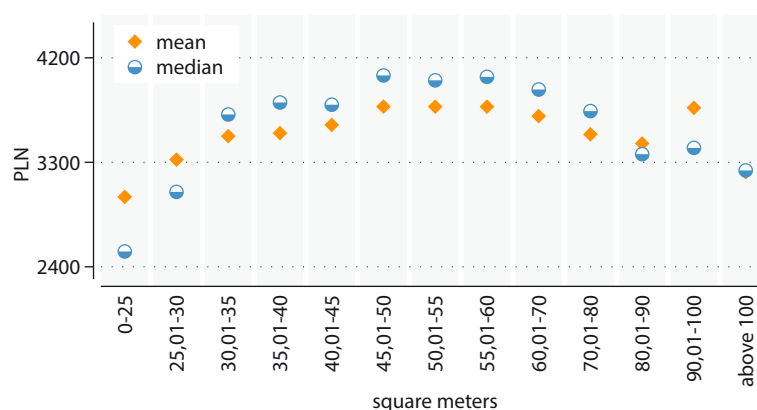


Fig. 6. Unit price of 1 m² of dwellings depending on the dwellings’ usable floor area in the years 2002–2013

2. See: Krajowa Polityka Miejska 2023. Warszawa, październik 2015 r., page 19, [a:] https://www.mr.gov.pl/media/10252/Krajowa_Polityka_Miejska_20-10-2015.pdf.

development rule is an action in favor of natural environment which increases the value of dwellings in the context of housing structure. The studies of the idea of a Concise City were carried out by (Ogrodnik 2015).

Table 6 and figure 6 display the results of the analysis of unit price of 1 m² in relation to dwellings usable floor area. Kruskal-Wallis test clearly proved that the unit prices of 1 m² in each group vary significantly in statistical terms. Definitely, the highest prices were observable in dwellings with the surface from 45,01 to 60,00 m²—with median values exceeding PLN 4 000. However, the dwellings of surface below 25 m² were the cheapest (Me = PLN 2 532).

The dwellings of the following surfaces can be described as follows:

- surface up to 25 m²—dwellings are usually located in the old resources and are the effect of the division of big apartments; according to the law in force at present there is no possibility of designing dwellings of such a surface³
- surface from 45,01 to 60,00 m²—dwellings most desirable among the buyers; their surface allows a fully rational planning the area of 2 or 3 rooms with a kitchen, bathroom and a hall, which makes the price so elevated
- surface above 90 m²—dwellings which are the object of interest for people who resign from buying a detached house in the suburbs; they are usually located on the top floors of old buildings or on the ground floor in the new ones and often have a separated part of a garden attached to the dwellings. High purchase price discourages potential buyers.

Table 7 and figure 7 show the results of the analysis of 1 m² depending on the year of transaction. Kruskal-Wallis test clearly proved that the unit prices of 1 m² in each group vary significantly in statistical terms. The highest prices were noted in 2011 (Me = PLN 4 745), the lowest in 2002 (Me = PLN 1 643). It is clearly visible that in the years 2002–2006 the prices have been slowly but steadily rising. In 2007, a very significant increase took place when the median value rose from PLN 2 494 to PLN 3 711 in comparison with the previous year. In the following years (up to 2011), the prices still have been on the increase with the exception of a slight fall in 2009. In 2011, this tendency reversed and the prices started to decrease. It is difficult to unambiguously define the reasons of such a phenomenon. They are influenced by a number of factors: the surface of housing resources, purchasing power, the ratings, the availability of credits, their costs and changes on financial markets.

Table 8 and figure 8 present the results of the analysis of the unit price of 1 m² according to the year of construction of the building. Kruskal-Wallis test clearly proved that the unit prices

Tab. 7. Unit price of 1 m² of dwellings depending on the year of transaction in the years 2002–2013 (in PLN)

Year	<i>n</i>	M	SD	Me
2002	718	1 603,37	535,66	1 643
2003	500	1 705,82	538,99	1 709
2004	482	1 908,56	657,50	1 892
2005	489	2 142,69	722,32	2 157
2006	704	2 516,77	824,73	2 494
2007	659	3 592,49	1 304,45	3 711
2008	788	4 308,47	1 526,05	4 372
2009	769	4 195,30	1 202,79	4 272
2010	1 046	4 444,26	1 104,16	4 497
2011	1 104	4 659,16	1 174,66	4 745
2012	953	4 500,69	1 119,16	4 572
2013	1 150	4 331,00	1 035,07	4 316
Total	9 362	3 609,76	1 550,80	3 852

Kruskal-Wallis test: $H = 5\,050,87$; $p < 0,001$

3. See: Obwieszczenie Ministra Infrastruktury i Rozwoju z dnia 17 lipca 2015 r. w sprawie ogłoszenia jednolitego tekstu rozporządzenia Ministra Infrastruktury w sprawie warunków technicznych, jakim powinny odpowiadać budynki i ich usytuowanie. DzU z 2015 r. poz. 1422.

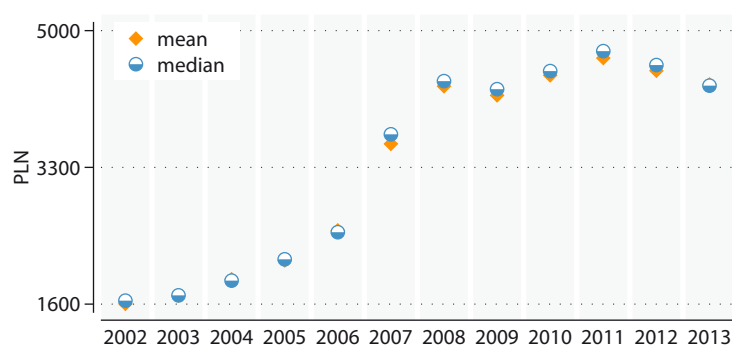


Fig. 7. Unit price of 1 m² of dwellings depending on the year of transaction in the years 2002–2013

of 1 m² vary depending on the year. It is clearly noticeable that the price rises alongside with the year of construction — the newer the building, the higher the price. This dependence is particularly visible in case of dwellings in buildings constructed after 2000, with the median value reaching as high as PLN 5 147. The age of the buildings reflects the following factors: construction technology, built-in materials, standard of finishing. New buildings require only ongoing repairs, however the old ones need renovation and modernization. The lack of ongoing renovations will result in the decapitalization and the reduction of property value.

Tab. 8. Unit price of 1 m² of dwellings depending on the year of construction in the years 2002–2013 (in PLN)

Years of construction	<i>n</i>	M	SD	Me
Up to 1900	258	2 463,64	1 605,46	2 146
1901–1910	220	2 123,04	1 466,39	1 727
1911–1920	223	2 106,41	1 457,91	1 764
1921–1930	172	2 404,98	1 474,87	2 086
1931–1940	273	2 809,64	2 309,28	2 419
1941–1950	83	3 015,28	1 518,39	2 635
1951–1960	1 100	3 217,75	1 525,11	3 040
1961–1970	1 498	3 394,86	1 321,82	3 632
1971–1980	1 159	3 860,36	1 074,44	4 063
1981–1990	812	3 879,95	1 065,48	4 140
1991–2000	944	3 991,88	1 351,22	4 269
2001–2013	1 470	4 919,71	1 282,63	5 147
Total	8 212	3 684,05	1 558,84	3 935

Kruskal-Wallis test: $H = 2\,060,77$; $p < 0,001$

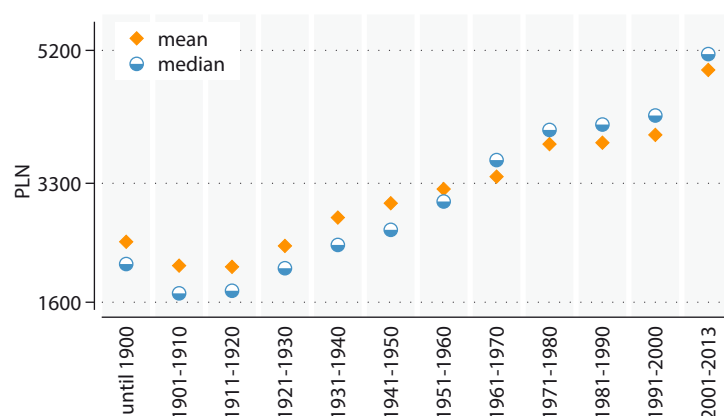


Fig. 8. Unit price of 1 m² of dwellings depending on the year of construction in the years 2002–2013

The results of the analysis regarding unit price of 1 m² depending on the number of rooms were presented in table 9 and figure 9. Kruskal-Wallis test proved that the unit prices of 1 m² vary depending on the number of rooms in dwellings. The highest prices were observed for the dwellings having from 3 to 6 rooms — medians close to PLN 4 000. The dwellings of 1 room only were visibly cheaper (Me = PLN 2 439) as well as the ones with 7 or more (Me = PLN 2 856). Small dwellings, similarly to dwellings of surface below 25 m², most often were created as a result of a division of bigger dwellings or a change of dwellings' way of use.

Tab. 9. Unit price of 1 m² of dwellings depending on the number of rooms in the years 2002–2013 (in PLN)

Number of rooms	<i>n</i>	M	SD	Me
1	211	3 076,43	2 126,92	2 439
2	1 891	3 453,60	1 631,04	3 424
3	3 846	3 782,93	1 491,25	4 072
4	2 357	3 731,22	1 446,27	3 947
5	602	3 632,82	1 268,29	3 817
6	84	3 834,55	1 508,58	3 865
7 or more	29	2 770,07	1 106,12	2 856
Total	9 020	3 671,05	1 522,06	3 906

Kruskal-Wallis test: $H = 101,88$; $p < 0,001$

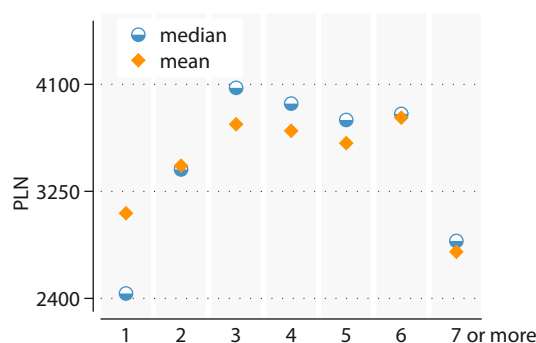


Fig. 9. Unit price of 1 m² of dwellings depending on the number of rooms in the years 2002–2013

3 The analysis of correlations between unit prices of 1 m² and selected determinants

The Spearman correlation ratios of dwellings unit prices for 1 m² and selected determinants were calculated. As it turned out, there exists a moderately strong correlation between the year of construction and the unit price of 1 m². Putting it simply, the “younger” the building, the higher the price. However, there is no linear correlation between the month and the price. One cannot conclude that the price is anyhow influenced by the month. Visible are slight correlations between the floor, usable floor area, the number of rooms and the price. Namely, the higher the floor, the

Tab. 10. The Spearman correlation ratios between the unit price of 1 m² and selected determinants

	<i>n</i>	<i>rho</i>	<i>p</i>
Year of construction	8 212	0,489	< 0,001
Month	9 362	0,016	0,124
Floor	9 180	0,084	< 0,001
Usable floor area	9 362	0,047	< 0,001
Number of rooms	9 020	0,043	< 0,001
Number of ground floors in a building	9 362	0,227	< 0,001
Distance from the center	9 362	0,343	< 0,001
Year of transaction	9 362	0,642	< 0,001

bigger the surface, the more rooms there are, the higher the price. Some slight correlations are also noted between the number of ground floors in a building and the distance from the center. The higher and further from the center the building is, the more expensive it gets. However, definitely the strongest correlation exists between the year of transaction and the unit price of 1 m²—the younger the building is, the higher is the price.

4 Transactions on the secondary market. The spatial aspect

The sale of dwellings in Lublin constituted more than 70% of transactions in the Lubelskie Voivodship. It is the result of the concentration of as many as 36 720 residential buildings in Lublin. The location of these buildings is of various density and is provoked by various environmental factors and functional/spatial structure of the city. The majority of housing is located in the north-western part of Lublin as the area in the western part of the city is rather industrial and the southern part has recreational character and is mostly covered with woodland.



Fig. 10. Road network and residential buildings

In the years 2003–2013, about 8 000 transactions were concluded on the secondary market. However, because of incomplete data, only 7 099 were analyzed. Figure 11 presents 677 hexagons with a number of sale transactions of separate dwellings of 50,75 ha. The lowest number of transactions (1–20) can be observed in 100 areas of 25 ha, in the range of 20–50 transactions, 63 areas of 15,75 ha are noted. The biggest number of transactions was reported in the following districts: Śródmieście, Wieniawa, Kalinowszczyzna, Czuby Południowe, Bronowice, and Tatary. Most visible, 153–204, were the transactions concluded in 6 areas:

- Czuby Południowe: Agatowa, Szafirowa, Opalowa streets, buildings dating 1998–2009
- Wieniawa: Księżycowa, Al. Raławickie, Weteranów, Debois, Długosza streets, buildings dating 1957–1965, 1998
- Wieniawa: Narutowicza, Nadbystrzycka, Muzyczna, Ochotnicza, Strażacka, Głęboka streets, buildings dating 1967, 1970
- Kalinowszczyzna: Lwowska, Walecznych, Podzamcze, Proletariuszy streets, buildings dating 1967–1970, 1987
- Tatary: Odlewnicza, Gospodarcza, Kresowa, Montażowa, Łęczyńska streets, buildings dating 1964, 1998
- Kośminek: Puchacza, Dulęby, Łabędzia, Wierzbowa, Kosmonautów streets, buildings dating 1959, 1965

With slight fluctuations these areas have been depopulating year by year.

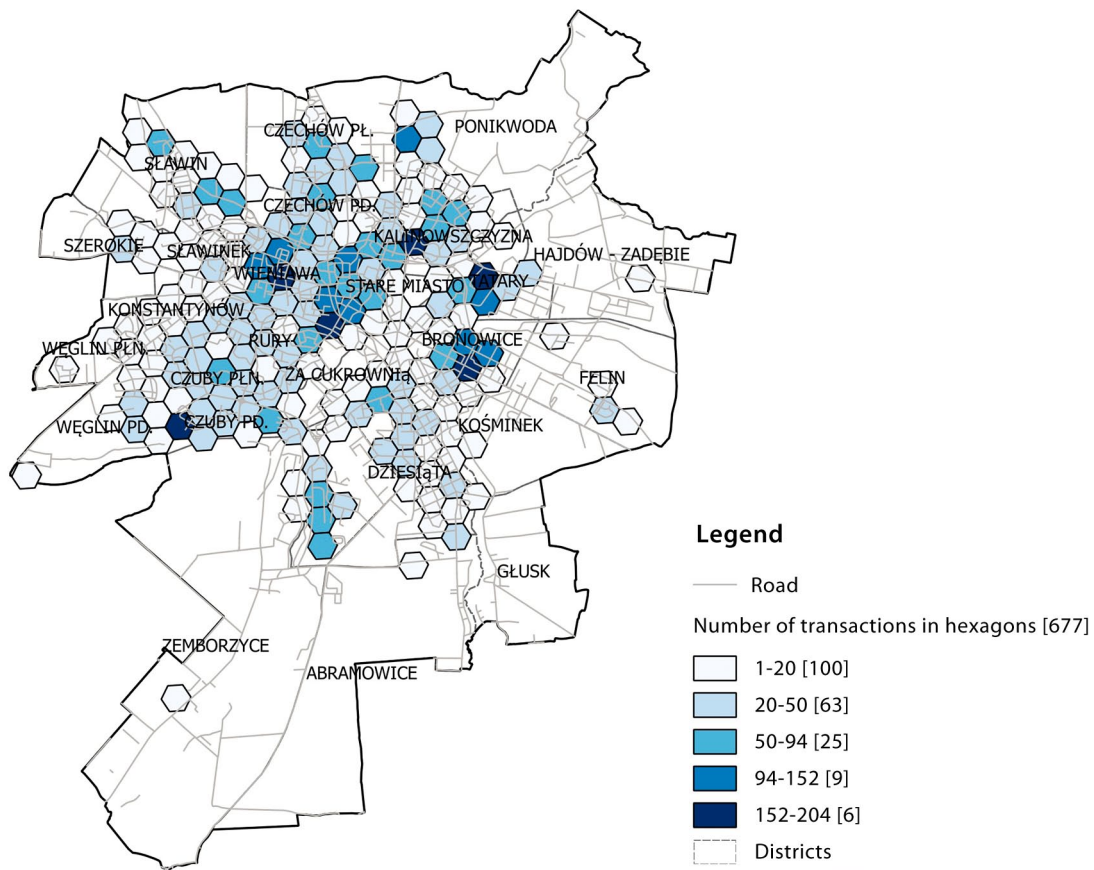


Fig. 11. Number of residential unit transactions in hexagons in the years 2003–2013

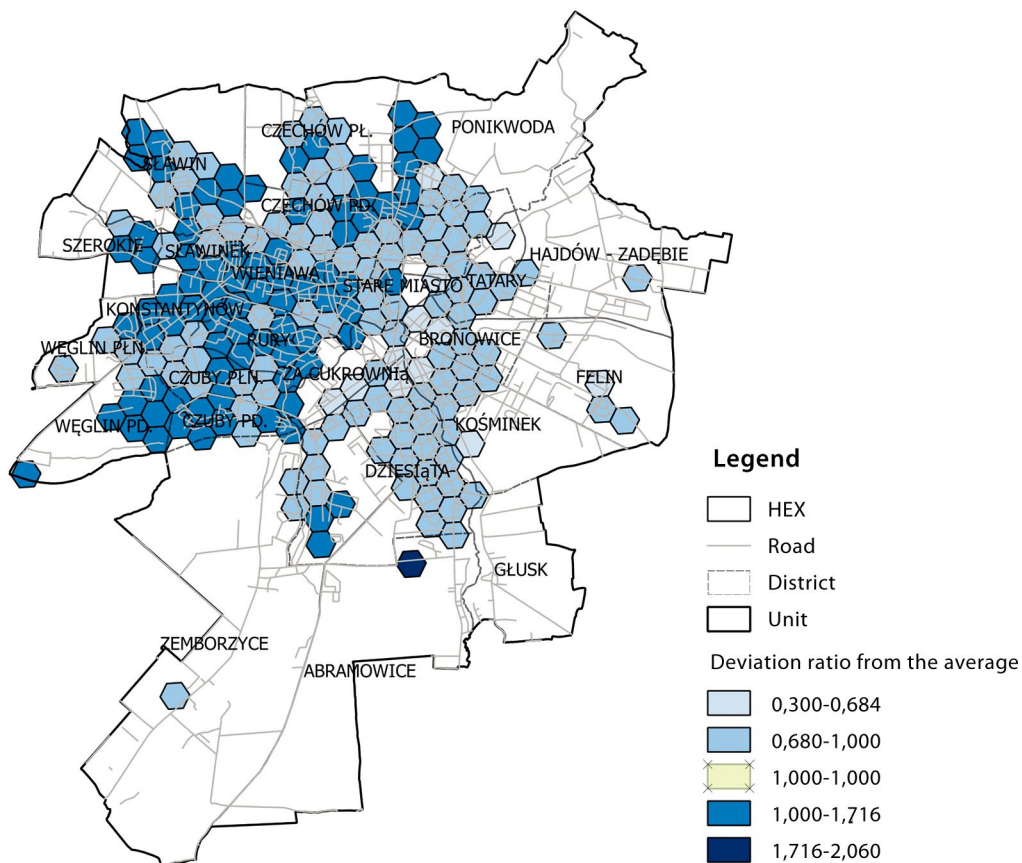


Fig. 12. Comparison of deviation ratio of the average unit price in the years 2003–2013 (in PLN)

Figure 11 shows the abovementioned transactions as a deviation ratio from the average with the assumption of marking the average as 1. The diversification of hexagons is clearly visible—the north-western part of the city is above the average with small areas below the average in the hexagons of a part of Czechów, Czuby and Sławinek; as well as the north-western part being below the average in areas with only few exceptions of Wrotków and Felin districts.

Conclusions

For four last years, the Polish property market has been dynamically developing again. More and more dwellings for sale are constructed by developers. The data published by Polish Central Statistical Office (GUS) indicate that in the three quarters of 2017 compare with the same period of 2016, more than 10% of dwellings were placed on the market in big cities. The buyers purchase them to inhabit them, for rent or to treat them as an investment. The market of primary dwellings influence the price of dwellings on the secondary market. Lublin is one of the cities where the price of 1 m² of the dwellings on secondary market is the highest. Under this criterion, Lublin is preceded only by the following cities: Warsaw, Cracow, Gdynia, Wrocław, Gdańsk and Poznań. Significant changes on the property market are underway since 2000 and their dynamics is still increasing. Until now the property market in Lublin has not been the object of analysis in terms of a number of factors such as the diversification of natural environment or spatial/functional determinants that shaped the actual urban area of Lublin.

There were 209 transactions on primary market in 2003; ten years later this number rose to 1 398. The data describing secondary market are as follows: 504 transactions in 2003 and 955 transactions in 2013 (a double increase). The value of transactions on secondary market was PLN 42,49 million and reached PLN 247,69 million in 2013. The analysis of the transactions of dwellings incorporated factors that considerably influence their price. These factors were determined on the basis of studies in terms of: the location of property, the time of sale (year, month), the surface, the number of rooms and floors in a given building, the year of construction and the dwellings' floor.

Kruskal-Wallis test was carried out and the Spearman's rank correlation was calculated in order to verify whether there exist any important statistical correlations. Data on the dwellings' transactions concluded on secondary market were presented in the form of maps using GIS spatial information. A huge influence was noted related to: the location of the dwellings in terms of transactional value, the dependence of the location in the center of geodesic precincts as well as in hexagons; and transaction date and the year of construction. It was observed that more detailed analyses need to be conducted in terms of: the number of dwellings in a building and the dwellings' floor. Also, it turned out that the data on similar buildings can be useful in the further studies.

The presentation on a map of the deviation ratio of the average unit transaction price in the years 2003–2013 allows displaying the differences according to the location in the north-western part of the city; average prices reach ratios up to 1,5 times above the average with the value of 0,7 in the eastern part.

The analysis indicated a strong correlation between the unit price and the year of construction—the younger the building, the higher the price. Also, the further it is from the center, the more expensive the dwellings gets. The presentation in form of a map of transactions presents the areas where the highest numbers of transactions were concluded. However, these are the areas where their value is below the average.

The spatial presentation of data with the division into smaller, more comparable areas enables the analysis and the study of successive thematic layers of features determining the property price. The presentation of data with spatial information is much more accurate.

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