A simple model of the housing market and the detection of cycles

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Introduction

The real estate sector consists of land and buildings, which can be traded and generate services to the owners or tenants. This sector is very capital intensive, the value of the real estate stock (both residential and commercial) exceeds the size of the GDP, in some countries even several times. Changes in its value have a very important impact for the economy, they affect the behavior of households and also determine the value of collateral for banks.

This sector is ruled by laws and by the market. The most important markets are the market for objects (creation of the capital stock and changes of its owners) and the market for space that can be rented (services, which the real estate generates) (see Wheaton and DiPasquale, 1992 and Fisher, 1992). The demand in the market is closely related to the financial sector which allows market participants to purchase real estate, while the construction sector, together with the market for land and construction material generates new objects.

Each property is a capital good that also generates a stream of utility, and each property is different, because of its location, age and quality. The rent someone is willing to pay should be – in the long run – related to the value or construction cost of the given real estate, but this can vary in the short term. Recently, due to low interest rates prices went up, while rents remain stable.

1. Housing market fundamentals

To understand cycles, we need to understand the fundamentals of the housing market first. Housing is a consumer and an investment good, and this fact is very important for the behavior of households. If housing is considered a pure consumption good, households should optimize their consumption, which means that we should not observe strong demand booms. When demand for housing goes up, its price goes up and in a standard consumer model the demand for housing should decline again. Demand shocks would be very short-lived. Many

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consumers would like to sell their house to investors and rent it. On the other hand, if housing would be a pure investment good, people would buy at low prices and sell at high prices. We do not observe such a behavior, contrary, we observe that people buy even when prices are high. And this results from the complex function of housing. People are afraid of future increases in rent levels, thus prefer to buy housing. They decide to buy housing when either income is growing or interest rates decline, and then a lot of other people want to buy, too. We observe a strong herding behavior and as people are worried about future price growth, they anticipate the purchase decision and add to the demand boom. In another chapter in this book (see Augustyniak et al., 2018) we present a simple four equation model of the primary housing market in Warsaw. We notice a negative relationship between price levels and demand, but we also find a strong effect of the appreciation of housing on the demand for housing.

Housing market follows business cycle, because housing demand reacts with a lag to the economic growth. This also means, that one recognizes a prolonged demand, even when the whole economy is slowing down. And when people finally realize the economic downturn, the housing demand ends abruptly and prices fall. Analysis by Łaszek, Leszczyński and Olszewski (2017) indicates such a behavior and points out that the commercial real estate market is closely linked to the business cycle. Firms analyze the market and when they expect a growth in employment, they ask for more office space or more retail space. As a result of growing employment and growing income, households demand more housing and this market starts to grow. Leszczyński and Olszewski (2017) performed a panel analysis of house price determinants in the primary and secondary housing market in sixteen Polish provincial cities and found that the primary market reacts stronger to changes in income than the secondary market, while the secondary market reacts stronger to changes in interest rates than the primary market does. They conclude that most likely housing on the secondary market is bought by first time buyers, who have a tight budget and need a mortgage, while housing on the primary market is more likely bought by those who have a higher income and probably sell their old flat and buy a new one. In such a situation, their wish to buy new housing results from their improving economic situation and they need relatively little mortgage to close the gap between the value of the old and the new flat. Also, the analysis presented in NBP (2017, p. 44) shows that around 60% of the value of purchased flats on the primary market in the largest cities is financed with cash. Most likely this cash comes from the selling of the old flat, but also from savings. Because investments in rental housing are a profitable business in the

low interest rate environment, one can expect that there will be a share of investors who move their wealth from various assets to the housing market. On the one hand cash purchasers do not generate any risk to the financial system as they use their own cash, but on the other hand such cash purchasers can generate a price boom in the biggest cities, where investments appear to be most profitable. So far there is no instrument to make such investments unattractive. If prices increase, people who need mortgages will need to take a larger mortgage and the bank might be willing to give it to them. Granting mortgages is profitable and as long as house prices are stable or even rising, the mortgage is well secured. In any case, when interest rates are low both consumers and investors want to buy more housing.

1.1. The fundamental housing model

The most fundamental model of the real estate sector is the Fisher-DiPasquale-Wheaton model (Wheaton and DiPasquale, 1992 and Fisher, 1992). We present in Figure 1 two selected quarters of the model that deal with the demand and supply for space (denoted Q) at a given rent level (P) and the relationship between the value and the rent level under a given interest rate. The value of a square meter of property (denoted V) is the discounted stream of rent it generates (denoted P), where the discount factor takes the interest rate and the risk premium into account (r). In such a model a direct relationship exists between rents and the property price and the non-arbitrage condition applies, thus a given rent to price ratio will be achieved in the long run. The mechanism is as follows. When rents are very high, owners are willing to rent their property to others and even want to buy more housing, by which prices increase and the price-to-rent ratio returns to its long run level. In the opposite case, when rents are very low, owners are ready to sell their property and rent it from others, thus house prices decline while rents start to grow.

The supply on the market is the whole available space, which is constant in the short term (depicted with line S1 in the upper panel of Figure 1). When the interest rate or the risk premium decline, a property that has a constant rent obtains automatically a higher value. Increases in demand for space make rents go up, which directly translates into rising prices of the objects (this is shown in the lower panel of Figure 1). When prices go up, construction of new objects becomes more profitable, thus developers start to deliver more objects to the market. Over the cycle there will be enough objects on the market to meet demand and their price will decline to the initial price. In the long run, property prices will be equal to the construction costs (land, material and labor). Construction costs are the result of demand and

supply of land, material and labor and they change over the cycle. When prices exceed construction costs, new construction becomes more profitable and more objects are constructed. But when prices are lower than construction costs, new construction becomes unprofitable and stops.

The simple model shows that short term cycles are generated by changes in the demand for objects. The total supply of objects changes very slowly and follows the total demand in the long run.

Figure 1. The Fisher-DiPasquale-Wheaton model (upper panel – equilibrium, lower panel – shift in demand)
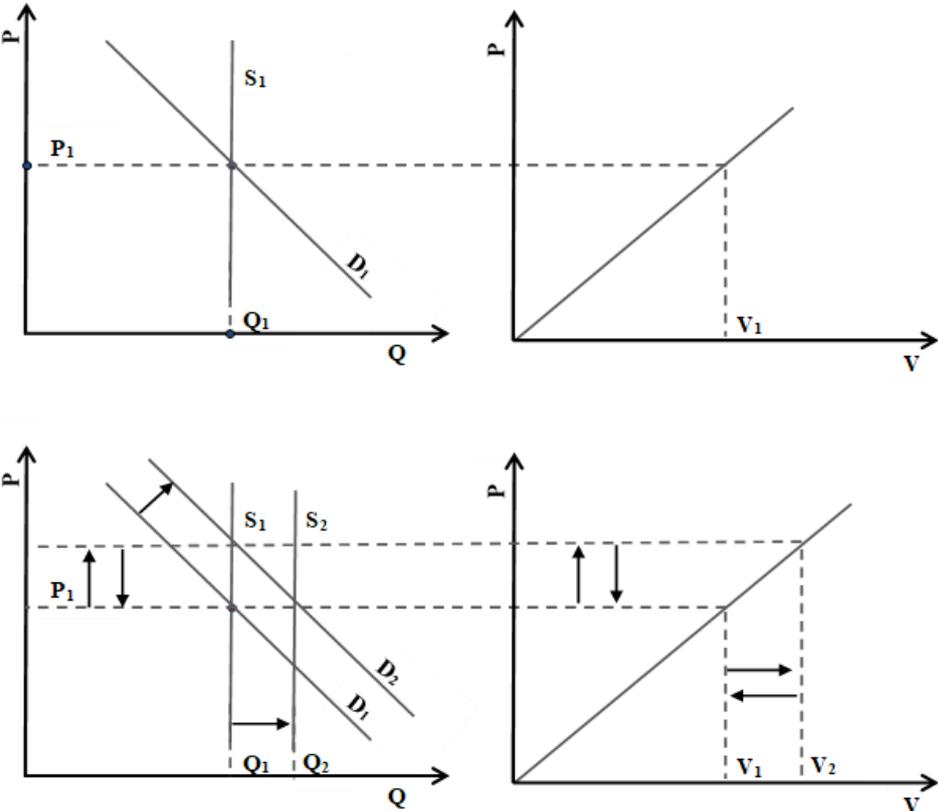
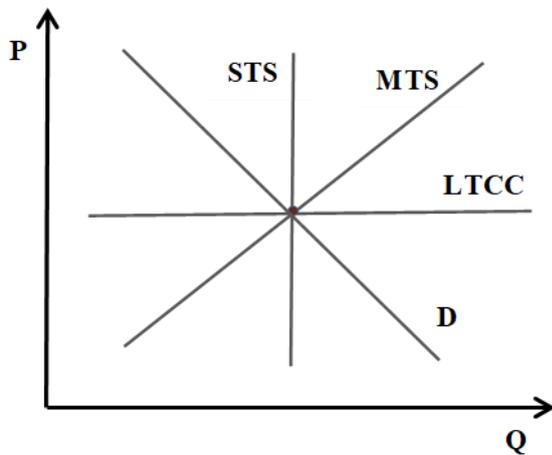*Source: own modification of DiPasquale-Wheaton model.*

When owner occupied housing (OOH) is analyzed, the market for objects and space can be analyzed jointly, as the object market is the most important one in this context. Housing is a heterogenous good and its price results from the value of the utility which its attributes generate. However, one has to buy a basket of attributes and can only choose between baskets offered on the market. For example, in a good location there might be only small and old flats, while larger ones are in a remote location. The situation is slightly simpler in the commercial space market, where the offered property is more homogenous from the demand point of

view. Owners put a lot of money into their property, thus plan for the future and have high expectations. Renters are concerned about the rent and can change the location and quality nearly every year. In the OOH market the consumption motive plays a dominant role, therefore the financial market, through the interest rates, determines mortgage availability and thus housing demand. Imputed rents, discounted with the interest rate play a minor role for owners. However, under specific conditions i.e., low interest rates, the investment motive can start to dominate and under high price growth the speculative motive becomes a significant demand driver.

The housing market consists of the whole housing stock and all people who satisfy their housing needs. Transactions in the market are those of new housing which is used to replace outdated housing and satisfy increases in housing demand, and also transactions in the existing stock. Transactions of housing units are rather rare, they account for only few percentage points of the stock per year (contrary, on the rental market for housing contracts can be renegotiated nearly annually and a significant part of the rentable stock is on the market each year). It should be noted that a small amount of transactions determines the value of the housing stock and can have a huge effect on the economy, for example through the collateral channel.

In a simple housing market model, the supply is the sum of new constructed flats and those who become empty from the whole stock (see Figure 2). Demand is determined by the usual factors: demographics, income growth, interest rates and subsidies. Moreover, it results from the relocation of people from one city part to another, change in the usage of housing as commercial space and also the depreciation of the existing housing stock. Supply is fixed in the short run (STS), because developers deliver to the market housing they have planned and started to construct some years ago. In some countries, pre-sale contracts can be sold, but this does not really satisfy housing demand until the flats are completed, is risky for the buyer and can be a signal for tensions in the market. In the medium run housing production increases (MTS), but construction prices go up quite quickly. Only in the long run the production of construction material and the labor force adjust to the new production levels and costs move back to their equilibrium levels (LTCC).

**Figure 2. Short, medium and long-run supply of housing and housing demand**

Source: own modification of the *DiPasquale-Wheaton model.*

2. Cycles on the market

Cycles are a natural phenomenon of the housing market, because of the lag between the construction start and the delivery to the market. The usual cycle is triggered by the simultaneous occurrence of economic triggers, such as decrease of interest rates, demographic factors, subsidies, which lead to a demand boom (Figure 3, part I). It is unimportant, whether those triggers are fundamental or just short-lived, because in both cases developers increase new construction. Developers tend to overestimate the factual demand, but also can restrict supply in order to let prices grow even more. The initial price increase generates further price increases, as some people start to speculate, others buy faster because they are afraid of further price rises, which adds to the price bubble and consequently production boom (part II). However, at some point banks and large investors realize that the market is overheated and curb lending or stop purchases, which leads to a significant drop of demand and price starts to decline (part III). People who wanted to make a house purchase hope that prices will fall further and postpone their decisions, thus demand decreases even more. When prices drop below a certain point, the whole housing stock can be affected as people with a mortgage that exceeds the collateral might want to stop to pay the mortgage and to go bankrupt. A large wave of forced sales will decrease prices even further and be harmful for banks that financed flats. The end of one cycle can trigger another one, when new construction was reduced to a minimum (part IV). Demand will again exceed supply.

Figure 3. The demand and supply cycle in the market
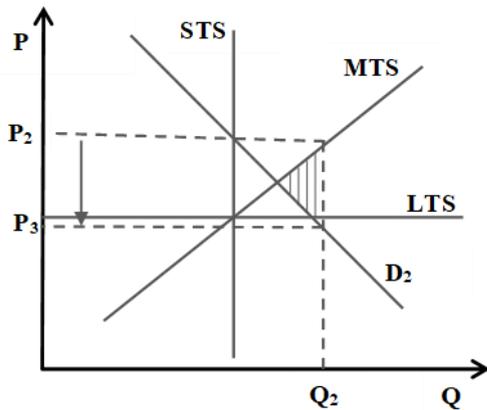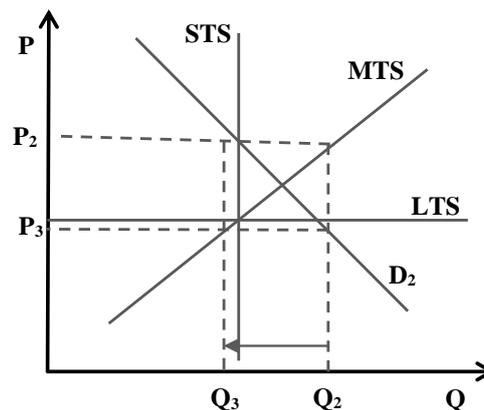
I.
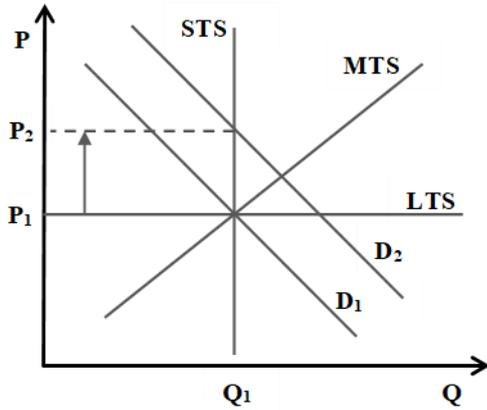
II.
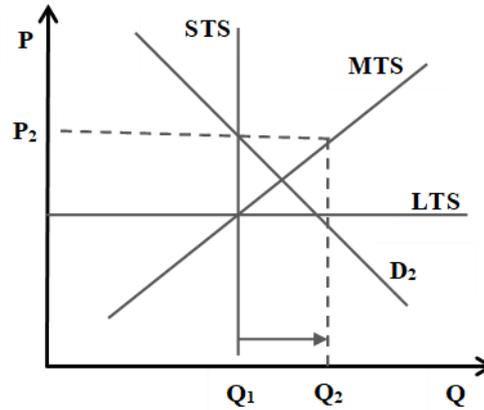
III.

IV.

Source: own modification of the DiPasquale-Wheaton model.

Another scenario is a slow recovery of the economy, with a low demand for new housing and a large stock of unsold housing (see Figure 4). If developers are left with a significant stock of unsold housing from the previous cycle, their financial strength and the behavior of banks that finance the construction projects will determine whether the developers survive or have to go bankrupt.

Figure 4. The cycle in the real estate market
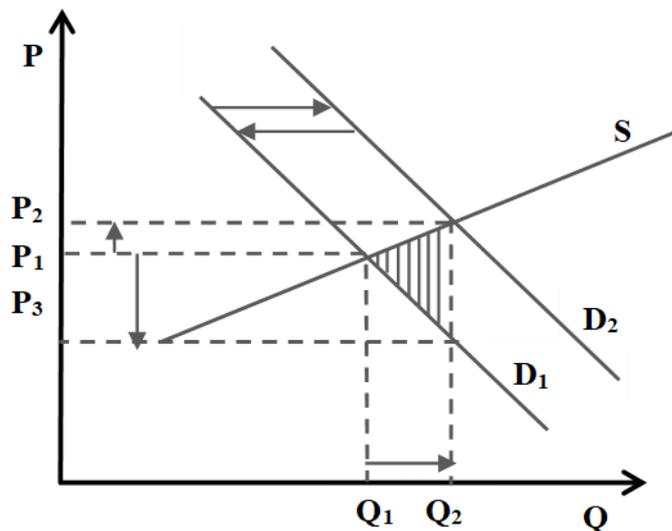
Source: own modification of DiPasquale-Wheaton model.

The housing market cycle can be described with the same methods as the real business cycle. It starts with the expansion phase and a price boom. The abrupt decrease in demand and the following price drops initiate the crisis phase, which lasts until prices stabilize and the bottom of the cycle is reached. A this point the depression phase begins, and it lasts as long as there is unsold housing on the market. A lasting lack of new housing and income increases initiate the recovery phase, which can again lead to a boom when supply does not catch up with the increasing demand (see Figure 4).

## 2.1. Detection of cycles and their phases

Price growth, which exceeds inflation, is an early-warning indicator of market tensions as evidenced by an analysis of the simple model and empirical observations. When the supply side is elastic, a worrying signal is a fast increase of new construction and purchases at stable prices. As stated above, it is unimportant whether the triggers of the cycles are fundamental or just incidental, because the effects are basically the same, and the cycle starts its own life. Usually increases in consumption and speculative demand are fueled by mortgage growth, thus price increases and fast mortgage growth are an indicator of tensions. A demand boom can be triggered without a mortgage boom, when interest rates are low and households

withdraw their savings and purchase housing for investment purposes. Large sales on the primary housing market also indicate that there is a boom, as at some point housing demand can be only satisfied with new construction. Purchasers will at some point accept risky pre-sale contracts for housing that will be delivered in the near future. When construction exceeds the usual levels significantly, construction land becomes a scarce good. Its price increases quickly, even faster than house prices, as land has a small fraction in the total cost but is a vital input in the construction process. Physical or administrative land availability is another barrier for the increase of housing construction, which can be a significant problem. There might be also problems to acquire enough qualified workers. Finally, when demand is excessive, new entrants buy pre-sale contracts for whole buildings from incumbent developers, hoping to finish those projects quickly and making excessive profits.

3. Cycles in the Polish housing market

The housing market in Poland underwent three cycles in the 1994-2017 period. None of the cycles, even considerable construction booms, resulted in a crisis, because the sector has only a small share in the GDP and also housing finance is relatively low in relation to the GDP. Each cycle was driven by different factors, had a different shape and resulted in different price reactions. The first cycle was only observed in Warsaw and it was the result of the abrupt end of subsidies. Prices increased only as fast as income growth and the construction boom was possible as for the first-time private firms could operate on the market. The second cycle was observed in five biggest cities and was driven by a mortgage boom that was the result of very low foreign denominated mortgage rates. The price increase was abrupt and signs of a bubble creation could be observed on some markets. The third – current – cycle was caused by monetary policy, and we observe a demand and supply increase, while prices remain rather stable. The cycles are presented in the next figures.

Figure 5. Cycles in the housing market in Warsaw in 1994-2017
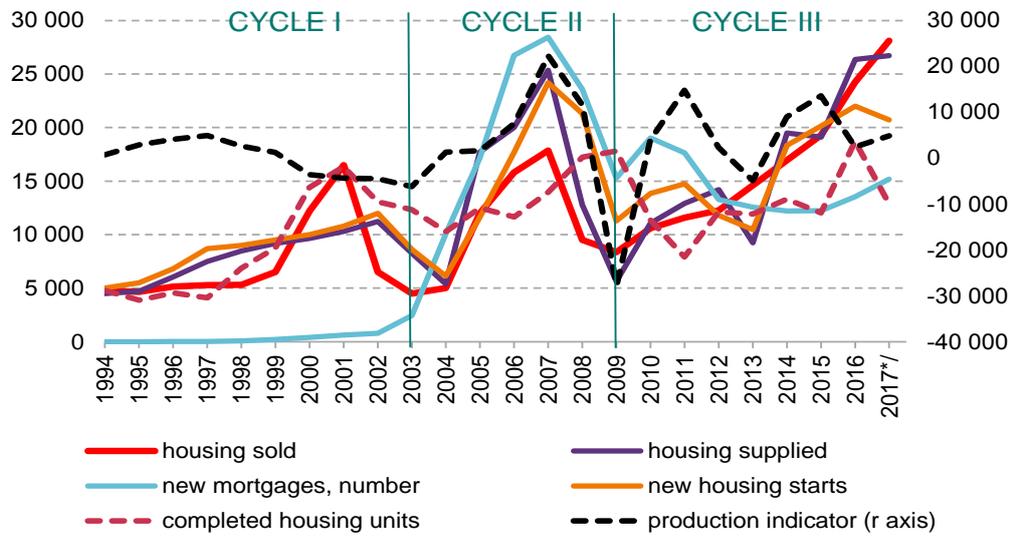
Source: own calculations based on NBP, CSO, REAS, BIK data.

Figure 6. Determinants of the housing cycles in Warsaw during 1994-2017
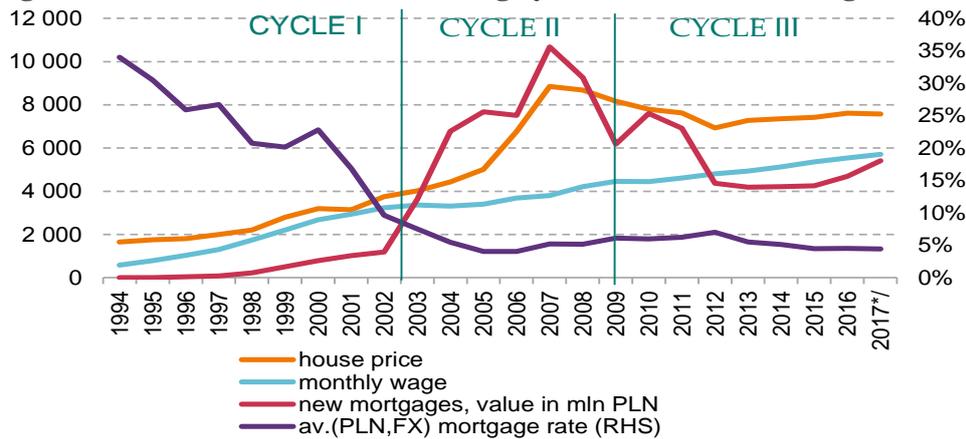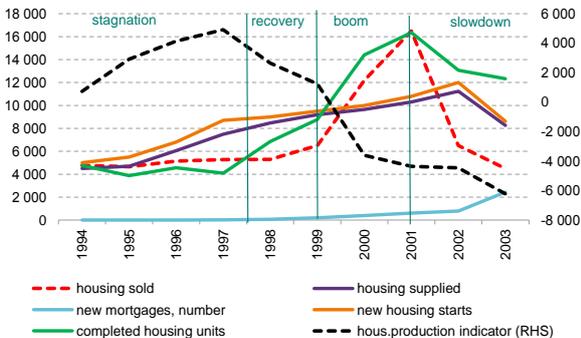

Source: own calculations based on NBP, CSO, BIK data.

The first cycle was a classic example of oversupply, which appeared when the government announced to stop a very broad subsidy program and to raise the VAT on building materials at the end of 2001. Many people who were able to finish their investment in 2001 started to purchase construction contracts. After 2001 demand decreased sharply, as there was little demand for more expensive housing. Many housing developers became bankrupt and the construction of new housing slowed down considerably. Nearly no new construction was started after 2001. New housing starts were already excessive, thus the new regulations only added to the existing problems.

Private housing developers (in contrast to the cooperatives) emerged in the early 1990s, and started to work on a large scale. Housing purchases were financed to around 70% by cash, developers financed themselves with pre-sale contracts. Therefore, mortgage growth had little effect on the housing market.

Figure 7. Cycle in the housing market in Warsaw in 1994-2003

Figure 8. Determinants of the cycle in the housing market in Warsaw in 1994-2003

Source: own calculations based on NBP, CSO, REAS, BIK data.
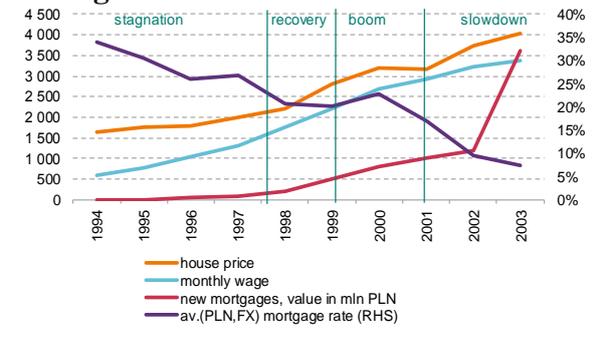
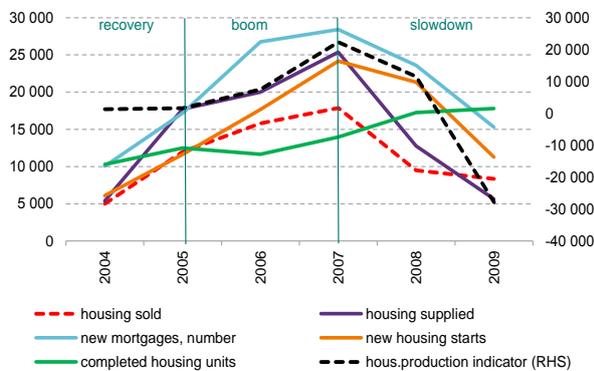*Source: own calculations based on NBP, CSO, BIK data.*

The second cycle (Figures 9-11) began when Poland entered the EU in 2004. Many economic factors augmented or annihilated each other, as concerns consumers, investors, developers and banks. Only the most important ones are presented here in a simplified way. The two-digit inflation fell after 2000 to quite normal levels, and mortgage rates followed. Also foreign denominated mortgages, especially CHF ones (almost twice lower mortgage rate then PLN mortgage rate), started to emerge. Banks and their employees were interested in offering CHF mortgages, because they were very profitable, and such mortgages were indeed paid out in PLN. The decline of interest rates increased the mortgage availability. At the same time there were many new marriages, that came from the post-war baby boom. The economic activity accelerated, and the major cities observed declining unemployment rates or even a shortage in workers, especially amidst the quite high unemployment rate in the whole country. The consumer sentiment was on a rise.

The supply of housing was created by small firms, that had financial problems that arose in the past cycle. There were little projects under construction, the stock of development land was rather low.

The fast increase in demand, amidst inelastic supply, lead to a strong price boom. This fueled speculative investments. Developers were selling pre-sale contracts, quite often just holes in the ground. The mortgage cost increased as prices rose, thus consumers tried to expand the
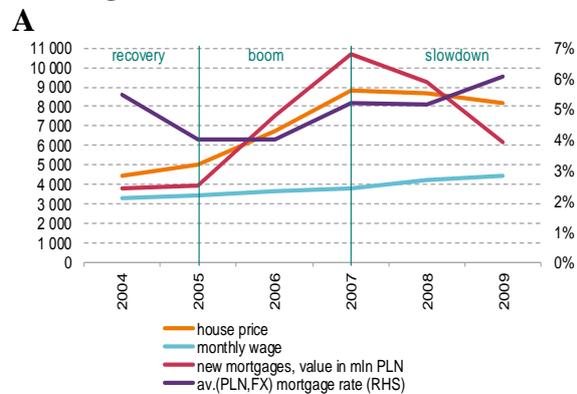
maturity as much as possible. New, foreign development firms were buying contracts from incumbent firms.

Figure 9. Cycle in the housing market in Warsaw in 2004-2009

Source: own calculations based on NBP, CSO, REAS, BIK data.

Figure 10. Determinants of the cycle in the housing market in Warsaw in 2004-2009, A

Source: own calculations based on NBP, CSO, REAS, BIK data.

Figure 11. Determinants of the cycle in the housing market in Warsaw in 2004-2009, B
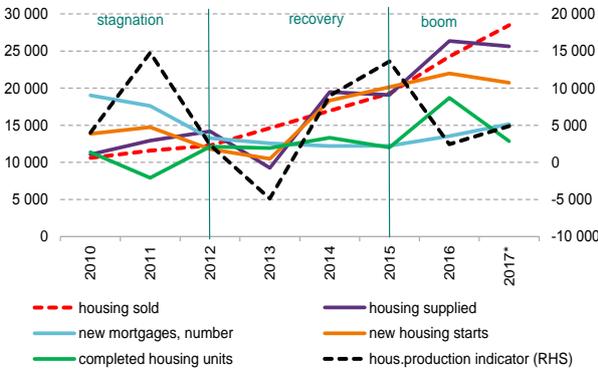

Source: own calculations based on NBP, CSO, REAS, BIK data.

The demand crash resulted from the global financial crisis, when cheap, foreign currency denominated mortgages became a rare good. The sub-prime crisis in the US also showed the consequences of an excessive lending boom. Banks that granted FX mortgages also started to have liquidity problems, and the factual mortgage rate was rising fast – only PLN mortgages were issued and banks restricted their lending. The housing demand dropped quickly, while developers increased their production. There were many unsold contracts and ready housing units on the market. Developers were able to survive, as they had now a better capitalization than they had in the first cycle. Developers also extended the time needed to finish housing units that were sold before, which was risky for the buyers. Prices were stable and no systematic problems were noted. An important improvement was that in 2006 the financial supervisory authority prohibited domestic banks to issue FX mortgages and extended this prohibition to all banks in 2013, unless the client was receiving his income in FX.

The third cycle (Figures 12-14) started in 2010, when the government increased the limit on housing subsidies. Even though the subsidies were both for the new market and the existing stock, housing on the new market gained the subsidies easier and took a major part in the whole program. The increases in the price limit lasted until 2011, and resulted in an increase of purchases of such flats. The subsidy program was stopped in 2013, but the announcement of such an decision made people anticipate their purchase. At the same time the Monetary Policy Council started a series of interest rate declines which lasted until 2016. Those lead to lower mortgage costs and also the deposit rates declined. In 2014 another subsidy scheme, aimed only at the primary market, was launched.

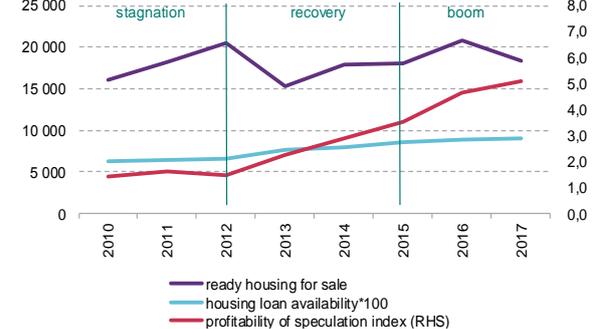**Figure 12. Cycle in the housing market in Warsaw in 2010-2017**

Source: own calculations based on NBP, CSO, REAS, BIK data.

Figure 13. Determinants of the cycle in the housing market in Warsaw in 2010-2017, A
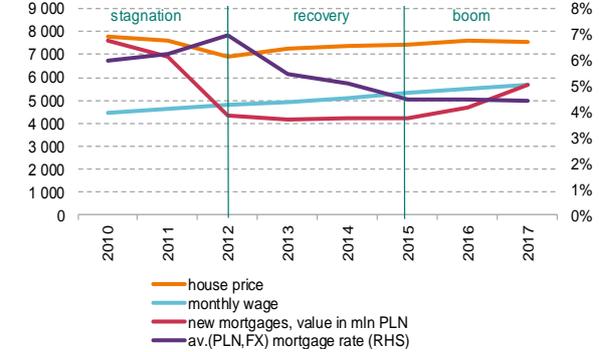
Source: own calculations based on NBP, CSO, REAS, BIK data.

Figure 14. Determinants of the cycle in the housing market in Warsaw in 2010-2017, B

Source: own calculations based on NBP, CSO, REAS, BIK data.

The joint work of the fiscal and monetary stimulus lead to a fast increase in housing demand that easily exceeded the levels from the 2004-2009 boom. Supply, also on the secondary market, was elastic and prices remained stable. No speculative behavior was triggered and there was also the expansion phase in smaller cities. Mortgages were rising continuously in a stable pattern but since 2014 cash purchases have started to play a major role. Also

investment purchases became important, as deposit rates were very low and the rate of return on housing investment was relatively high.

The Polish experience indicates that cycles are individual and no easily replicated. The list of potential determinants is short and well known, but their combination can lead to various unexpected scenarios.

Conclusions

The aim of this article is to stress that in order to understand housing cycles better, one needs to bear in mind that housing is a durable consumer good and an investment object at the same time. This fact makes buyers react in a seemingly irrational way, especially more housing is bought when its price increases. We use the Polish experience to show that housing cycles are quite similar, but each time can be driven by different factors. In consequence, cycles cannot be easily replicated, and in order to know how to contain a given cycle, one needs to analyze what is its current driver. While the list of potential determinants is short and well known (income, interest rates, regulations), their combination can lead to various unexpected scenarios. We find that prices rising stronger than inflation is a good early warning indicator of a potential boom.

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