



## Monopolistic Competition and Price Discrimination as a Development Company Strategy in the Primary Housing Market

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**Abstract:** *Firms operating in the property sector use information asymmetry and the local monopoly to differentiate prices of housing units. Selling similar housing to purchasers at various prices allows them to maximise profits. The aim of this article is to analyse empirically the behaviour of developers that shape the market situation. It is necessary to depart from the classic approach to analysing enterprises that operate in a free and competitive market and produce typical, homogeneous goods. Here we are rather analysing firms that produce heterogeneous goods and make individual transactions with each client. We use the hedonic regression to compare the theoretical and empirical prices per sq. m. of dwelling in the primary market in Warsaw and find significant dispersions. A price discrimination strategy may be one explanation for the high and upward elasticity of prices observed.*

**Keywords:** Monopolistic competition, price differentiation, housing market, information asymmetry.

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<sup>1</sup> The paper presents the personal opinions of the authors and does not necessarily reflect the official position of Narodowy Bank Polski or the Warsaw School of Economics.



## Introduction

The housing market plays an important role for households because of its consumption and investment functions (Łaszek, 2004). A housing unit is a specific, costly and immobile good, and many empirical studies have tried to explain the demand and supply side of this good. However, the supply side is not that well described, especially at the micro level. Taking into account that transactions are individual, it is important to make the market more transparent.

New dwellings amount only to a small part of the housing stock each year, but they play an enormous role in satisfying housing needs. There is competition between the primary and secondary market, but it is not perfect. There are several reasons for this: subsidised housing programmes, administrative, legal and taxation issues, the diversity of the technical conditions of a building and the quality of a dwelling. When there is not enough housing offered from the existing stock, new housing needs to be constructed.

Understanding how developers shape the market can help to reduce the risk of a banking crisis and to effectively satisfy people's housing needs. The developer is an entrepreneur who organises the construction process and sells dwellings to gain profits. Developers do not operate in a free and competitive market and produce typical, homogeneous goods. They produce heterogeneous goods and sell housing units at different prices to different clients (Łaszek and Olszewski, 2015), using both first-degree and second-degree price discrimination strategies. Observing the development of house prices and single transactions in the Warsaw market, we formulated the two research questions and tackled them with a hedonic regression:

**Research hypothesis 1:** The developer market in Poland works as a price discriminating market, not under free competition.

**Research hypothesis 2:** Due to information asymmetry developers can charge a higher price than under free competition and consumers suffer a welfare loss, compared to what they would pay under free competition. Better dissemination of information would help to reduce this problem.

While analysing developers, we want to stress that the supply side has not yet been completely explored in the literature, most likely owing to the lack of reliable data on single investments and single transaction prices. Macro analyses of the supply side have been conducted by DiPasquale and Wheaton (1992), DiPasquale (1999), and Wheaton (1999). Stover (1986) and Epple (2010) have carried out empirical search, whereas the supply and demand side has been described by Tse et al. (1999) and Phang et al. (2010). But we lack enough literature that discusses theoretically and empirically the supply side on a micro scale. Łaszek and Olszewski, (2015) present a first approach to this problem, while we analyse it empirically.

## The primary housing market and the behaviour of developers

There are four factors that have a huge influence on prices in the housing sector: imperfect knowledge about individual transactions and information asymmetry, the heterogeneous quality of dwellings, spatial location, and the individual character of every transaction.

House buyers try to obtain as much information as possible about the market, but what they really know at a given moment are average prices and some offers that they receive from



developers. By contrast, given that there are relatively few large firms on the market and there is high market concentration (see NBP, 2012), developers know quite well what their competitors are offering. They offer each client a similar housing unit at an individual price and keep the amount of available housing units in a given location secret, and also they highlight differences between similar housing units so they appear more attractive to various buyers.

Supply in the primary housing market is determined by land accessibility, the structure of the stock of yet unsold constructed housing and regulations constraining supply. Rising prices usually cause increasing production costs or land prices and may lead to the introduction of legislative restrictions. It takes around four years to complete a housing development project in Poland. Developers need to purchase land and obtain all the necessary permits, which takes around two years, and then the construction process takes another two years. The pre-sale contracts are sold when the physical construction process has just started. Developers have land banks for construction purposes that amount to around six years of production (NBP, 2012), and have numerous building permits on hand so that they can quickly adjust housing production to higher market needs.

The housing market is very heterogeneous, which complicates the analysis for the home buyer. Prices per sq. metre depend negatively on the size of the dwelling,<sup>2</sup> but grow with the amount of amenities the given dwelling offers. Taking into account the diversification of flats, one has to understand the transaction price as the sum of valuations of housing attributes, such as the total area, standard, location (see Rosen, 1974). Various articles have addressed the issue of housing heterogeneity and the quantification of that problem (Ridker and Henning, 1967; Tse et al. 1999; Tomczyk and Widłak, 2010). Because it is nearly impossible to find a perfect substitute for a particular flat, the market operates as a monopolistic competition.

Monk and Whitehead (1996) state that the land market is spatially segmented, which implies that land at one location is not a perfect substitute for land at a different location. The degree of spatial differentiation can be changed due to improvements in communication such as the development of public transportation and the construction of roads. If we create access to the transportation system on earlier difficult-to-access grounds, we can generate a higher demand for this land. This improvement will reduce transportation costs, and as a consequence households will be less willing to pay more for places nearer to the city centre. Regardless of spatial segmentation, the return of the investment in the long term should level out, as the costs of better-located lands are higher.

Transactions are made by private persons, who have different tastes, financial circumstances and living conditions. Leaving aside taste, a person's financial situation and current living conditions play an important role in the decision process. If buyers are currently renting another dwelling, where they pay more or less the same amount of money to a landlord as they would pay to a bank in mortgage instalments (see NBP, 2015), they'll want to buy a new dwelling as quickly as possible. If buyers need to make the purchase with the help of a mortgage, they might worry that the price could increase quickly and they will not be able to take a huge loan. Conversely, cash purchasers who buy the dwelling for their children or for rent are in a better

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<sup>2</sup> The construction of a dwelling has some fixed costs, such as the kitchen, the toilets and other fixed parts, that are there irrespective how big the flat is. Additionally, people have a given amount of money they can spend, thus the demand for small dwellings is quite high. Developers know that and charge higher prices per sq. meter than in the case of larger dwellings.



situation. They can collect multiple offers and wait a considerable amount of time before they buy, by which they have some negotiation power.

The development company is a price maker, not a price taker, mainly for three reasons: uncertainty, diversity of quality, location and the individual nature of transactions. The development sector is usually described in the literature as a free market and the strong competition between a large number of business entities is stressed. These conclusions are based on international data, but the Polish development sector is characterised by a high level of production concentration (NBP, 2012). There are huge market entry costs and land is difficult to substitute, so the developer has monopolistic power and as a consequence can control prices (Emmanuel, 1985). A particular number of enterprises supply the market with a diversified product, which is intended to satisfy basically the same needs. But each new building is presented by its creator as a unique good because of its higher quality and spatial monopoly. Competition from companies that sell similar flats is thus constrained. While settling prices enterprises move along the demand curve, which implies that they are price makers. The analysis of the Polish development sector performed by NBP (2015) indicates that developers engage in some behaviours that are characteristic for monopolistic competition or a classic monopoly. Developers have a tendency to keep prices high, but react elastically to an increase in demand and have a propensity to produce excessive supply.

Our empirical findings and theoretical considerations follow the line of oligopolistic land developer models, where the assumption about perfect competition is relaxed. Henderson and Thisse (1999, 2001) present a strategic community development model where pricing policies differ across developments. They examined the equilibrium formation of communities differentiated by their residents' income and they endogenise the number and size of developments. Epple et al. (2010) focused not on total housing supply but only the supply of new housing on which basis they discuss how to estimate the production function for housing and state that prices and quantities for housing are never observed separately, so by using latent variables it is possible to identify and estimate the production function without relying on strong assumptions about the functional form. In this way it is possible to estimate the price elasticity of the housing supply per unit of land and the elasticity of substitution between land and non-land factors. The housing supply is usually studied in terms of new flats supplied as an aggregate to a market, where its determinants are interest rates, developer profits, construction permits and various administrative obstacles. The analysis of a single development project (how many flats are in a given location, at what prices and where to build) is less studied in the literature. Most likely this is due to the lack of very detailed data on private firms, which try to keep this information secret. A detailed study of the stages in a development project in Poland, focusing especially on costs and income streams at each stage, is presented in Augustyniak et al. (2012).

We find signs of first- and second-order price discrimination in the primary sector. Monopolists offer flats at prices equal to the clients' maximum willingness to pay, which means they gain all consumer surpluses. In the housing market all deals are closed in individual contact with a purchaser – this is a typical situation for a discriminating monopoly (Łaszek and Olszewski, 2015). There are some smaller companies, but they do not produce many dwellings. They attempt to find their own niche to compete with bigger players, but they do not lower prices in fear of a price war. Instead they focus on extensive promotions to highlight the distinctive benefits and features of their products or they deliver goods to particular groups of buyers. Raymond (1998) suggests that some developers regularly sell a small number of housings to give the impression of shortfalls, which in turn constrain consumer choice, strengthen the competition between purchasers and cause an information asymmetry. There are also other



methods to generate extraordinary profits. Barlow (1993) claims that in the real estate sector negotiation skills and finishing projects on time help to maximise profits.

## The empirical analysis of price differentiation in the primary market

Housing is a heterogeneous good, so simple dispersion methods, such as standard deviation, variance or range, present inaccurate results because different products are being compared. In the first step we estimate a hedonic model of price per sq. m., which will explain how developers valued their new flats. In the next step we calculate the theoretical values of housings and compare them with real transaction prices.

We use information about transactions from the primary housing market that are gathered in the BaRN data base.<sup>3</sup> The next step was to clear the data set and reject outliers. We dropped observations if the price per sq. m was higher than 20 000 and lower than 2 000 PLN or the total area of a dwelling was less than 15 sq. m. and more than 150 sq. m.

The final data set consists of 33 337 transactions in the Warsaw primary market concluded from Q1 2006 to Q4 2014. Our data set consists of physical attributes of dwellings, such as the number of rooms, standard, location variables (dummy variable for districts), information about the transaction date and many more parameters mentioned in appendix 1. We decided to consider variables where no more that 30% of observations are missing. All the explanatory variables included in the model are chosen on the basis of our market experience and econometric test of the models (tests VIF and RESET). We estimated an OLS model that consists of 53 independent variables and 1 dependent variable (the logarithm of price per sq. m). The RESET test indicates that the model is specified correctly and the collinearity is moderate (VIF<10). We use the heteroskedasticity and autocorrelation consistent estimator (HAC). On the basis of our estimation results, we confirm that most variables are statistically significant and their estimated direction of influence on house prices is as we conjectured. The coefficient of determination  $R^2$  amounts to about 64%. Taking into account that this is a model built on micro data we can claim that our results are satisfactory.

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<sup>3</sup> A database created by Narodowy Bank Polski.



**Table 1: The result of the OLS regression. Sample: 33377 observations, dependent variable: logarithm of the price per sq. m. of housing**

	<i>Coefficient</i>	<i>Standard Error</i>	<i>t-Student</i>	<i>p-value</i>	
const	9,2630	0,0067	1390,2508	<0,00001	***
Mokotow	-0,2803	0,0073	-38,2505	<0,00001	***
Wola	-0,3904	0,0069	-56,3638	<0,00001	***
Zoliborz	-0,3442	0,0069	-50,2462	<0,00001	***
Ochota	-0,2989	0,0075	-40,0836	<0,00001	***
Ursynow	-0,4236	0,0083	-51,0140	<0,00001	***
Wilanow	-0,4453	0,0067	-66,7535	<0,00001	***
T_20062	-0,3838	0,0048	-79,9149	<0,00001	***
T_20063	-0,1952	0,0067	-29,0744	<0,00001	***
T_20064	-0,1253	0,0065	-19,3792	<0,00001	***
T_20071	0,0275	0,0084	3,2890	0,00101	***
T_20072	-0,0187	0,0109	-1,7205	0,08536	*
T_20073	0,1212	0,0091	13,3273	<0,00001	***
T_20074	0,1935	0,0082	23,6415	<0,00001	***
T_20081	0,2064	0,0111	18,5933	<0,00001	***
T_20082	0,2174	0,0101	21,4944	<0,00001	***
T_20083	0,1978	0,0099	20,0234	<0,00001	***
T_20084	0,1563	0,0086	18,1852	<0,00001	***
T_20091	0,0934	0,0128	7,3116	<0,00001	***
T_20092	0,0831	0,0057	14,5454	<0,00001	***
T_20093	0,0869	0,0074	11,7174	<0,00001	***
T_20094	0,0888	0,0070	12,7513	<0,00001	***
T_20101	0,0324	0,0075	4,3197	0,00002	***
T_20102	0,0153	0,0058	2,6528	0,00799	***
T_20103	0,0365	0,0053	6,9058	<0,00001	***
T_20104	0,0255	0,0046	5,5314	<0,00001	***
T_20111	0,0368	0,0053	6,9690	<0,00001	***
T_20112	0,0402	0,0045	8,9373	<0,00001	***
T_20113	0,0217	0,0053	4,0986	0,00004	***
T_20114	0,0249	0,0047	5,2552	<0,00001	***
T_20121	-0,0016	0,0049	-0,3252	0,745	
T_20122	-0,0194	0,0048	-4,0144	0,00006	***
T_20123	-0,0482	0,0061	-7,8574	<0,00001	***
T_20124	-0,0640	0,0050	-12,6913	<0,00001	***
T_20131	-0,0376	0,0043	-8,7579	<0,00001	***
T_20132	-0,0200	0,0039	-5,1166	<0,00001	***
T_20133	-0,0196	0,0040	-4,9347	<0,00001	***
T_20134	0,0081	0,0038	2,1226	0,0338	**
T_20141	0,0096	0,0036	2,6745	0,00749	***

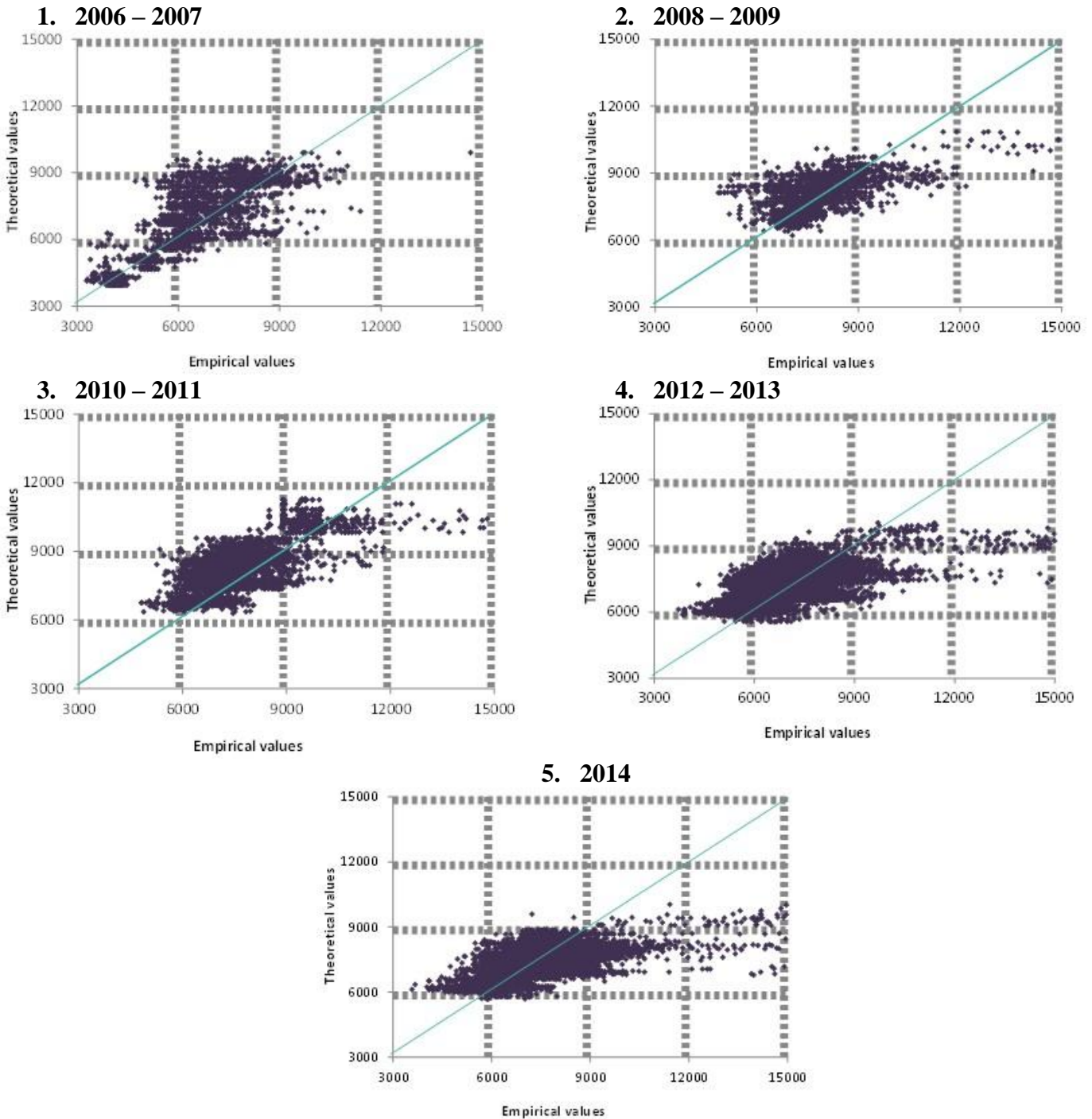


T_20142	0,0159	0,0035	4,5589	<0,00001	***
T_20143	0,0271	0,0037	7,2777	<0,00001	***
T_20144	0,0150	0,0034	4,4100	0,00001	***
gr1	-0,4586	0,0067	-67,9630	<0,00001	***
gr2	-0,6252	0,0067	-92,6317	<0,00001	***
gr3	-0,4082	0,0069	-59,1718	<0,00001	***
gr4	-0,5788	0,0089	-64,9283	<0,00001	***
gr5	-0,5383	0,0070	-76,5830	<0,00001	***
p40	0,0191	0,0020	9,5858	<0,00001	***
p60_80	-0,0244	0,0017	-14,5386	<0,00001	***
p80	-0,0290	0,0026	-11,1062	<0,00001	***
tech_2	0,0303	0,0028	10,6725	<0,00001	***
tech_3	0,0875	0,0030	29,5157	<0,00001	***
niskie	-0,0392	0,0014	-27,0919	<0,00001	***
wysokie	0,0771	0,0088	8,7282	<0,00001	***

Charts 1-5 present theoretical (axis X) and empirical values (axis Y). If the transaction price is equal to its valuation on the basis of the model, the points should lie on the 45 degree line. The large dispersion of points suggests that prices are differentiated. Moreover, we can observe that our points are on the right side of the 45 degree line, which means that dwellings are sold at a higher price in comparison with valuation on the basis of our model. The process of price differentiating occurs in a bigger scale in the case of more expensive apartments. This is reasonable, as richer clients are able to pay more for housing that they believe is better for them (better location, standard and other attributes). The analysis confirms that developers use a discriminating monopoly power. The price discrimination strategy caused by changes in demand could be one of the explanations of the observed high, short-term, upward elasticity of prices. In reality, amidst relatively low price elasticity of demand at high prices, the possibility of price reductions and a profitable sale of the housing surplus are limited. During the boom period the price differentiation was constrained. The demand was high, so dwellings were sold quickly at high prices and the developer did not need to offer differentiated prices. After the bust in 2008-2012 we can see a drop in demand as developers had a problem with selling their investments. The strategy of elastic prices helped them survive.



## Charts 1 – 5: Theoretical and empirical prices per sq. m. of housing. Estimations of theoretical values base on primary market model







## Conclusion

Developers produce very heterogeneous goods and make individual transactions with every client. Moreover, firms operating in the property sector use information asymmetry and local monopoly to differentiate the prices of housing units, which allows them to maximise their profits.

Our empirical analysis shows that there is a dispersion between the empirical and theoretical prices per sq. m. of dwellings on the primary market and over subsequent periods that dispersion grows. On the basis of the results we claim that developers differentiate prices of flats. One of the explanations of this short-term, upward elasticity of prices could be the price discrimination mechanism. During the boom period the demand was high, dwellings sold quickly at higher prices and developers offered differentiated prices to a lesser extent. During 2008-2012, the demand dropped and developers used the price discrimination strategy more often.

The conclusions that we draw here have direct consequences for theoretical and empirical research. First, developers have a very strong impact on the boom bust cycle, because they can create the impression that housing is a scarce good, while they have enough housing on stock to satisfy demand. This directly adds to the price increase during an upswing. On the other hand, developers have enough equity to hold on to a significant stock of unsold housing during the price decline, whereby they keep prices high. This calls for the development of theoretical models about the interaction of the housing market with the whole economy that would consider the monopolistic behaviour of developers during the cycle. Another point for future theoretical research is to find what allows developers to hold on to a significant stock of unsold housing not only during the boom, when they expect higher profits in the future, but also during the downswing. The empirical answer is that developers sell flats in form of pre-sale contracts, thus obtain payments from buyers during the development process, but pay the construction firm after the work is done. Based on our current results and the model by Augustyniak et al. (2012), what needs to be investigated is under what economic circumstances developers would start to behave as in normal competition and, most notably, would lower their prices amidst significant oversupply. We also need detailed data on single development projects in various countries, to understand how developers work there. Combined with more advanced microeconomic and macroeconomic models, this data would help financial market stability authorities to monitor the market carefully.



## References

- Augustyniak, H., K. Gajewski, J. Łaszek, G. Żochowski 2012. *Real estate development enterprises in the Polish market and issues related to its analysis*. MPRA Working Paper Nr. 43347. Published in Polish in 2013 as *Przedsiębiorstwo deweloperskie na rynku w Polsce oraz problemy jego analizy*, *Bezpieczny Bank* 4 (53): 227-235.
- Barlow, J. 1993. Controlling the housing land market: some examples from Europe. *Urban Studies* 30 (7): 1129-1149. DOI: 10.1080/00420989320081091.
- DiPasquale, D., W. C. Wheaton 1992. The markets for Real Estate Assets and Space: A Conceptual Framework. *Journal of the American Real Estate and Urban Economics Association* 20 (1): 181-198. DOI:10.1111/1540-6229.00579.
- DiPasquale, D. 1999. Why Don't We Know More About Housing Supply? *The Journal of Real Estate Finance and Economics* 18 (1): 9-23. DOI: 10.1023/A:1007729227419.
- Emmanuel, D. 1985. Urban land prices and housing distribution: monopolistic competition and the myth of the law of differential rent. *Urban Studies* 22 (6): 461-480. DOI: 10.1080/00420988520080841.
- Epple, D., B. Gordon, H. Sieg 2010. A New Approach to Estimating the Production Function for Housing. *The American Economic Review* 100 (3): 905-924. DOI: 10.1257/aer.100.3.905.
- Henderson, J. V., J. F. Thisse 1999. On the pricing strategy of a land developer. *Journal of Urban Economics* 45 (1): 1-16. DOI:10.1006/juec.1998.2080.
- Henderson, J. V., J. F. Thisse 2001. On strategic community development. *Journal of Political Economy* 109 (3): 546-568. DOI: 10.1086/321017.
- Łaszek, J. 2004. *Sektor nieruchomości mieszkaniowych w Polsce*. Monografie i Opracowania, Szkoła Główna Handlowa.
- Łaszek, J., K. Olszewski 2015. *The behaviour of housing developers and aggregate housing supply*, NBP Working Paper 206. (Appeared in Polish as *Zachowania firmy deweloperskiej na rynku mieszkań i zagregowana podaż*, *Kwartalnik Nauk o Przedsiębiorstwie* 2014 (3): 71-87).
- Monk, S., C. M. Whitehead 1996. Land supply and housing: A case-study. *Housing Studies* 11 (3): 407-423. DOI: <http://dx.doi.org/10.1080/02673039608720865>.
- NBP 2012. *Report on the situation in the Polish residential and commercial real estate market in 2011*. Narodowy Bank Polski.
- NBP 2015. *Report on the situation in the Polish residential and commercial real estate market in 2014*. Narodowy Bank Polski.
- Phang, S.Y., K. H. Kim, S. Wachter 2010. *Supply Elasticity of Housing*, *International Encyclopedia of Housing and Home*. Elsevier and Science Direct.



Raymond, Y. C. 1998. Housing price, land supply and revenue from land sales. *Urban Studies* 35 (8): 1377-1392. DOI: 10.1080/0042098984411.

Ridker, R. G., J. A. Henning 1967. The determinants of residential property values with special reference to air pollution. *The Review of Economics and Statistics* 49 (2): 246-257. DOI: 10.2307/1928231.

Rosen, S., 1974. Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition. *Journal of Political Economy* 82 (1): 34-55.

Stover, M.E. 1986. The price elasticity of the supply of single-family detached urban housing. *Journal of Urban Economics* 20 (3): 331-340. DOI:10.1016/0094-1190(86)90023-9.

Tomczyk, E., M. Widłak 2010. Konstrukcja i własności hedonicznego indeksu cen mieszkań dla Warszawy. *Bank i Kredyt* 41 (1): 99-128.

Tse, R.Y.C., C. W. Ho, S. Ganesan 1999. Matching housing supply and demand: an empirical study of Hong Kong's market. *Construction Management and Economics* 17 (5): 625-633. DOI: <http://dx.doi.org/10.1080/014461999371231>.

Wheaton, W.C. 1999. Real Estate "Cycles": Some Fundamentals. *Real Estate Economics* 27 (2): 209-230. DOI:10.1111/1540-6229.00772.



## Appendix

Description of the explanatory variables. The variables that serve as the benchmark for dummy regressions are underlined.

*Mokotow*: dummy variable taking 1 if the flat is located in the city quarter Mokotów.

*Ochota*: dummy variable taking 1 if the flat is located in the city quarter Ochota.

*Srodmiescie*: dummy variable taking 1 if the flat is located in the city quarter Śródmieście.

*Ursynow*: dummy variable taking 1 if the flat is located in the city quarter Ursynów.

*Wilanow*: dummy variable taking 1 if the flat is located in the city quarter Wilanów.

*Wola*: dummy variable taking 1 if the flat is located in the city quarter Wola.

*Zoliborz*: dummy variable taking 1 if the flat is located in the city quarter Żoliborz.

*gr1*: dummy variable taking 1 if the flat is located in the city quarters Bielany or Bemowo.

*gr2*: dummy variable taking 1 if the flat is located in the city quarters Białołęka or Targówek.

*gr3*: dummy variable taking 1 if the flat is located in the city quarters Praga Północ or Praga Południe.

*gr4*: dummy variable taking 1 if the flat is located in the city quarters Wawer, Wesoła or Rembertów.

*gr5*: dummy variable taking 1 if the flat is located in the city quarters Ursus or Włochy.

*p40*: dummy variable taking 1 if the total area of a flat (in sq. m.) is less than 40.

*p40-60*: dummy variable taking 1 if the total area of a flat (in sq m.) is between 40 and 60 sq. m.

*p60-80*: dummy variable taking 1 if the total area of a flat (in sq m.) is between 60 and 80 sq. m.

*p80*: dummy variable taking 1 if the total area of a flat (in sq m.) is more than 40

*tech1*: dummy variable taking 1 if the flat was built in traditional technology.

*tech2*: dummy variable taking 1 if the flat was built in improved traditional technology

*tech3*: dummy variable taking 1 if the flat was built in monolithic technology.

*niskie*: dummy variable taking 1 if the flat on ground or the first floor.

*srednie*: dummy variable taking 1 if the flat on 2-9 floor.

*wysokie*: dummy variable taking 1 if the flat on 10 and higher floor.

*T\_20061 - T\_20144*: dummy variable taking 1 if the flat was sold in a given year and quarter.