Panel analysis of home prices in the primary and secondary market in 17 regional cities in Poland

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Abstract

We analyse the local determinants of house prices in the primary and secondary market of 17 regional cities in Poland. We find that prices were driven by fundamentals, such as income growth or rise in employment, as well as by the increase in loan availability, that was mostly driven by low interest rates generated with FX denominated housing loans. Moreover, we confirm empirically that the house appreciation in the past period has a strong effect on the current price, which confirms herding behaviour in the housing market. Another finding is that the primary market has a stronger effect on the secondary market than the other way around. Finally, we find that price increases in Warsaw spill over to other market. This finding is consistent with the contagion theory in the real estate market, according to which price increases in the center lead to price increases in the periphery.

Key words: housing market, house prices, primary and secondary market, spillover effects

JEL classification: E21, R21, R31

1. Introduction

Growth in home prices in the primary and secondary market is the subject of continuous interest of central banks and regulators, as it rapidly translates into changes in real estate development production, drives housing cycles (see Augustyniak et al., 2013) and generates risk for the banking sector. The stiffness of supply in short term can cause pricing shock and also create price bubbles. The study focuses on determinants of the average price[3] of square meters of housing in Poland's

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The paper presents the personal opinions of the authors and does not necessarily reflect the official position of the Narodowy Bank Polski.

[3] Dwellings in the primary and secondary market display differences in terms of building technology, quality of finishing, as well as in location, thus it would be optimal to use the hedonic price, which accounts for the heterogeneity. The simple home price indices (median and mean) if replaced with the hedonic index can enhance the reliability of price measurement, thus increasing the transparency of the market (see Widłak, 2013). However, such an analysis requires very detailed data that have been collected in the BaRN data base since 2006 Q3 only. If we limited the analysis to the period

17 largest urban markets[4]. On the macro level, it can be also assumed that some fundamental variables observed in all markets can explain changes in average prices. The aim of the analysis is to determine to what extent growth in home prices in the primary and secondary market was driven by fundamental variables. We analyse factors that should effect the demand for new and existing housing in the local markets, using the results of the analysis of convergence and differentiation of local markets and structural changes presented in NBP (2013, Appendix 1) (see also Andrews (2010) and Igan and Loungani (2012)). Our previous analysis of the Polish housing market (see NBP (2013), Augustyniak et al. (2013a)) indicates that there is a high demand for owner occupied housing. The desire to own housing has two main reasons. Renting is quite costly, and in many cases the loan instalment can be even lower than the rent, and after a given period when the loan is paid back, the owner keeps the house forever. Secondly, there are investment motives, because housing is not only a durable consumer good but also an investment good (see Łaszek, 2013 for a detailed discussion). The desire to own housing can be only satisfied, if the household has enough income to cover the loan instalments and expects that he will receive income in the future. Factors that increase the housing demand are high income and/or low interest rates, that lead to lower loan instalments. Moreover the average unemployment rate is a good proxy for the overall performance of the economy. A falling unemployment rate indicates that the economy is booming and makes people more optimistic. As concerns the investment demand, the appreciation of housing (change of prices from period to period) makes the buyer to speculate that prices will rise further (see Augustyniak et al., 2012 and 2013b). These factors increases demand, which under fixed supply in the short run, increases house prices. Real estate developers observe rising prices and start to increase the production of new housing and start to sell more pre-sale contracts. The price depends on the construction costs and the profit margin of the developer. While profit margins are determined individually, the construction costs are rather common to all developers and also readily available.

The remainder of the paper consists of the empirical analysis. In chapter 2 we analyse the primary and secondary market, interactions between those two markets and also search for a spillover effect of rises in the Warsaw market to other local markets. Section 3 discusses the main results.

2. Empirics

Prices of new housing should be affected by structural factors (i.e. the number of new marriages per 1 000 inhabitants, migration, the ratio of the productive-age population to post-productive age population, etc.) as well as economic factors (income growth, unemployment, loan availability). Yet, a considerable part of these

commencing practically in 2007 we would not be able to capture the behaviour of prices during the period of price stability, that is, in the years 2002 - 2005.

[4] The analysis includes Gdynia, which is a large real estate market, forming almost a common market with Gdansk.

variables follows an upward trend only, rather than to display fluctuations likely to explain the ups and downs in prices and the boom period in the housing market. If accounted for, they would lead to spurious regressions. Moreover, many data show a strong collinearity. After running numerous regressions, we decided to include the following explanatory variables: lagged price, average wages in the enterprise sector, the unemployment rate, the loan availability and buildings costs[5]. All monetary variables are deflated with the CPI, in order to exclude the inflation trend. For each market, we use local explanatory variables.

Our model specification draws on the metropolitan area house price model of Jud and Winkler (2002). We change the variables according to our experience, described in detail in NBP (2013). The demand for housing Qd is determined by:

Qd = f(price, wages, loan availability, economic conditions, error term)

the supply Qs is determined by:

Qs = f(price, construction costs, profits, local determinants, error term)

Because demand has to equal supply in equilibrium we can join the two equations and obtain the determinants of the house price:

P=f(wages, loan availability, economic conditions, construction costs, profits, local determinants, error term).

We modify the equation in line with Augustyniak et al. (2013) and include the lagged price to capture the effect of housing appreciation on housing demand.

The analysis of transaction prices of housing in the primary and existing market of 17 cities in Poland is based on annual data for the years 2002-2012[6]. The analysis, which takes into account the relatively stable period in the housing market (2002-2005), the housing boom period (2006-2008) and the market's slow return to the equilibrium point afterwards gives a good picture of the determinants of price changes in the primary residential market. In all the regressions logarithms of the above-mentioned variables were used, which helped us to better capture the non-linear relationships between price changes and the explanatory variables. A theoretical model of house prices and nonlinear relationships between prices and fundamental variables is presented in Augustyniak et al. (2013). We apply the fixed

[5] Loan availability was calculated under the assumption that loans denominated in zloty and in foreign currency were granted during the period 2005-2011, whereas in the remaining years only zloty denominated loans were granted.

[6] Transaction prices of housing for the years 2006-2012 are from the BaRN database (primary and secondary market), and previous prices were extrapolated on the basis of price growth based on PONT Info from the period 2002 to 2006 (primary market).

effects regression method[7] with robust standard errors (bootstrapped). Home prices like most explanatory variables are non-stationary, yet, the Pesaran test (2004) showed that the error terms are not correlated, therefore, it can be concluded that the models are correctly specified. The error terms are also stationary.

The empirical analysis is divided into three units. The first and second deal with the primary market and secondary (existing) market analysis, respectively. In the third part we explain prices in the primary market using data from the secondary market and vice versa. We also investigate the price spillover effects from the Warsaw market to other local markets.

2.1 Analysis of the primary market

In the first regression, the transaction price per square meter of housing is explained by the delayed price, the rate of unemployment, building costs and the average wage in the enterprise sector. All the variables are significant at the 1% level. In our opinion this regression gives the best results and describes the boom period well. The current price depends to a certain extent on the past price. This confirms the hypothesis, that the appreciation of housing adds to housing demand. A decline in the unemployment rate, thus growth in employment lead to higher housing demand that translates into a rising price. Increases in wages have a very similar effect. Moreover, the growth rate of construction costs was included. It shows that if construction prices increase, developers ask for higher prices.

In the second model we use the rate of unemployment, building costs and the loan availability. Again, a declining unemployment rate, which is also a proxy for the general economic situation leads to price increases. Increasing construction costs, this times in levels, make the developers to increase prices. A little bit surprising, the loan availability does not have any significant impact on house prices. We would expect that it has the same positive impact as wage increases have, but it turns out to be insignificant. Maybe, housing in the primary market is bought at least to some extend with cash (see NBP 2013), therefore the loan availability seems to be less important.

In the third regression we include again the delayed price, the rate of unemployment, building costs and the loan availability. The results are similar as in regression 1 as concerns the appreciation effect and the rate of unemployment, but the construction costs and loan availability are not significant. Maybe there is

[7] First, the choice of the fixed effects regression model has theoretical foundations. This method is used when the selected sample is not a random sample, but represents the entire population. Moreover, the economic analysis of individual markets, presented in NBP (2013, Annex 1), shows that each market has a unique character, which practically does not change with the time. The fixed effects method makes it possible to exclude this fixed element which is impossible to detect with any variable, and would be erroneously attributed to the error term of the model. We also ran the Hausman test. It showed that the random effects model can be used, however, the results of this test can be considered reliable only after a much bigger number of observations (at least 20-30 observations in a time-series).

endogeneity between growing construction costs and the lagged price. When prices rise, developers start to build more housing and in consequence construction costs increase in the subsequent period. The increase in construction costs seems to be already captured by the level of lagged prices.

We run the fourth regression with unemployment, construction costs and the average wage in the enterprise sector. As previously the unemployment rate and wages have the expected and significant impact, however the increase of construction costs does not have any impact on house prices.

The analysis of the determinants of the primary market leads us to conclude that house prices depend on the past price, thus the appreciation has an impact on housing demand. Moreover, the unemployment level has a negative effect on house prices, while they rise with the wage level. The loan availability does not have any impact on prices while that of construction costs is not robust and depends on the model specification.

Table 1. Regression results for the primary housing market

L_price_prim	(1)	(2)	(3)	(4)
L_price_prim L1.	,3638*** [,0956]		,5313*** [,0624]	
L_unemployment	-,3351*** [,0677]	-,5310*** [,0798]	-,4415*** [,0497]	-,4794*** [,0570]
L_constr_costs D1.	,4304*** [,1644]			,0397 [,1265]
L_wages	,7685*** [,2077]			1,5736*** [,2339]
L_constr_costs		1,2270*** [,2329]	-,2412 [,3206]	
L_loan_availability		-,0505 [,1148]	,1260 [,0842]	
constant	-0,1962 [1,2435]	,7289 [1,9191]	4,9583*** [1,7318]	-3,3197* [1,9602]
Nr. Obs.	170	170	170	170
R-sq. within	0,8744	0,8001	0,8653	0,8450
between	0,5962	0,3835	0,7205	0,3654
overall	0,7397	0,6721	0,7888	0,5278

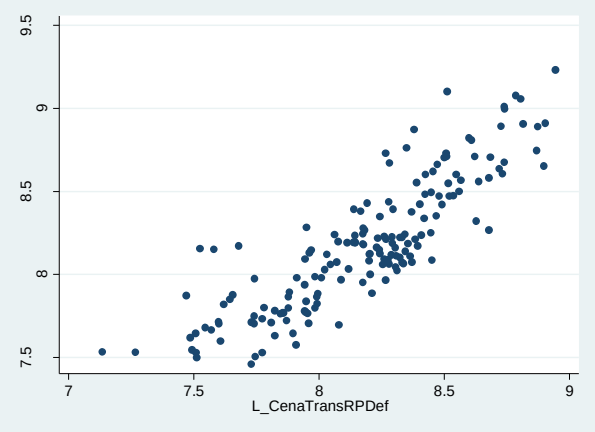
*Level of significance: 10% - *; 5% - **; 1% - ***; robust standard errors in brackets.*

The analysis of the actual observed prices and predicted prices confirms that the model is well specified. To improve the visibility of the results, the cities were divided into eight large and nine smaller ones[8]. Only in the case of Katowice there is a significant shift between actual and predicted data. Katowice itself is a quite small market in the whole Silesian agglomeration, shows a very high average wage and low unemployment rate, that leads to a high house availability. In consequence, the

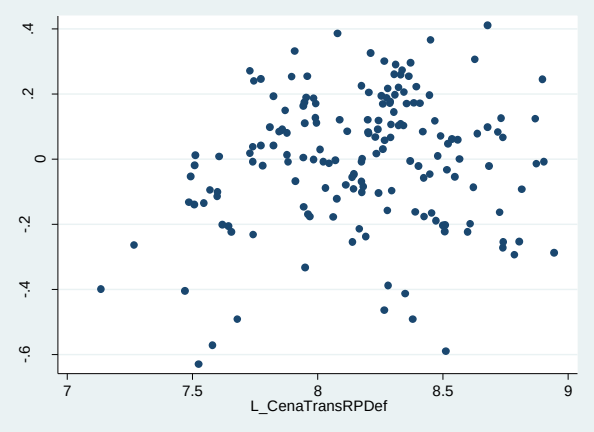
[8] The division was based on the number of inhabitants in a particular city. "Large" cities, i.e. with population exceeding 400 thousand inhabitants include: Gdańsk and Gdynia (as one big market), Kraków, Łódź, Poznań, Szczecin, Warsaw and Wrocław. The group of "small" cities, i.e. with population of less than 400 thousand inhabitants include: Białystok, Bydgoszcz, Katowice, Kielce, Lublin, Olsztyn, Opole, Rzeszów and Zielona Góra.

actual price is overestimated, given the fundamentals of the economy. We also tried to run regression (Model 1) without Katowice but the results stayed quite the same for the primary and also the secondary market. We present the empirical analysis of secondary market prices in the next section.

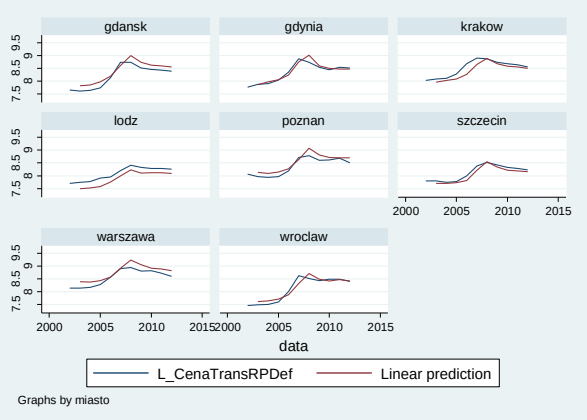
Graph 1 Predicted and actual observations for Model (1) – Primary market



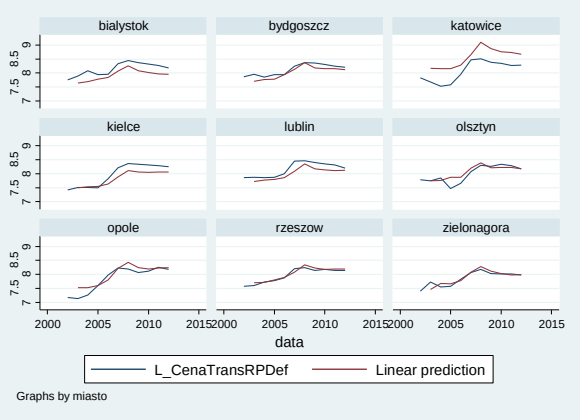
Graph 2 Error and real data for Model (1) – Primary Market



Graph 3 Predicted and actual observations for Model (1) for „big cities"



Graph 4 Predicted and actual observations for Model (1) for „small cities"



2.2 Analysis of the secondary market

Now we analyse the price determinants in the secondary (existing) housing market. We use different data structural and economic factors, mentioned in the introduction to create the best model. After running a lot of regressions and because of the strong economic correlation between the primary and secondary market, we decided to use the same explanatory variables like in the primary market. Our basic model for the primary market (Model 1) seems to be well suited for the secondary market too, has even better R-sq values and all explanatory variables are significant at the 1% level. Current prices depend positively on lagged prices and wages, while they decline with growing unemployment. Surprisingly, the cost of construction has

a significant impact on house prices in the secondary market. One possible explanation is that if construction costs in the primary market rise, consumer tend to substitute primary market housing with cheaper housing from the secondary market.

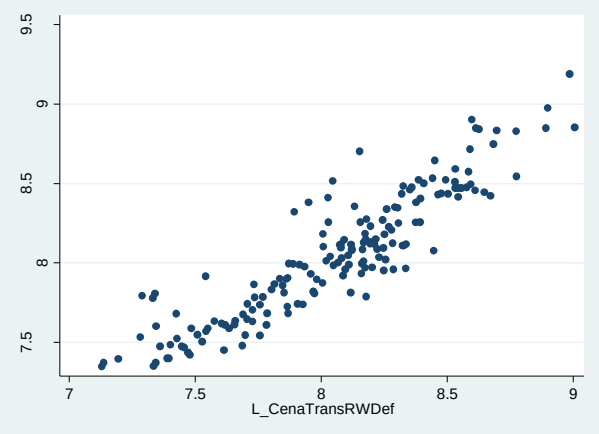
Models 6, 7 and 8 to be discussed....

Table 2. Regression results for the secondary housing market

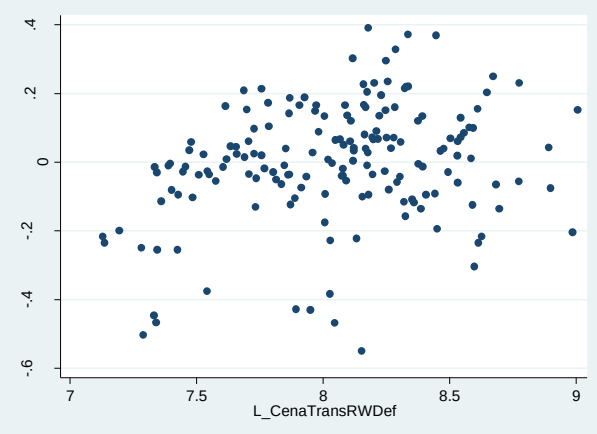
L_price_sec	(5)	(6)	(7)	(8)
L_price_sec L1.	,5181*** [,0657]		,6910*** [0,5184]	
L_unemployment	-,2668*** [,0549]	-,4848*** [,0658]	-,4183*** [,0392]	-,4445*** [,0669]
L_constr_costs D1.	,6405*** [,2023]			,2244 [,2233]
L_wages	,4930*** [,1858]			1,9885*** [,2620]
L_constr_costs		1,6416*** [,2833]	-,6880** [,2961]	
L_loan_avaliability		,0735 [,0825]	,2083*** [,0462]	
constant	,5357 [1,2361]	-4,1354* [2,3483]	5,8643*** [2,1981]	-6,1655*** [2,1403]
R-sq within	0,8973	0,7986	0,8996	0,8401
between	0,7233	0,3737	0,7610	0,2805
overall	0,8293	0,6482	0,8200	0,4775

*Level of significance: 10 % - *; 5 % - **; 1 % - ***; robust standard errors in brackets.*

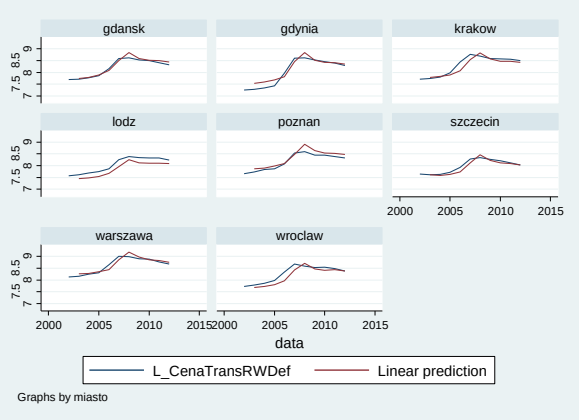
Graph 5 Predicted and actual observations for Model (5) – Secondary market



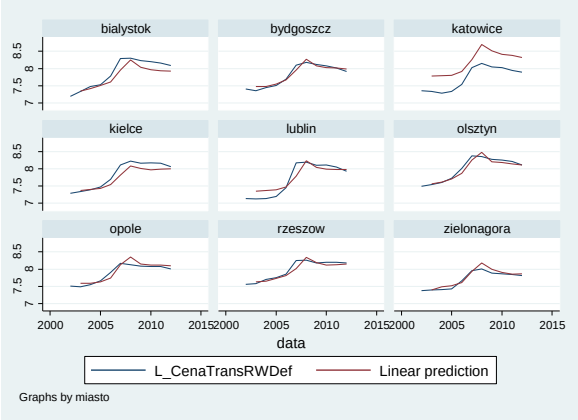
Graph 6 Error term and actual observations for Model (5) – Secondary Market



Graph 7 Predicted and actual observations for Model (5) for „big cities"



Graph 8 Predicted and actual observations for Model (5) for „small cities"



2.3 Interdependence between the primary and secondary market and spillover effects

In the third section of this paper we tried to explain primary market prices with secondary market prices and vice versa (Model 9 and 10). We also tried to check the price spillover effects from Warsaw to other local cities for both markets (Model 11-14).

We use the same set of explanatory variables as in regression 1 and 5 to explain prices in the primary or secondary market, adding the lagged price of the other market. The most important result is that lagged prices in the secondary market help to explain the prices in the primary market, but it does not work the other way around. This means that price signals from the secondary market spread to the primary market. First, if demand in the secondary market is excessive, at some point the housing demand can be only satisfied with newly constructed housing from the primary market, thus its prices increase. Secondly, housing developers are able to use marketing techniques to rise prices. On the other hand, when prices in the primary market rise, they have little effect on the secondary market. It is huge and along with rising prices more and more owners decide to sell their housing, which has a stabilizing effect on price increases.

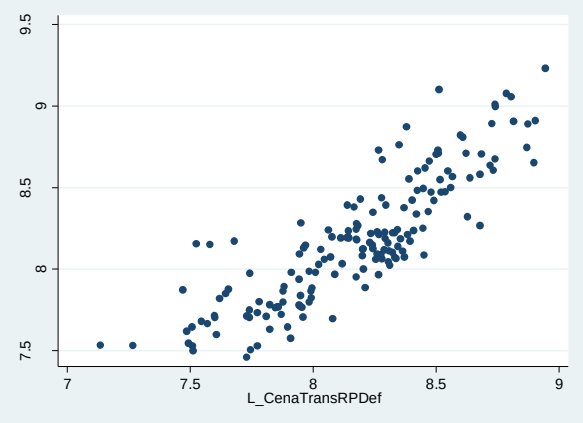
Table 3 Primary Market explained with secondary market and vice versa; Price spillover effect

L_price_prim	(9)	--	(11)-W	--	(13)-W	---
L_price_sec	--	(10)	--	(12)-W	---	(14)-W
L_price_prim L1.	--	,1210 [,0960]	,3703*** [,1008]		,3802*** [,0736]	
L_price_sec L1	,1991** [,0969]	--		,5260*** [,0770]		,4055*** [0,410]
L_unemployment	-,4111*** [,0738]	-,3965*** [,0642]	-,3321*** [0,670]	-,2679*** [,0564]	-,1157 [,0766]	,0044 [,0726]
L_constr_costs D1.	,1996 [,1526]	,3543** [,2156]	,4352*** [,1627]	,6425*** [,1949]	,2455* [,1324]	,2843** [,1341]
L_wage	1,0298*** [,2646]	1,6407*** [,3038]	,7640*** [,1945]	,4764*** [,1905]	,0178 [,1644]	-,2669 [,2102]
L_price_prim_WAW					,4919*** [,0732]	
L_price_sec_WAW						,6950*** [,0826]
constant	-,7452 [1,6957]	-5,1269** [2,2161]	-,2087 [1,1218]	,6081 [1,1977]	,9371 [1,0151]	,8974 [1,2517]
R-sq within	0,8548	0,8421	0,8738	0,8995	0,9014	0,9564
between	0,4471	0,3113	0,4674	0,5771	0,8758	0,8069
overall	0,6298	0,5233	0,7147	0,8034	0,8609	0,8562

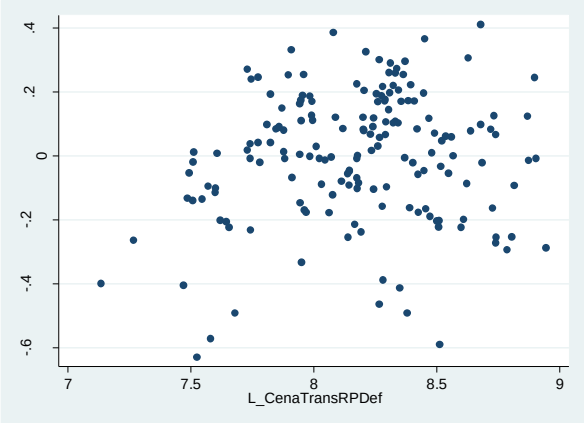
*Level of significance: 10 % - *; 5 % - **; 1 % - ***; robust standard errors in brackets.*

Finally, we investigate the contagion effect of rising prices in Warsaw to other local markets. In regressions 11-14 we include all cities but Warsaw. First, we find that the regression results do not differ significantly from the basic model 1 and 5. On this ground we add the current price of housing in the Warsaw market. For the primary and secondary market the respective prices in Warsaw have a significant impact, while surprisingly the unemployment rate and wage level becomes insignificant. At a first glance one can argue that the price indeed spreads from the capital city to other local markets. It is however difficult to interpret why the main price determinants, that is unemployment rate and wages are not significant anymore. Maybe, the price rise in Warsaw reflects the overall performance of the Polish economy, thus it has a stronger impact on local prices than the individual economic indicators of local markets. But this finding calls for further research.

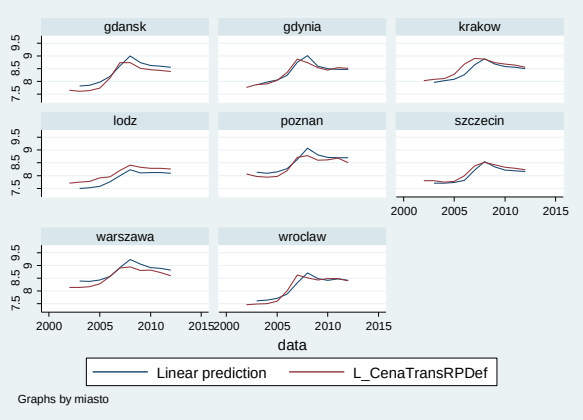
Graph 9 Predicted and actual observations for Model (9)



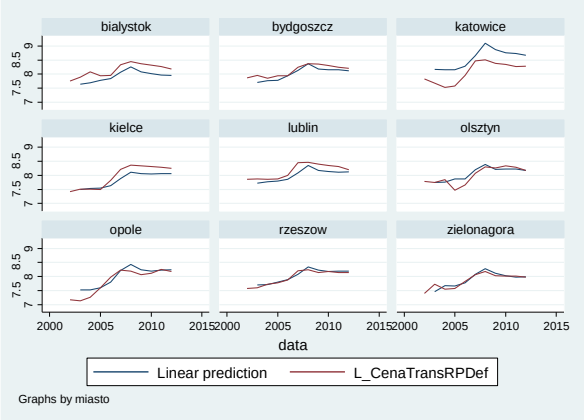
Graph 10 Error term and actual observations for Model (9)



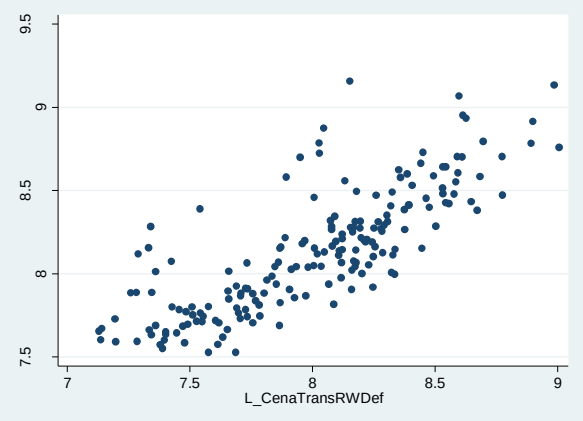
Graph 11 Predicted and actual observations for Model (9) for „big cities"



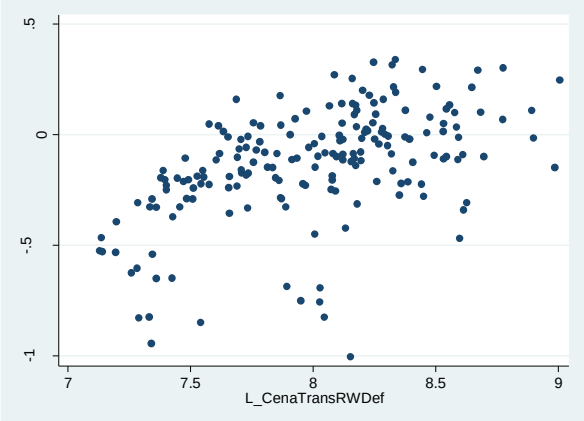
Graph 12 Predicted and actual observations for Model (9) for „small cities"



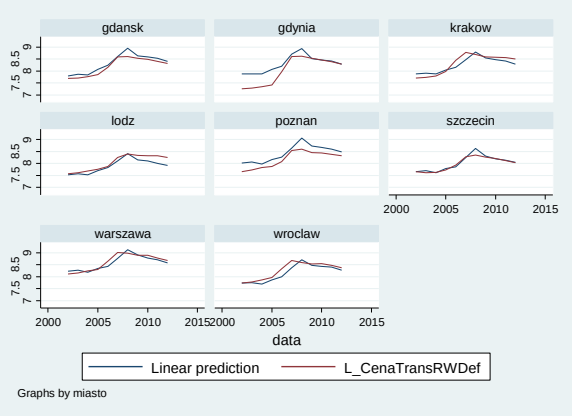
Graph 13 Predicted and actual observations for Model (10)



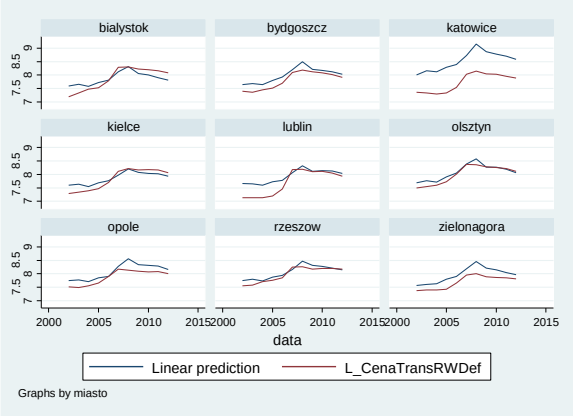
Graph 14 Error term and actual observations for Model (10)



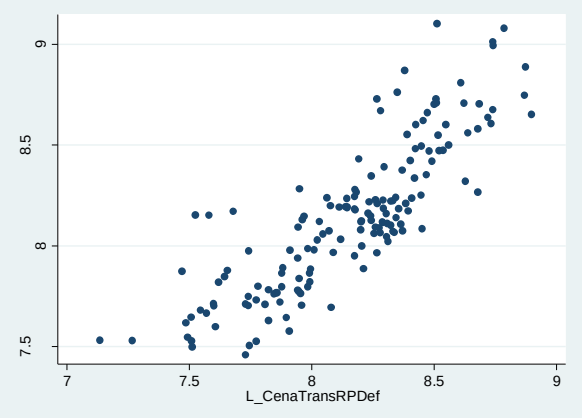
Graph 15 Predicted and actual observations for Model (10) for „big cities”



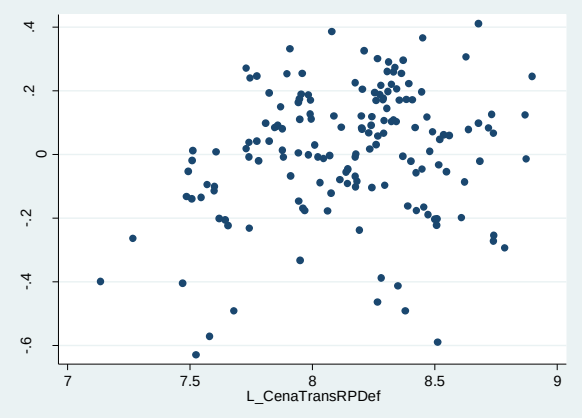
Graph 16 Predicted and actual observations for Model (10) for „small cities”



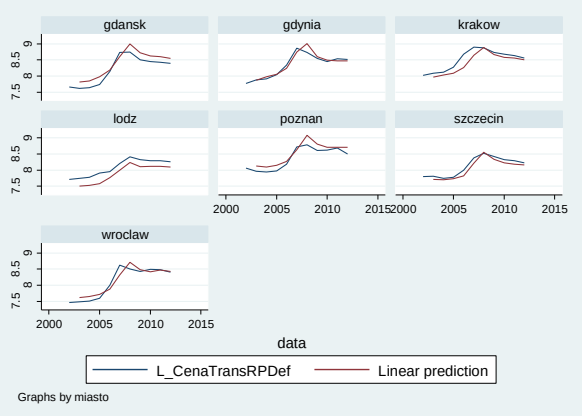
Graph 17 Predicted and actual observations for Model (13)



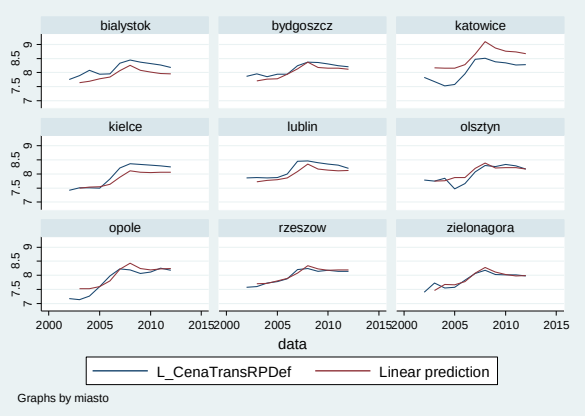
Graph 18 Error term and actual observations for Model (13)



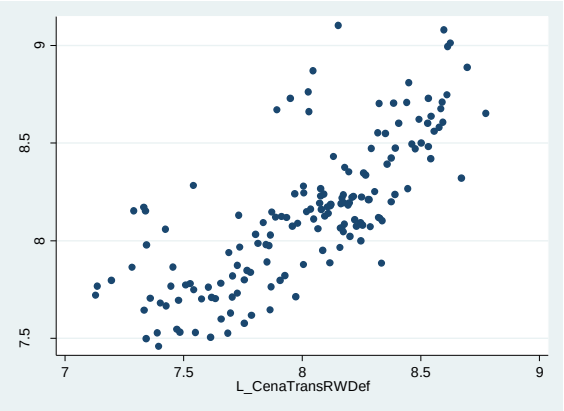
Graph 19 Predicted and actual observations for Model (19) for „big cities”



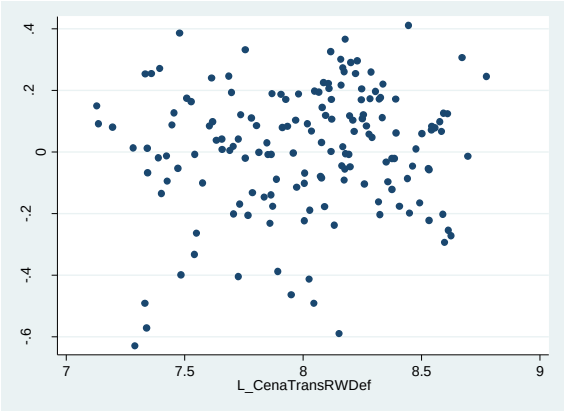
Graph 20 Predicted and actual observations for Model (13) for „small cities”



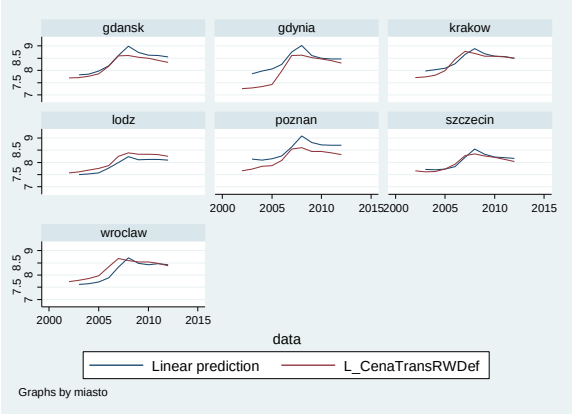
Graph 21 Predicted and actual observations for Model (14)



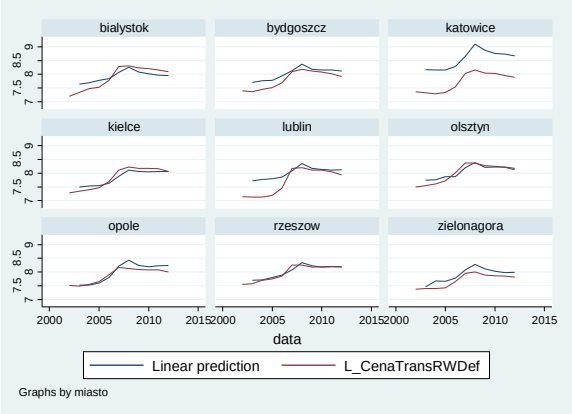
Graph 22 Error term and actual observations for Model (14)



Graph 23 Predicted and actual observations for Model (14) for „big cities"



Graph 24 Predicted and actual observations for Model (14) for „small cities"



3. Conclusions

The analysis confirmed that transaction prices in the primary and secondary market in the regional cities in Poland depend on fundamental variables such as wages, the rate of unemployment and building costs. Moreover, we confirm empirically that the appreciation of housing affects the utility function of the household and impacts on its optimal decision, which confirms the theoretical results presented in Augustyniak et al. (2013).

We also find that that prices in the secondary market help to explain the prices in the primary market, however this relationship cannot be inverted. Finally we confirm the existence of a contagion effect of price rises in the Warsaw market, that spill over to other local markets.

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