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Monitoring and analysis of the risk of the commercial real estate sector in Poland: data sources, methodology and empirical results*

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Abstract

This paper shows how Narodowy Bank Polski analyses the commercial property market in Poland and monitors risks that it can generate for the financial sector and the whole economy. This market is crucial for the functioning of the modern economy, but it has also led to economic and financial crises in many countries. Especially under the very low interest rates in the euro zone, a lot of capital flows into the commercial real estate market. A holistic approach to its analysis is needed. We present a hedonic rent index for office and retail properties in two major cities and a transaction price index for the office market and the retail market in the whole country. Commercial real estate is very heterogenous, therefore we need to apply hedonic regressions to obtain reliable price and rent indices. For this purpose we also describe which data about commercial real estate rents and prices and information about their determinants is collected and how this is done. Finally, we present an analysis of the profitability of an office space investment, which helps to understand the situation of investors and also to make a simple stress test of the rate of return, which accounts for increasing interest rates and/or vacancy rates.

Keywords: office and retail property, rents and prices, commercial property data collection, hedonic regression, return over equity of an investment

JEL: C22, R33

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1 Introduction

The commercial real estate market plays a major role in the modern economy (Łaszek, Leszczyński, Olszewski 2017), its cycle is strongly connected with the business cycle (Quigley 1999; Wheaton 1999) and due to its significance for the stability of the financial system it is of interest to central banks and financial supervisors (see Olszewski 2013; ESRB 2015; 2018; Deryol et al. 2019). In this paper we present the comprehensive analytical and research framework that is applied by Narodowy Bank Polski (NBP, hereafter) to get more insight into the commercial real estate market, covering the hedonic analysis of rents and transaction prices as well as a model to calculate the rate of return over equity of office investment.

This article has two main purposes. The first is to show that the commercial property market is complex and heterogenous, therefore the hedonic regression method has to be used to obtain reliable information about its situation. Such an analysis requires data at the micro level, which are not easily available and need to be collected through a survey. The second purpose is to explain which data should be collected and how this data collection can be managed. The European Systemic Risk Board (ESRB 2016) recommends[1] the national macroprudential authorities to collect data about the residential and commercial real estate market, which cover the physical market and also the exposures of the financial system related to real estate. Our paper focuses on the first goal and is written in a similar vein as the handbook on commercial property prices by Eurostat (2017) and the IFC report by Deryol et al. (2019), which explains how to close the data gap about commercial property prices. Similar papers which present a comprehensive approach to the data collection about the CRE market and its analysis can be found for Denmark (see Mølskov, Jensen 2019), Ireland (see Dwyer-Bond, Casey, Coates 2019) and Portugal (see Evangelista, Moreira, Teixeira 2019).

Commercial real estate (CRE henceforth) can be used by its end user or can be rented out to third parties in order to make profits. This property type is financed to a large degree by banks (ESRB 2015). Especially under the very low interest rates in the euro zone a lot of capital flows to this sector (see NBP 2018b). Domestic investors also have access to mortgages in euro, which have a low interest rate. A single property is usually very expensive and in many cases the market, especially that for the largest and most expensive buildings, is concentrated in few large cities in a given country. Unlike in the case of residential real estate,[2] the income that the given property generates is also used to pay back the mortgage. At the same time, the discounted stream of rental income determines the value of the property, which is the collateral of the mortgage. Investors expect a given rate of return, and when rents decline and the return drops, those investors can quickly decide to sell the commercial property. If this happens at a large scale, the prices of similar properties will decline. Due to this complex connection to the economy and financial system central banks (ECB 2008, 2010, 2011; Hiebert, Wredenborg 2012; Olszewski 2013) started to monitor this market. In order to make appropriate macroprudential recommendations, the authorities need to understand how the market works and what drives rents and prices. Sharp price increases, like in the residential real estate market, can be a sign of a price boom that finally can end in a bust. Data presented by Ellis and Naughtin (2010) on commercial property prices shows that changes in this market can be twice as large as those observed in the residential market.

[1] Recommendation of the European Systemic Risk Board of 31 October 2016 on closing real estate data gaps (ESRB/2016/14).

[2] In the residential market the majority of house owners obtains an income from sectors that are not directly related to the real estate industry. An aggregate shock to household income can occur when a city loses its main employers, but this happens relatively seldom.

The main aim of our article is achieved in four steps. After we present the literature overview (step 0), we introduce the NBP commercial property data collection framework (step 1) which is used for the empirical analysis (and covers the second purpose of the paper). The empirical analysis focuses on the heterogeneity of rents (step 2) and prices (step 3), which needs to be tackled with the hedonic regression. The information about rents and prices is used to assess the profitability of office investment and its robustness to interest rate or vacancy rate increases (step 4).

We want to point out that section 2.1, which introduces the commercial property survey, is based closely on its description (see NBP 2018a). Section 3 contains the description of the empirical analysis and is based closely on the research papers by Leszczyński and Olszewski (2015), Olszewski et al. (2018) and Narodowy Bank Polski quarterly and annual reports. Section 4 is based on the paper by Trojanowski et al. (2018), but presents a more extended analysis of the return over equity of an office investment in Gdańsk and its reaction to increases of the interest rate and vacancy rate or declines in the rent. This paper can be considered as a guide to a holistic analysis of the commercial property market from the point of view of the central bank, which should be further augmented in the future and adopted to country specific cases.

2 Research methodology and data sources

In order to make a detailed analysis of the commercial property market, we need to understand which factors determine rents and property prices. Like in the case of residential property, commercial property is heterogenous and the average rent or price can change not only due to market conditions, but also due to the fact that the composition of the analysed sample changes. In order to solve this problem, we apply the hedonic regression which was developed by Rosen (1974). According to this methodology, each heterogeneous good can be separated into a set of features which it consists of. An example can be the location assessment, which is essential for the value of real estate, but de facto cannot be "purchased". It is an inseparable part of the property, but we can assess its partial impact on the price of the entire property. We use the hedonic regression to get price estimates and subsequently indices that are robust to random changes of the analysed sample of properties. Such an approach is advocated by Silver (2019), and was applied, for example, by Evangelista, Moreira and Teixeira (2019) to analyse CRE rents in Portugal and Chegut, Eichholtz and Rodrigues (2015) to analyse office rents in Hong Kong, London, Los Angeles, New York City, Paris, and Tokyo. Transaction prices were also analysed with this method, for example by Deschermeier, Voigtländer and Seipelt (2014) in Germany, by Raposo and Evangelista (2016) in Portugal and by Deryol (2019) in Turkey. The precursors of the application of this method in Poland in relation to residential real estate were Łaszek and Widłak (2008), Tomczyk and Widłak (2010), Widłak (2010a, 2010b), Nehrebecka and Widłak (2012) and Olszewski, Waszczuk and Widłak (2017). NBP uses this method to analyze property prices and rents in the residential and commercial market (NBP 2018b), the description of the applied hedonic models can be found in Leszczyński and Olszewski (2015) and Olszewski et al. (2018).

Detailed data about the building and single spaces that are rented is needed in order to run the hedonic regression. Step 1 of our research focuses on the mandatory survey of commercial property prices and rents, because aggregate data on rents that can be obtained from various sources is not that useful for a detailed analysis of the market. We briefly describe how NBP obtains the data –

in a similar fashion as Mølskov and Jensen (2019) do it for Denmark, Dwyer-Bond, Casey and Coates (2019) for Ireland and Evangelista, Moreira and Teixeira (2019) for Portugal. While data collection about the residential real estate market has a long history, data collection about the CRE market has only recently gained attention and is in many countries at an early stage. We present the data collection framework in section 2.1 and the detailed NBP questionnaire in the Appendix.

The analysis of rents is step 2 of our research. We present the hedonic rent index for offices in Warsaw, which is the capital city and also the largest office market in Poland in section 3.1. We also show the construction of the hedonic rent index for shopping malls in Poznań, which is a major city in section 3.2. Before we move to the empirical analysis we present a short overview of papers that performed similar research. The hedonic analysis for both rents and transaction prices should include similar attributes. This is motivated by the fact that the value of a building is the discounted stream of rental income which it generates. In the case of transactions the price per m2 of a building should be analysed. For the rental market the regression should be run on single rent contracts, or when this is appropriate, on the average rent of a building. We do this in case of office buildings, because the rents in a given building in Warsaw, Gdańsk and Poznań in Poland, do not vary much (see Olszewski et al. 2018). Fuerst (2008) also analyses the average rent per office building. In the retail market the rents differ significantly in a single shopping centre, therefore attributes of the individual shops should be taken into account.

In the office market rents are determined by the location and quality of a building. Bollinger, Ihlanfeldt and Bowes (1998) analyse office rents in the Atlanta region in the US and point out that despite the evolution of new telecommunication techniques, face-to-face meetings are important. The authors present a model which explains this concept and their empirical results support it – offices that are located close to other ones obtain higher rents than those that are more or less alone in a given location. We conclude form their analysis that office space should be clustered and located preferably in the inner city or close to it, which simplifies the access of workers and clients to the firms that rent such offices. Fuerst (2008) includes in the estimation of office rents in Manhattan, New York, the vacancy rate in the building, its size, the year of construction or major renovations, the number of stories and also variables that describe the amenities of the building. In a further step the author also includes variables which describe its location, such as the weighted sum of distance to the next 20 office buildings, square feet of office space in walking distance, proximity to a subway station and the geographical coordinates. Fuerst (2008) finds that rents increase when a building is surrounded by other buildings by which the amount of potential business clients increases. His findings are in line with that of Bollinger et al. (1998). Ustaoglu et al. (2013) analyse office rents for Ankara, Turkey and find that the location, lease terms and physical characteristics of the building determine the rents.

The rents of shopping malls are determined by similar factors that are found in the office market: additionally the location and size of the single shop in the mall has also a significant impact on the rent. Sirmans and Guidry (1993) analyse the rents in Baton Rouge in the US and find that rents are affected by the size, age and anchor tenant of the mall. Moreover, its location in the city and its shape affect rents. Market conditions, which are measured among others by the vacancy rate in the market, also have a significant impact on the rent level. Gerbich (1998) analyses the rents in seven shopping malls in New Zealand and finds that they are determined by the size of each single rented space and the type of services or goods that are offered there.

Step 3 of our research is the creation of a hedonic transaction price index. Silver (2019) strongly recommends to use transaction-based commercial property indices for policy analysis purposes and

proposes different hedonic regression approaches. The traded buildings are heterogenous and usually one building is not sold again over a longer period. In this case the mean price can be misleading, but the hedonic transaction index helps to get a reliable picture about the market. According to Fisher, Geltner and Pollakowski (2007) individual characteristics of the building need to be taken into account in the regression. Different types of buildings need to be analysed separately, and the regression should include their location and attributes which represent their quality. Such variables are the size of the building, its age, and the number of storeys. For example Chegut, Eichholtz and Rodrigues (2015) use the age, size and the number of storeys and the fact whether the building is located in the central business district to explain the price of office buildings. Because we usually have relatively few observations of a given commercial property type (office, retail) in a given year, we apply the time-dummy hedonic regression[3] (see de Haan, Diewert 2011; Diewert, Heravi, Silver 2009). Under this approach all available transaction data in the whole analysed period for a given property type are included in the regression, while the parameters of the time dummies capture the pure price inflation in relation to the base year. Those deviations can be directly used to calculate the hedonic index. This is an advantage of the time dummy approach, the drawback is however that such a model needs to be estimated again when a new period is included and the results can change slightly. We show the construction of a hedonic transaction price index for the office and retail market in Poland in section 3.3.

The aforementioned hedonic rent index and hedonic transaction index are used in step 4 to analyse the profitability of an investment in office properties, which is financed partially with mortgages. The analysis of average yields (annual rent to price ratio) and average rates of return (ROE) has a long history in the literature (see for example Geltner et al. 2001), but the analysis of single investments is less well described. The explanation for this fact is that yields and return indicators (such as performance indices) for whole investment sectors are publicly available, but such information for a single property is very hard to obtain. The yields carry a lot of information and we should understand what determines them. For example in the US, the average yields changed quite a lot during the recent boom and bust, which can be seen on real yields (corrected with the 10 year expected inflation) that are presented by Duca and Ling (2018) for different commercial property types. According to their figure, between 1994–2002, when the whole market was "normal", yields were more or less constant. But due to the structured finance and commercial mortgage-backed securities (CMBS) fueled investment boom, yields declined over the period 2002–2008 and increased rapidly in 2008 after the outbreak of the global financial crisis. And when the interest rates were lowered to nearly zero in order to prevent a global economic crisis, the yields started to decline again. Due to long lease contracts (around 3–5 years) rental rates change only slowly, therefore the only explanation for such rapid changes in the yield is a significant price change. A detailed analysis of a single model investment helps to understand the driving forces behind the change of yields and also the ROE. When the return does not satisfy the investors, they start to sell their buildings and their prices decrease, which makes the yields go up. We also present how the average ROE depends on the credit cost and the situation in the market, which is expressed with the vacancy rate. For this purpose we apply the analytical framework presented by Trojanowski et al. (2018). Further on, the knowledge about the determinants of rents and prices that we gained from the hedonic regressions allows to understand the functioning of the market in more detail.

[3] Also the majority of empirical papers that can be found in the overview in Evangelista, Moreira and Teixeira (2019) apply the time dummy regression.

2.1 Data sources – the NBP commercial real estate survey

The commercial real estate survey was introduced on a mandatory basis into the Statistical survey programme of official statistics[4] in 2013 and is supervised by the President of Narodowy Bank Polski. The construction of the survey and how it is carried out is based on the survey of the residential real estate market that was introduced by Narodowy Bank Polski in voluntary form in 2006 and in mandatory form in 2013, and which is described in Łaszek and Widłak (2008) and Widłak and Tomczyk (2010). Before the operational and official version of the survey was created, the existing literature was studied and also many discussions with market experts were conducted. After the first rounds of data were collected and analysed, some small modifications of the survey were introduced. The data from the survey is augmented with data from public sources. For example, some brokers only manage a part of the building, so data about the whole building has to be collected from various sources. Some general information about the technical characteristics of the buildings is publicly available, but data on individual rents and transaction prices is a business secret of the owner. All data that is regulated by the Law on Official Statistics, which guarantees its safety. The survey is conducted by trained analysts of the local branches of the NBP. Owners of commercial property, brokers, administrators and advisory firms active in the commercial real estate market are obliged to fill out the survey on a semiannual basis. Offers are collected as of 30 June and 31 December, while transactions which appeared in the whole previous half year are collected. The survey is conducted between the 1 and 20 March for the half year that ends in December and between the 1 and 20 September for the half year that ends in June. The analysts of the local branches of NBP need around two months to clean the data and analyse it.

The collected data includes prices, rents and rental or price-building attributes of commercial space and/or commercial properties. The survey[5] for each type of property (office, retail and industrial) has its own set of information, but all surveys share the same design. The survey for each property type has two sheets, the first covers the building, while the second covers rents and rent related attributes. The information about the building contains its address, the total leasable area, the number of storeys, the year of the construction, the technical condition of the building, the unleased space, the share of common space, the number of parking places, the type of the building, the number of single premises, operational costs, information about the purchase/sale transaction as well as information about the last valuation of the building, etc. Some variables are collected only for given property types, for example the number of shops in the retail property survey, or the minimal rental unit in the case of industrial property. The second page contains detailed information about the rented premises, such as their size, location in the building (for office and retail buildings) and information about the rental contract (its start, duration, etc.). The full list of collected variables, their description and information for which market segment those variables are collected is presented in tabular form in the Appendix.

Data for the following types of commercial property is collected:

- office real estate – office space located only in office buildings, with a leasable area of at least 50 m2;
- retail space:
  - being part of large retail properties located in the agglomeration of the voivodeship capital city, with an area of at least 100 m2 each,

[4] More information can be found here: http://bip.stat.gov.pl/en/statistical-survey-program-24/.

[5] The original survey sheets can be found here: http://www.nbp.pl/home.aspx?f=/publikacje/rynek_nieruchomosci/ankieta.html.

– commercial and service facilities located in office buildings, with an area of at least 50 m2 each,
– warehouses – space in warehouses located in places that constitute storage centres of the voivodeships.

3 Empirical analysis of the rental and transaction market

In this section we show that the hedonic model is suitable to explain the rents or transaction prices of office and retail properties in Poland. The regressions are run using data which is collected through the NBP commercial property survey and obtained from other sources.

3.1 Hedonic analysis of office rents in Warsaw[6]

The hedonic model for the office market is presented on the case of rents of office buildings that are located in Warsaw. Rental rates, as of the end of 2017 were obtained by NBP as part of the Statistical survey programme of official statistics. The object of the analysis are monthly transaction rents per m2 of office space. As the dominant part of the premises is rented in euro, this currency was used for the analysis. Rental rates denominated in other currencies have been converted into euro. The analysis covers premises over 100 m2, located in modern office buildings. Because no significant differences between rents for office premises located in the same building were found, the average rent per building is analysed.

In the first step, the data was verified in terms of correctness. Missing information about the building was collected from various public sources. The rents were checked for errors or outliers. The analysis covers only premises in office buildings that are used as offices, which means premises used for retail and auxiliary purposes are excluded. Also, office space located in residential or retail buildings was excluded.

The amount of data for a single period is sufficient to use the hedonic imputation method. The dependent variable is the log average rent of office building *i*, which is explained by the characteristics of the building $\beta_k z_{ik}$. The estimated model is as follows:

$$ln(r_i) = \beta_0 + \sum_{k=1}^{K} \beta_k z_{ik} + \varepsilon_i$$

The explanatory variables were chosen in order to capture the quality of the building and its location, similarly to the approach proposed by Fuerst (2008), which can be written as:

ln rent EUR = f (office building class, ln age of the building plus 2, ln total leasable area, location)

We use dummy variables that distinguish the class of the office building into office class_A and B, while office_class_A serves as the reference category. Class A buildings are modern office buildings with high quality equipment, located in the central zone of the city or in its very well communicated

[6] This is a modified version of Olszewski et al. (2018).

parts. Class B facilities are office buildings of a standard lower than class A, regardless of their location. Class C buildings are older buildings with low quality equipment. The dummies are called office class_A, office class_B and office class_C. The quality of the location is measured by the distance to the city centre (the variables is called ln_distance from the_centre). We expect that buildings in the city centre obtain higher rents than those located further away. The total leasable area of the office building is described by the variable ln_total_leasable_area, and we expect larger buildings to obtain higher rents as they can host more firms or supply more space in one place to one firm.

The regression was run on a sample of 152 office buildings, the R^2 is 71%. The results of the hedonic regression show that the transaction rent per m2 of office space depends significantly on the office class. With regard to rents listed in class A office buildings, the class B buildings obtain lower rents by around 25% and class C office buildings rents that are nearly 51% lower. The location is of high importance, rents decrease with the distance to the city centre. This is a natural finding for a monocentric city. The main governmental institutions are located in the city centre, office space that is located in the central business district is also relatively simple to reach by workers and clients who travel from any other point in the city. This also causes land in the city centre to be the most expensive, and investors need to ask for higher rents in order to have a profitable investment. With the distance to the centre the supply of land increases in a nonlinear way; however, transportation costs increase, too. The gross leasable area of the building has a statistically significant positive impact on rents. It can be considered as a measure of the diversification of clients and also prestige. Land is most expensive in the city centre and investors build high and large buildings there, while smaller buildings can be found in more distant locations. This is probably also captured by the building class and the distance to the city centre, which explains why this variable is only significant at the 10% level, while the remaining variables are highly significant. The regression results are presented in Table 1.

The estimated model is used to calculate the theoretical rent value, which is received by multiplying the values of the variables by the coefficients estimated in the model. The next step is to calculate the exponent in order to get the estimated rent value in EUR. The final step is to divide the average rent for the city by the average theoretical rent, which results in the hedonic index. This ratio is a direct measure of the pure rent inflation when it is above 100% and a measure of deflation when it is below 100%. It should be very close to 100% in the base half-year, when the model is well specified. The mean index is calculated as the average of rents, which are divided by the average for the base half-year, that is the end of 2017. A similar analysis was run for Poznań and the Tricity (see Olszewski et al. 2018 for more details), the mean and hedonic rent index for office properties in all three cities is shown in Figure 1 at the end of subsection 3.2. The hedonic rent index for Warsaw is smoother than the mean rent index, which is calculated on the average rents. The other advantage of the use of the hedonic regression is that we can quantify the rent determinants, which can be used for further research.

3.2 Hedonic analysis of retail rents in Poznań[7]

The hedonic rent index for the retail market is created on the base of data obtained from shopping centres located in Poznań and in the neighbouring area that together are customarily treated as the Poznań agglomeration. Unlike in the case of office buildings, the initial inspection of rent data shows

[7] This is a modified version of Olszewski et al. (2018).

a considerable variance in the same shopping centre. Therefore, not mean rents per shopping centre, but rents of single retail premises, of the size from 100 to 500 m2, which are located in all shopping centres, are included into the regression. This restriction allows us to analyse rents for premises that are also subject of analysis of large real estate brokers, as they represent a significant share of all premises located in a retail facility. All rents are converted into euro. To improve the fit of model, all continuous variables are transformed into logarithms. The model for Poznań is estimated on transactional rents registered in the second half of 2017.

The empirical model is quite similar to the one in the office market, the difference is that rents for single shops in the mall are analysed. The dependent variable is the log average rent of shop *j* in the shopping centre *i*, which is explained by the characteristics of each single shop $\alpha_k s_{jin}$ and the building $\beta_k z_{ik}$. The model we estimate is:

$$ln\left(r_{ij}\right) = \beta_0 + \sum_{n=1}^{N} \alpha_k s_{jin} + \sum_{k=1}^{K} \beta_k z_{ik} + \varepsilon_{ij}$$

In fact we have various variables that describe the whole building, while each single shop is only described by its size. This results from the fact that in the initial rounds of data collection only the size of each single shop was asked for. Based on the literature and the initial inspection of the data, the following attributes were analysed:

ln rent EUR = f (ln size of the single shop, ln number of parking lots, ln number of shops in the shopping centre, ln age of the building plus 2, top shopping centre)

We start with the size of the single shops (ln_shop_size), where we expect to observe negative correlation of rents with shop size, which results from the economy of scale. Larger shops tend to sell more diversified but average goods, while small ones focus on goods with a higher markup. Moreover, a larger shop generates the same fixed costs, thus rents per m2 are lower than for a smaller shop. We now move to the attributes of the building itself. The logarithm of the number of parking lots (ln_parking_lots) is a measure of the accessibility of the shopping centre by car. It is expected to increase the rent. The number of shops (ln_number_of_shops) determines how differentiated the offer of the shopping centre is – rents should be higher for those shopping centres which offer a wider range of services and shops that attract many customers. The age of the building (ln_age_of_the_building) can have both positive and negative effect on rents. On the one hand, the older malls were built in better locations, while the newer ones were left with alternative locations. On the other hand, older malls could be of a lower technical standard and have an outdated architecture. Finally, we observe that some shopping centres are considered by the market participants as top (top_shopping_centre), thus their rents should be higher.

The hedonic regression was run on 681 observations and the coefficient of determination of the model amounted to about 41%. This is a reasonable result, but significantly lower than the determination of the office rent regression presented in section 4.1, which amounted to 70%. In order to improve the fit of the model more details about the single shops should be included in the regression. However, more data needs to be collected to perform the extension of the model. The estimated parameters of the model are listed in Table 2.

We find a negative relationship between the size of the single premises and its rent; also Gerbich (1998) obtains such a result for US shopping malls and Olszewski, Waszczuk and Widłak (2017) for flat prices in Warsaw), which can be interpreted as economy of scale. A similar relationship can be found between house prices and their size. When we move to the parameters of the building, we find that rents increase with the number of parking spaces and the number of shops. This means that shopping centres with a diversified offer and easier access by car charge higher rents. The empirical analysis shows that in the Poznań retail market a higher age of the building positively affects the rents. This can result from the fact that the vast majority of shopping centres was constructed several years ago, most likely in good locations. Moreover, we find that rents in top shopping centres are about 17% higher than in the remaining ones. The hedonic rent index and the mean rent index are calculated as explained in section 3.1 for office rents and the results are presented in Figure 2.

The hedonic rent index for retail properties is much smoother than the mean rent index, which results from the heterogeneity of the collected data on rents. Not only did the number of shopping centres increase over time, but so did the number of observations of rents in single shops. Applying the hedonic analysis we obtain a rent index that is resilient to such changes of the composition of data.

3.3 Mean and hedonic transaction prices of office and retail buildings in Poland[8]

Transactions in the commercial property market are rare, because whole buildings are not sold that often. Given that the traded buildings are heterogenous and we include buildings located in various cities to construct the transaction price index, the mean price index can give misleading results. Therefore, the hedonic regression is used to calculate the transaction price index for office and retail real estate. The majority of transactions is noted in euro, while transactions in other currencies are converted into euro. The number of observations in each year is relatively small, therefore it would be difficult to obtain a good model on a single year. The solution is the application of the time dummy regression, which utilizes all available information about transactions in the whole analysed period. We estimate the log price per m2 of leasable area of a building i at a given point in time t $ln\left(p_i^t\right)$ on the hedonic characteristics of the building $\beta_k z_{ik}^t$ and the time dummy for each year D_i^τ, where the parameter δ^τ captures the pure price inflation. The model we estimate is:

$$ln\left(p_i^t\right) = \beta_0 + \sum_{\tau=1}^{T} \delta^\tau D_i^\tau + \sum_{k=1}^{K} \beta_k z_{ik}^t + \varepsilon_i^t$$

The function defined in this way formally, includes the following variables for office properties:

ln price EUR = f (city size, location, building class, ln age, ln leasable area, ln number of parking spaces, time dummy)

Because we analyse transactions in the whole country, we have to capture the size of the city in which the office is located. For this purpose we use the dummy large city and small city,[9] while

[8] This is a modified version of Leszczyński and Olszewski (2015).

[9] Large cities are: Gdańsk and Gdynia (called Tricity, Sopot is excluded) Kraków, Poznań and Wrocław; small cities are: Białystok, Bydgoszcz, Katowice, Kielce, Lublin, Łódź, Olsztyn, Opole, Rzeszów, Szczecin, and Zielona Góra.

Warsaw, which has the most transactions serves as the baseline. We include the log distance to the city centre to differentiate locations in a given city. The difference between offices classes is captured by the dummy office class A, where the office class B serves as the baseline. The total leasable area can be a variable that determines the price. Finally, we find that some buildings differ in design and location and obtain significantly higher transaction prices per m2. We include a dummy variable that captures prime buildings.

We estimate the model and find quite similar results as in the rent analysis. Class A offices obtain prices that are 17% higher than those of B class buildings, while buildings that are considered prime and have a very good location and quality obtain prices that are 42% higher than the B class buildings. The price declines with the age of the building and the distance to the city centre, while the total leasable area does not affect it. Interestingly we do not find any impact of the size of the building – most likely it is already captured in the class and its location, as usually buildings in the best locations, where the development land is very expensive are high and therefore large. Office properties that are located in the large cities are by around 37% cheaper than those in Warsaw, while those in the smaller cities are around 58% cheaper. A similar finding applies also to residential property prices, which can be explained by the differences in the GDP per capita levels and also the land and construction costs.

The analysis of transaction prices of retail properties covers the following variables:

ln price EUR = f (city size, location, retail type, ln age, ln size of an average store, ln number of parking spaces, time dummy)

Similarly as for office properties, we should differentiate between different cities. However, the initial inspection of the data did not show significant differences of prices per m2 between Warsaw and the rest of the voivodeship cities, but slight differences in prices of shopping centres located in agglomerations and outside of those. We capture this by the dummy variable large agglomeration. As in the case of rent analysis, we include the total leasable area, the number of single shops that are in the shopping centre and also the number of storeys. The more differentiated the offer of a given shopping centre, the higher its rents and in consequences, the prices should be higher, too. We also added the age of the building, adding 2 to it, as some objects were sold before they were delivered to the market. We also need to differentiate between different classes of buildings. The baseline is the average shopping centre, while we distinguish between prime property that has a very good location and quality and also retail parks which are much simpler than average shopping centres.

The location in a large agglomeration and also the size of the given object have no significant impact on the transaction price. We find that retail buildings that are considers prime property obtain prices that are 68% higher than the average. Retail parks, on the other hand, obtain values that are 26% lower than the average. Similarly as in the case of rents, we find that the price increases with the number of single premises in the retail object. This can mean that more shops attract more clients. Also the number of storeys has a positive effect on the price. Most likely, objects in good locations where land is rather expensive have more storeys than objects that are on the outskirts of the city. The age of the retail object has no effect on its price.

All regression results can be found in Table 3. The mean and hedonic price index are shown in Figure 3 and 4. The mean price index is calculated like in the case of rents: the average transaction

price per m2 in each year is divided by the mean price in the base year 2004. The parameters of the dummy variables give us directly the hedonic transaction price index. It is the pure price change from our base year, after we have accounted for the hedonic differences of the analysed samples in each year. As it was pointed out in Leszczyński and Olszewski (2015), the significance of the time dummy variables does not carry any information. In the case of other dummy variables the statistical significance is very important as it tells us whether the dummy variable really separates two or more different types of groups, like in the case of A and B class office property. In the case of time dummy variables the significance depends mainly on the base year. The error term is calculated in any case in the same way, but the estimated parameter can be large or small, depending on the base year. If we choose 2002 as the base year, we would obtain quite large estimators, which exceed the error term and in consequence many of the time dummies are considered as significant.

Our results show that the hedonic transaction index is much smoother than the mean price index and gives a reliable picture about the market. For the sake of completeness, we also show the mean and hedonic transaction index for Warsaw, which was calculated according to the same model as for Poland. Only the dummies which differentiate between large and small cities were dropped. Also for Warsaw, which is shown on the left hand axis, the hedonic price index is smoother than the mean price index. The same applies to the transaction index for retail properties. We conclude that one should apply the hedonic regression in order to get a reliable price index. As a by-product, we gain information about the determinants of transaction prices. The hedonic index for the office market shows a general upward trend, while in the retail market we could observe a peak in 2008 that was followed by a decline in prices until 2011. Since then prices increased again and fluctuate. One potential explanation is that there is still demand for office properties and therefore their price is on a steady rise. As concerns the retail market, it is most likely more connected to consumer sentiment and therefore we could observe price increases since the beginning of the series, which declined for a while after the global financial crisis broke out. When people were less worried about the future, they most likely wanted to do more shopping, so shopping centres were needed. But this observation requires a more detailed analysis.

4 Analysis of the profitability of office investment in the Tricity market under various mortgage cost and vacancy rate scenarios[10]

The NBP monitors, among others, the risk associated with the financing of commercial real estate investments with mortgages from banks. There has been a fast development of the modern office space market in major cities in recent years. The previously introduced data collection allows us to gather data that is needed to calculate the average rent and average transaction price of an office building. This information and knowledge about the determinants of rents and prices can be used to gain some insight about how the market can evolve in the future, which is important for the financial system. Investors usually hold many commercial properties in their portfolio and private investors buy shares of various investment funds in order to diversify the investment risk. But the total return is the result of the returns of each single commercial property, therefore we focus in this section on a single property.

We analyse the profitability of investing in office real estate on the example of A class office buildings located in Tricity. The average leasable area of the analysed objects is 15.7 thousand m2,

[10] This is a modified and augmented version of Trojanowski et al. (2018).

the transaction price is approximately 2,500 euro per m2. In the first half of 2018 the average rent for class A office buildings in Tricity was EUR 13 per m2 per month. We apply a discount rate of 7% for equity, and assume that the investment is financed to 70% by a bank loan with a 25-year repayment period.[11] The remaining amount (30%) is equity. The profitability analysis is carried out with particular emphasis on the evolution of the following indicators over the investment period: EBITDA (earnings before taxes interest, debt service and amortization), net profit, FCFE (free cash flow), DSTI (debt service to income). Also the internal rate of return (IRR) for capital expenditures incurred by shareholders and the net present value (NPV) of discounted future cash flows under the adopted discount rate are analysed. We test how the indicators react to the growth of mortgage costs and increases in the vacancy rate. The assumptionss is that everything is deterministic and once a variable is changed, it remains at the new level. The calculations of each economic indicator are explained in detail in Trojanowski et al. (2018), while the results are shown in Table 4.

In each of the analysed periods (25 years of loan repayment plus 1 year after the repayment) the balance of cash flows indicates a positive value with a certain margin of safety. The financial flows guarantee the repayment of loan liabilities within the assumed time horizon. The basic economic indicator EBITDA (earnings before taxes interest, debt service and amortization) increases slowly over the duration of the investment.

The net profit increases gradually due to the decrease in interest charges, from around 461 thousand PLN in the first year to over 1,832 thousand PLN in the twenty-fifth year of the investment. It should be pointed out that as the outstanding mortgage is reduced, also the interest payments decrease. The highest net profit was recorded in the first year after repayment of loan liabilities. The office building generates positive FCFE flows (free cash flow for capital owners) in every period. This means that the revenues generated fully cover the expenses incurred.

Also, the DSTI (inverse of the DSCR – debt service coverage ratio) in all years of the repayment of loan liabilities remains below 0.8, which is a level that is considered as safe. This means that the investor allocates less than 80% of taxable income to repay the loan. Thus, the investor has a financial buffer of around 20% of taxable income.

Under our deterministic assumptions, the price of a property (residual value) that can be obtained at the end of the investment (after 25 years) is over EUR 40 million. This makes the investment profitable. For the assumptions made, the IRR for expenditures incurred by the shareholders is 9.46%, which is higher than the assumed discount rate of 7%, see Table 5. The investment should be considered as profitable. The NPV for the adopted discount rate and the analyzed period is PLN 4.95 million. This amount shows today's value of the future income from the investment, after deducting the initial expenditure, i.e. what profit from the project can be expected in today's value. It can be concluded that the purchase of an office building with the assumptions made allows for stable loan servicing, which is important for the crediting bank.

In order to do the stress test we repeat the calculations with increased mortgage costs (now 5%) and a higher vacancy rate (now 20%). Under such a scenario, the economic indicators have deteriorated significantly. The level of debt burden threatens the financial stability of the investment. The first nine years of operation of the investment would result in losses, because due to the excessive burden

[11] The duration of the investment is set to 25 years to match the maturity of the mortgage. In reality most of investments last only 10 years or are even shorter, but the mortgage is taken for a longer period, by which the annual mortgage instalments are reduced. But, at the end of the investment there is outstanding debt which has to be paid back with the money obtained from the sale of the building.

of credit obligations the expenditures exceed the proceeds (see Table 6). The investment has become unprofitable (the IRR is below the assumed discount rate, see Table 7).

In Table 8 we present the main results of our model investment for different mortgage costs or vacancy rate increases. This simple exercise gives us some insight into how the investment profitability depends on various economic factors. We find that increases in the interest rate decrease the ROE because the debt service increases. In consequence, the debt service to income measure (DSTI) also increases. The increase in vacancy rates or the decrease in the market rent rate have a negative effect on the income that the property generates. In general we find that relatively small negative shocks can reduce the profitability of the investment and make the investor exit the market. We conclude from this simple exercise that when the investor analyses the potential profitability of an office investment, potential negative shocks should be taken into account, which should make the whole investment robust.

5 Conclusions

This paper shows how NBP analyses the rents and prices in the office and retail market. We introduce the mandatory survey about rents and transaction prices of commercial property (office, retail and industrial buildings) and use this data to construct a hedonic rent index and a hedonic transaction price index for the office and retail market. We show how the information can be used to get insight about the situation in the market by calculating the profitability of an office investment. A simple stress test is applied to show how the rate of return and other economic indicators change when the mortgage cost or the vacancy rate increase.

The main conclusion of our paper is that data on rents and transactions is heterogenous and that the hedonic index should be used, as it is robust to changes of the analysed sample of commercial properties. Especially in the case of the retail market the hedonic rent index is much smoother that the mean rent index. The coefficients of the underlying hedonic model also allow, to capture the determinants of rents and transaction prices in the commercial property market, which can be used for further research.

Further work could be done on the hedonic rent index for commercial properties, in order to improve the coefficient of determination. Differences in rents can be observed not only among shopping centres, but also within such centres. Therefore, more details about the rents of single shops in shopping centres should be considered in the regression, which requires longer data.

The hedonic transaction index for the office market shows stable growth, while the prices in the retail sector were first rising but reached a peak in 2008, after which a small downturn could be observed. In the recent years they continue to grow again. Prices of shopping malls seem to follow GDP growth, but also consumer sentiment or the sentiment of investors. The pure price inflation of both office and retail buildings requires a deeper analysis, especially since it has a significant impact on the yields and rates of return of investments and also on the value of the collateral in the case of mortgages.

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Appendix

Table 1
Results of the estimation of log office space rents in Warsaw (in euro per m2 per month)

Variable	Coefficient	Standard error	Statistical significance
Office class B	-0.252351	0.0360762	***
Office class C	-0.517643	0.0715926	***
ln distance from the centre	-0.132730	0.0176110	***
ln total leasable area	0.0278962	0.0160566	*
Constant	3.67582	0.194659	***

Note: the regression was run with OLS, using 152 observations, the R2 is 71%.
*** p < 0.01, ** p < 0.05, * p < 0.1.

Source: authors' calculations on NBP data.

Table 2
Results of the estimation of log retail space rents in Poznań (in euro per m2 per month)

Variable	Coefficient	Standard error	Statistical significance
Constant	2.96643	0.253102	***
ln shop size	-0.346554	0.0184646	***
ln parking spaces	0.107218	0.0248292	***
ln number of shops	0.220312	0.0278825	***
ln age of the building	0.0875909	0.0362018	***
Top shopping centre	0.159862	0.0518214	***

Note: the regression was run with OLS, using 681 observations, the R2 is 41%.
*** p < 0.01, ** p < 0.05, * p < 0.1

Source: authors' calculations on NBP data.

Table 3
Results of the estimation of log transaction price per m2 for office buildings and retail buildings in Poland

Offices	**Coef.**	**Std. err.**	**p-value**	**Retail buildings**	**Coef.**	**Std. err.**	**p-value**
ln leasable area	-0.00107	0.024	0.96	ln leasable area	-0.0615	0.0607	0.313
office class A	0.174	0.047	0.00	large agglomeration	0.056	0.065	0.390
ln age plus 2	-0.094	0.024	0.00	prime property	0.720	0.155	0.00
ln distance	-0.078	0.018	0.00	retail park	-0.254	0.142	0.077
prime property	0.420	0.078	0.00	ln number shops	0.107	0.051	0.040
Small cities	-0.582	0.069	0.00	ln number storeys	0.119	0.057	0.041
Big cities	-0.372	0.057	0.00	ln_age_plus_2	-0.048	0.057	0.041
d2000	-0.086	0.161	0.59				
d2001	-0.039	0.174	0.82				
d2002	-0.094	0.152	0.53	d2002	-0.166	0.280	0.554
d2003	-0.216	0.153	0.16	d2003	-0.213	0.307	0.489
d2005	-0.072	0.116	0.53	d2005	-0.025	0.223	0.908
d2006	-0.008	0.114	0.94	d2006	0.175	0.219	0.426
d2007	0.043	0.116	0.70	d2007	0.213	0.224	0.344
d2008	0.145	0.124	0.24	d2008	0.461	0.238	0.055
d2009	0.144	0.227	0.52	d2009	0.395	0.246	0.111
d2010	0.069	0.124	0.57	d2010	0.159	0.230	0.491
d2011	0.148	0.121	0.22	d2011	0.156	0.218	0.475
d2012	0.159	0.127	0.21	d2012	0.335	0.242	0.169
d2013	0.086	0.119	0.46	d2013	0.468	0.217	0.033
d2014	0.071	0.121	0.55	d2014	0.257	0.243	0.292
d2015	0.165	0.117	0.15	d2015	0.445	0.217	0.043
d2016	0.057	0.127	0.65	d2016	0.344	0.239	0.152
d2017	0.168	0.140	0.23	d2017	0.432	0.231	0.064
d2018	0.177	0.121	0.14	d2018	0.380	0.262	0.151
const	8.619	0.309	0.00	const	7.487	0.503	0.000

Note: the regression was run with OLS. For office transactions the number of observations is 283, the adjusted R2 is 45%, for retail transactions the number of observations is 137 and the adjusted R2 is 34%.

Source: authors' calculations on NBP data.

Table 4
Economic results, assuming a 2.5% interest rate on the loan and a 5% vacancy rate (in euro)

Year	EBITDA	Net profit	FCFE	DSTI
1	2 186 401	460 695	597 033	0.71
2	2 197 333	485 941	602 043	0.71
3	2 237 445	535 237	630 592	0.70
4	2 277 497	584 909	658 993	0.69
5	2 315 838	633 629	685 906	0.68
6	2 354 681	683 202	713 121	0.68
7	2 394 146	733 735	740 732	0.67
8	2 434 242	785 248	768 745	0.66
9	2 474 979	837 761	797 164	0.65
10	2 516 369	891 294	825 997	0.64
11	2 558 420	945 869	855 247	0.63
12	2 601 145	1 001 507	884 920	0.63
13	2 644 553	1 058 229	915 023	0.62
14	2 688 655	1 116 057	945 561	0.61
15	2 733 463	1 175 015	976 539	0.60
16	2 778 988	1 235 126	1 007 964	0.60
17	2 825 242	1 296 413	1 039 842	0.59
18	2 872 235	1 358 900	1 072 178	0.58
19	2 919 981	1 422 613	1 104 978	0.57
20	2 968 490	1 487 577	1 138 249	0.57
21	3 017 776	1 553 817	1 171 997	0.56
22	3 067 850	1 621 360	1 206 228	0.55
23	3 118 725	1 690 233	1 240 947	0.54
24	3 170 414	1 760 463	1 276 163	0.54
25	3 222 930	1 832 079	1 311 880	0.53
26*	3 276 287	1 893 814	2 832 059	–

* First year where the mortgage is fully paid back.

Source: authors' calculations.

Table 5

The profitability of the office building's activity measured by NPV and IRR with the assumption of 2.5% of the loan interest rate and 5% of the vacancy rate

IRR (for the equity of the investor at the initial date of the investment)	9.46%
NPV (discounted value of the future cash flows, after considering the investment expenditure and the residual value)	4 957 566 euro
Residual value (cash flow in the 26th year/discount rate)	40 457 986 euro
Discount rate	7.0%

Source: authors' calculations.

Table 6
Economic results during the investment, assuming a 5.0% loan interest rate and 20% vacancy rate (in PLN)

Year of the investment	EBITDA	Net result	FCFE	DSTI
1	1 728 277	-464 271	-94 233	1.05
2	1 736 919	-433 824	-92 733	1.05
3	1 768 744	-383 404	-72 735	1.04
4	1 800 828	-331 519	-52 822	1.03
5	1 831 542	-279 423	-34 327	1.02
6	1 862 637	-225 633	-15 850	1.01
7	1 894 229	-169 983	2 688	1.00
8	1 926 326	-112 393	21 276	0.99
9	1 958 937	-52 776	39 903	0.98
10	1 992 069	8 954	58 556	0.97
11	2 025 732	72 891	77 221	0.96
12	2 059 934	139 133	95 884	0.95
13	2 094 682	207 782	114 530	0.94
14	2 129 987	278 944	133 142	0.94
15	2 165 856	352 732	151 703	0.93
16	2 202 300	429 264	170 195	0.92
17	2 239 326	508 664	188 597	0.91
18	2 276 945	591 060	206 888	0.90
19	2 315 166	676 589	225 046	0.90
20	2 353 998	765 394	243 048	0.89
21	2 393 452	857 624	260 867	0.88
22	2 433 536	953 436	278 478	0.87
23	2 474 263	1 052 994	295 851	0.87
24	2 515 640	1 156 471	312 956	0.86
25	2 557 680	1 264 049	329 762	0.85
26*	2 600 393	1 346 339	2 284 585	–

* First year where the mortgage is fully paid back.

Source: authors' calculations.

Table 7
The profitability of office building operations measured by NPV and IRR, assuming an increased loan rate of up to 5% and a vacancy rate of up to 20%

IRR (for the equity of the investor at the initial date of the investment)	4.56%
NPV (discounted value of the future cash flows, after considering the investment expenditure and the residual value.)	-4 815 126 euro
Residual value (cash flow in the 26th year / discount rate)	32 636 927 euro
Discount rate	7.0%

Source: authors' calculations.

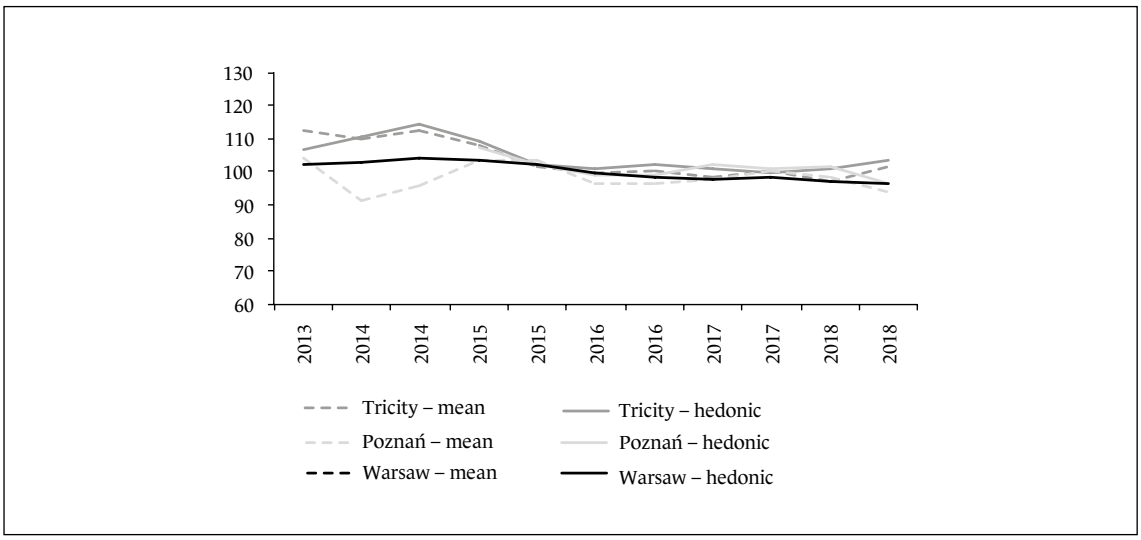
Table 8
Analysis of the sensitivity to the increase in interest rates on loans and the vacancy rate and the decrease in the net rent rate

Category	**Change**	**IRR (%)**	**NPV (euro)**	**DSTI***	**ROE* (%)**
Mortgage cost	0%	9.46	4 957 566	0.71	5.1
	+0.5 p.p.	9.09	4 245 257	0.74	4.6
	+1.0 p.p.	8.72	3 508 725	0.78	4.0
	+1.5 p.p.	8.34	2 748 435	0.81	3.5
	+2.0 p.p.	7.95	1 964 914	0.84	2.9
	+2.5 p.p.	7.56	1 158 738	0.87	2.4
	+3.0 p.p.	7.16	330 534	0.91	1.7
Vacancy rate	0%	9.46	4 957 566	0.71	5.1
	+5%	8.49	2 966 278	0.76	4.0
	+10%	7.50	974 990	0.81	3.0
	+15%	6.47	-1 016 298	0.87	1.9
Net rent	0%	9.46	4 957 566	0.71	5.1
	-0.5 euro/m2/month	8.89	3 790 628	0.74	4.5
	-1.0 euro/m2/month	8.32	2 623 691	0.77	3.8
	-1.5 euro/m2/month	7.74	1 456 753	0.80	3.2
	-2.0 euro/m2/month	7.1	289 815	0.83	2.6
	-2.5 euro/m2/month	6.54	-877 122	0.86	2.0

***** Value calculated at the time the mortgage was taken.
Base values: 2.5% interest on the loan, 5% vacancy rate, rent is 13 euro/sqm/month).

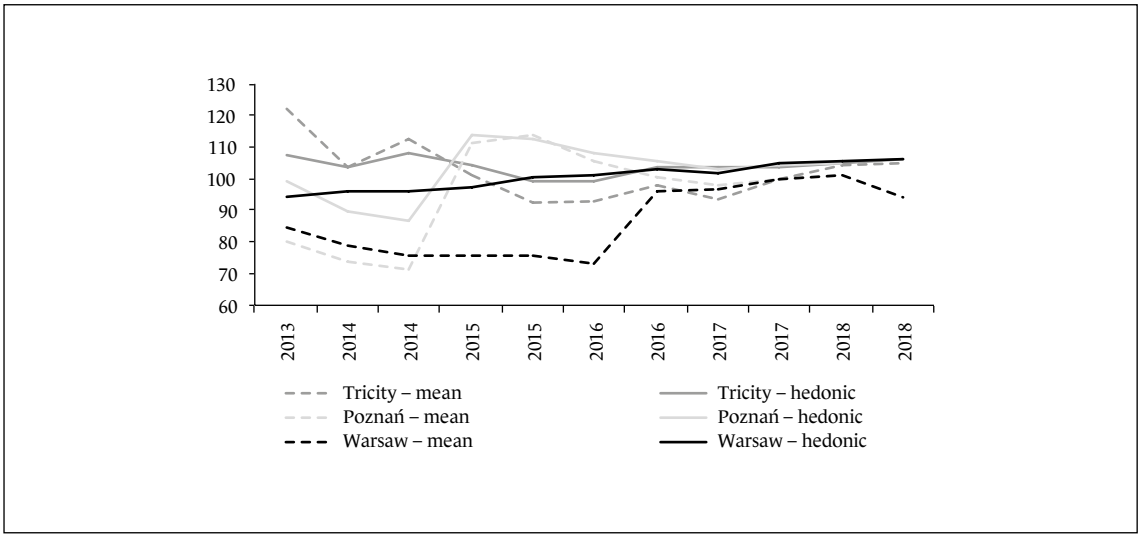
Source: authors' calculations.

Figure 1
Index of rents for offices, mean and hedonic (IV 2017 = 100)



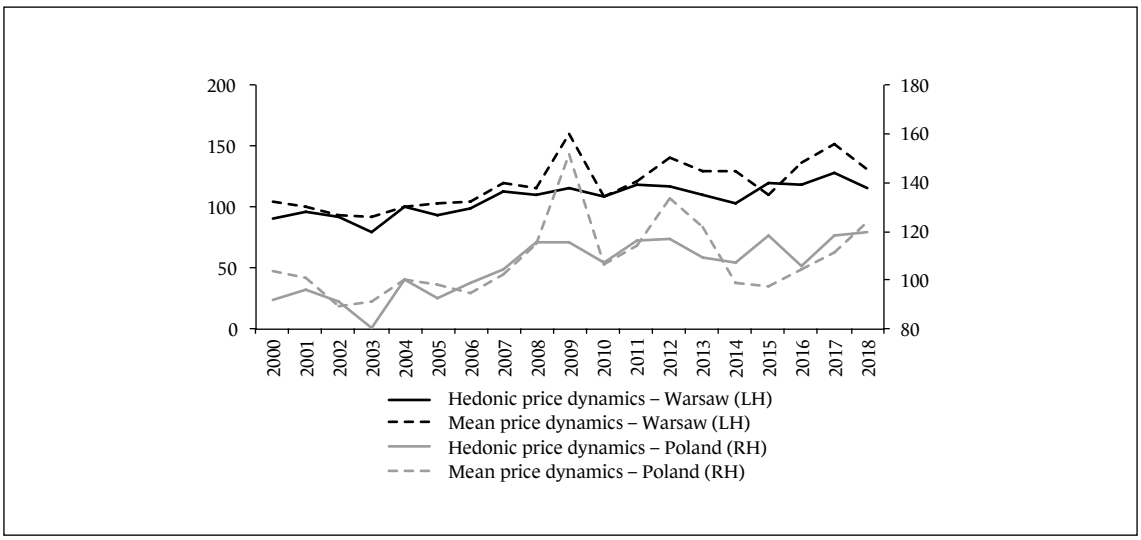
Source: NBP.

Figure 2
Index of rents for shopping centres, mean and hedonic (IV 2017 = 100)



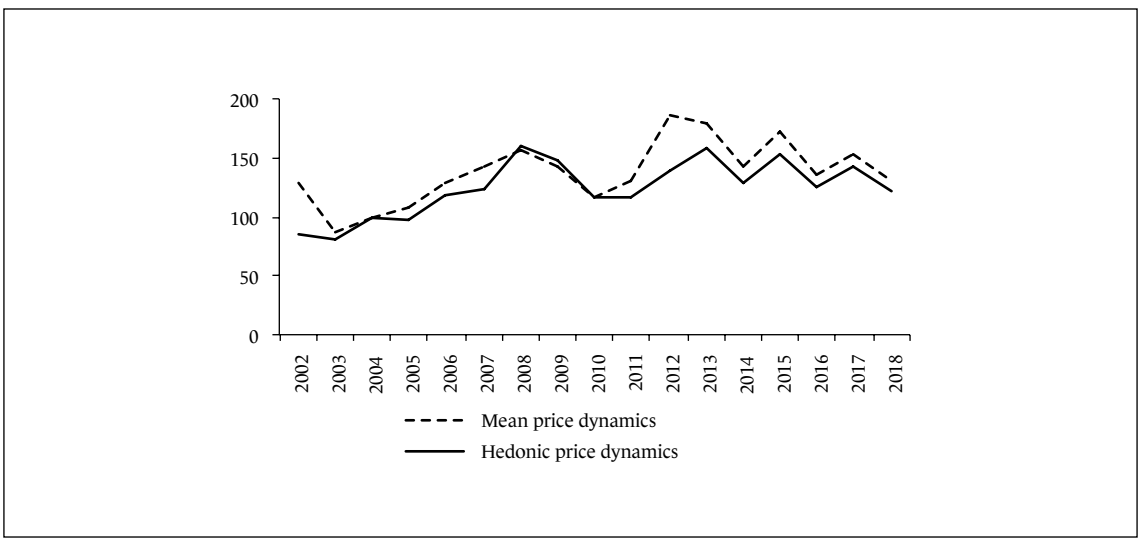
Source: NBP.

Figure 3
Mean and hedonic price index for office properties in Warsaw and Poland (2004 = 100)



Source: NBP.

Figure 4
Mean and hedonic price index for retail properties in Poland (2004 =100)



Source: NBP.

Variables collected in the survey and layout of the survey

The table below contains all collected variables, their detailed description and the type of property, for which the given variable is collected. The survey for the office sector has the signature NBP-NK/B (*biura* means offices in Polish, NK stands for *nieruchomość komercyjna*, which means commercial property), the survey for retail properties it is called NBP-NK/H (*handel* means retail in Polish) and the one for industrial properties is called NBP-NK/M (*magazyny* means industrial property in Polish).

List of variables and their explanation

	Number	Variable	Name of the survey	Instruction on how to fill out the survey
Header	1	Respondent's number	NBP-NK/B NBP-NK/H NBP-NK/M	The respondent's number will be assigned by the NBP Regional Branch
Localisation of the property	2	City	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter the city where the property is located
	3	District	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter the district in which the property is located
	4	Street	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter the street name at which the property is located
	5	Street number	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter the building's address number (or the number assigned by the developer)
Data about the building	6	The name of the building	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter the name adopted by the developer / owner for a given building
	7	Year of completion	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter the year of completion of the property, YYYY format
	8	Technical condition (after modernization, without modernization)	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter if the property has undergone modernization since its completion (after modernization / without modernization) Modernization does not mean the ongoing maintenance of the object. Modernization includes: extension, façade replacement, replacement of elevators, replacement of installations, etc.

	Number	Variable	Name of the survey	Instruction on how to fill out the survey
Data about the building	9	The year of the latest modernization	NBP-NK/B NBP-NK/H NBP-NK/M	If the property has undergone modernization, please enter the year of the latest modernization, YYYY format
	10	Total net rentable area (m2)	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter the total net leasable area in sqm. The net leaseable area determines the area that tenants actually use for direct business operations. For example, it is the size of a shop or service point, office space, etc., excluding social, administrative or common areas. This includes surfaces used by the owner of the building, if the owner runs business there himself. An example is a large grocery store operated by the owner of a shopping centre
	11	Net vacant space (m2)	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter the amount of currently vacant net space for rent in sqm. For office buildings with a retail and services part, please provide only the indicator regarding office space. For retail property, please take into account only retail space, not including any office space. For industrial buildings, please only take into account industrial space, not including any office space
	12	Share of common areas in the gross lease area (%)	NBP-NK/B NBP-NK/H	This is the share of common area in the gross leasable area of the whole building expressed in %. The common area includes the entrances to the building, the building reception, lift halls, corridors, toilet areas, smoking rooms and other auxiliary rooms available to all or part of the tenants. This list is not closed, please enter the share according to the building specification The **gross leasable area** is the net lease area of the whole building plus the area of the auxiliary premises of the tenants, such as administrative and social rooms, storage rooms, reception desks and tenant's participation in exploiting the common areas of the building, such as corridors, staircases, public toilets
	13	Number of parking spaces	NBP-NK/B NBP-NK/H	Please enter the number of underground parking spaces and above-ground parking spaces belonging to the property
	14	Number of overground storeys	NBP-NK/B NBP-NK/H	Please enter the number of overground storeys of the building, e.g. for a one-story building enter 1, for a single-story building, number 2, etc. The number of storeys in the building does not include those with a garage

	Number	Variable	Name of the survey	Instruction on how to fill out the survey
Data about the building	15	Office class (A, B, C)	NBP-NK/B	Please enter the office building class. A – modern building (less than 10 years have passed since the construction or major renovation) with high quality equipment, located in the city centre, well connected; B – building constructed or modernized more than 10 years ago, of a lower standard than the A class building located in the centre city or a building with good technical parameters, but located outside the city centre; C – a building constructed or modernized more than 10 years ago with low quality equipment and located outside the city centre or a building built or modernized more than 20 years ago with low quality equipment located in the city centre
	16	Share of retail and services area net	NBP-NK/B	Please enter the share of the retail and services area in the net rentable area in %
	17	Operating costs per month	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter the operating costs incurred by the owner of the property for a month. Please enter the average for the half-year for the entire property. Operating costs of the business include maintaining the technical condition of the real estate, repairs and modernizations, ensuring safety, cleaning works, taxes and other fees related to the property and, possibly, the costs of the management. Fixed costs are independent of the level of renting the building
	18	Currency of the operating costs	NBP-NK/B NBP-NK/H NBP-NK/M	Please select the currency of the operating costs per month; PLN or EUR
	19	Transaction price of purchase/sale of the real estate (gross)	NBP-NK/B NBP-NK/H NBP- NK/M	Please enter the transaction price of the real estate (gross)
	20	Currency of the transaction price for buying/ selling real estate (gross)	NBP-NK/B NBP-NK/H NBP- NK/M	Please select the currency of the transaction price for the purchase/sale of the real estate (gross); PLN or EUR
	21	The date of the offer to sell the property	NBP-NK/B NBP-NK/H NBP- NK/M	Please enter the date of the offer (DD-MM-YYYY)
	22	Date of purchase/sale of real estate	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter the date of the purchase/sale transaction (DD-MM-YYYY format)

	Number	Variable	Name of the survey	Instruction on how to fill out the survey
Data about the building	23	The value of the property resulting from the last valuation	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter the value resulting from the last valuation
	24	Currency of the property value resulting from the last valuation	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter the currency of the value resulting from the last valuation; PLN or EUR
	25	The capitalization rate resulting from the last valuation	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter the capitalization rate resulting from the last valuation
	26	The day on which the last valuation was made	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter the date of the last valuation (format DD-MM-YYYY)
	27	COMMENTS	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter additional information about the offer/ transaction, which should be considered particularly important
	28	Type of building (shopping centre, local shopping centre, outlet, retail park, retail and service premises)	NBP-NK/H	Please enter the type of building: shopping centre, local shopping centre, outlet, retail park, retail and services premises (in an office building)
	29	Number of retail and service premises in the building	NBP-NK/H	Please enter the number of all retail and services premises located in the building
	30	Office space (sqm)	NBP-NK/M	Please enter what the office space is in the total warehouse space in sqm
	31	Warehouse adapted for production (YES/NO)	NBP-NK/M	Please enter whether the warehouse is also adapted for production, YES/NO
Data about the rents	32	The name of the building	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter the name of the building, using the name that has been given to the property in the description of the building in the NBP-NK/B or NBP-NK/H or NBP-NK/M form (from column 1)
	33	No. of the leased area	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter the number of the area for which the offer or lease transaction applies. Please give each surface a unique number and use this number in subsequent editions of the survey

	Number	Variable	Name of the survey	Instruction on how to fill out the survey
Data about the rents	34	The size of each area, rented or for rent (m2)	NBP-NK/B NBP-NK/H NBP-NK/M	Please specify the size of each rented area or area offered for rent in sqm
	35	Fees related to the operation and maintenance of space per sqm in a month	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter the fees associated with the use of space, per sqm for a month in PLN or EUR (please specify the currency). Please enter the average value for the half year under review. Net charges related to the exploitation of space per sqm for a month are fees for utilities such as gas, electricity, water, central heating, as well as ongoing repairs and maintenance. The net fees are borne by the building owner and then either directly transferred to the lessee (then the net rent is quoted) or covered by the building owner from the cash flow that is received from the tenant (then the gross rent is quoted, e.g. in the case of cooperatives)
	36	Currency (PLN/EUR)	NBP-NK/B NBP-NK/H NBP-NK/M	Applies to fees associated with the operation and maintenance of space per sqm in a month
	37	Net rent applicable on the day of quotation/ offered per sqm in PLN or EUR per month	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter the net amount of the rent (remuneration for the landlord, i.e. gross rent resulting from the contract, reduced by fees related to the operation and maintenance of space) per sqm per month in PLN or EUR (please enter the currency in the next item of the questionnaire). In the event that there is a contractual rent, please enter the contractual amount without taking into account the no-rent period and other short-term discounts. If the rent is calculated on the turnover, please enter the average of the last six months. These costs should be entered in the column Net charges related to the space per sqm in a month. Applies to individual premises. If, in the case of cooperatives, the Net charges related to the space per sqm in a month, are already included in the rent, please specify this rent (then we refer to the gross rent)
	38	Currency (PLN/EUR)	NBP-NK/B NBP-NK/H NBP-NK/M	Applies to the net rent applicable on the day of quotation/offered per sqm per month (PLN/EUR)
	39	The office space tenant sector	NBP-NK/B	Please provide the main sector of the office space tenant: 1 – financial sector, insurance, 2 – logistics, trade, 3 – technologies, 4 – IT and telecommunications, 5 – public sector, 6 – other

	Number	Variable	Name of the survey	Instruction on how to fill out the survey
Data about the rents	40	The type of service offered by the tenant of office space	NBP-NK/B	Please provide the main type of services offered by the tenant of office space: 1 – direct customer service from outside (i.e. natural persons or business entities) e.g. by consulting companies, 2 – remote customer service, e.g. call centre, 3 – office service of the activity of the firm or its mother company (including external customer service and/or customer service of the company remotely, e.g. call centre for its clients)
	41	Location of the area in the building	NBP-NK/H	Please give the location of the rented space in relation to the entrance (this may be in relation to the main entrance or an important entrance from the car park): 1– near the entrance, 2 – relatively well located (at the same level as the entrance, but at some distance from the entrance), 3 – far from the entrance (the location is not very favorable, requires looking for the shop, using stairs, elevators)
	42	The business sector of the renter of the retail space	NBP-NK/H	Please enter the industry of the tenant of the retail space: 1 – fashion and accessories, 2 – jewelery, 3 – shoes, leather products, 4 – Television, household appliances, 5 – cosmetics, pharmacy, 6 – catering, 7 – banks, insurance, etc. 8 – other)
	43	Floor	NBP-NK/B NBP-NK/H	Please enter the number of the floor on which the rented space is located. If the entire multi-storey building is rented by one tenant, enter 0 (ground floor level). If one tenant occupies a part of the building on many floors (eg. 0, 1, 2, 3, 4, 5) then the number of the lowest storey should be entered, and if the number of one of the floors occupied by the lessor is under the ground floor (e.g. -1) then enter 0
	44	Lease terms – contract length (years)	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter for how many years the current lease contract has been signed. If the contract was annexed, please indicate for how many years the latest contract was signed. Please enter the value for each premise
	45	Lease terms – length of the period free of rent (months)	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter, for how many months the tenant, with current contracts, is exempt from paying rents. Please enter the value for individual surfaces
	46	Date of issuing the lease offer (DD-MM-YYYY)	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter the date of issuing of the lease offer, format DD-MM-YYYY
	47	Date of the lease transaction (DD-MM-YYYY)	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter the date of the transaction of the currently valid lease contract, format DD-MM-YYYY If the contract was annexed, please enter the date of the latest annex concerning the change in the rent

	Number	Variable	Name of the survey	Instruction on how to fill out the survey
Data about the rents	48	Valorisation of the rent (YES/NO)	NBP-NK/B NBP-NK/H NBP-NK/M	Please state if the rent is subject to valorisation
	49	Area status (rented, for rent)	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter whether the space is rented or unoccupied
	50	Green building (YES/NO)	NBP-NK/B NBP-NK/H NBP-NK/M	Please enter if the building is a green building (YES/NO) A green building is a building that uses environmentally friendly solutions throughout its life cycle, meeting the requirements of BREEAM, LEED

First page of the office survey, with data about the building and its price and valuation – example of the office sector survey

NARODOWY BANK POLSKI		
name and address of the reporting unit	**NBP-NK/B** The survey for the office sector NBP-NK/B	NBP Regional Branch ……
		PBSSP.

Time needed to fill out the questionnaire		
Please enter the time (in minutes) needed to prepare the data	1	
Please enter the time (in minutes) needed to fill the form	2	

NBP-NK/B 1 DATA FORM FOR SURVEYING THE COMMERCIAL REAL ESTATE MARKET - OFFICES

1	The respondent's number will be assigned by the NBP Regional Branch.

Office real estate - office spaces located only in office buildings - with an area no less than 50 sqm

Location					**Description of the building**											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
The number of the building	City	District	Street	Street number	The name of the building	Year of completion	Technical condition (after modernization, without modernization)	The year of the latest modernization	Total net rentable area (sqm)	Net vacant space (sqm)	Share of common areas in the gross lease area (%)	Number of parking spaces - underground	Number of parking spaces - above-ground	Number of overground storeys	Office class (A, B, C)	Share of retail and service area net%
I1																
I2																
I3																
etc.																

18	19	20	21	22	23	24	25	26	27	28	29
Operating costs per month	Currency of the operating costs (PLN/EUR)	Transaction price of purchase / sale of the real estate (gross)	Currency of transaction price for buying / selling real estate (gross)	The date of the offer to sell the property	Date of purchase / sale of real estate	The value of the property resulting from the last valuation	Currency of the property value resulting from the last valuationy (PLN/EUR)	The capitalization rate resulting from the last valuation (%)	The day on which the last valuation was made	Green building (YES / NO)	COMMENTS

Second page of the office survey, with data about the rents and attributes of single premises in the building described on the first page

Office real estate - RENT															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
The number of the building from form NBP-NK office 1	Number of the leased area	Floor	The type of service offered by the tenant of office space	The business sector of the renter of the retail space	The size of each area rented / for rent (sqm)	Fees related to the operation and maintenance of space per sqm in a month	Currency of exploitation fees and maintenance of space per sqm per month (PLN / EUR)	Net rent applicable on the day of quotation / offered per sqm in a month	Currency (PLN / EUR)	Lease terms - contract length (years)	Lease terms - length of the period free of rent (months)	Date of issuing the lease offer (DD-MM-YYYY)	Date of the lease transaction (DD-MM-YYYY)	Valorisation of the rent (yes, no)	Area status (rented, for rent)