

INVESTMENT AND CONSUMPTION DEMAND AND SHORT-TERM EQUILIBRIUM IN THE RESIDENTIAL DEVELOPMENT MARKET IN POLAND

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ARTICLE INFO	ABSTRACT
Keywords: office space supply, estimation of office stock, regional growth, non-linearities JEL Classification: E22, R21, R31	Housing demand for newly constructed housing in Poland has observed some changes along the recent economic perturbations that were related to the Covid-19 pandemic and the Russian war on Ukraine, but despite significant changes in the mortgage interest rate, the market was rather stable. We propose an explanation for this phenomenon. The main forces are 1: relatively flexible supply of housing developers who sell pre-sale contracts, 2: large and experienced developer companies with a pool of construction permits, which can adjust their supply to the current demand and 3: owner occupier and investment demand for housing, which are complements at stable times, and times substitutes at turbulent. In Poland, investment demand is mainly financed by cash, so it is not so sensitive to interest rate shocks.
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1. Introduction

In Poland, demand shocks resulting from interest rate changes and subsidies have been observed in the recent years. However, the housing developer sector was able to adjust, such that neither house price booms nor busts were observed. We focus on two types of housing demand by private people. The first is demand by owner occupiers, that is people who buy housing mainly for the purpose to live in it. The second is investment demand, which means that people buy housing to rent it to others and make profits. In both cases it is possible that someone sells the flat later at a higher prices, which could be understood as a speculative investment, but is not the main motive. We elaborate on the purchase motives and empirical evidence about them in the paper. This article tries to present the whole market in a simple way, which relies on four facts, which we draw from an exhaustive analysis of the real estate market in Poland published by NBP (2025b) and research by Łaszek and Olszewski (2014), Łaszek et al. (2016) and Łaszek and Olszewski (2023). 1) In Poland developers sell pre-sale contracts for the construction of new housing, which is much more flexible than the offer of ready built houses. The

pre-sale system is well regulated and buyers have appropriate legal protection. 2) Owner occupier demand and investment demand for housing are rather complementary, while during turbulent times those two types of demand were substitutes, which makes total demand rather smooth. 3) There were short-lived governmental interventions to keep up demand in times of economic distress, however they rather added to the cyclicity of the market. 4) The developer sector is populated by large firms which have a large capital stock, a lot of construction land and building permits and experience in the market. This allows those firms to adjust supply to current demand conditions, and while maximizing their profits they smooth out transaction prices in the broader perspective. We explain those phenomena with the help of a developer supply model, which is rather anti-cyclical and demand, which reacts in a non-linear way to interest rate and wage changes.

In this article we focus solely on the short run behavior of house buyers and want to explain our decision. Demand for housing can be studied in the

short and the long run, similarly as supply is studied¹. In theory, the buyer should consider not only the current economic situation, but also try to consider future changes of interest rates or income. Such an approach is usually followed by professional investors in the commercial property market (discounted cash flow model). But, for individual house buyers, there is a vast literature which shows that they mostly rely on the most current information, and make extrapolations based on past experience. Shiller and Thompson (2022) made a survey among house buyers and conclude that they have reasonable and fact based expectations in the short run, but “fantasize” when the long run is concerned. We know from the literature that house purchases are affected by behavioral biases. Bao and Saunders (2022) present a detailed literature overview about this. Waszczuk (2024) provides empirical evidence for Poland that people form expectations based on the currently available information. Such a behaviour leads to herding and speculations in the market (Malpezzi and Wachter, 2005) and creates speculative bubbles (see Herring & Wachter, 2003). We conclude that speculation is a normal feature in the housing market. This is observed among buyers that want to satisfy their housing needs, as well as among investors. Some people buy housing only to resell it later at a higher price. The house price appreciation and related speculation has some impact on the buyers, even if the investor focuses on rental income as a source of gains, or the house owner and user focuses on the utility that the house gives him through imputed rents. Bajari et al. (2013) present how house appreciation enters the utility function and affects purchase decisions. Beside this, speculation has a direct impact on the purchase itself. Buyers form extrapolative expectations, meaning that under when prices rise, they anticipate further increases, which can make it financially difficult to purchase the same house in the future. Further on, as Olszewski (2024) shows on the example of Poland, where house prices were on a rise in nominal terms over the last two decades, postponing the purchase decision has not been an economically sound option, as the potential house buyer not only has to pay rent to have a place to live, but also needs to accumulate a higher downpayment for the future, if he is going to finance

the purchase with a mortgage.

We conclude that speculative investment, is de facto, a natural part of both types of purchase decisions examined in this paper. It should affect both types of housing demand in a similar fashion, and therefore has been neglected in our analysis.

Also worth mentioning is the long run housing demand, which we do not cover in our paper. The long run demand, as estimated, for example, by Steiner (2010) for Switzerland, is determined by the available housing stock, wages, house prices and demographics. The model proposed by Steiner covers all of Switzerland, because good data, especially regarding the population, is usually available for large aggregates. When current housing demand exceeds the housing stock, prices start to rise, which triggers new housing construction and an improvement of the housing situation in the long run. In the case of Poland, we have a housing shortage in the largest agglomerations, which is shown with the help of Statistics Poland data on maps that are presented in the NBP (2025b, p. 29) report. From this we conclude the fact that the shortage will motivate buyers to purchase housing from developers when a mortgage financed purchase will become possible considering their financial situation as well as mortgage rates. .

A survey carried out by the NBP among buyers of newly constructed housing that covered the years 2019 to 2024 gives us a detailed insight about the purposes of purchases made and their financing. The survey results presented in NBP (2025b, p. 92, Figure 9.6) show that, in the years 2019 – 2024, around 65% of house purchases of newly constructed flats were connected with buying the first flat or improving living conditions. Around 20% of the respondents reported buying flats for rental, fewer than 5% answered that they bought a flat to sell it at a higher price (speculation), and around 10% could not clearly indicate the purpose, which covered both their own use and rental, or rental with the option to sell the flat at a higher price in the future. As concerns the sources of financing the purchases, the NBP (2025, p. 92, Figure 9.7) report shows that, during 2019 – 2024, the share of pure cash purchases for ownership amounted to around 25%, whilst 75% of such purchases were financed with a mortgage, at least to some extent. In the case of purchases for rental

¹ When the supply side is analysed the short and long run are clearly different. Housing takes some years to be build, so after an increase in housing demand we usually observe in the short run only an increase in house prices. Developers see

an opportunity to sell houses at higher prices and make higher profits, so in the long run they will adopt to the new increased demand and will increase the production of housing. In the long run the house prices should fall, at least in real terms.

purposes, those shares were nearly exactly opposite. Among the few respondents that declared buying for speculative purposes, nearly 70% of the purchase was financed entirely with cash.

This information is very important for our estimate of purchases for own use and purchases for investment purposes, which we calculate on the basis of NBP (2025a) estimates of purchases financed by cash and those financed at least partially by mortgage.

To understand the behavior of homebuyers in the context of quickly changing interest rates, housing should be considered a complex consumer and investment good. This unique feature of housing, distinguishing it from all other goods, even very expensive ones used long-term, leads to interesting, and sometimes even peculiar, behavior on the part of buyers. A home purchased for personal use can be rented out for income, and vice versa.

From the perspective of consumers and investors, the decision-making mechanism is complicated, but at the aggregate level we can assume that the decisions are driven by fundamental factors such as house prices, wages and interest rates. A decline in interest rates leads to lower borrowing costs and an increase in demand for housing. As a second-round effect, GDP and income growth typically also occur, further shifting the budget constraint and increasing consumer demand. In the short term, this increase in demand encounters a supply squeeze and causes an increase in housing prices, which has the opposite effect on

consumer demand, resulting in a decrease. When prices only increase, consumers reduce their demand for housing (substitution and income effects). If prices and incomes rise simultaneously, we achieve equilibrium at higher prices.

On the investment side, lower discount rates, by definition, cause asset (housing) prices to rise, so announcements of interest rate cuts will generate additional demand until a new equilibrium is reached. The formula also indicates that particularly strong increases in housing value will be achieved at low interest rate levels. Rising housing prices will, of course, result in lower rental yields, but the additional capital gains from price appreciation will significantly outweigh the losses resulting from higher prices. Interest rate cuts provide a very strong and rapid boost in capital gains, so the expectation of such declines is a powerful stimulus, rendering any measures intended to curb price increases virtually useless. The total number of sales and the estimated share of cash financed sales is shown in Figure 1.1. On the basis of the share of cash-financed purchases and relying on the results of the NBP (2025b) survey, we assumed that such purchases are mainly carried out for investment purposes. Consequently, we assumed that purchases financed at least partially by mortgage are dominantly for own use. The volumes of cash- and mortgage-financed purchases (in bln PLN), the CPI, as well as the nominal and real interest rate are shown in Figure 1.2.

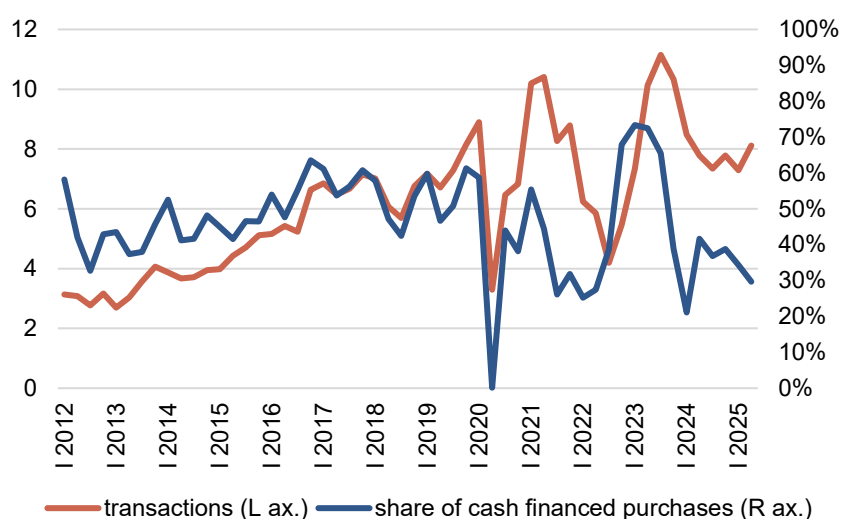


Fig. 1.1. Transactions volume of newly constructed houses (units of flats) in the 6 largest cities (left axis) and estimated share of cash financed purchases (right axis). The tics on the axis indicate the first quarter of each year. *Source of the figure:* NBP (2025a, figure 35 and table 3), source of data: NBP, JLL, ZBP, Statistics Poland.

As consumer demand declines with rising prices, investment demand may become the primary motive for purchasing apartments. In the long term, high prices will trigger a supply response, and as a consequence, a new equilibrium will emerge, with prices reflecting long-term production costs and a larger housing stock. Of course, this mechanism will only work if there are no natural or regulatory constraints on residential

construction growth. Investment purchases should also be mentioned, generating demand shocks and price increases in an environment of low or even negative real interest rates, as these pose a depreciation risk – the real value of assets decreases, and even revenues from increased interest rates may not compensate for inflation-induced declines.

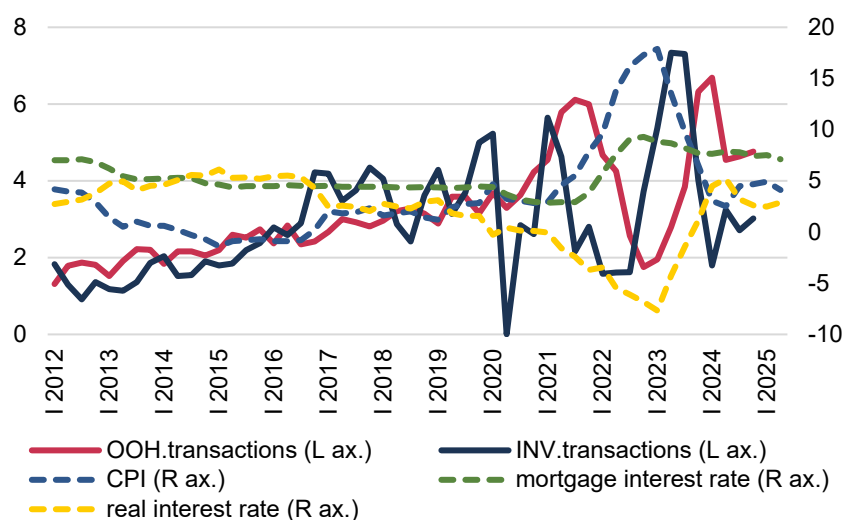


Fig. 1.2. Estimated mortgage-financed transaction volume (owner occupier demand, bln PLN) and cash financed transaction volume (investment demand, bln PLN) for the 6 biggest cities in Poland, CPI, nominal and real mortgage rate (multiplied by 100). *Source of the data:* nominal and real interest rate - NBP (2025, figure 26), based on NBP and Statistics Poland data; OOH and INV transactions NBP (2025, Figure 35) based on NBP, JLL and ZBP data. CPI – Statistics Poland data.

Owner-occupier and investment demand directly shape the actions of housing developers, whose goal is to maximize profits. In Poland, they sell pre-sale contracts, so they are more elastic in their supply than their western peers who usually offer only finished housing on the market. This article, shows the interaction of these two groups of market participants, explaining with a nonparametric regression the demand for owner-occupied housing and housing bought for investment purposes. The two add up, despite some cyclical behavior, to a rather smooth demand for housing that can be satisfied by developers without significant increases in real house prices.

2. Modeling of housing demand

The literature offer an extensive body of research that not only explains housing demand, but also captures the mutual linkages between the real estate market and the whole economy (Iacoviello and Neri, 2010; Bajari et al., 2013). The authors wish to investigate how the interest rate and house price relationship has changed, by first presenting selected papers that help understand the mechanics of real estate demand. It is

important to stress that housing is both a consumer and an investment good. The consequence is that, for example rising prices which would lower demand for most other pure consumption goods, increase demand in the case of housing and even lead to bubbles. What is more, the two demand drivers enforce each other. Those who simply needs to satisfy their housing needs will go for better and bigger housing, as this person considers it a way to protect savings against inflation.

The authors want to briefly present a rather intuitive and simple housing demand model, which allows both ownership-related and investment-related house purchase decisions to be explained. We draw here on a description of the housing demand which we presented in Łaszek et al. (2017).

The demand side is based on a CES (constant elasticity of substitution) utility function and takes into account the appreciation of the apartment. This approach is based on Bajari et al. (2013), who incorporated the appreciation of the apartment into the utility function $A = \frac{p_t}{p_{t-1}}$, and an increase in its utility due to an increase in its value. If a classical function, in which only square footage is relevant, were

used, apartments would be treated solely as consumer goods, and as prices rise, demand would fall, thus quickly balancing the market. However, the investment function of apartments (Henderson and Ioannides, 1983; Łaszek et al., 2017) means that, as their prices rise, demand also increases. In this particular case, the apartment's size H is multiplied by its market price p and the coefficient k , which measures the price-to-rent ratio. The utility function for the consumption of other goods and housing takes the following form:

$$U(C, H) = (\theta C^\mu + (1 - \theta)A^\gamma(kpH)^\mu)^{\frac{1}{\mu}} \quad (1)$$

where C represents other goods, H is the apartment size in square meters, k is the market price-to-rent ratio, and p is the apartment price. Parameter A reflects price increases, thus the price expectations of buyers for the near future. The elasticity parameter $\varepsilon = 1 / (1 - \mu)$ and parameter θ determine the inclination of consumption towards housing relative to the consumption of other goods. The gamma parameter reflects the extent to which the consumer is also an investor, i.e., is sensitive to price increases.

Consumers have a limited budget that can be allocated to the purchase and consumption of goods and housing in a given period. We assume that they have taken out loans for the apartments, and their cost is the repayment of the loan. With a budget size b , a loan constant (interest plus principal repayment), and the size of the apartment H , assuming that the prices of other goods have been rescaled to 1, we obtain the budget equation:

$$b = rpH + C \quad (2)$$

After solving this simple equation, we obtain the condition for the optimal allocation of funds between the consumption of apartments and other goods. And, when this optimal condition is incorporated into the budget equation, we obtain the optimal choice of consuming other goods and housing:

$$C^* = \frac{b}{1 + rp \left(\frac{\theta}{1 - \theta A^\gamma (kp)^\mu} \right)^{\frac{1}{\mu-1}}} \quad (3)$$

$$H^* = \frac{b}{rp + \left(\frac{1 - \theta A^\gamma (kp)^\mu}{\theta} \right)^{\frac{1}{\mu-1}}} \quad (4)$$

It can be seen that purchase of apartments for consumption purposes increases with an increase in the budget and a decrease in the loan constant. The overall level of prices reduces the demand for apartments, but with appropriate elasticity parameters, their increase may have a positive impact on demand through the investment element.

The demand is, in fact, more complex, because as Malpezzi and Wachter (2005) show, buyers form heterogeneous expectations. Moreover, under favorable temporary conditions, investors consider such conditions as permanent. House price expectations are also incorporated in research on housing demand by Dieci and Westerhoff (2016). Furthermore, the fundamental price determinants are subject to change over time, with the interest rate playing a paramount role. When house prices are explained by means of discounted cash flows, changes in the fundamental interest rates can lead to large house price swings. This economic relationship was empirically studied for a wide range of countries by Hott and Monnin (2008) and by Yand et al. (2018) for China.

Another important factor is the overlap of short- and long-term determinants, with situations when determinants considered fundamental begin to behave like cyclical ones, as described by, among others, Brzezicka (2021), found to be particularly interesting.

3. Demand pattern in developer markets and the reaction of developers

Modeling prices and demand in housing markets using classical economic models (demand, supply, prices) often fails to produce the expected results. The associated problems can most often be rightly described as stemming from the complexity of housing as a good (heterogeneous, for consumption and investment, tied to land and the financial system, and highly political) and the related equally complex, diversified across countries, and heavily regulated housing market system. It is clear that all these factors significantly impact the functioning of the system, causing, especially under extreme conditions, unusual and diverse behaviors that take the form of so-called paradoxes, or multiplier and accelerator mechanisms. These problems arise especially when attempting to describe housing markets using the neoclassical market model, i.e., as equations containing demand, supply, prices, and the mechanism (velocity) of market equilibration. Without going into technical details, it turns out that housing is an investment and consumption good, and factors on the demand side are subject to frequent changes. The main element of the supply side – labor and material costs – are determined outside the housing sector. Additionally, strong non-linear effects appear (the effects of time shifts and the impact of flows and resources). The public sector (government programs) has an equally strong impact. Many experiences show that economic models that take into account all these variables become very

complex, and their results leave much to be desired.

Therefore, a key question arises: how can these relationships be simplified to obtain a simple and effective model? This is possible if the sector's operation can be divided into certain blocks within which internal, self-regulating market mechanisms operate, which can be easily described mathematically and key model parameters can be quantified.

Observation of the developer market shows the mechanism of its operation, as confirmed by analyses by Łaszek et al. (2016). In the Polish housing sector, due to the large structural housing shortage, the developer market has been, and remains to be, of primary importance as it increases the housing stock. The market is dominated (price leadership) by large and highly capitalized entities (own funds account for 50%), including those listed on the stock exchange. They have extensive market and technical experience, and they build continuously (project pipelines, building land banks) in the largest domestic urban markets (Figure

3.1). In their market strategy, they successfully strive to maintain margins, which is achieved through a policy of differentiating the prices of apartments sold, selecting a basket of projects between cities, and appropriately managing market supply and the time it takes to sell apartments. Margins on apartment construction costs are also quite stable (Figure 3.2). A very important fact in this context is that, in Poland, developers sell pre-sale contracts. They can thus offer such contracts at a very early stage, when they have a plot of land and building permits, which makes the supply quite elastic, even in the short run. At the same time, pre-sale contracts require mainly the development land as an input, while the buyer has to pay in tranches for given stages of construction. In most cases, the developers use only a small amount of external financing, and finance the undertaking mainly from their own equity and the prepayments of buyers (see NBP, 2025b, p. 103; Figures 9.35 and 9.36).

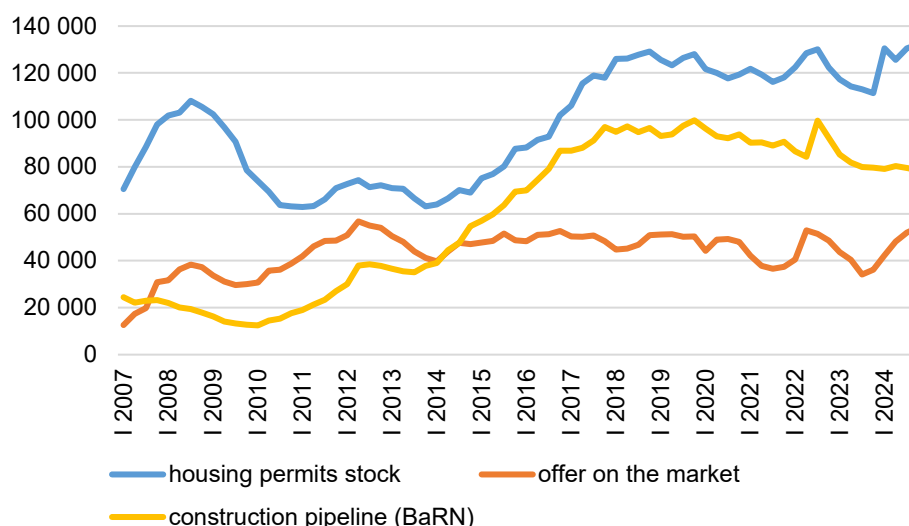


Fig. 3.1. Estimated construction pipeline, housing permit stock and offers on the market of developer in 6 largest cities in Poland. The ticks on the axis indicate the first quarter of each year. *Source of the figure:* NBP (2025, Figure 60 and 61), source of data: NBP calculations of construction pipeline, JLL data on offers, Statistics Poland data on permits.

The second factor in determining price is income, which ensures the saleability of apartments. The strategy of large development companies seems simple and effective. Price is determined by the current level of costs, to which a margin is added. They strive to maintain relatively stable prices and margins and sell as many apartments as customers desire to buy at this price. Prices are relatively inflexible downward, but during the economic downturn (2008-2013), developers adjusted prices to reflect decreased demand (Figure 3.3). Because prices are relatively

inflexible and demand is volatile, sales frequently fluctuated, as did the timing of sales and the stock of unsold contracts on the market. When demand increases and the number of unsold apartments on the market decreases, a decision is made to increase margins and prices to achieve a new equilibrium level. This situation is possible because developers sell projects for their construction, not apartments. Generally, with an average two-year construction period, the stock of such contracts is approximately four times that of the annual sales. Additionally,

developers have access to ready projects (building permits), which they can launch quite quickly, and later on to sites where projects are still in preparation.

The developer market can therefore be represented (Figure 3.4 and 3.5) as a market where prices are administered and do not clear the market (there is a

relatively large stock of apartments on the market), with the elasticity of supply depending on the scale and speed of demand (see Łaszek et al., 2016). With relatively small shocks, supply is quite elastic, but stiffens as the shock deepens and the impact of time shortens.

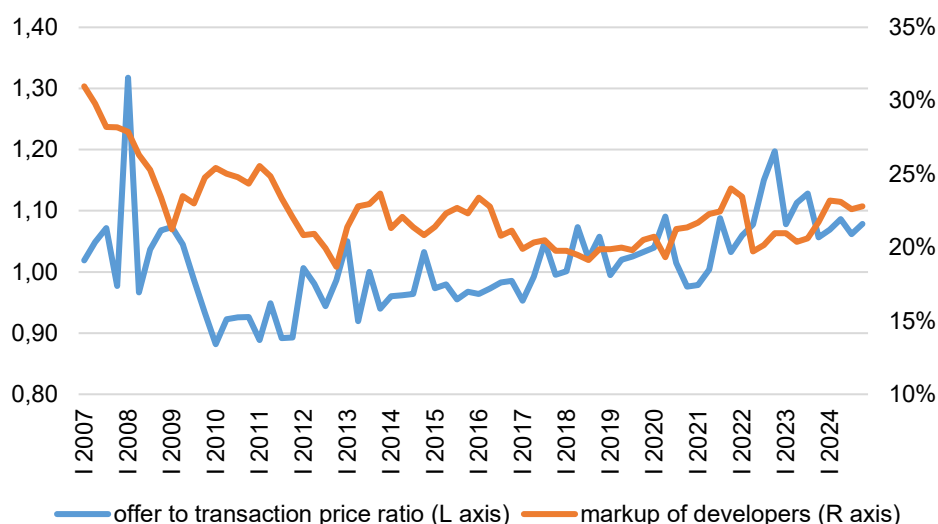


Fig. 3.2. Estimated markup of developers and the ratio of first time offers versus transaction prices of newly constructed housing. The ticks on the axis indicate the first quarter of each year. *Source of the figure:* data presented in NBP (2025a, figures 48 – 53), source of data: NBP calculations based on Sekocenbud data and NBP data on housing transaction prices; offer to transaction price ratio – NBP data on housing offer and transaction prices. A detailed presentation of the house price components for six biggest cities, which are used to calculate the markup of the developer can be found in the NBP (2025a) report.

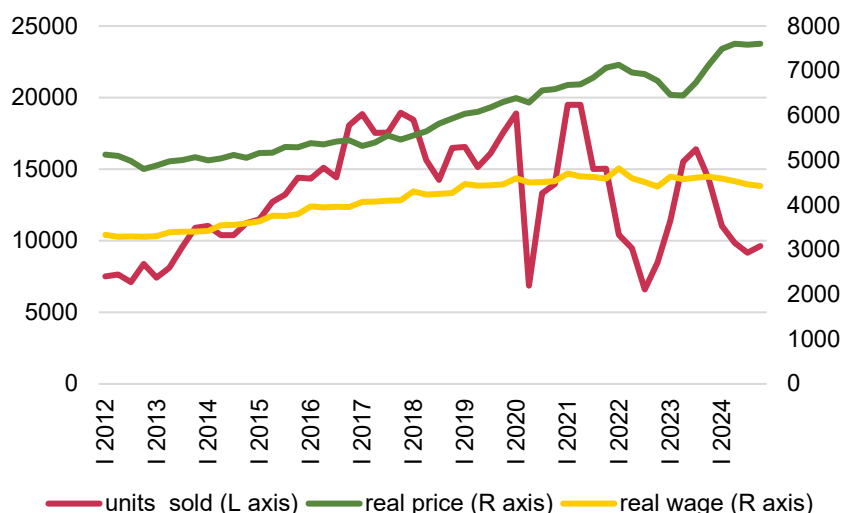


Fig. 3.3. House sales in 6 largest cities (in housing units) and real wages and real prices (in PLN). The ticks on the axis indicate the first quarter of each year. *Source of the figure:* NBP (2025, figure 59), source of data NBP, JLL, GUS.

Considering the above facts, the developer market can be viewed as an extension of the RE-AD-AS model, which was proposed by Łaszek and Olszewski (2023), as an adjustment of the classical AD-AS model to the real estate market. In such a modified model, construction

costs rise as production increases, prices are gradually raised alongside rising costs, and the market sells out, with supply being replenished by transferring additional apartments from ongoing production followed by the sale of contracts from newly launched

projects.

Such functioning of the developer sector significantly simplifies its modeling, as we model demand alone, while supply adapts itself. Depending on the market, demand and its changes will be determined by income, the related availability of credit, housing prices, household preferences (an indirectly

determined factor), migration, and demographic factors. Historical data show that, in Poland, the primary demand factor was steadily and moderately rising incomes, which determined the proportional increase in demand, while interest rates, due to their frequency of changes, were responsible for demand shocks.

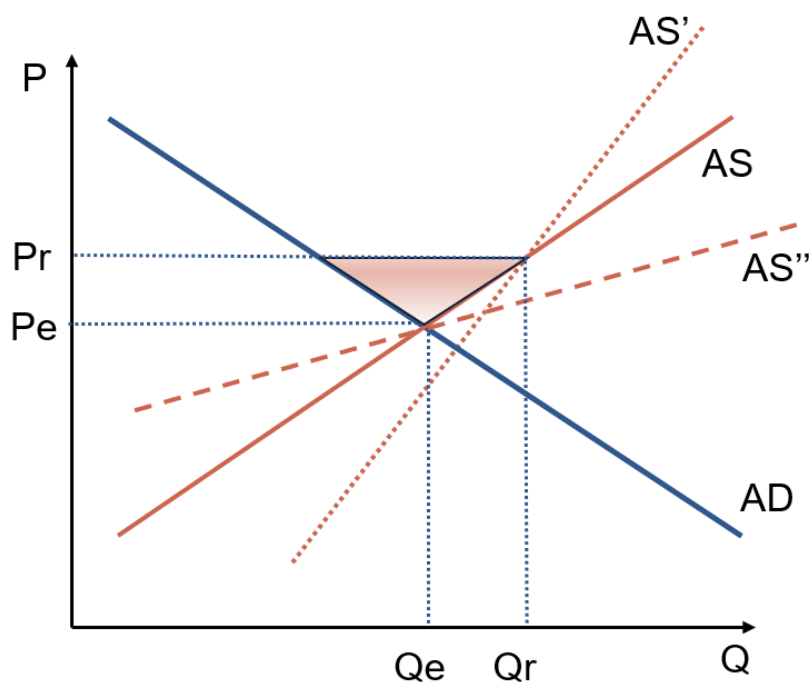


Fig. 3.4. The developer market and the supply curve. Source: own study.

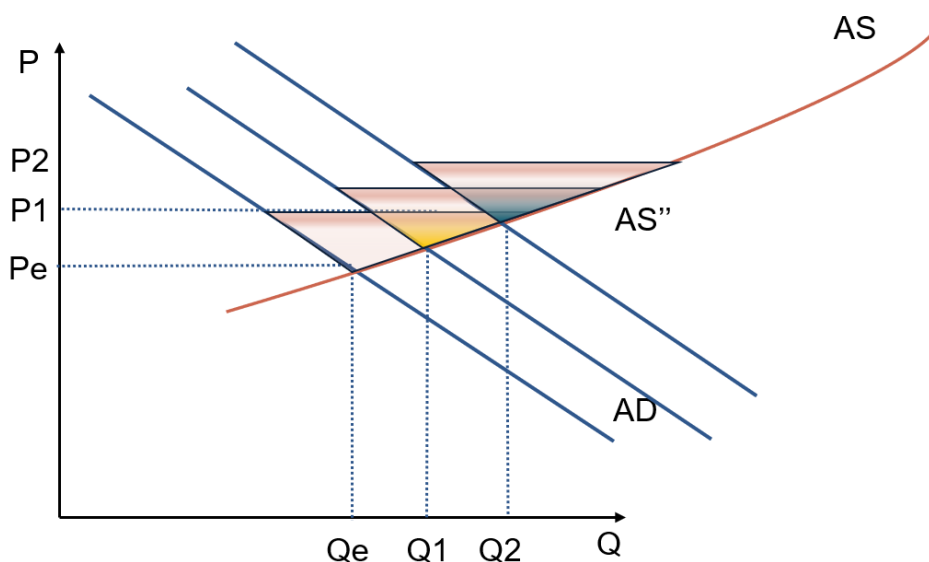


Fig. 3.5. The developer market, the supply curve and demand shifts. Source: own study.

4. Empirical analysis

We estimate the demand for newly constructed

housing in the 6 largest cities in Poland on quarterly data, dividing it into purchases for ownership and

investment purposes. There is no official data about those purchases, so we need to estimate those figures. We start the analysis from Q1 2012, because the NBP (2015 to, 2025a) publishes estimates of cash and mortgage house purchases starting in that quarter. These values are calculated for the years 2012 - 2014 on the basis of an estimate of new mortgages, which is only possible for mortgages in one currency. The NBP estimates new mortgages as the difference between the mortgage stock in two quarters, and adds the quarterly amortization of the mortgage stock². Before 2012, mortgages in Poland were also denominated in foreign currency (mainly Swiss Francs) and, due to the exchange rate changes, the estimates would be less accurate. We applied the share of mortgage purchases to the number of all purchases and, in this way, obtained the number of flats bought for ownership and for investment purposes. We assume that owner-occupied housing is bought mainly with a mortgage while housing for investment purposes is generally paid for with own money. One reason is that, in Poland, people pay a proportional tax of 8.5% on the rental income. There is no tax shield and, as can be seen from the analysis of housing investment for rent (NBP, 2025a), using a mortgage does not increase the ROE. The interest rate is close to the yield from private rental housing investments and may even exceed it at times.

We apply the share of cash transaction volume to the volume of total house purchases, and then multiply this ratio by the number of housing units sold to obtain an estimate of the number of houses bought with cash,

which we interpret as houses bought mostly for investment purposes. The remainder of the transactions are considered to be mainly purchases for purposes of own use.

There is a small shortcoming in our approach because some people buy a newly constructed flat with money they get from selling their old flat and require a mortgage to finance only a small amount; our estimated share of investment purchases could therefore be biased upwards.

We applied the generalized additive regression method (Wood, 2001) because it can be expected that the demand depends, in a nonlinear way, on the explanatory variables. We apply the most important ones, i.e. the mortgage interest rate, the house prices, and wages, the last two deflated by the CPI. In addition to this, two dummy variables are added to the model. The Covid dummy covers Q2 2020, in which, due to the lockdown, hardly any transactions were carried out. The second dummy accounts for the BK2% program (Bezpieczny Kredyt 2%), which was a housing subsidy program that offered mortgages at a 2% interest rate to eligible first time buyers during the period Q3 2023 – Q1 2024, and boosted demand at that time. First, we ran a regression for total housing purchases. We tested the model and decided to apply the spline only to the real price. The wages and interest rate enter the equation in a usual, linear way. We find that that the effect of the price is strongly nonlinear, as shown by the table with the estimation results and Figure 3.3.

Table 1

Regression results of total house purchase numbers					
Component	Term	Estimate	Std Error	t-value	p-value
A. parametric coefficients	(Intercept)	-16.248	5.498	-2.955	0.0051 **
	intrate	-8.018	1.162	-6.901	0.0000 ***
	wages.r	3.141	0.659	4.767	0.0000 ***
	Covid	-0.937	0.120	-7.782	0.0000 ***
	BK2	0.407	0.091	4.470	0.0001 ***
Component	Term	edf	Ref. df	F-value	p-value
B. smooth terms	s(prices_new.r)	4.957	6.068	11.230	0.0000 ***
Signif. codes: 0 <= '***' < 0.001 < '***' < 0.01 < '*' < 0.05					
Adjusted R-squared: 0.873, Deviance explained 0.895					
-REML: -29.759, Scale est: 0.0127, N: 52					

Source: own study.

In the next step, we run the same regression for owner-occupier housing purchases. Here, interest rate and the real house price have a nonlinear effect on

purchases. What is interesting is the fact that, up to some point, a higher real price decreases purchases, but above it, the relationship becomes positive. The

² The NBP explains the estimation methodology for years 2012 – 2014 in the NBP (2015) report, on page 12 below table 1. Since 2015 new mortgages are reported by banks.

most likely explanation is that high real prices were observed when there was a housing boom, but inflation was low.

Table 2

Regression results of the number of house purchases for mainly owner occupation purposes					
Component	Term	Estimate	Std Error	t-value	p-value
A. parametric coefficients	(Intercept)	-5.868	5.573	-1.053	0.2985
	wages.r	1.760	0.670	2.626	0.0121 *
	covid	-0.272	0.125	-2.180	0.0350 *
	bk2	0.282	0.100	2.827	0.0072 **
Component	Term	edf	Ref. df	F-value	p-value
B. smooth terms	s(intrate)	3.168	3.854	50.682	0.0000 ***
	s(prices_new.r)	3.550	4.444	3.625	0.0161 *
Signif. codes: 0 <= '***' < 0.001 < '***' < 0.01 < '*' < 0.05					
Adjusted R-squared: 0.852, Deviance explained 0.880					
-REML: -24.170, Scale est: 0.0134, N: 52					

Source: own study.

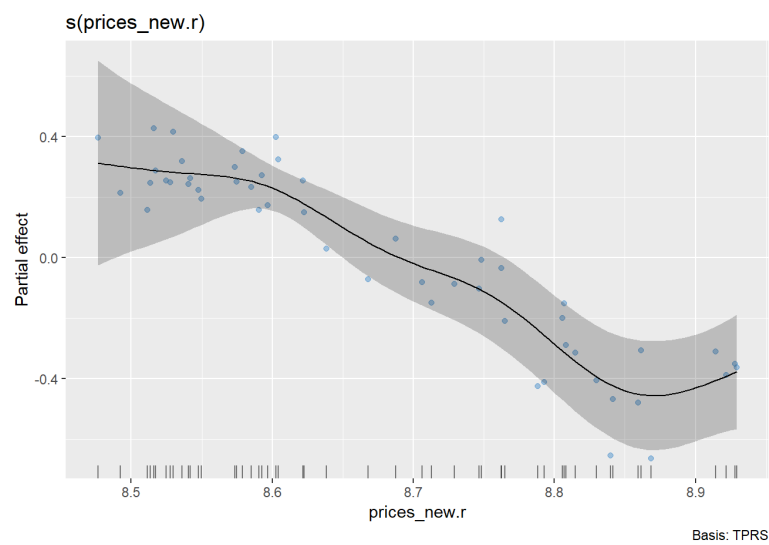


Fig. 4.1. Partial effect of the real price on new house purchases, total. Source: own calculations.

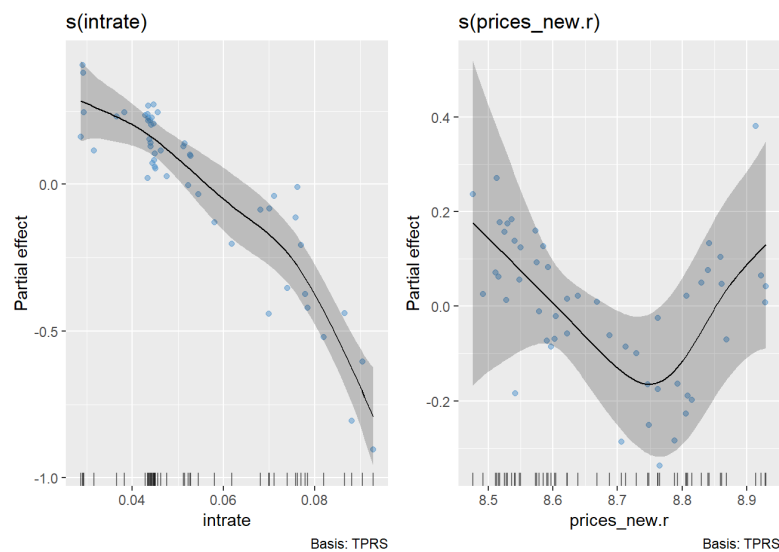


Fig. 4.2. Partial effect of the interest rate and real price on new house purchases, ooh. Source: own calculations.

Finally, investment purpose purchases are explained and, in this case, wages enter the regression in a

nonlinear way, while interest rates have no statistically meaningful impact. This finding can be explained by

two facts. It is in line with the assumption that investment is mainly financed by cash purchases, so the interest rate, as a proxy for mortgage availability, does not have a significant impact. Moreover, when we consider the interest rate as a proxy for the alternative costs of investment, we run into another interesting observation. When interest rates were low, house prices were high, and the yield from such an investment was

not better than a government bond which was risk free. However, when interest rates went up, house prices started to slow down, as purchasers for owner occupation were not able to enter the market. We can therefore interpret the whole observation as proof of the substitution between owner-occupier purchases and investor purchases.

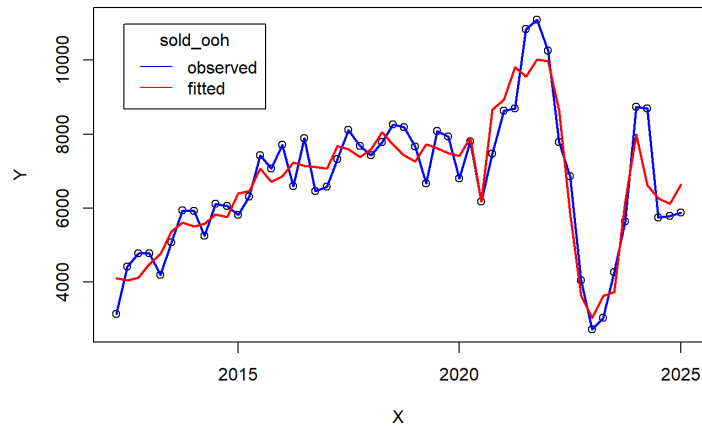


Fig. 4.3. Observed and fitted house purchases, OOH. *Source:* own calculations.

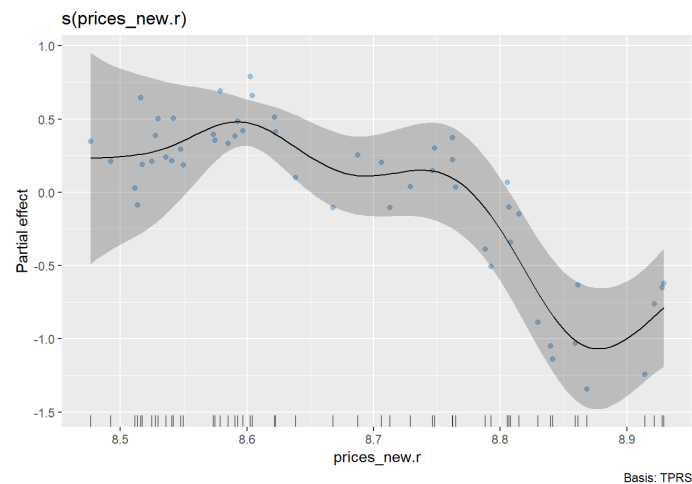


Fig. 4.4. Partial effect of the real price on new house purchases, investment. *Source:* own calculations.

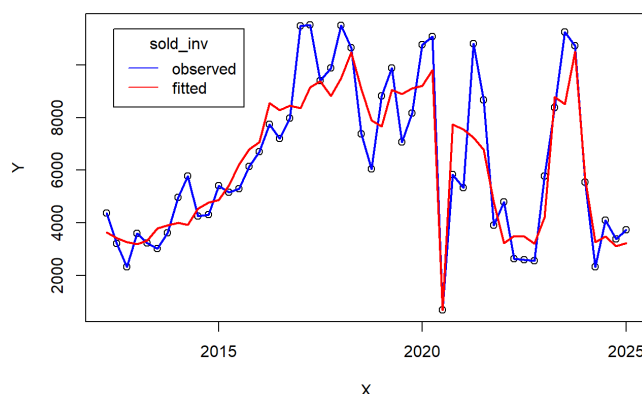


Fig. 4.5. Observed and fitted house purchases, investment. *Source:* own calculations.

Table 3

Regression results of the number of house purchases for mainly investment purposes

Component	Term	Estimate	Std Error	t-value	p-value	
A. parametric coefficients	(Intercept)	-20.698	12.015	-1.723	0.0926	.
	intrate	-2.875	2.410	-1.193	0.2397	
	wages.r	3.548	1.440	2.464	0.0181	*
	Covid	-2.655	0.252	-10.553	0.0000	***
	BK2	0.628	0.188	3.334	0.0018	**
Component	Term	edf	Ref. df	F-value	p-value	
B. smooth terms	s(prices_new.r)	6.476	7.613	14.425	0.0000	***
Signif. codes: 0 <= '***' < 0.001 < '**' < 0.01 < '*' < 0.05						
Adjusted R-squared: 0.834, Deviance explained 0.868						
-REML : 6.373, Scale est: 0.0532, N: 52						

Source: own study.

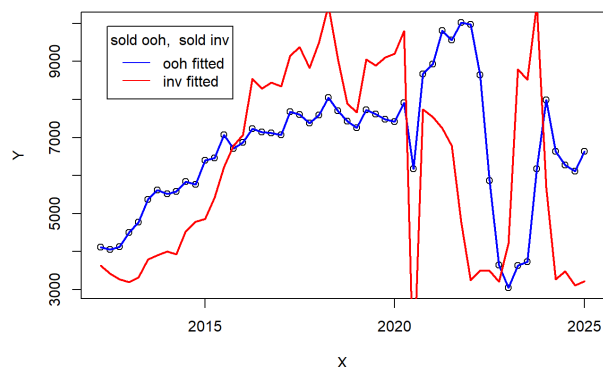


Fig. 4.6. Observed and fitted house purchases, owner occupied and investment housing separately. *Source:* own calculations.

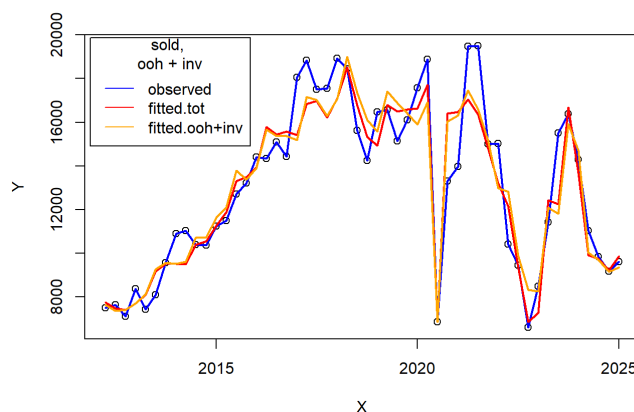


Fig. 4.7. Observed and fitted house purchases, owner occupied plus investment housing. *Source:* own calculations.

5. Discussion of the results and limitations of the paper

The analysis of consumer demand and investment demand which we present in this paper shows that the two kinds of purchase decisions are driven by different economic parameters. Our estimation of the two types of demand helps us to overcome the fact that direct

data regarding these two types of purchases does not exist in the case of Poland. Nevertheless, this is one of the weak points of our paper. We base our results on data that we have obtained ourselves on the basis of NBP (2025b) data. Secondly, we look at the aggregate purchases and are unable to distinguish between the types and locations of the dwellings. It is possible that rental dwellings are rather small, but well located, which

makes them attractive to tenants. It is also possible that owner occupied flats are larger, but located in less favorable parts of the city. We do not include the speculation motive in the regression, as it is unknown whether the person who bought the flat resells it. As we discussed in the introduction, the speculative motive affects both types of house buyers, but it is possible that typical speculative investors react differently to the economic factors. Those shortcomings require us to be careful when interpreting our results.

6. Conclusions

The analysis of owner occupier and investment housing purchases on the 6 biggest markets in Poland allows us to draw three important conclusions. We assumed, on the basis of surveys among house buyers in Poland carried out by NBP (2025b), that housing for own use is mostly financed with a mortgage, while housing that is bought for investment purposes is mainly financed with cash. Under this assumption, which helped us to separate total housing demand into those two components, we found that owner occupier demand is driven mainly by mortgage rates and wages in a nonlinear way, while investment demand is mainly driven by wages in a nonlinear way. For the period under analysis, both types of demand depend linearly on house prices, but interestingly, investment demand does not depend on mortgage rates. One could assume that they reflect alternative costs of investment, but turn out to be insignificant. What is more, both types of demand complement each other during stable times, but, are substitutes during times of turbulence. Finally, the smooth adoption of housing developers, without signs of boom bust cycles, to changing housing demand is possible, thanks to the offering of pre-sale contracts. In Poland, the market is well-regulated, so buyers trust developers. These adjust their offer prices to transaction prices and transaction prices relative to construction costs, according to the market situation. We should, however, keep in mind that the emergence of speculative investments might change the picture, at least in the short term. Moreover, we did not run any forecasts, so we can only draw conclusions about the past, not the future.

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purposes. Finally, we added a discussion section and softened our conclusions in accordance to their suggestions.

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