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# Analysis of demand and supply of residential properties on the secondary market in Opole

## Analiza popytu i podaży nieruchomości mieszkaniowych na rynku wtórnym w Opolu

### ABSTRACT

The article presents the structure of supply and demand in Opole between June 2022 and December 2022. The influence of property market characteristics on the unit price of a residential unit is also demonstrated. The research was conducted on the secondary market, utilizing data from residential property sales offers on online portals and completed transactions from the Real Estate Price Register during the study period. The analyses showed that demand and supply were not in equilibrium in the market during the study period. Of the market characteristics of the properties examined, floor area showed the most significant influence on price. However, the type of building also showed a high correlation. In contrast, the presence of an accessory room did not have a significant impact on the unit price of a dwelling.

### STRESZCZENIE

W artykule przedstawiono strukturę podaży i popytu na terenie miasta Opole w okresie od czerwca 2022 roku do grudnia 2022 roku. Wykazano także wpływ cech rynkowych nieruchomości na cenę jednostkową lokalu mieszkalnego. Badania przeprowadzono na rynku wtórnym, a do analizy wykorzystano dane pochodzące z ofert sprzedaży nieruchomości lokalowych z portali internetowych oraz danych dokonanych transakcji z Rejestru Cen Nieruchomości w badanym okresie. Analizy wykazały, że w badanym okresie popyt i podaż nie były w stanie równowagi na rynku. Z badanych cech rynkowych nieruchomości powierzchnia użytkowa wykazała największy wpływ na cenę. Natomiast wysoką zależność wykazał też rodzaj budynku. Natomiast występowanie pomieszczenia przynależnego nie miało znacznego wpływu na cenę jednostkową lokalu mieszkalnego.

**Keywords:** property market, property market characteristics, demand, supply.

### INTRODUCTION

Residential property plays a key role in the real estate market, and in fact, it is the primary market for the marketing of these properties. Nowadays, especially in European countries, housing is an asset that belongs to every human being and represents a significant consumption challenge, as real estate is ranked among the most expensive goods. Housing and other forms of real estate satisfy human needs and represent a tangible asset that serves as a form of security and an object that can generate income. Demand and supply are influenced by numerous factors that shape the real estate market. These two factors also have an

impact on various economic and business aspects and are, to some extent, interdependent.

More than 500,000 real estate purchase/sale transactions were recorded in 2022, of which 48% of the transactions recorded in the real estate price registers kept by the County Offices concern residential properties. In the secondary market, there has been an increase in signed deeds for purchase/sale transactions. This indicates that the country is experiencing economic and social development, and that an increasing number of the population can afford to purchase their own homes.

The law, and in particular the Civil Code, defines the concept of real estate as "a part of the earth's surface constituting a separate object of ownership (land), as well as buildings permanently connected to the land or parts of such buildings, if under specific provisions they constitute an object of ownership separate from the land" (Ustawa z dnia 23 kwietnia 1964 r. – Kodeks cywilny [Polish Civil Code], 2022, art. 46 §1). In relation to the above article of the Civil Code, immovable property is an area of land constituting a separate object of ownership – land, together with all parts which are permanently connected to that land, e.g., buildings, trees (Podwórna & Ślusarek-Furgalska, 2016). Based on Article 46 § 1 of the Civil Code, we distinguish between land, building, and premises. A building or premises may be identified as immovable property under special provisions in which it is a separate object of ownership from the land. In such a situation, the real estate is separated from the land and constitutes the so-called separate ownership of premises, together with which is linked the so-called co-ownership of the land, according to which the owners of separate premises are also co-owners of the land on which the premises in question are located (Korenik & Zakrzewska-Półtorak, 2021). The definition of immovable property is a relatively broad concept, from which it follows that the classification of immovable property by type also has a broad spectrum of views. The classification is made by distinguishing between a subject classification resulting directly from the previously quoted definition of immovable property set out in the Act, a subject classification strictly related to a specific entity with ownership rights to the property in question, and a classification according to the function that the property performs (Cymerman & Filipiak-Kowszyk, 2015).

The research presented here relates to premises property arising from the subject classification. A residential real estate is an independent unit, as well as a unit for other purposes, constituting a separate object of ownership. An independent dwelling can be defined as a dwelling that is separated by permanent walls within a building, a room or a set of rooms intended for permanent residence of people, which together with auxiliary rooms serve to satisfy their housing needs (Ustawa z dnia 24 czerwca 1994 r. o własności lokali [Act on Ownership of Premises], 2021, art. 2 ust. 1, ust. 2). Accordingly, in order for a residential real estate to be created, it must, among other things, meet the condition of independence stipulated in the Act on Ownership of Premises and appropriate legal actions must be performed, such as the establishment of a land and mortgage register and making an entry in it. A share in the common property, which consists of the land and the parts of the building and the facilities that serve the everyday use of all the residents, is permanently connected with the residential property.

Transactions between a buyer and a seller, which are carried out continuously and voluntarily between independent entities in accordance with the applicable legislation, form a market. The parties to these transactions are the seller, who represents the supply, and the buyer, who demonstrates a demand for the commodity in question. In the real estate market, the subject of exchange is not the physical property itself, but rather

the rights to it. The entire transaction takes place in an organized manner, and the participants are not anonymous, as real estate trading requires a written form of transfer of rights to the property, usually in the form of a notarial deed (Ludwiczak, 2017). Nowadays, the term "market" is often associated with an economic category, as it is the place where the market mechanism operates. This mechanism is the law of mutual interaction between components, such as demand, supply, and price, and these actions aim to achieve a mutual equilibrium among the above components (Kucharska-Stasiak, 2004). The real estate market plays a crucial role in the state's economy, as its turnover significantly influences the overall functioning of the economy. The real estate market is a dynamic one that constantly changes, and with these changes, the prices of individual properties fluctuate. The real estate market closely links the demand and supply sides, while balancing them, especially at the national and local levels (Olszowy, 2017). The real estate market is also defined as the area where housing demand meets housing supply, shaping the price and enabling transactions (Łaszek, 2006).

The most important elements in real estate trading are the concepts of demand, supply, and price. In a market economy, price primarily plays a key role in adjusting the balance between supply and demand, which is crucial in understanding the concepts explained (Lu et al., 2020). By demand is meant the number of potential buyers or tenants seeking the correct type of property in a given local market segment at a particular time, assuming that other factors (population, income level, expectations of future prices, and buyer preferences) remain unchanged. Supply, on the other hand, is understood as the number of properties available (sale/rent) in a given market and at a given time, at different prices, assuming that these factors, such as labor and production costs, remain constant. In summary, the definitions re-emphasize the importance of the parties involved in determining the price of a property. One of them makes a demand for the property (reflects demand), while the other offers the property for sale (therefore generates supply) (Antczak-Stępnia, 2019). Price, on the other hand, represents the amount offered to be paid for the service or good provided, but price does not always reflect value. The market value of a property is the estimated price at which the property would be sold on the valuation date to a willing buyer (Nikolaos et al., 2011). Demand and supply analysis is the study of the interaction of buyers and sellers to determine transaction prices and quantities. As we will see, prices simultaneously reflect both the value to the buyer and the cost to the seller (Eastin & Arbogast, 2011).

The relationship between supply and demand is one of the most significant factors that can impact the real estate market, particularly the prices of these properties. If there is a change in both demand and supply, this will have a direct impact on the prices of the premises on offer (Gurran et al., 2015). Related to this are clearly defined laws, such as the law of demand and demand. The law of demand states that when the price of a good increases, the quantity of the good that consumers are willing to buy decreases, assuming *ceteris paribus* (all other factors remain constant). Namely, a decrease in the price of a property will cause

an increase in demand, while an increase in price causes a decrease in demand (Kondratenko, 2013). The amount of supply depends not only on the price but also on other shaping factors, including non-price factors, primarily changes in production and maintenance costs. A feature of supply is the slow response to price changes. Demand, supply, and price interact by entering different phases of the cycle, such as surplus/deficit demand, surplus/deficit supply, and equilibrium. In the short term, an increase in demand will not lead to a sharp change in supply, nor will the price affect the supply. In the short term, a shortage of supply can be eliminated by better development of existing spaces or vacant properties or possibly changing the function of the property. In the longer term, on the other hand, an increase in demand leads to an increase in prices. At this point, the erection of new buildings, with prices exceeding costs, will result in a decrease in prices, and there will be an intersection of the supply and demand curves, leading to an unprofitable investment in the construction of new properties for the investor (Kucharska-Stasiak, 2016).

The purpose of this study is to determine the structure of supply and demand for real estate in Opole, Opolskie Voivodeship, and, above all, to present the factors influencing the formation of demand and supply on the local market. The thesis undertakes to indicate the dependence of market characteristics, such as the location of the real estate, the area of the premises, the type of building in which the premises are located, and the availability of a parking space or ancillary premises, on the price of the real estate. The analysis covers residential properties for residential purposes on the secondary market.

## 1. MATERIALS AND METHODS

The research section focused on analyzing the housing market in the city of Opole. The city is the capital of the Opole Voivodeship and covers an area of approximately 149 km<sup>2</sup>. The city is situated in south-western Poland (Fig. 1). It is located in the Silesian Plain, on the Oder River, and the distance to the Czech border is approximately 40 kilometers. The city has convenient and fast rail connections, with a density that is twice the national average. The city is situated near the A4 motorway and is accessible via many national roads. Opole boasts a thriving public bus service, operating 70 buses. The city is also home to plants for the construction materials industry, mainly food cement, IT machinery and equipment, and others. Opole is also part of the Walbrzych Special Economic Zone, which is the nucleus of the city's future economic and production center. The city also has six higher education institutions, including Opole University and Opole Technical University. The city is also a cultural center with an interesting artistic offering, known mainly for its national event, the National Festival of Polish Song. The city of Opole also offers many green and recreational areas, such as the picturesque Bolko Island or Pasieka Island. The city also boasts the Opole Zoological Garden, which houses around 300 animal species. The city also impresses with its architecture, including many historical monuments. Opole also cooperates with many

European and world cities, including Alytus, Carrara, and Grasse, among others (Urząd Miejski Opole, 14.11.2024 r.).

Figure 1. Location of Opole in the context of Poland



Source: Own elaboration based on geoportal.gov.pl

In the research, a structured database was created based on sales offers. The direct observation method was used here. Data was collected on offer prices and, separately, on transaction prices in the real estate market in the city of Opole, Opolskie Voivodeship. The collected data on property prices pertained to the same research period, spanning from June 2022 to December 2022. The data on offer prices is an important source of knowledge about the market, providing valuable information about real estate, specifically the offers for sale of real estate. Therefore, it was decided to utilize this source for the study (Bełej, 2012). In addition, information on the characteristics of these properties was recorded, including floor area, number of rooms, parking spaces, and more. Data from the Real Estate Price Register provided by the Opole City Hall, Department of Geodesy and Cartography, was also used for the analysis. In this case, the indirect observation method was used. In both cases, the data were arranged chronologically with a breakdown by registration precinct. The homogeneity of the data set, in terms of subject matter and prices, will allow for direct comparisons to be made and correlations to be established. The area of the study, as already mentioned, is the city of Opole within its administrative boundaries, which was divided into 23 precincts (Borki, Świerkla, Czarnowąsy, Krzanowice, Wróblin, Sławice, Wrzoski, Bierkowice, Półwieś, Zakrzów, Gosławice, Kolonia Gosławicka, Opole, Ządrze, Żerkowice, Chmielowice, Szczepanowice-Wójtowa Wieś, Winów, Nowa Wieś Królewska, Grudzice, Malina, Groszowice, Grotowice).

During the creation of the database for the analysis, the following property attributes were extracted: the location of the property in the city, the date the offer/transaction was posted, the offer/transaction price, the unit price per m<sup>2</sup>, the type of building, the floor on which the property is located, the number

of rooms in the property, the area of the property, and information on associated premises, i.e. parking space, basement. The market attributes of a property refer to the characteristics that significantly influence its prices and, consequently, its market value (Juchniewicz, 2011), which was the primary aim of the analysis.

The following research questions were formulated during the study:

1. Do average offer prices for residential sales on the secondary real estate market in Opole differ from average transaction prices?

2. Was the supply and demand relationship for residential units on the secondary property market in Opole in the period June 2022 to December 2022 in equilibrium?

3. Do the market characteristics of the property affect the unit price of housing in Opole?

Statistical, comparative, and graphical analysis was used to analyze the collected dataset and to draw appropriate conclusions. Changes in spatial distribution were shown, and individual parameters were depicted. This analysis aims to illustrate the changes occurring in the city of Opole, assess the degree of development, and determine how specific features may impact property values.

### 3. ANALYSIS OF THE STRUCTURE OF DEMAND AND SUPPLY IN THE SECONDARY REAL ESTATE MARKET

#### 3.1. Supply analysis of the Opole property market

To carry out the intended analysis, a database was created based on residential sales offers on the secondary real estate market. The city of Opole was divided into registration districts for the analysis. In the studied period, 487 offers for sale of residential premises were collected on the secondary market. In this case, three variables were analysed, namely: offer price, unit price and

usable floor area (Table 1).

For the collection, it was determined that the offer prices for the entire study range from PLN 175,000 to PLN 1,099,000. The gap between these prices is PLN 924,000. This is due to the variation of dwellings in terms of floor area. The average secondary market offer price is PLN 446,722.32, while the median is PLN 419,000. Regarding unit prices, the spread is PLN 10,036 per square meter. The minimum Value in the surveyed set per 1 m<sup>2</sup> is PLN 3,244, with a maximum value of PLN 13,280. The average unit price (per 1 m<sup>2</sup>), including the secondary market, is PLN 7,358.71, with a median of PLN 7,158. The floor area of the dwellings ranges from 19.66 m<sup>2</sup> to 139.98 m<sup>2</sup>. The mean Value of the floor area is 62.76 m<sup>2</sup>, and the median is 60.09 m<sup>2</sup>. The mean calculated value and median for unit price and floor area were significantly close to each other. However, for the offer price, the difference was greater compared to the other variables examined, and this may indicate greater variation in the set.

Relationships between variables were also analysed. Among other things, the dependence of the offer unit price on the dwelling's area was considered. The Pearson coefficient used to test the correlation is -0.475, indicating a clear linear relationship within a moderate range. The correlation is negative because an increase in the floor area of a dwelling corresponds to a decrease in unit prices, which is a well-established trend (Fig. 2).

Referring to the correlation between property location and unit price, the correlation is natural. Pearson's linear correlation coefficient is -0.071. This means that the linear relationship does not exist and is very weak. A negligible upward trend is visible in the graph below (Fig. 3), indicating that the unit price increases closer to the centre; however, the differences are practically imperceptible in this case. Such a situation may be related to the fact that Opole is a relatively small city compared to other provincial cities, so the location closer to the centre does

Table1. Basic statistical measures for offer data (secondary market)

Specification	Value minimum	Value maximum	Average value	Median	Stretch
Offer price [PLN]	175 000,00	1 099 000,00	446 722,32	419 000,00	924 000,00
Offer price unit [PLN/m <sup>2</sup> ]	3 244,00	13 280,00	7 358,71	7 158,00	10 036,00
Useful floor area [m <sup>2</sup> ]	19,66	139,98	62,76	60,09	120,32

Source: Own elaboration

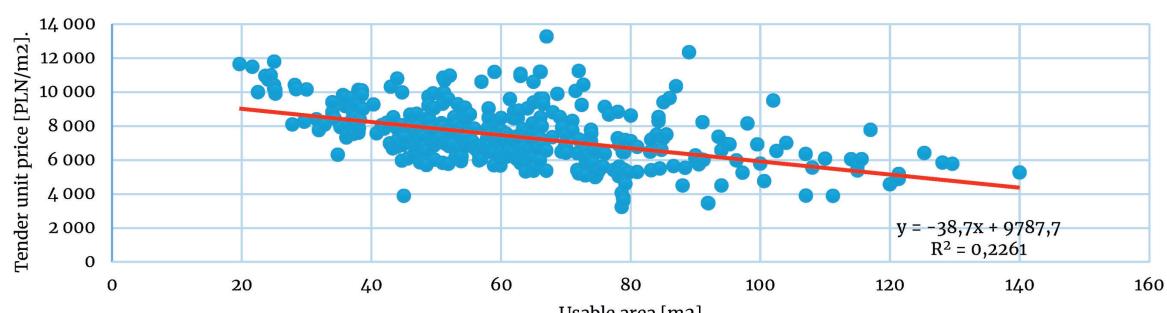


Figure 2. Interdependence between the offer price per unit and the usable floor area of a dwelling in the secondary market

Source: Own elaboration based on offer data.

not significantly impact the unit price for a dwelling.

Another relationship examined is the effect of building type on unit price. The Pearson coefficient is 0.356, indicating a clear but weak relationship. Dwellings built with contemporary technology show higher unit prices than dwellings in tenements or in large-panel buildings (Fig. 4).

An examination of the relationship between the parking space and the unit price revealed a negligible relationship in this case. The Pearson coefficient is 0.159. To a small extent, there is a noticeable tendency towards higher unit prices for flats with a parking space in a garage, as shown in the graphic below (Fig. 5).

The room attached to the dwelling has no significant impact on the unit price. The Pearson coefficient is 0.028, indicating no correlation, as illustrated in the graph below (Fig. 6).

### 3.2. Analysis of housing demand on the Opole real estate market

This section of the research utilised data obtained from the Real

Estate Price Register maintained by the Municipal Office in Opole. This data served as the basis for determining how demand for flats on the secondary real estate market was created during the studied period. Between June 1, 2022, and December 31, 2022, there were 407 purchase and sale transactions involving residential units within the city of Opole. The most significant number of transactions was enjoyed by the Opole-centre precinct, which has a large number of multi-family buildings. A large number of transactions also characterised the Szczepanowice-Wójtowa Wieś and Gosławice precincts. In the entire study set, three variables were taken into account in the analysis: transaction price, unit price and floor area (Table 2).

Analysing the calculated statistical measures for the collected transactions, it was determined that the transaction prices for the entire study range from PLN 120,000 to PLN 770,000. The gap between these prices is PLN 650,000, which is due to the variation of dwellings in terms of floor area. The average transaction price is PLN 341,037.22, while the median is

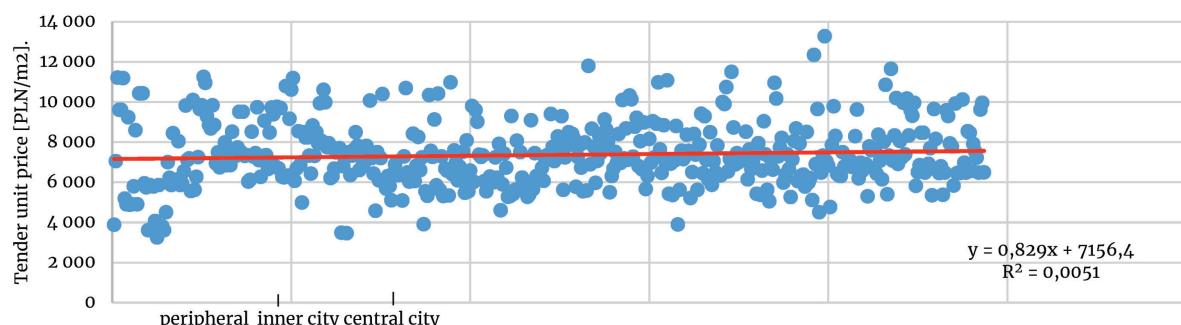


Figure 3. Interaction between the offer unit price and the general location of the dwelling (secondary market)

Source: Own elaboration based on offer data.

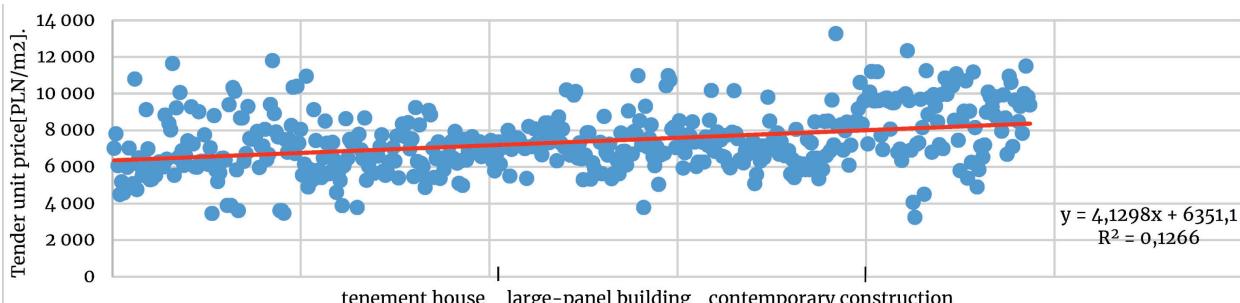


Figure 4. Interdependence between offer unit price and building type (secondary market)

Source: Own elaboration based on offer data.

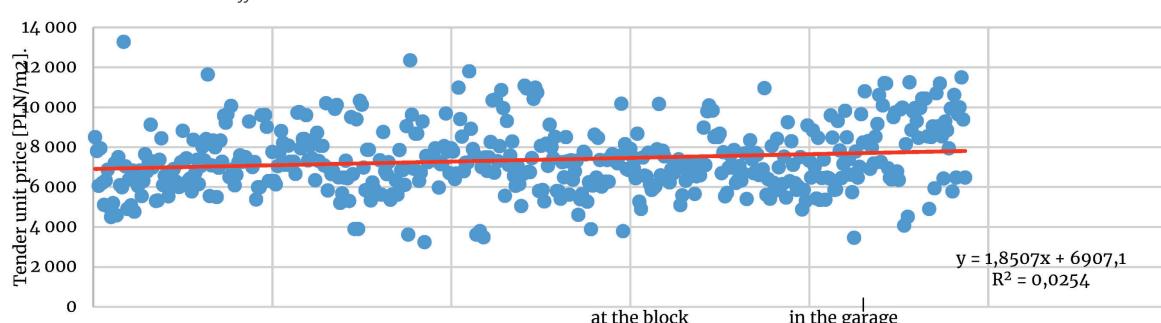


Figure 5. Interdependence between the offer price per unit and the location of the parking space (secondary market)

Source: Own elaboration based on offer data.

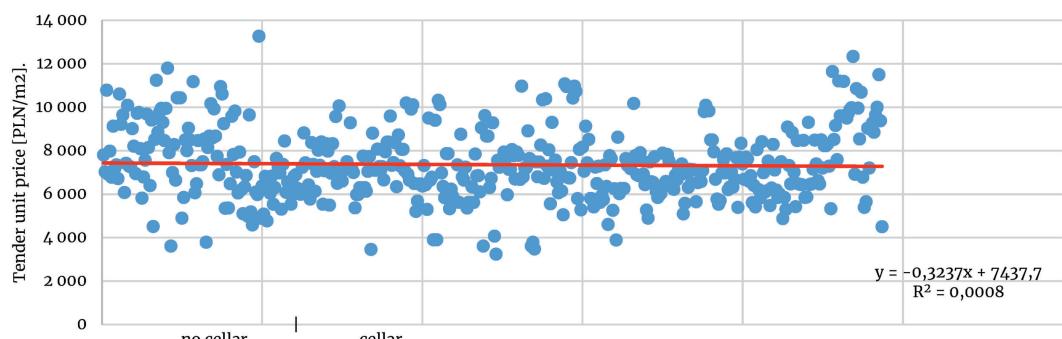


Figure 6. Interdependence between the offer price per unit and the presence of an accessory premises (secondary market)

Source: Own elaboration based on offer data.

Table 2. Basic statistical measures for transaction data (secondary market)

Specification	Value minimum	Value maximum	Average value	Median	Stretch
Price transaction [PLN]	120 000,00	770 000,00	341 037,22	324 000,00	650 000,00
Unit price transaction [PLN/m <sup>2</sup> ]	1 754,81	14 080,83	7 072,26	6 816,06	19 154,29
Useful floor area [m <sup>2</sup> ]	16,47	145,54	50,27	47,70	129,07

Source: Own elaboration

PLN 324,000. Referring to unit prices, the spread is PLN 19,154.29, with unit prices ranging from PLN 1,754.81 per m<sup>2</sup> to PLN 14,080.83 per m<sup>2</sup>. The average unit price and the median (per 1 m<sup>2</sup>) are PLN 7,072.26 and PLN 6,816.06, respectively. The floor area of the dwellings ranges from 16.47 m<sup>2</sup> to 145.54 m<sup>2</sup>. The average floor area of the dwellings in the study set is 50.27 m<sup>2</sup>, and the median is 47.70 m<sup>2</sup>. In this case, the statistical results for the mean and median values were close to each other. This indicates that, despite the significant differences between the extreme values, there was relatively little divergence for the analysed variables.

The dependence of the transactional unit price on the floor area of the dwelling was taken into account in the analysis. Pearson's coefficient is -0.423, indicating a moderate linear relationship. There is a negative correlation, as an increase in the floor area of the dwelling corresponds to a decrease in unit prices (Fig. 7).

Another correlation examined is the effect of location on the unit price of a dwelling. The Pearson linear correlation coef-

ficient is 0.139. This means that the linear relationship is clear but weak. The graph below (Fig. 8) illustrates that the correlation is so weak that the location of the property has no significant impact on the unit price of the dwelling.

For the secondary market, the relationship between building type and unit price was also examined. The Pearson coefficient was 0.376, indicating a significant relationship between these variables. However, the relationship is clear in the weak range. The chart (Fig. 9) shows that flats in contemporary construction show higher unit prices than flats in tenements or large-panel buildings.

The effect of parking space location on unit price was also examined. The Pearson coefficient is 0.230, indicating a weak but clear correlation. According to the graph below, it can be seen that flats with a parking space in a garage exhibit higher unit prices per square meter of floor area (Fig. 10).

The last correlation analysed is the effect of having a room attached to a dwelling on its unit price. The Pearson coefficient is

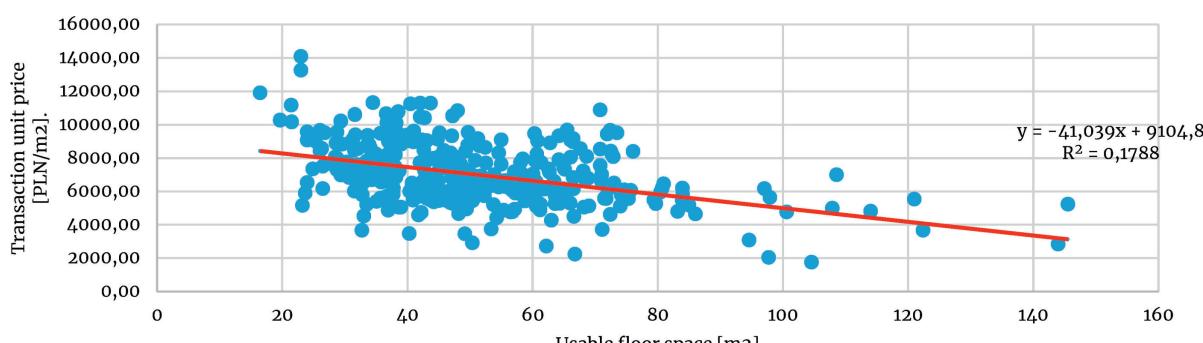


Figure 7. Interaction between transactional unit price and floor area of dwelling (secondary market)

Source: Own elaboration based on data from the Property Price Register.

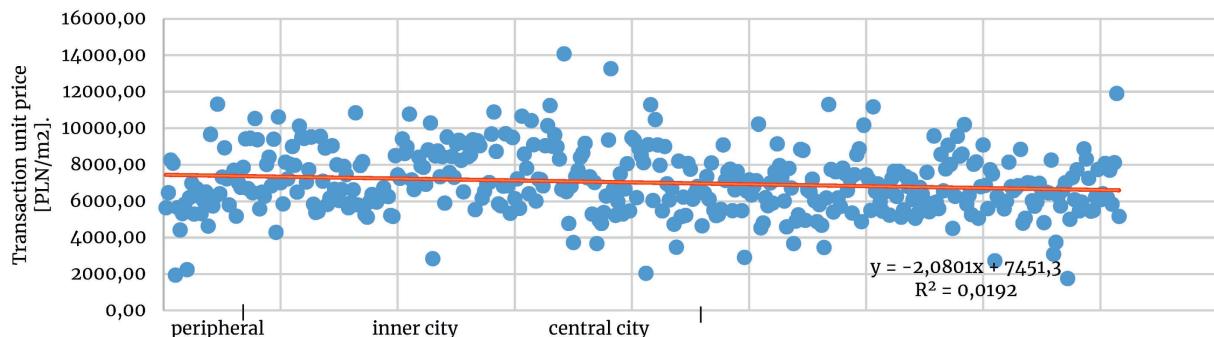


Figure 8. Interdependence between the transaction unit price and the general location of the dwelling (secondary market)

Source: Own elaboration based on data from the Property Price Register.

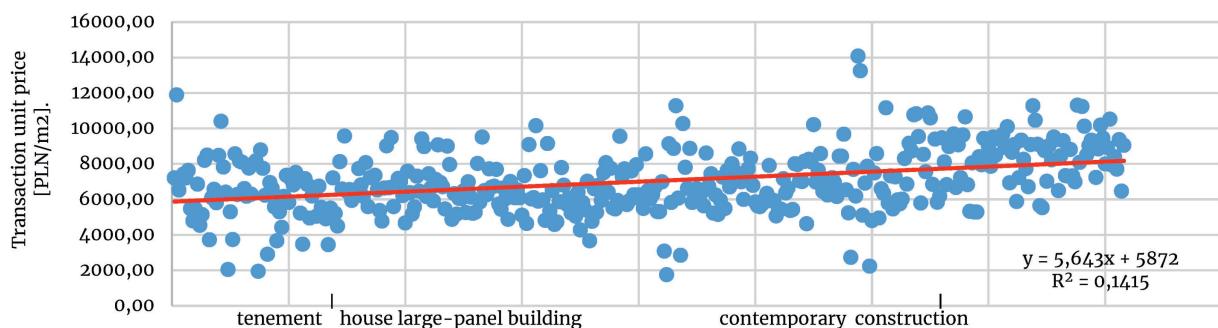


Figure 9. Interdependence between transaction unit price and building type (secondary market)

Source: Own elaboration based on data from the Property Price Register.

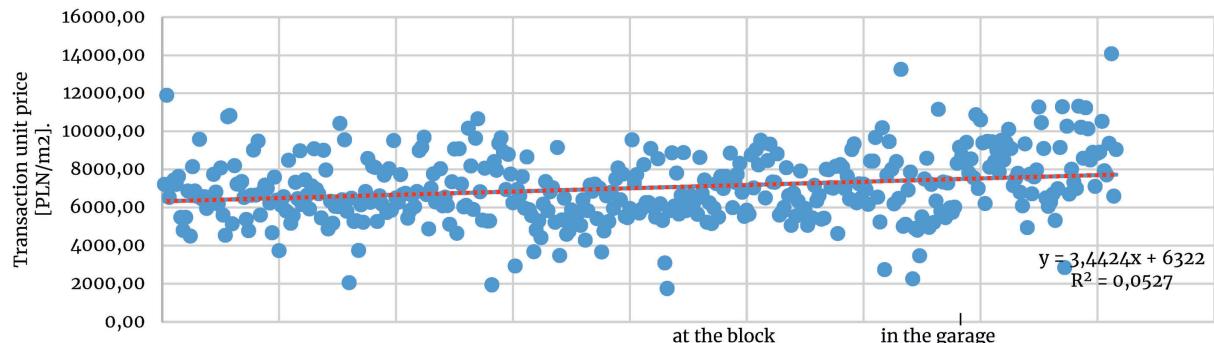


Figure 10. Interaction between transaction price and location of parking space (secondary market)

Source: Own elaboration based on data from the Property Price Register.

0.181, indicating a negligible relationship with a weak degree of intensity. It follows that the presence of a belonging room (cellar/compartment) has practically no effect on the unit price of a dwelling, and even a slight decrease in these prices can be observed (Fig. 11).

#### 4. RESULTS AND DISCUSSION

The analysis of demand and supply of real estate in the city of Opole provided a solution to the research problem, which was to present the relationship between demand and supply in the city of Opole. The analysis was conducted on the secondary market, taking into account the determination of the influence of the market features of the real estate on the unit price in terms of: the location of the real estate, the location of the parking space, the belonging room and, in the case of the secondary market, the

type of building.

During the research, various problem questions were formulated to address the research objective. One of them was to indicate whether the average offer prices for residential sales in Opole differ from the average transaction prices in the area. The secondary market analysis revealed that the average offer prices (PLN 446,722.32) are 31% higher than the average transaction prices (PLN 341,037.22). The average unit offer prices were found to be 4% higher than the average unit transaction prices. This is because the offer data is often overestimated by sellers and reacts with a delay to changes in relation to transaction prices (Tryga, 2009).

In the secondary market, 407 transactions and 487 residential sales offers were collected. In this case, supply exceeded demand in the secondary market, so the supply and

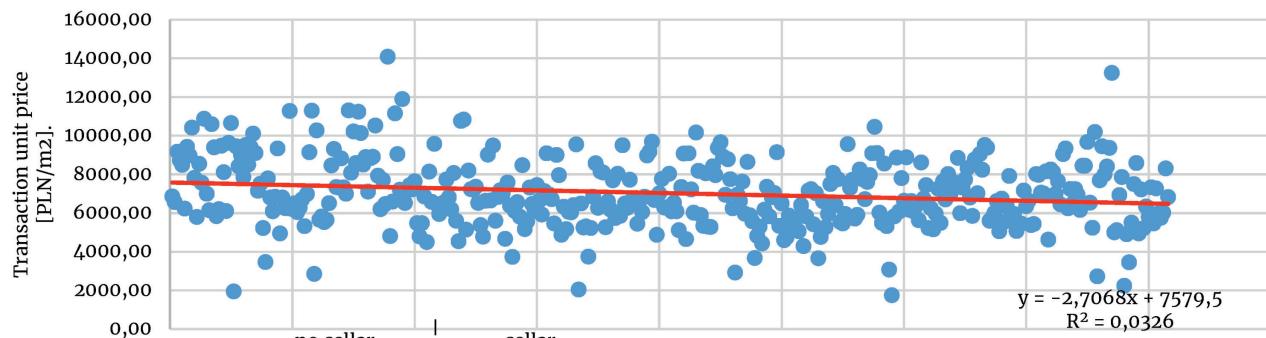


Figure 11. Interdependence between the transaction unit price and the presence of an accessory premises (secondary market)

Source: Own elaboration based on data from the Property Price Register.

demand relationship was not in equilibrium. On the other hand, the differences between the number of offers collected and the number of transactions were small (Fig. 12).

The chart above shows that unit offer prices of residential units are higher than unit transaction prices. The most significant divergence is found in the case of one-room flats, where the offered prices were 10% higher than the transaction prices. On the other hand, the smallest divergence occurred in the case of four-room and larger dwellings (3%). It follows from the above that on the secondary market, offer prices are inflated.

The analytical section also illustrates the relationship between the market characteristics of the property, such as floor area, location, parking space location, presence of an accessory room, or type of building, and the unit price of the property.

It has been established that the floor area of the dwelling has the most significant influence on the unit price. The type of building also shows a significant influence. Among the dwellings put up for sale, the location of the parking space shows a slight influence on the price (dwellings with a parking space in a garage show higher prices). The same situation occurs with transactional data. In the secondary market, the presence of a belonging room has a negligible impact on the unit price. It follows from the above that the market characteristics of the property result in price and value differentiation within a specific market (Dydenko, 2006).

## 5. CONCLUSIONS

The analysis of the local real estate market's behaviour showed that the demand-supply relationship in the secondary market was close to equilibrium, as the number of transactions and the number of offers in the surveyed set differed by only 80 items. In this case, supply exceeded demand. The average unit offer prices are higher than the average unit transaction prices. In this case, offer prices are also higher than transaction prices, which is influenced by the human factors mentioned in the primary market analysis. Referring to the relationship between property characteristics and unit price, it follows that floor area shows the most significant influence on price, as well as building type. This relationship indicates that higher unit prices are characteristic of a unit located in a building constructed with contemporary technology. The location of the parking space has little influence on the price, which may be because there are relatively fewer flats with a garage space on the secondary market than flats with a parking space located in front of the building in which the dwelling is situated. In the secondary market, the presence of a belonging room does not influence the unit price.

It follows from the above that an imbalance existed between demand and supply in Opole between June 2022 and December 2022. It was also found that the average offer price exceeds the average transaction price. There is a high demand for flats within the city of Opole, as a total of 805 transactions

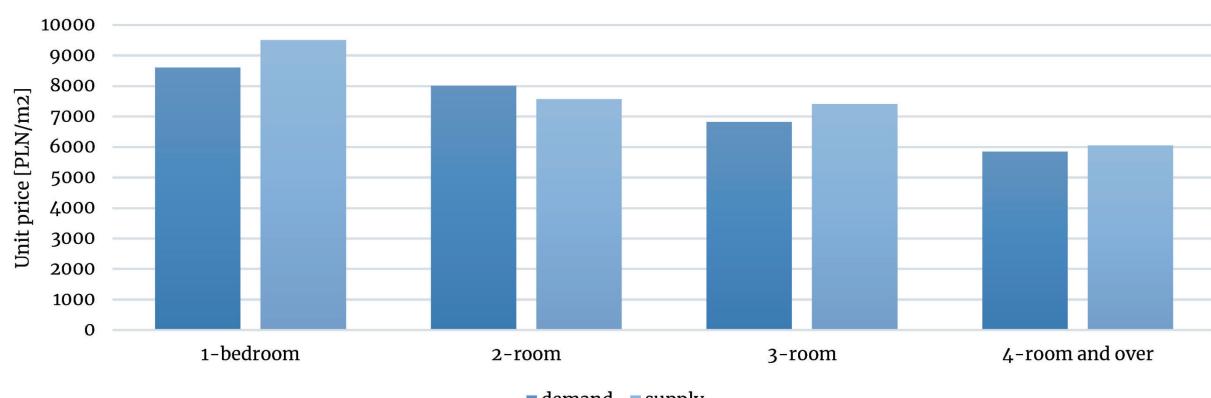


Figure 12. Distribution of unit prices in relation to the number of rooms in a dwelling on the secondary market in Opole between June 2022 and December 2022

Source: Own elaboration based on data from the Property Price Register.

were collected during the study period, with the number of sales offers collected amounting to 588. Opole is a city in development. Numerous housing developments are underway in the city, resulting in a constant increase in the city's housing stock.

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