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The Development of Residential and Commercial Real Estate, and Economic Development in Polish Voivodships

Jacek Łaszek, Robert Leszczyński, Krzysztof Olszewski
Narodowy Bank Polski, Poland
Warsaw School of Economics, Poland

Abstract

The article presents the development of residential and commercial real estate in Poland and its 16 voivodships. This is closely linked to the economic development of the regions. The first part shows how the stock of this real estate grew on a national scale and how their values changed. The second part analyzes the change in the stock of residential and commercial real estate (office and commercial property) in particular voivodships. Dependencies are noted. The residential areas developed in a similar manner in different voivodships, with supply increasing with a delay of about two years after economic growth. This can be explained by the fact that when the economic situation of households improves, they want to improve their housing situation. On the other hand, the development of commercial space is accompanied by economic development with a one-year delay. Taking into account that the process of physical construction takes about 2 years, this implies the existence of a strong endogeneity between employment in the service or retail sectors and income growth. This endogeneity acts as feedback (revenue growth is an increase in surface area, which in turn generates income), so the cause and effect have slight time delays. The development of commercial real estate in individual voivodships intensified in different periods. This is probably connected with the inflow of foreign capital, which first came to Warsaw and the Warsaw agglomeration, then to large centers (Trójmiasto, Poznań) and only with some delay to other voivodships.

Keywords: residential real estate, commercial real estate, development of regions

JEL classification: R31, R33

Introduction

The aim of the article is to present the relationship between economic development and the development of residential, office and retail real estate in Poland. In developed economies, there is strong feedback between these variables as real estate meets the housing needs as well as those associated with leisure time, work and shopping. At the same time, such development results in an increase in the production of services, employment and income. The real estate sector is an important element in any economy, and the situation in it is a significant factor in the overall economic situation of the region. Through its links to other sectors, and above all with the services sector, the labor market, and the capital and construction sectors, any emerging tensions are usually significantly enhanced.

At the turn of the last millennium, Poland, like other post-socialist countries, had a relatively small housing stock and a very small and obsolete stock of commercial real estate, particularly retail and office space. Along with the transformation of the system, private business began to develop, including private residential and commercial development. The financing of this real estate on a large scale was largely made possible by the inflow of foreign capital. Commercial real estate was mostly financed by foreign funds (foreign currency loans), residential real estate was financed by domestic funds, and external funds (denominated loans) were of a complementary nature. These loans, however, contributed to tensions in the financial sector when the exchange rate of the zloty

against currencies such as the Swiss franc and the euro weakened significantly (Łaszek, Augustyniak, and Olszewski 2016). In turn, commercial real estate, especially shopping centers and office buildings, were financed directly from abroad.

The development of the commercial market on a large-scale started with Poland's accession to the EU, and was connected with the improvement of infrastructure and greater mobility of households. Housing construction usually follows the business cycle, while commercial construction is directly linked to this cycle. In the case of Poland, there were also strong structural impulses that acted as feedback. When economies shift from agro-based to service-based, sufficiently large modern commercial space is needed. In these buildings, employees receive higher salaries as a result of higher productivity, thanks to which they can buy more. They do this in shopping malls, whereby there are more people employed there. Commercial buildings need much more intensive service than housing, thus creating new jobs. Structural changes, including shifting the workforce from traditional branches and traditional commerce and services to modern commercial space, are an important component of productivity growth in the US and the EU. It must be stressed, however, that the causal relationship between construction and GDP growth is not unambiguous, especially in the short term.

1 Overview of views and research

Theoretically, the relationship between investment in commercial and residential real estate and the level of GDP is simple and easy to explain on the basis of the theory of circular flow of factors of production and economic growth. As revenue grows, households report higher demand for residential and commercial services and hotels. These services can be met through a larger amount of capital allocated to those sectors, which takes the form of residential, commercial or hotel real estate stock. In the case of office real estate, this is not demand for consumer services, but production services, as reported by manufacturing companies, and is a result of increased production. There is also an important structural factor in this — in modern economies, the service sector becomes an independent and leading growth driver.

The increase in investment causes both a short-term revival in the local markets (construction and income paid out there), and also creates new jobs in the real estate sector (management, repairs, financing, etc.), which has a positive feedback effect on local income. Of course, excessive or unprofitable investments will not generate these effects, only losses, as there will be no demand for their services. However, such a mechanism is not easy to verify econometrically for many reasons. The simplest and most common is bad data. Also, real processes do not run in a text book manner. In the case of large commercial real estate, the invisible hand of the market is usually the computer of an analyst and a board member of a large international corporation allocating capital under risk conditions. We are not able to recreate their decision-making processes or the economic parameters taken into account, so our models, based on local markets, are usually oblivious to their logic. In the case of residential real estate, in addition to the decision-making process of property developers, the local risks and difficulties of the construction process should also be taken into account. Also, the impact of these investments on local incomes can have a different effect, as well as one that is spread differently over time. The above-mentioned factors sometimes make it difficult to capture these relationships when operating with models that usually assume some constant and repetitive dependencies, and may be one of the factors that cause a large variety of conclusions.

Summing up the research of the last 40 years, Giang and Pheng (2011) point to the strong link between economic growth and construction for developed countries. However, they stress that the construction of real estate beyond the needs of the economy is negative for its further development since it is a waste of resources. Wigren and Wilhelmsson (2007) carried out a comprehensive study of the dependencies between construction and GDP growth. They used data on investment in residential and commercial real estate and infrastructure for 14 Western European countries between 1980–2014. Based on Granger's causality analysis, they found that construction of infrastructure and housing impact on economic growth. They also noted that GDP growth translates into increased investment in commercial construction, but did not observe the opposite tendency.

Wilhelmsson and Wigren (2011) repeated their 2007 study, this time using cointegration analysis. They noticed strong mutual relationships between infrastructure investments and economic growth as they did earlier for the short term. They also found that infrastructure construction drives housing construction and vice versa. They clarified that the positive impact of housing construction on growth is particularly strong when unemployment is high in the economy and/or where the housing stock per person is inadequate for growth. However, in the case of saturated markets, the impact of housing construction on GDP growth is not observed. Contrary to the previous analysis, they also note that non-residential (commercial) construction translates into both short-term and long-term GDP growth. However, the authors do not explain what changed the result. One can only guess that the change in results is the result of a change in method. While Granger's causality analysis tests whether the addition of a second factor better explains the development of the first rather than only its delayed growth, the cointegration method seeks to capture phenomena that are strongly associated with each other.

The development of residential and commercial real estate is an integral part of the economic development of the former socialist states. Tsenkova (2006) stated that in the case of post-socialist states, the change of the system translated into the process of urbanization and the gradual relocation of institutions and important companies from strict capitals. While in the times of socialism the capital and the central power were the most important, in the open, democratic economy the remaining cities also gain in importance and begin to develop. However, an important economic factor for these countries was to move away from agriculture, heavy industry and large factories in favor of other sectors, and smaller private companies that offer a variety of services or produce specialized, diversified goods. The need was therefore to create office and retail space not only in the centers of large cities, but also in smaller towns. The population moved from the village to larger centers that offer not only work but also better consumer opportunities.

With the example of Budapest, Tosics (2006) showed that the development of the residential and commercial real estate sector can be divided into three main phases, called the vacuum phase, adaptation phase and adjustment phase. The first phase came after the collapse of socialism, when economic ideas were born, and state laws could not keep pace with reality. During the rapid privatization, investors tried to get the most benefits and located themselves in the best locations in the city. In the second phase, which took place in the 1990s, an appropriate legal framework was created, and strategic decisions were made for the future development of cities. The third phase began in the late 1990s and was characterized by far-reaching strategic plans and the establishment of public-private partnerships in the shaping of the city. Similar stages of development could be applied to analysis of the market in Poland.

Parsa, McGreal and Keivani showed, with the example of Warsaw, Prague and Budapest, that globalization had a very strong effect on the development of commercial real estate in these cities.[1] The researchers have shown on the basis of a survey aimed at investors that the level of cooperation with local authorities and the subjective perception of risk in these markets is very important when making investment decisions. Laposa and Lizieri (2005) found empirically strong positive relations between the inflow of foreign direct investment and the construction of office space in Warsaw, Budapest and Prague. They noticed that in Warsaw office construction goes hand in hand with the influx of investment, which they explain as anticipation of future demand for these facilities by the developers. However, in Budapest, the construction of offices follows the influx of foreign direct investment. Also, Kucharska-Stasiak and Matysiak (2004) note that globalization and Poland's preparations for accession to the European Union had a significant impact on the development of the entire property market, which, according to the authors, was very underdeveloped in the early 1990s.

Domalewski and Baxa (2015) presented one of the first analyses of local office space development in Central and Eastern European countries based on the example of the Czech Republic. They argue that the supply of offices was dictated by local conditions and that additionally international

1. See: Globalisation of Real Estate Markets and Urban Development in Central Europe. RICS Cutting Edge Conference, 2000.

macroeconomic shocks, such as the recent global crisis, also had an impact. Cities close to major Western European cities have shown the fastest growth in office space.

It is also important to emphasize the role of politicians in the development of the commercial real estate market, which in Poland depends to a great extent on the influx of foreign capital. Lieser and Groh (2014) analyzed the factors affecting international commercial investment in 47 countries between 2000 and 2009. They argued that these investments were fueled by economic growth, rapid urbanization and demographic growth, but were hampered by political instability, opaque legal systems and administrative burdens. In another article, Lieser and Groh (2011) created an index of attractiveness of the country for foreign real estate investors, which placed Poland very close to the most developed Western markets. This gives Poland very good prospects, and the actual inflow of investment seems to confirm Poland's good standing, even after the outbreak of the global financial crisis.

2 Research hypotheses

The review of the literature on the subject allows us to form the main research hypothesis to be verified against the data of individual voivodships. It assumes that there is a strong link between GDP growth and property development in Poland. The hypothesis is considered using two auxiliary hypotheses. The first hypothesis assumes that the stock of residential property develops following economic growth, while the increase in the stock of commercial property accompanies it. The second hypothesis is that real estate development is diversified in different voivodships and depends not only on the rate of growth but also on the level of economic development. In order to verify the research hypotheses, the second part shows the development of real estate stock in Poland, the third describes the development of space in individual voivodships and the econometric analysis of this phenomenon, while the fourth part summarizes the results.

3 Characteristics and history of real estate development in Poland

In the period of the Polish People's Republic, housing construction, although significant, was insufficient in comparison with demographic needs, whereas commercial real estate in the modern sense practically did not exist. This was due to doctrine and the poorly functioning economy. In a certain sense, significant improvements in the housing situation, office buildings, and retail and warehouse space occurred only in the period of pre-accession to the European Union. For this, we focus on the last 13 years, in which construction output in Poland represented from 5% to over 7% of GDP (fig. 1). A clear revival of housing and non-residential construction was observed in 2008. The ratio

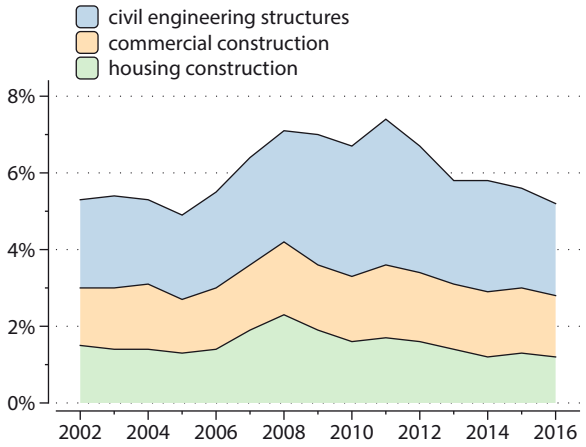

Fig. 1. Structure of construction production in Poland by type of building (% of GDP)

Source: Own elaboration based on data published by Central Statistical Office of Poland (GUS) in 2017

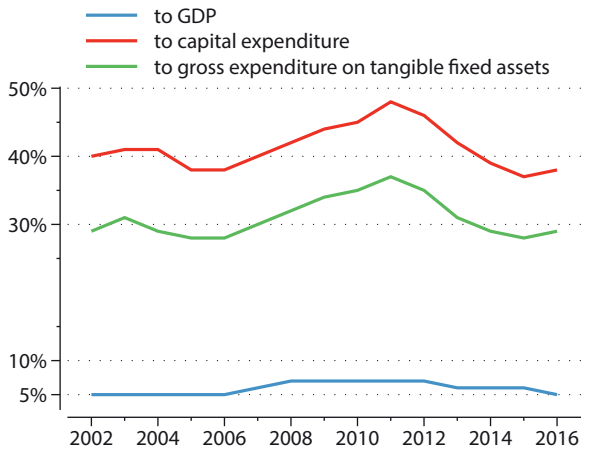

Fig. 2. Relationship of investment in housing construction in Poland

Source: Own elaboration based on data published by GUS in 2017

of investment outlays in housing construction to GDP is stable at around 7%–8% and reaches the highest values in 2011 relative to investment outlays and fixed capital formation (fig. 2). A detailed analysis of the developer process is described in the articles by Łaszek and Olszewski (2014) and Łaszek et al. (2013). Interested readers are directed to these articles.

Since the transition period in Poland, we have seen an increase in housing assets, which play an increasingly important economic role. It is estimated that their stock exceeds 1 billion square meters and its total value now exceeds PLN 3 trillion, wherein alongside real growth there has also been an increase in its value (fig. 3–4). On the commercial real estate market, a significant revival is observed only from the turn of the 20th and 21st centuries. At the end of 2015, the stock of this real estate amounted to nearly 30 million square meters and had an estimated value of over PLN 200 billion.

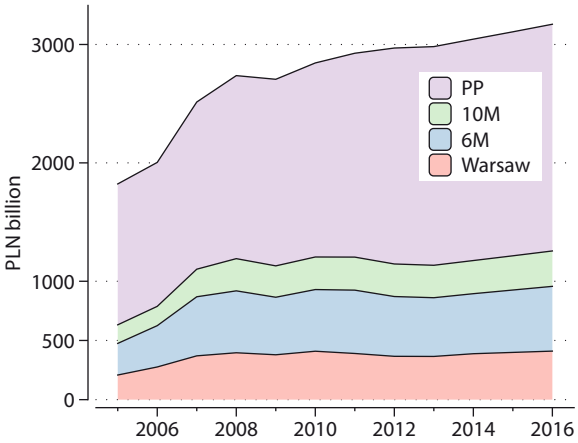

Fig. 3. Estimated value of housing stock in Poland

Source: Own elaboration based on data published by Narodowy Bank Polski (NBP), GUS, and PONT Info Ltd. in 2017

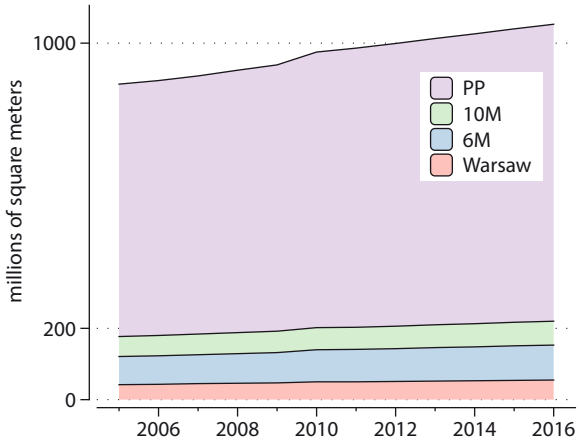

Fig. 4. Area of housing stock in Poland

Source: Own elaboration based on data published by NBP, GUS, and PONT Info Ltd. in 2017

Note: 6M — Gdańsk, Gdynia, Kraków, Łódź, Poznań, Wrocław; 10M — Białystok, Bydgoszcz, Katowice, Kielce, Lublin, Olsztyn, Opole, Rzeszów, Szczecin, Zielona Góra; PP — rest of Poland. The estimate was made on the basis of GUS data on the usable area of the housing stock in specified centers. This housing stock was multiplied by the transaction prices of apartments (average of the primary and secondary market) in 16 towns, and in the rest of Poland by the replacement prices. The graphs show cumulative values.

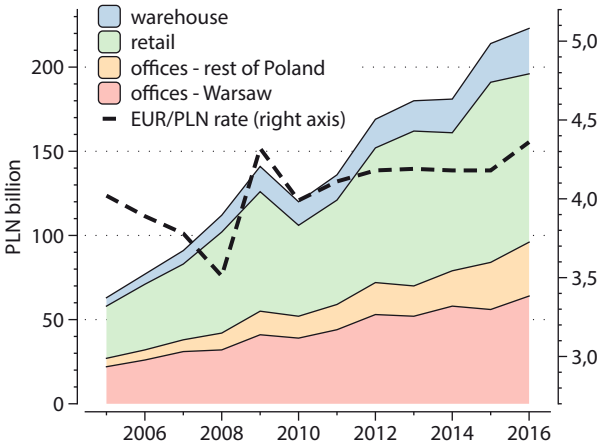

Fig. 5. Estimated value of the commercial stock in Poland and the PLN/EUR exchange rate

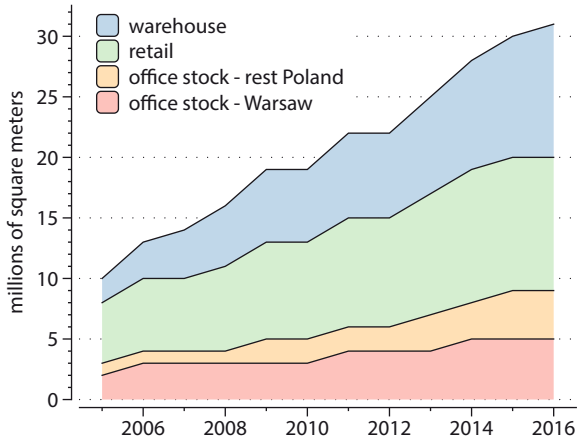

Fig. 6. Estimated area of the commercial stock in Poland

Source: Own elaboration based on data published by NBP and data of consulting companies (transaction process from the website comparables.pl)

Note: The estimates were made based on publicly available data on commercial real estate stock. Offices are modern office space, retail is shopping centers, and warehouses are modern large-scale warehouses. The stock was multiplied by hedonic transaction process of commercial real estate. Prices given in euro were converted to zloty. The graphs show cumulative values.

The total estimated assets of residential and commercial real estate in Poland at the end of 2015 was approximately 187% of GDP (including residential real estate — 173% of GDP). The ratio of value of housing stock to GDP in 2015 decreased due to a higher GDP growth rate (3,5%)[2] than the increase in housing stock (2%). In 2014, employment in the real estate sector in the broad sense of the term accounted for 7,4% of total employment. The longevity of housing investments and also the specificity of Poland's real estate market make the scale of depletion of housing stock marginal, standing at around 0,02% (average for 2005–2014), while the long-term depreciation rate is estimated at 0,3%–0,5% annually.

As depletion of stock is still marginal in Poland, changes in the total volume of stock results essentially from the construction of new space. The length of the investment process in construction means the response of supply to increased demand takes a minimum of about 2 years, which is a short period. In the case of housing, it is the sale of contracts, which are purchased about 2 years before the building is handed over for use. The full construction cycle takes 4–5 years, which means that the developer must anticipate demand in the perspective of 2–3 years. Taking the length of the investment cycle literally, the developer would have to anticipate demand around 4 years in advance, which is practically impossible. A very important element is the land bank and building permits, which developers create when they sense the overall improvement of the economy and possible future demand. The advantage of this activity is the opportunity to buy land at previous, lower prices. Building permits in turn are valid for 10 years. The developer buys the land in good locations, arranges all the necessary documents, and only when he senses real demand does he begin to sell developer agreements, or modify the design of the building and make a start with the physical construction. As has already been mentioned, this lasts 2–3 years. On the commercial market the whole investment cycle lasts 2–3 years, with the actual construction period being less than 2 years. Delayed supply often leads to cyclical real estate development, which in turn can promote tensions in these markets. An increase in demand with rigid short-term supply always leads to increased prices. In the long run, there is an increase in the supply of housing leading to a fall in prices and an increase in the number of unsold apartments, which additionally creates pressure for further price reductions.

The stock of commercial real estate grows much faster than residential real estate. It is worth pointing out that even in 2015, the commercial stock was 8 times smaller than the residential stock. It is largely outdated and unmatched to the present market needs, and a large portion consists of old shops, exhibition halls and warehouses with low value in relation to the total stock of commercial real estate. As a result of the small base and high demand, commercial real estate stock is growing at around 5% per year, more than three times faster than the housing stock.

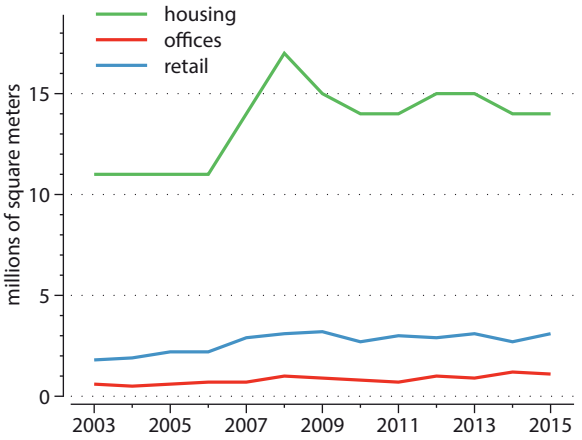

Fig. 7. New housing, office and retail space in Poland

Source: Own elaboration based on data published by GUS in 2017

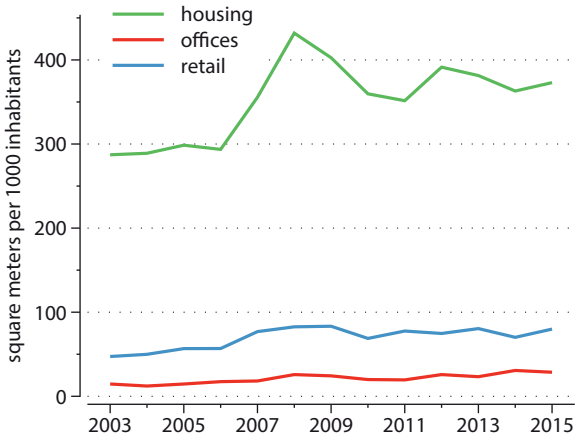

Fig. 8. New housing, office and retail space in Poland

Source: Own elaboration based on data published by GUS in 2017

2. [In the journal European practice of number notation is followed — for example, 36 333,33 (European style) = 36 333.33 (Canadian style) = 36,333.33 (US and British style). — Ed.]

The largest increase in new residential space in Poland was observed in 2007–2008. Also, at the same time, there was an increase in commercial space, both retail and office space. The period of a boom for real estate in Poland falls in the years of recovery in real estate markets around the world. One of the many reasons for the recovery in the real estate markets was the relatively easy access to low-interest loans, which were not known earlier in the Polish market (including the significant share of loans denominated in foreign currencies — see figure 9). The peak of transactions on the commercial real estate market was primarily a result of Poland's accession to EU structures — the highest volume of transactions was in 2006 (about EUR 4,5 billion). In the following years transaction volumes declined until 2009, where they reached a value below PLN 1 billion, but started to peak again in 2010 and reached nearly EUR 4,5 billion in 2016.

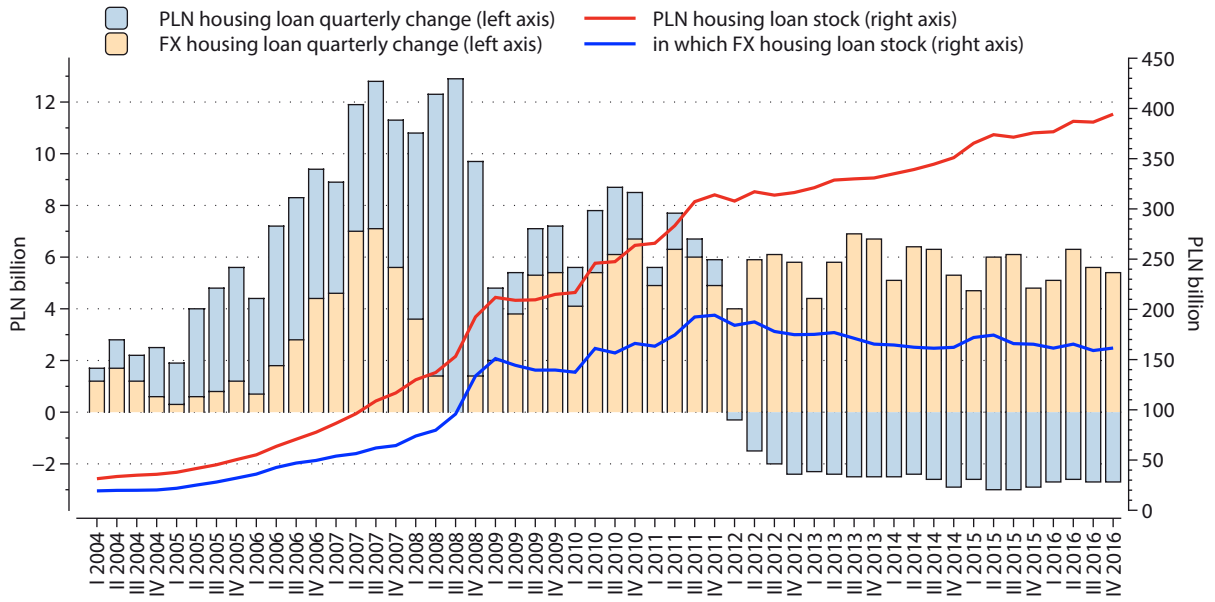

Fig. 9. State and quarterly changes of receivables of households due to housing credit after adjustments and the currency structure of quarterly increments

Source: Own elaboration based on data published by NBP in 2017

The rapid growth in demand for residential real estate combined with the previously rigid supply translated in the short term into strong and rapid price growth in 2007–2008 (fig. 10 — prices for the 7 largest cities in Poland). In subsequent years, a relative stabilization of housing prices was observed and its gradual decline to levels similar to those just before the boom (and the beginning of the survey of housing prices by NBP). This was due to the rapidly growing supply. As shown by Łaszek, Olszewski and Waszczuk (2016), in later years buyers were more informed about the market and developers could not easily differentiate and raise prices.

Prices for office real estate reached their highest levels in 2008–2009 and are now lower than they were in 2004 (see figure 12 for hedonic prices on the office market, 2004 being the base year). The rise in prices was mainly due to the small supply of office space and to a large extent its mismatch to demand (outdated stock, lack of modern modular space). A factor that can hinder the further dynamic development of office space is demographic change, with fewer people of working age. In addition, companies are looking for savings and use so-called hot desking (many people using the same desk at work), or employees work extensively from home.

Prices for retail property showed an upward trend starting from 2004, which was the base year in the survey (fig. 13). Using not only the classical methods of average price, but also hedonic price dynamics (see: Leszczyński and Olszewski 2015), its present level is more than twice as high as in the base year (with the local maximum in 2012). The high saturation of retail space in the major cities means that investors are now focusing on smaller centers and locating their investments there. It seems that, as in previous years, the potential for further dynamic growth of retail stock has already been largely used up, and the revitalization of existing buildings will be increasingly

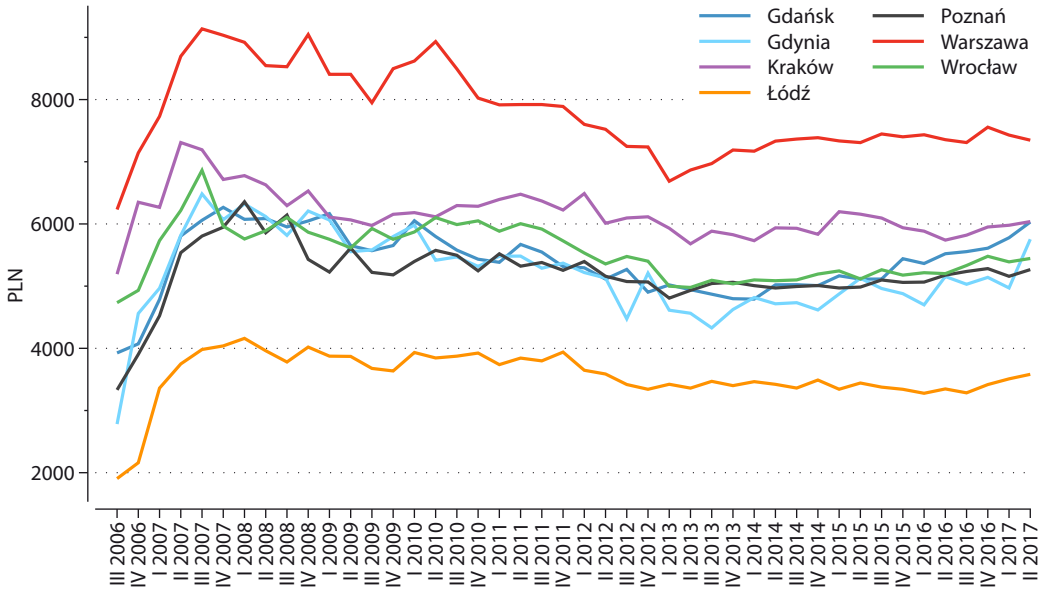

Fig. 10. Transaction prices of square meter of apartments in the secondary market

Source: Own elaboration based on data published by NBP in 2017

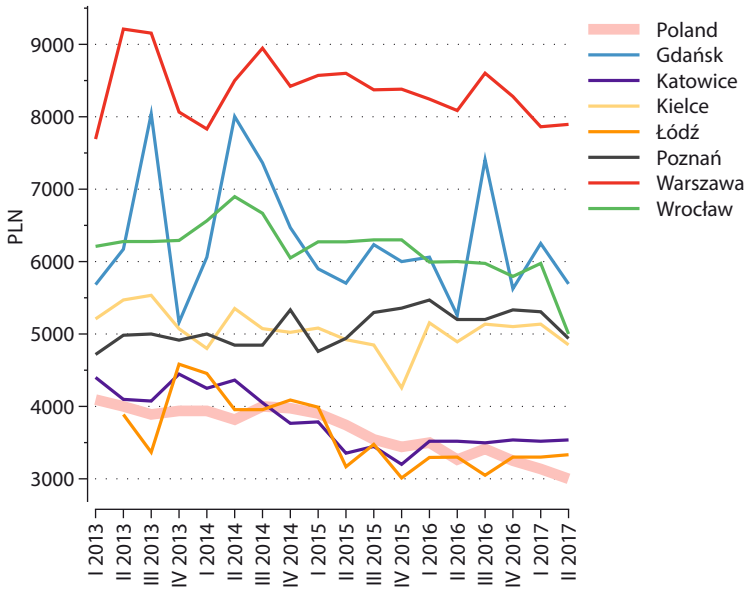

Fig. 11. Prices of square meter of business premises

Source: Own elaboration based on data published by PONT Info Ltd. in 2017

important. Growth of this stock may be slowed down when e-commerce finally starts to draw customers away from shopping centers. Unsuccessful investments can be observed which, either immediately after the start, or even before the opening, are partially or completely transformed into libraries, places of culture and the arts, or sports facilities. It should also be stressed that the entire commercial market is taking advantage of very low interest rates abroad. When the rates rise there, capital inflows may slow down, or even begin to flow out.

4 Study of the determinants of the development of the real estate sector in Poland in the voivodship system

After a preliminary analysis of the development of real estate in Poland, we shall move to an analysis of this phenomenon for particular voivodships. In this way, we take into account the diversified

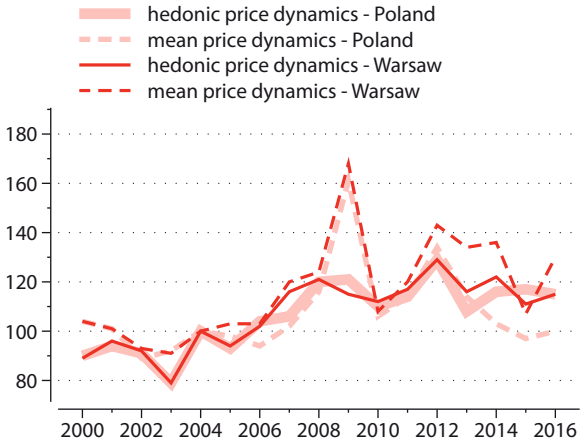

Fig. 12. Dynamics of average and hedonic prices of office real estate (2004 = 100)

Source: Own elaboration based on data published by NBP in 2017

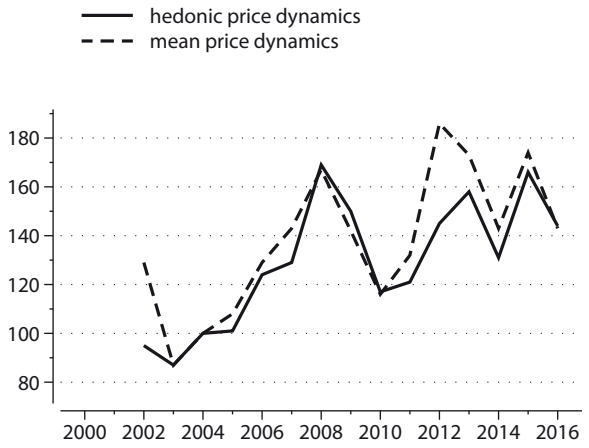

Fig. 13. Dynamics of average and hedonic prices of retail real estate (2004 = 100)

Source: Own elaboration based on data published by NBP in 2017

economic development as well as this market throughout country. Before analyzing the growth of retail space and office space, it was necessary to estimate the initial stock of these properties. By following the method generally used in macroeconomic research to estimate the stock of fixed capital, like Eppli and Shilling (1995), the authors estimated the initial stock using the perpetual inventory method. The authors will make the data available to interested researchers. Data on newly added space from the GUS tables were added to the initial stock for each type of real estate and each voivodship. The calculated stock is shown in relation to the stock of residential space, which is directly accessible from GUS, in figure 14. It can be noticed that retail and office space are much smaller than residential space. However, retail space, which is bigger than office space, has had stronger growth than office space. A more accurate picture of the growth of these markets can be obtained by looking at the growth of these types of space and confronting them with the growth or levels of important economic variables, as depicted in figures 16–18.

The growth of residential, retail and office space against wage increases (CPI deflation) is shown in figure 15, while figure 16 shows the increase in office and retail space against wage increases (CPI deflation) and unemployment for each voivodship in Poland. The presented growth of commercial space does not show a homogeneous development trend or a common dependence on wages and unemployment. Sudden sharp increases in office and retail space are observed in different years in different voivodships, which is mainly due to the different stages of development of particular regions and the saturation of such space. In the case of residential space, its increased growth in 2008–2010 (a housing boom) is observed, with a slow downward trend observed in all voivodships. These increases are not correlated with the salaries recorded in the voivodships and are primarily due to a worldwide revival in housing construction resulting from the availability of loans and their low interest rates (in the region of Eastern Europe loans denominated in foreign currencies). Figure 17, showing the growth of commercial space as well as education and relative unemployment, also does not represent a simple relationship of the variables analyzed. Salary growth in the regions is similar to the national trend, but by analyzing the ratio of people with higher education among people aged 30–34 (accepted as the development potential of the region) dependence has not been demonstrated.

The analysis shows that the supply and demand factors for the housing market are already quite well-known, while in the case of commercial real estate, the subject needs further in-depth research, particularly into the supply side.

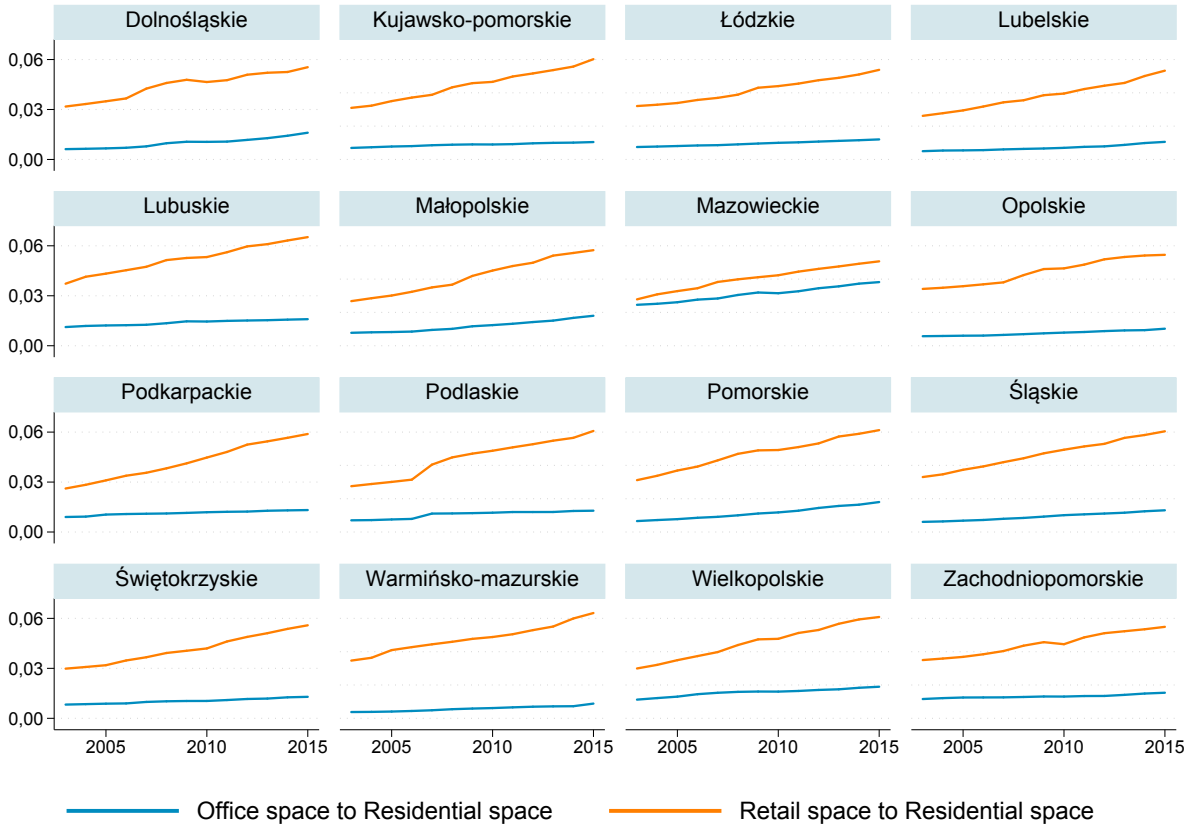

Fig. 14. Commercial space against residential space in voivodships

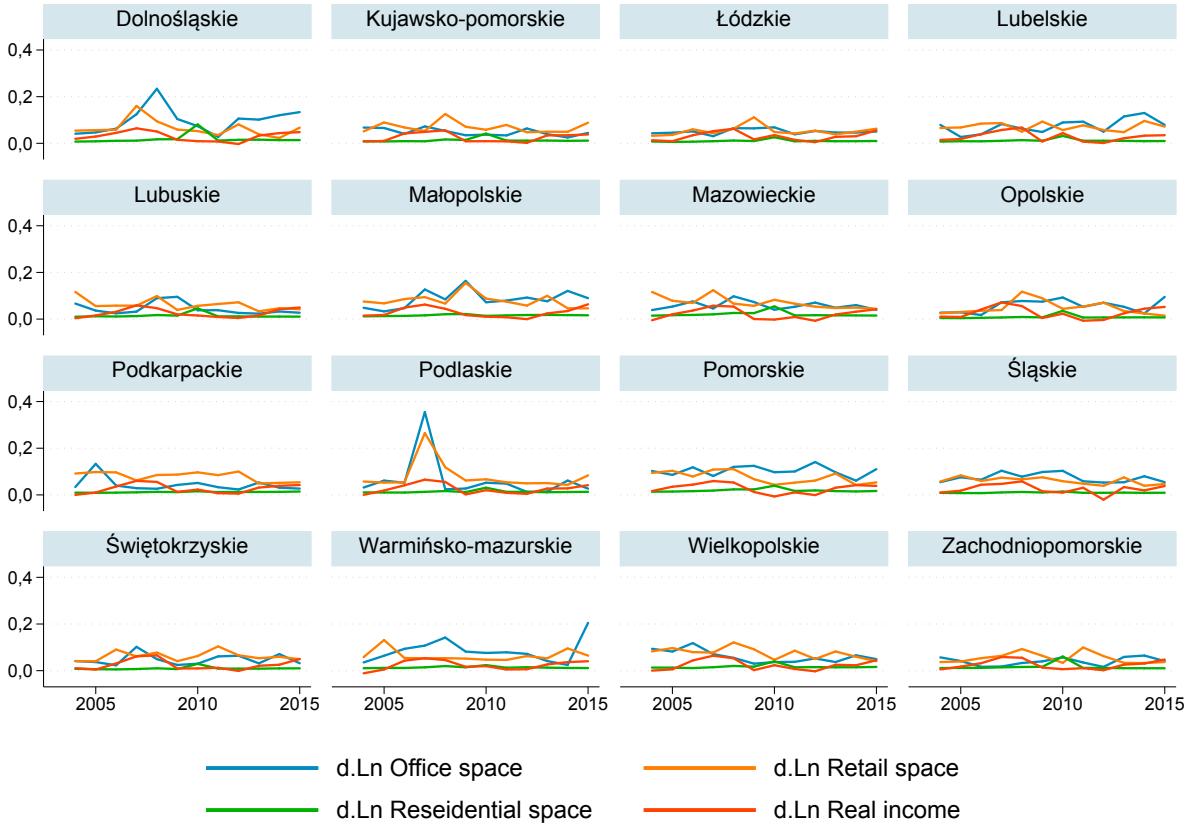

Fig. 15. Increases in commercial space and growth of income and increases in residential space

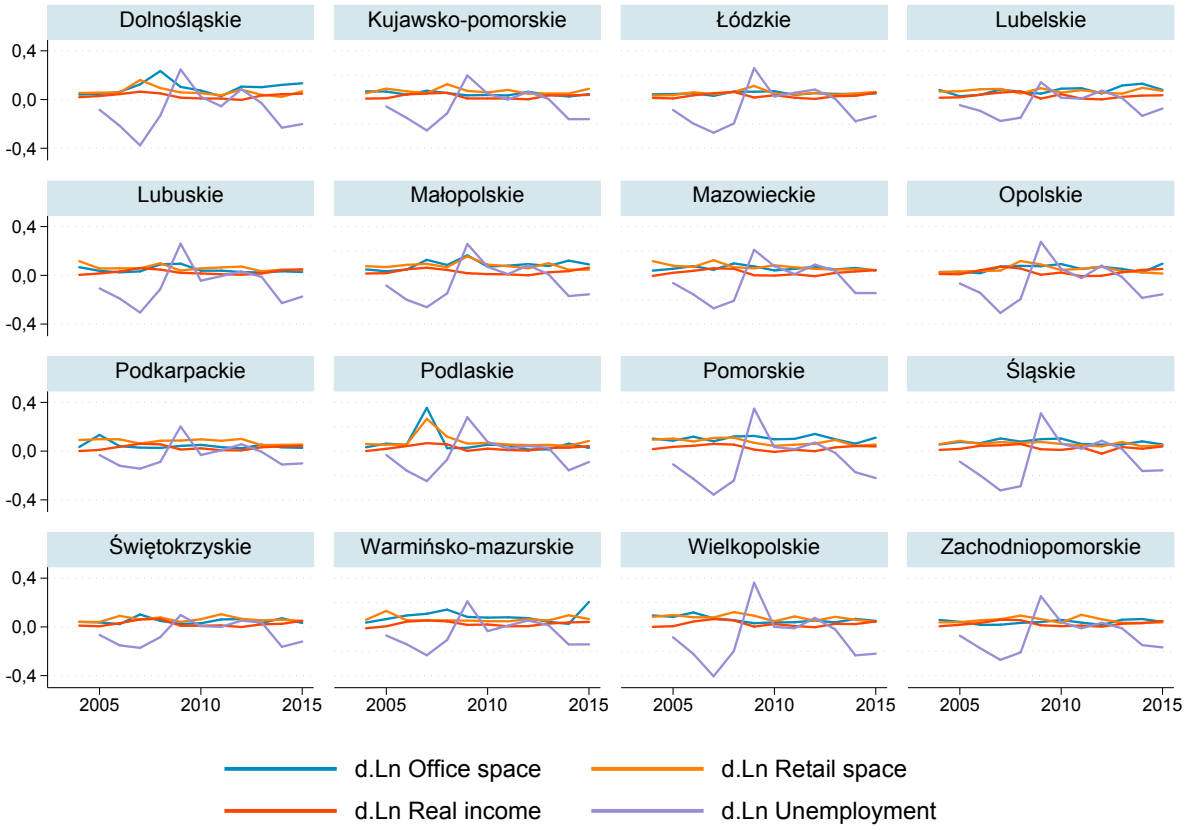

Fig. 16. Increases in commercial space and real income growth and changes in unemployment rate

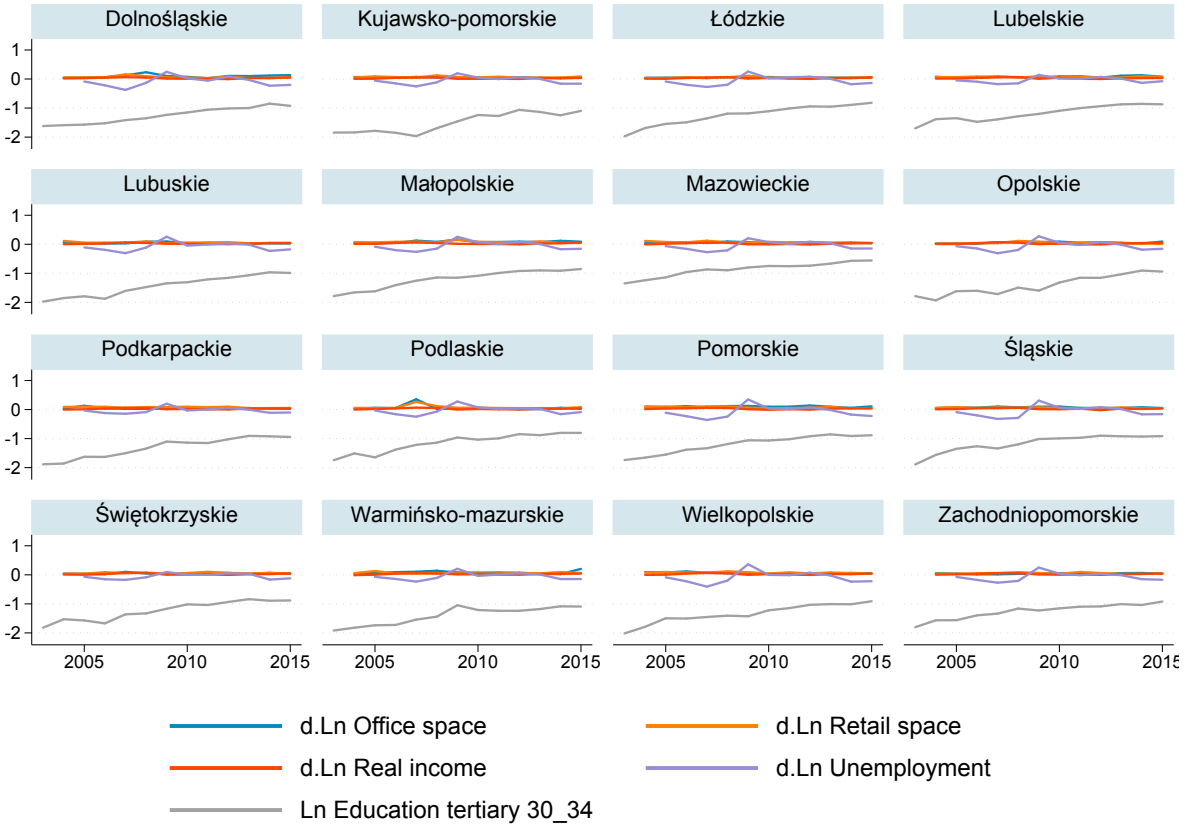

Fig. 17. Increases in commercial space, tertiary education indicator and log of unemployment rate

5 Econometric analysis of the relationship between GDP and investment in real estate

The econometric analysis of this phenomenon has been carried out on the basis of the data presented in the previous chapter on the growth of residential and commercial space. The question is raised as to what the relationship is between the demand for residential and commercial investment and an increase in local income measured by GDP. The analysis uses the approach proposed by Eppli and Shilling (1995) and Wadu Mesthrige (2014), which assumes a long-term balance between the real estate stock $\boldsymbol{S}$ and economic development measured by the level of income $\boldsymbol{I}$. This relationship can be expressed with the following equation, where t denotes the time index and j is the index for the voivodships:

$$S_{tj} = \alpha \cdot I_{tj} + \varepsilon_{tj}. \tag{1}$$

In the short term, economic shocks translate into increases or decreases in construction in different segments of the market. However, as mentioned before, the construction process (assuming that the developer already owns a plot of land and has all construction permits) takes around two years from the construction start to its completion. In consequence, the market will observe the growth of space with some delay in relation to the appearance of economic growth, where k represents the number of years:

$$dS_{tj} = \alpha_1 \cdot dI_{(t-k)j} + \varepsilon_{(t-k)j}. \tag{2}$$

The theoretical considerations of the factors influencing the growth of the new residential and office and retail space were confronted with empirical analysis in Polish conditions. The impact of income growth combined with income levels in the given voivodship in relation to the average income of the whole of the European Union was analyzed. Graphical analysis has shown that the construction industry is affected not only by the rate of growth, but also by the level of economic development. We capture the various levels of development with the use of the threshold model, as presented by Girma (2005). The indicator function I_1 is equal to 1 when the relative income level is below 30% of the EU average and 0 otherwise. I_2 is equal to 1 when the relative income is in the range 30% to 40%, I_3 is equal to 1 when it is in the range 40% to 50% and I_4 is equal to 1 when the relative income is in above 50% of the EU average, and 0 otherwise. This allows us to capture the effect of the growth of income separately for four levels of economic development, which can be expressed in the following way:

$$dS_{tj} = \alpha_1 \cdot dI_{(t-k)j} \cdot I_1 + \alpha_2 \cdot dI_{(t-k)j} \cdot I_2 + \alpha_3 \cdot dI_{(t-k)j} \cdot I_3 + \cdots + \varepsilon_{(t-k)j}. \tag{3}$$

The panel regression was run on annual data for 16 voivodships for the years 2002–2016. The fixed effects model was used and robust standard errors (reported in brackets) were obtained with the bootstrap algorithm, which was run 1 000 times for each regression. The study confirms that apartments follow economic development, and, as Laposa and Lizieri (2005) already noted for Warsaw, commercial developers anticipate economic growth in particular Polish voivodships, thus the development of trade and offices go hand in hand with economic development. While in the case of housing construction we have a very simple cause-and-effect relationship, in the case of commerce this relationship is complex and strongly endogenous.

Checking different model specifications showed that in the case of residential space the "delay" in the production of housing is 2 years in relation to a change in income. Commercial developers better anticipate the development of the economy, and the supply response to office space is one year behind the change in income. It is worth pointing out that in the case of office space, income growth at every level of economic development had a positive impact on the increase in office space. The strongest effect was when the given voivodship had a per capita income of 40%–50% of the EU. On the other hand, in the case of retail space, the highest rate of economic growth was observed when the per capita income did not exceed 30% of the EU average. The higher the level of development of the region concerned, the lower the impact of further economic growth on construction of retail space, and at a level of income of the population above 50% of the EU average

Tab. 1. Regressions for the housing market and office and retail space

Independent variable	Parameter	Stand. error
Regression for d.Ln_Area_Apart_1os		
d.L2.income, when GDP level is 30% of EU	0,0460***	0,0179
d.L2.income, when GDP level is 30%–40% of EU	0,2046***	0,0585
d.L2.income, when GDP level is 40%–50% of EU	0,1732***	0,0218
d.L2.income, when GDP level is above 50% of EU	0,5327***	0,0089
constant	0,0122***	0,0004
R-square	0,3294	
Regression for d.Ln_Area_Off_1os		
d,L1, income, when GDP level is 30% of EU	0,2790*	0,1657
d,L1, income, when GDP level is 30%–40% of EU	0,5535**	0,2376
d,L1, income, when GDP level is 40%–50% of EU	0,6485***	0,2414
d,L1, income, when GDP level is above 50% of EU	0,2155**	0,0844
constant	0,0555***	0,0050
R-square	0,0611	
Regression for d.Ln_Area_Retai_1os		
d,L1, income, when GDP level is 30% of EU	0,4295***	0,1433
d,L1, income, when GDP level is 30%–40% of EU	0,3039**	0,1221
d,L1, income, when GDP level is 40%–50% of EU	0,1020**	0,1451
d,L1, income, when GDP level is above 50% of EU	−0,2312***	0,0665
constant	0,0584***	0,0028
R-square	0,0782	

Note: Letter d denotes first difference, L1 — lag of one year, and L2 — lag of two years
* $p < 0{,}1$; ** $p < 0{,}05$; *** $p < 0{,}01$

it was a factor inhibiting the development of the sector. This means that in these regions there has already been saturation of retail space, and producers are moving their production (investments) into less prosperous regions. There is a steady relationship between the level of prosperity and the increase in income in the housing market — the higher the income, the stronger the increase in income is translated into growth of new housing space. It is likely that in voivodships with a higher level of well-being, the inhabitants not only meet the basic housing needs, but also increase their well-being by moving to newer, better residential properties.

The applied approach to income and growth is a collective measure of the potential of the region, which recognizes such variables as road network development, education and training, and development potential. The results of the indicator and regression analysis allow the research hypotheses to be positively verified at the beginning of this paper.

Conclusions

The purpose of the analysis is to show how GDP growth in local markets in Poland affects the development of residential and commercial real estate. This is probably the first such study, and one of few in the world. The first conclusion is that there is no directly available data on commercial real estate stock. While such data is collected very scrupulously by statistical offices in other countries, in the case of commercial real estate in Poland, only data on new space are collected, and in a fairly short historical perspective. In the face of a lack of data, the researchers have generated an estimation of the stock, which was calculated using the method known from the estimation of the fixed assets in macroeconomic analyses. The authors will be happy to share the data with interested researchers.

The second, very important conclusion, is that commercial real estate has grown rapidly from around the time of accession to today. There is no data older than 2002 for voivodships. The analysis shows that in general commercial space has developed similarly to housing. This, and the fact that stock of commercial space was small in 2002, suggest that it developed very slowly between 1990 and 2000. In general, apartments are the most numerous, next in terms of quantity is retail space, and finally, office space, which is in line with the demand for such space.

An interesting phenomenon is that we first observe an increase in retail and office space, which follows economic growth with a one-year lag, and only after two years do we see an increase in residential space. The delayed development of housing in terms of economic development is a natural phenomenon, as higher incomes result in higher demand, which developers react to with some delay. On the other hand, the almost common development of commercial space and economic growth makes it possible to establish that there are strong feedback links between the two variables, and firm conclusions about the causality of phenomena cannot be drawn. Taking into account approximately 2 years of real estate construction time, it can be concluded that developers forecast future economic development, which is why they begin construction one year in advance and hand over the building one year after the economic development. Many commercial investments are generated on order, so it is the investor who does the market research or already has a contract with the main tenant for a particular space. Office developers build offices where they expect increased employment in the service sector. On the other hand, companies can only employ office staff on a large scale when relatively cheap office space is available. The same is true of retail space, which also creates jobs directly and indirectly.

It has to be stressed that residential developers sell construction contracts, so cash flow is already taking place during the construction process. On the other hand, commercial developers receive a return on investment only when the building has been put into operation and is rented out. Further econometric studies are still needed here, probably carried out on individual investments. Another important phenomenon is the diversified development of individual space among different voivodships, both in size and time. The size of the space is relatively well suited to the prosperity and population of a given voivodship, but it can be noticed that development was first initiated in the largest voivodships in economic terms, and only later did it also reach the smaller voivodships. Further deep analysis is needed in this area, which will take into account the level of saturation of space, and also the relative incomes.

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