

THE IMPACT OF CRIME ON RESIDENTIAL PROPERTY VALUE - ON THE EXAMPLE OF SZCZECIN

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Abstract

The decisions of buyers on the housing market are not only the sum of their subjective expectations but also of the perception of real estate through a prism of opinions and suggestions arising from the surroundings. One of the basic criteria driving households determined to meet basic housing needs is security. The aim of the study is to identify the relationship between the transaction prices of housing and the crime rate in the various districts of Szczecin. For this purpose, data from the Regional Police Headquarters in Szczecin (i.e. map of crimes) and transactional data from notarial acts are analyzed in the work. Then, using statistical and econometric models, spatial relationships of the examined crimes are investigated.

Key words: *crime, the real estate market.*

JEL Classification: C19, R21, R52, R58.

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1. Introduction

An apartment is often the greatest material good owned by households. Hence the decision to buy or sell it is important and affects the situation of the family in years to come. Typically, the buyer and seller are focused on the physical qualities of a property. Their decisions in the housing market are the sum of the subjective expectations of buyers, as well as the perception of real estate through a prism of opinions and suggestions arising from the surroundings. One of the basic criteria which drive households when buying a flat is the sense of security. The location of an apartment in districts with a bad reputation, in neighborhoods with higher levels of social pathology, is associated with the risk of social problems (FRYSZTACKI, 2000), including the intensification of crime (SKIBA, 2013). Price is the most important factor behind the choice of residential location. Other factors identified by the respondents included the sense of security and a quiet neighborhood (ŻRÓBEK, 2015). Apartment prices in a specific area are strongly affected by crime in its neighboring zones, regardless of the type of crime (CECCATO et al., 2011). For example, the Chicago School of Sociology has, since the 1920s, emphasized the impact of the spatial distribution of areas of social pathology on the development of social relations and the formation of urban structures in cities (CZEKAJ, 2007).

The feeling of safety and security is a supreme human need, and its absence causes anxiety and may evoke a sense of danger. Satisfying the need for security is an integral part of human existence. According to A. Maslow, the sense of security is a basic human need. According to research of the Public Opinion Research Centre (CBOS) conducted in April 2012, 66% of Poles considered Poland to be safe (Opinions on safety...). At the same time, there was a decrease (down to 57%) in the percentage of respondents (N = 1,192 respondents) who were satisfied with the functioning of law enforcement agencies.

In this context, even though the topic of crime in cities is of interest to various disciplines, such as criminology, sociology and geography, references to the real estate market are seldom. The investigated subjects cover, e.g., the impact of crime on the development of social relations, the strengthening of social exclusion or the structural transformation of the urban fabric. Nonetheless, in their research, authors rarely assume debates on the consequences of these transformations, that is the degradation of the urban space as a result of the escape of law-abiding people from areas at risk of crime to safer neighborhoods (FORYS, 2013).

On the other hand, "better" and richer districts attract property crime, especially car theft, or theft of goods from apartments and houses. Studies related to crime most frequently focus on social aspects, socio-demographic changes in certain urban areas, or on providing a diagnosis of crime. They do not, however, analyze the impact of these phenomena on the local real estate market, and especially the housing market. Its condition and potential is also included in social phenomena (FORYS, 2011). However, in the analysis of the housing market, the safety factor is rarely taken into account as a criterion influencing the market value of housing (CELLER, KURYJ, ŻRÓBEK, 2005), (WENTLAND et al., 2014).

The aim of this article is to identify and assess the relationship between the transaction price of housing and the crime rate in areas managed by different police headquarters in the city of Szczecin, Poland. The authors wish to test the hypothesis that high crime rate in a given neighborhood negatively affects the turnover of flats in the secondary market, i.e., following an increase in crime in an area, the popularity of this location and the unit price of housing fall.

2. Crime in urban areas

The topics discussed in this work fall within the area of interest of criminology. However, the high level of fear connected with crime is not only a criminological but, primarily, a social and political problem. The decline in safety coincides with the deterioration of the living conditions of the population but also reduces trust in the police and judicial system. Research on crime is often correlated with research on demoralization, social derailment and social pathology.

Based on police statistics, an attempt can be made to determine the size of crime in relation to (BŁACHUT, 2007) :

- 1) recorded crime - that is, the number of social acts registered and pre-qualified as crimes by the law enforcement agency,
- 2) ascertained crime - that is, the number of acts for which their prequalification as crimes is ascertained by law enforcement agencies,
- 3) detected crime - that is, the number of acts for which their prequalification as crime is confirmed and their probable perpetrators are identified.

Crime figures obtained from the Regional Police Headquarters include registered crime, referring to so-called ordinary crimes. The concept of an ordinary crime/offence is used in police statistics; it is not a category of criminal law and does not comprise crimes that belong to different categories in the Polish penal code. Ordinary crimes form a category largely overlapping with crimes of violence, arousing higher levels of fear. In this article, common crimes include: larceny, such as car theft and break-ins to homes, shops, basements and attics, as well as other objects. Moreover, this category also covers fights and beatings, robbery, theft with assault, criminal coercion, willful short-term theft of automobiles and property damage.

In large urban areas, police activity is subject to regionalization into police headquarters and stations. Szczecin is divided into five such police stations (Polish: *Komenda Policji KP*)/districts, shown on (Map 1) :

- 1) Śródmieście (KP Śródmieście),
- 2) Niebuszewo (KP Niebuszewo),
- 3) Pogodno (KP Pogodno),

- 4) Nad Odrą (KP Nad Odrą),
- 5) Dąbie (KP Dąbie).

The areas encompassed by these police headquarters are very diverse, both in terms of the surroundings and the population size and number of dwellings. The largest surface area falls under control of KP Dąbie and covers the entire right-bank of the City of Szczecin.



Map 1. Territorial division of Szczecin into the areas of operation of five police headquarters/stations.

Source: www.bip.szczecin.kmp.policja.gov.pl [access: 10.07.2016].

When looking at the population size, the largest percentage of the city's population lives in the area of KP Pogodno (over 96,000 inhabitants). KP Dąbie covers an area of 81,000 inhabitants, while the remaining four police stations serve a total of 285,990 of the city's population. It is worth mentioning that, since the early 1990s, a linear decrease in the city's population has been observed (www.bip.um.szczecin.pl/chapter_50049.asp [access : 07.10.2016]). At the same time, the age structure of the population is changing towards the dominance of an aging population (Figure 1), which undoubtedly affects both the level of insecurity as well as the scale of crime in the city.

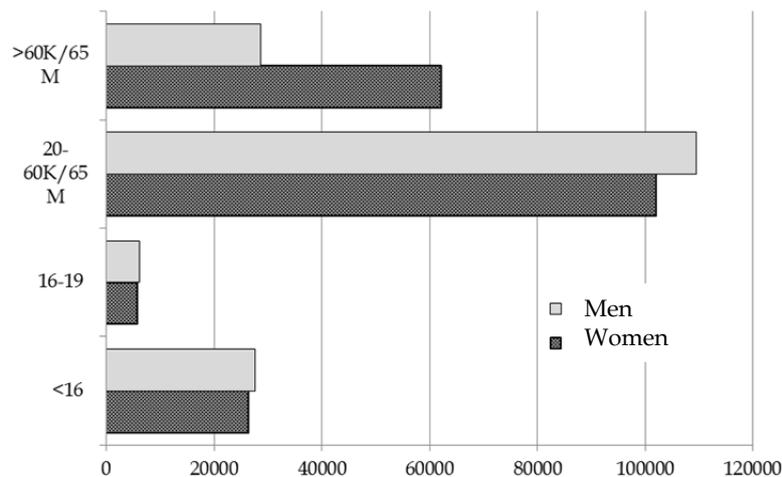


Fig. 1. Population structure in Szczecin by age and sex (as of 10-07-2016). Source: own calculations based on www.bip.um.szczecin.pl/chapter_50049.asp [access: 10.07.2016].

Minors under 18 years of age account for 16.2 % of the total population of Szczecin. Juveniles are a group that is often involved in property crimes. In 2012, the acts committed by juveniles accounted for 8.4 % of all crimes recorded in Poland (Report on the state of security...) and this number is increasing. Persons aged 19 to 65 years in the case of men and 19 to 60 years in the case of women comprise the largest population group. In addition to changes in the population age structure, there has been also a noticeable decrease in the number of inhabitants living in Szczecin on a permanent basis. The decline from 402,000 in 1997 to 368,000 permanent residents in 2016 illustrates an unfavorable demographic phenomenon, but can also be an indirect cause of a decline in the number of reported crimes.

Analysis of data provided by the Regional Police Headquarters in Szczecin regarding crimes committed in the period 2009-2015 (according to the various categories; the so-called "map of crimes") shows a downward trend for crime in Szczecin (Fig. 2).

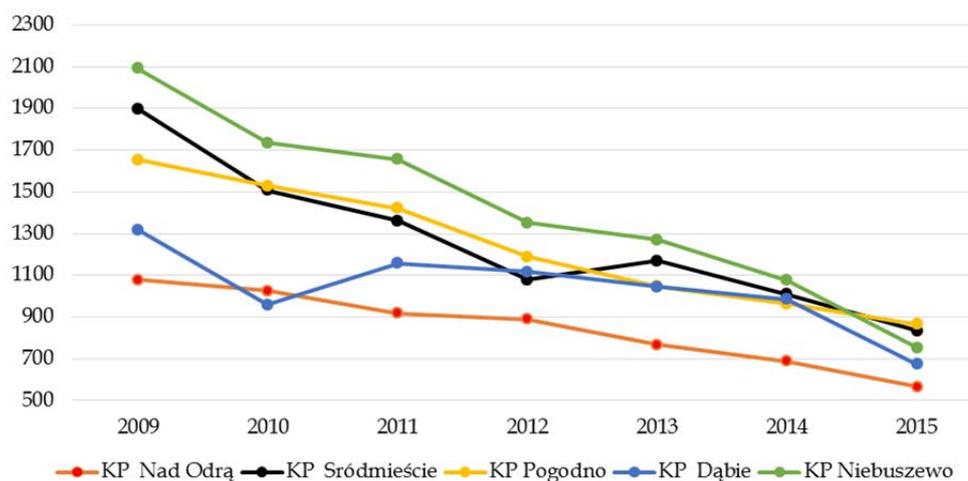


Fig. 2. Evolution of the number of crimes/offenses committed in Szczecin in the areas of operation of particular police stations of Szczecin. *Source:* own calculations.

In the analyzed period (2009-2015), 40,640 crimes were recorded in Szczecin. In this time interval, the number of crimes in Szczecin was decreasing every year by more than 12% on average. The largest decrease is seen in KP Pogodno and amounted to more than 15.5% per annum. The second largest decline in the number of crimes was recorded in the area controlled by KP Niebuszewo. In other areas, the number of crimes decreased by approximately 10% per year (Table 1).

Table 1

The number of crimes/offenses in individual police station districts of Szczecin (per 1000 persons)

Year	Police Station / Districts				
	KP Dąbie	KP Nad Odrą	KP Śródmieście	KP Niebuszewo	KP Pogodno
2009	19.22	24.65	20.74	24.18	21.72
2010	17.78	23.42	15.1	19.21	18.02
2011	16.5	20.97	18.22	17.36	17.19
2012	13.82	20.29	17.58	13.75	14.04
2013	12.17	17.5	16.48	14.9	13.19
2014	11.2	15.7	15.51	12.87	11.16
2015	10.07	12.91	10.62	10.62	7.81

Source: own calculations.

Within the area of KP Pogodno, crime in the investigated time period fell by almost 14 crimes per 1,000 residents. A very large drop in crime was also observed in KP Niebuszewo: a decline of around 13.5 crimes per 1000 residents. In 2015, the safest area was the area under the jurisdiction of KP Pogodno, with an index of 7.81 crimes per 1,000 inhabitants, despite the fact that, in previous years,

the area of KP Dąbie seemed safest. Looking at the types of crime, the safest districts of Szczecin are: in terms of robberies - the area of KP Nad Odrą, and the district of KP Śródmieście when burglaries to dwellings are considered (Table 2).

Table 2

The number of robberies and burglaries to dwellings in individual police station districts in Szczecin

Police Station / Districts	2009	2010	2011	2012	2013	2014	2015
Number of robberies							
KP Nad Odrą	32	21	19	14	13	5	5
KP Śródmieście	79	53	65	54	41	40	28
KP Pogodno	40	26	37	20	12	13	10
KP Dąbie	40	28	25	24	29	18	16
KP Niebuszewo	96	52	78	72	40	33	28
Number of burglaries to dwellings							
KP Nad Odrą	43	46	54	55	47	47	47
KP Śródmieście	33	29	28	25	27	15	21
KP Pogodno	65	50	86	69	96	79	49
KP Dąbie	70	58	76	56	65	53	49
KP Niebuszewo	64	50	46	47	41	33	35

Source: own calculations.

The least safe area in terms of robberies is the area of KP Niebuszewo, having already had a bad reputation among the residents of Szczecin for decades. In Niebuszewo, typical housing are municipal tenement dwellings in the quarters of pre-war buildings. These dwellings are inhabited by less prosperous households. On the contrary, Pogodno District is dominated by low-rise residential buildings and multi-family housing, and households that tend to have a higher economic status. It is a very well-regarded area of the city, which is associated with a high rate of domestic burglary.

3. Trade on the secondary property market in Szczecin

The present study encompassed the empirical investigation of notarial sales agreements issued for the sale transactions of apartments from the secondary market in the time period 2009-2015. Within this time, 17,805 notarial deeds for housing purchases were contracted. In order to compare areas of activity of individual police departments with the patterns of trade in these transactions, apartments were assigned to the five areas coinciding with the districts managed by particular police stations.

In the analyzed period, a division into two groups can be seen when looking at the number of concluded notarial deeds. The first of them comprises two regions, i.e. Pogodno KP and Niebuszewo KP, with a total of 600-900 transactions per year in 2009-2015. The second distinguished group is formed by regions of activity of the remaining police stations in Szczecin, i.e.: KP Nad Odrą, KP Śródmieście and KP Dąbie, with a total of 200-600 transactions per year in 2009-2015 (Fig. 3).

Overall, the highest number of contracts were signed in 2012 in the area of the KP Pogodno (900), while the fewest, in 2009, in KP Dąbie (233). The number of concluded contracts is connected with the population density of an area. In 2015, the highest incidence of transactions per 1000 inhabitants was recorded in the area of KP Niebuszewo (10.7), followed by KP Nad Odrą, KP Pogodno (8.6), and KP Śródmieście (7.5), whereas in the area of KP Dąbie, the number of housing sale/purchase agreements was the lowest (3.5). The greatest interest among buyers is observed in the area of KP Pogodno, which is one of the oldest districts of Szczecin. It is also the most popular area among developers, where a generational change is currently taking place.

In 2010, in Szczecin, a recovery in the housing market can be noticed. The number of housing sale/purchase agreements increased in all of the areas. The biggest jump was recorded in the area of

operation of KP Nad Odrą, where the number of transactions per 1000 inhabitants increased by 100%. This is also the area where the greatest number of transactions per 1000 inhabitants was reported.

The popularity of the city is also related to the level of transaction prices. Assuming the earlier indicated division of the city of Szczecin into five areas, it can be observed that the average unit prices in the years 2009-2015 were the highest in the area of KP Nad Odrą, which included popular districts of the city, such as: Osów, Warszewo enclaves of modern detached houses, and multi-family housing development (Fig. 4).

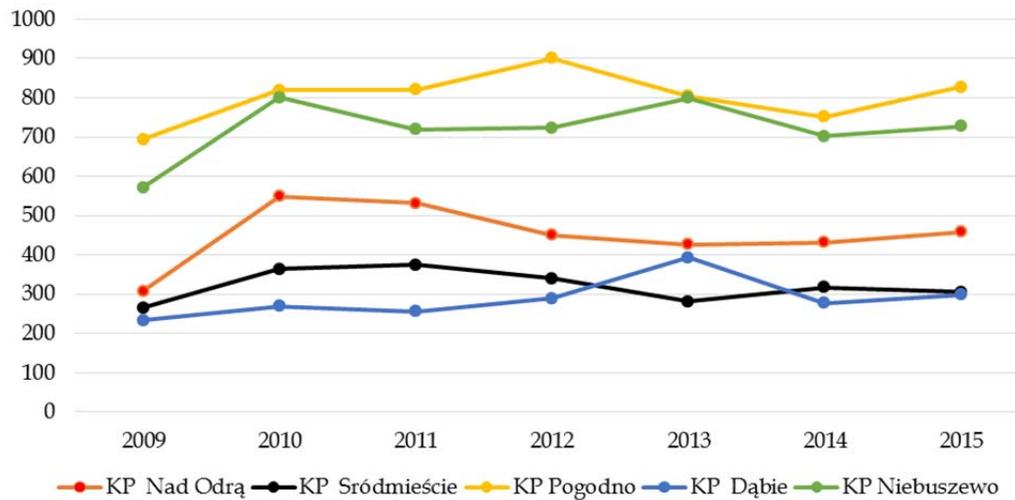


Fig. 3. Dynamics of the number of sales contracts of apartments divided into areas of operation of particular police stations of Szczecin in 2009-2015. Source: own calculations.

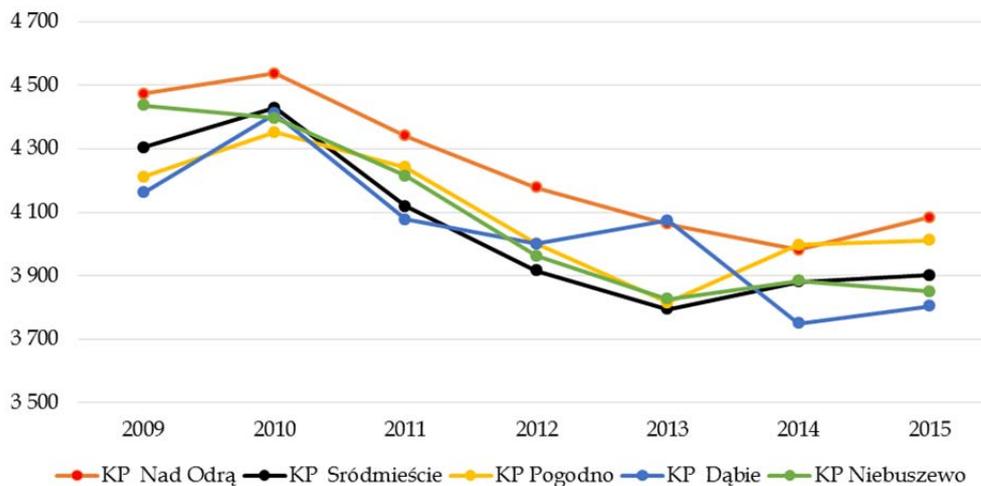


Fig. 4. Dynamics of changes in the average unit price of sold apartments divided into the area of operation of particular police stations of Szczecin in the years 2009-2015 (PLN/m²). Source: own calculations.

In the analyzed period, the average apartment price per 1 m² of floor area fell in the range from 3,700 PLN to 4,700 PLN, with 75% of contracts in 2009-2015 with prices not exceeding 5,140 PLN/m², and half of the transactions concluded for an amount lower than 4,542 PLN/m² (Tab. 3).

Table 3

Descriptive statistics of transactional sales price of housing in individual police station districts of Szczecin

Years	2009	2010	2011	2012	2013	2014	2015
KP Dąbie							
Average	4 295	4 287	4 179	3 968	3 813	3 966	4 015

Mean	4 211	4 353	4 242	4 000	3 815	3 997	4 012
Quartile 1	3 395	3 869	3 751	3 463	3 368	3 459	3 536
Quartile 3	4 782	4 786	4 738	4 480	4 290	4 473	4 496
KP Nad Odrą							
Average	4 534	4 529	4 344	4 052	3 927	3 905	4 004
Mean	4 473	4 538	4 341	4 179	4 063	3 981	4 084
Quartile 1	3 749	4 085	3 981	3 506	3 523	3 468	3 523
Quartile 3	5 117	5 008	4 768	4 600	4 387	4 396	4 476
KP Śródmieście							
Average	4 231	4 273	4 085	4 020	4 048	3 833	3 766
Mean	4 162	4 411	4 078	4 000	4 074	3 750	3 804
Quartile 1	3 445	3 763	3 673	3 467	3 378	3 275	3 139
Quartile 3	4 736	4 803	4 576	4 478	4 779	4 499	4 379
KP Niebuszewo							
Average	4 244	4 368	4 034	3 913	3 684	3 804	3 772
Mean	4 304	4 429	4 119	3 916	3 795	3 880	3 901
Quartile 1	3 774	3 850	3 460	3 485	3 217	3 288	3 247
Quartile 3	4 707	4 837	4 545	4 314	4 170	4 346	4 344
KP Pogodno							
Average	5 498	4 374	4 198	3 978	3 840	3 890	3 834
Mean	4 438	4 398	4 215	3 962	3 826	3 884	3 850
Quartile 1	3 773	3 863	3 658	3 395	3 334	3 498	3 278
Quartile 3	5 140	4 922	4 699	4 542	4 373	4 327	4 416

Source: own calculations.

In the next step, in order to determine the impact of the number of crimes and offenses on the price of 1 m² of usable area of housing, a trend of power series was estimated (Fig. 5). The choice of this trend as a function is the result of two conditions. The visible change in prices over time is characterized by two trends: a decreased rate from a high pace in the years 2009-2013 and a linear rate increase in 2013-2014. The division into two price indices leads to similar results as the proposed estimate using the power function ($R^2 = 81.93\%$). The exponent of the power function indicates the annual change in prices, while the power symbol denotes a downward trend.

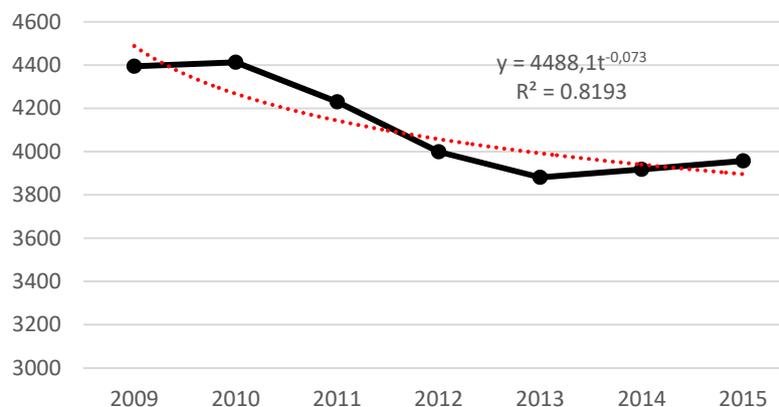


Fig. 5. Dynamics of changes in the average unit price of apartments sold in Szczecin (PLN/m²). Source: own calculations.

In the years 2009-2015, prices on the residential real estate market in Szczecin were falling from year-to-year, on average by 0.07%. However, it should be emphasized that, in 2014 and 2015, a slight increase in prices could be observed. Figure 6 depicts the dynamics of the average transaction prices of apartments in five areas of the city managed by different police stations distinguished in the analysis, adjusted by the ratio determined above the annual price changes.

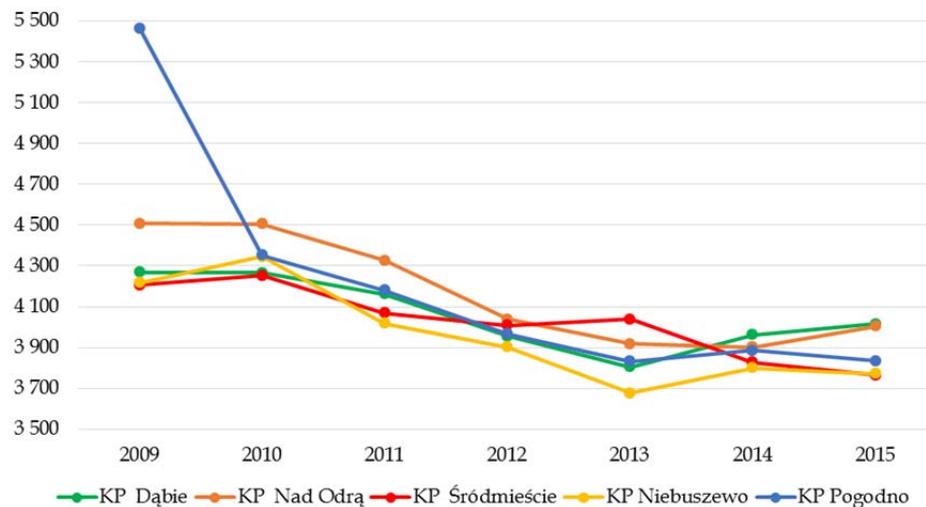


Fig. 6. The dynamics of the adjusted average unit price of apartments sold in different areas of operation of particular police stations in Szczecin (PLN/m²). *Source:* own calculations.

The biggest drop in prices, especially in the years 2009-2010, was recorded in the area of KP Pogodno. This is the effect of rapid price increases: the so-called price bubble in the period of economic boom in this highly-acclaimed district. As a result, in 2009, the beautiful pre-war residences in the historical area of Pogodno underwent a change of ownership. Consequently, a re-evaluation of the location took place, which resulted in drastic price declines in the following years (BATÓG, FORYŚ, 2014). In other areas, prices dropped until 2013, except for the area of KP Śródmieście, where the price decline had already stopped in 2012. Afterwards, slow price growth occurred in most parts of Szczecin. Finally, in 2015, the average unit prices in Szczecin on the secondary market stabilized within the range of 3,700 to 4,100 PLN m², marking the lowest price level since 2005.

4. Pattern analysis in terms of interdependencies between the incidence of crime and transactions on the secondary housing market

The descriptive statistics presented in the previous chapters of the transaction price of 1 m² according to areas of operation of individual police stations in Szczecin allowed for estimating the trend in the average price of 1 m² of housing in Szczecin. Furthermore, based on this calculation, the impact of the downturn of housing prices (Fig. 6) was eliminated. In the next step, this procedure enables us to evaluate the relationship between the occurrence of crime of a specific type and the activity of the secondary housing market, measured by the average transaction price of housing in the area (Tab. 4).

Regarding the crime types, the term "theft with burglary to dwelling" occurs when the perpetrator takes the property in order to appropriate it as a result of the removal of a physical obstacle, which is part of an enclosed space structure or special construction that protects access to the property (CURYŁO, 2011). However, the burglary is not always related to physical damage or to the destruction of barriers limiting access to properties, e.g., it can be performed with the use of an earlier stolen key.

Then again, thefts to dwellings might take place when there is no burglary, because the perpetrator is, e.g., admitted voluntarily to the apartment by the owner, e.g., under the guise of meter reading or when intruders do not violate obstacles such as, e.g., front doors, but instead enter the apartment through an open window.

Based on the results obtained in the analysis, it can be stated that, in most cases, there is a strong association between crime and housing prices in the investigated areas. In the case of theft with burglary and thefts to dwellings, a weak negative relationship between these quantities can be observed in two areas: that of KP Nad Odrą and KP Niebuszewo. These are the areas that are only now undergoing a gentrification process (FORYŚ, 2013), that is, the displacement of local communities

by the influx of wealthier population groups into new housing investments. Therefore, criminal groups may not yet be attracted to these areas. The contrary is true in the area of PS Śródmieście and PS Pogodno, where the correlation is high and positive. The increase in housing prices in these areas leads to a rising incidence of apartment burglaries and thefts.

Table 4

The correlation between the average unit price of apartments (PLN/m²) within a particular police station district and the number of crimes and offenses by type (per 1,000 inhabitants)

Police Station /Districts	Theft with burglary to dwelling	Theft to dwellings	Fights and beatings	Robbery and theft with assault
KP Nad Odrą	-0.493	-0.260	-0.508	-0.813
KP Niebuszewo	-0.235	-0.279	0.473	-0.153
KP Dąbie	0.489	0.523	0.850	0.341
KP Śródmieście	0.647	0.794	0.855	0.879
KP Pogodno	0.858	0.528	0.944	-0.250

Source: own calculations.

What stands out is the relationship between the location of the property and the number of fights and beatings. In districts inhabited by affluent households, one could expect no strong (and esp. positive) relationships between the two variables. However, only in the district of KP Nad Odrą does a rise in housing prices cause a statistically significant decrease in fights and robberies, whereas in other parts of the city, this relationship is strong and positive (in KP Pogodno - close to linear). Naturally, this dependency may result from other factors, such as the location of various non-residential facilities, such as entertainment centers, pubs and restaurants, etc. and not merely be a simple consequence of the nature and wealth of the population living in a particular area.

In the case of robbery and theft with assault, a strong negative correlation exists in the area of KP Nad Odrą (-0.813), which corresponds with the presented view that the replacement of the population in a given area and the influx of new, socially more valuable households improves the status of an area and reduces crime in this territory. A high and positive correlation coefficient in KP Śródmieście results from the concentration of social pathologies and extensive multi-family municipal housing in the city center. Here, the higher housing price is the consequence of the central location in the city and decisions on the housing market not usually being determined by security levels. The destructive behavior of inhabitants of municipal houses transformed into residential communities tends to become a daily problem for homeowners detected only after buying an apartment.

The relationship between the number of transactions and the number of crimes turned out to be statistically significant only in a few cases (Tab. 5).

Table 5

The correlation between the number of transactions in the particular police station districts and the number of crimes by type (per 1,000 inhabitants)

Police Station /Districts	Theft with burglary to dwelling	Thefts to dwellings	Fights and beatings	Robbery and theft with assault
KP Nad Odrą	0.522	0.224	0.343	0.484

KP Niebuszewo	-0.229	-0.440	-0.249	-0.259
KP Dąbie	-0.001	0.378	-0.181	0.060
KP Śródmieście	-0.246	-0.227	-0.338	0.771
KP Pogodno	-0.615	-0.008	-0.008	0.307

Source: own calculations.

A growing number of thefts with burglary to dwellings, robberies and thefts with assault are positively and significantly correlated with an increase in the number of apartment purchase transactions in the area of KP Nad Odrą. In the event of an increase in thefts with burglaries to dwellings, the number of transactions significantly decreased in the area of KP Pogodno. Theft in dwellings are common in the highly urbanized areas inhabited by the elderly, who, unaware of the danger, let intruders and scammers enter their apartments. There is, therefore, no direct causal link with the number of transactions. Similarly, it may be challenging to correctly interpret the high positive correlation coefficient determined for the area of KP Śródmieście. It can be deduced that the high turnover of residents (a large number of transactions) favors robberies and thefts with assault.

Arriving at more far-reaching conclusions, however, requires more detailed research, including the narrowing of areas of the occurrence of crime to smaller units.

5. Conclusions

The aim of the study was to verify the idea that the sense of security is such a strong determinant of the decision to buy an apartment that buyers may discredit neighborhoods with high crime rates, which could be observed both in the number of transactions as well as the price of the apartments. The available data on crime in Szczecin shows that areas with low-priced apartments connected with their location (transaction price) coincide with areas of increased crime of a non-pecuniary nature. Apartment burglaries, on the other hand, are the domain of either heavily-populated areas or those perceived as elite and exclusive.

On the premises of police districts KP Nad Odrą and KP Niebuszewo (areas of the city with a bad reputation), the increase in crime rates causes a decrease in unit prices of apartments on the market. In the area of operation of the other three police stations, a rise in housing prices is associated with a subsequent increase in property crime (e.g. dwelling theft), which is mostly the result of the increased number of new households with higher incomes (the effect of gentrification). Thus, the increase in "the value" of location corresponds with a decrease in the number of robberies but, at the same time, tends to result in a higher number of property crimes.

Although in the period 2009-2015 the total number of crime and offenses committed in Szczecin dropped twofold (among others as a result of extending the monitoring in the city), crime rates are so high, that this translates into a good or bad perception of a given location of an apartment. Therefore, it is important that the undertaken study be continued in order to follow this phenomenon and gain a better understanding of it. Henceforth, the authors plan to further investigate both the location of crime as well as its impact on the local housing market.

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