www.degruyter.com/view/j/remav

DE GRUYTER OPEN

ANALYSIS OF HOUSING DEVELOPMENT ACTIVITY IN POLAND FROM 2005-2014

Radosław Cellmer, PhD
Faculty of Geodesy, Geospatial and Civil Engineering
University of Warmia and Mazury in Olsztyn
e-mail: rcellmer@uwm.edu.pl

Janusz Jasiński, PhD
Faculty of Geodesy, Geospatial and Civil Engineering
University of Warmia and Mazury in Olsztyn
e-mail: bas@uwm.edu.pl

Abstract

The growth of both the construction market and the property market depends on various macroeconomic and legal factors, as well as on demographic, institutional, stock and local conditions. The aim of this research was to determine the spatial differentiation, dynamics and determinants of housing development activity in Poland in the context of historical and current legal conditions. This activity was measured, first of all, by the number of construction contracts and the number of completed buildings and dwelling units.

During the research, an attempt was made to establish determinants of construction activity, by analyzing social, demographic and economic factors concerning individual districts. With this aim in view, the study used statistical panel data models, constructed on the basis of data created as a result of combining time series of observations for cross-sectional units.

The results of the research are presented not only in the form of statistical models, but also as a series of cartographic studies, prepared with the application of GIS tools, presenting the current status of housing development activity in Poland.

Key words: construction law, housing development, construction permits, panel analysis.

JEL Classification: C59, R31.

Citation: Cellmer R. Jasiński J., 2016, *Analysis of Housing Development Activity in Poland from 2005-2014*, Real Estate Management and Valuation, vol. 24, no. 4, pp. 47-58.

DOI: 10.1515/remav-2016-0029

1. Legal conditions for implementing investment projects and for the construction industry in Poland in a historical perspective

The development of the real estate sector depends on the level of development of the construction market, property market and the entire economy. In turn, the growth of both the construction market and the property market depends on various macroeconomic and legal conditions, as well as on demographic, institutional, stock and local factors. Legal conditions and regulations concerning the realization of the investment and construction process also have a very significant effect on construction activity, which includes housing development. The issues of housing development are regulated in various areas of law, particularly administrative and civil law. These regulations are of significant importance not only as regards the organization of the construction process, but also for shaping the attitudes of its participants. According to BILIŃSKI (2009), the subject matter of implementing the investment and construction process requires not only taking a comprehensive look at the normalization of construction regulations evolving in Poland, but also at their immediate and indirect legal and institutional environment. The author points out that in the historical perspective, the establishment of appropriate enforcement regulations in the construction industry was necessitated, first of all, by the development of industry and urban agglomerations. The first construction regulations on Polish land were implemented in the period of the Partitions. Additionally, the construction law of the former partitioners was still in force immediately after the formation of Polish statehood, on the basis of a decree of the Chief of State of 1919 (DECREE… 1919). The first Polish construction law was developed in the period from 1918 to 1928. Legislative work resulted in the Construction Law Act, which entered into force under the Regulation of the President of the Republic of Poland of 16 February 1928 (REGULATION…1928). This Act governed not only the construction process and its supervision, but also the issue of the spatial development of towns, settlements and, in particular, spa resorts. The Act of 1928 remained in force for 33 years, until 1961, with some organizational amendments introduced by the Act of 14 July 1936 (ACT… 1936) and then the decree of the President of the Republic of Poland of 25 August 1939 (DECREE… 1936). After World War II, in the period of a socialist economy, significant technological and organization changes were introduced, along with changes in construction management, also concerning property management and the purchase of land (plots) for construction purposes. Modifications of legal regulations were therefore necessary, and these were introduced through resolutions of the Council of Ministers, regulations and orders. The Construction Law Act of 31 January 1961 (USTAWA… 1961) brought about significant changes to the construction law. The Act, with a completely different structure and legal construction, was reduced to legal regulations of the construction process, entirely omitting the issues of spatial development, and was transferred to the separate Spatial Management Act, also dated 31 January 1961. This Act broadly discussed issues of the spatial economy, included in the Decree of 2 April 1946 on spatial economy and planning (DECREE… 1946). On the other hand, the intensive growth of the construction industry in the 1970s, an increasing number of construction tasks and growing social expectations resulted in commencing work on a new act. This work led to passing the Construction Law Act of 24 October 1974 (ACT… 1974), which was in effect for 20 years. However, the Act was criticized as early as the mid-1980s since the range of legal regulations it provided did not prove successful, the efficiency of many regulations turned out to be unsatisfactory, and the introduction of subsequent changes and additions in subsequent amendments had a negative effect on the coherence of legal solutions. On 1 June 1995, two acts of fundamental importance to managing Polish space and the organization of the construction process entered into force: the Land Development Act and the Construction Law Act (USTAWA… 1994). The Land Development Act of 7 July 1994 explicitly designated the local government as the only institution authorized to determine local zoning plans and to issue planning permission. Full independence of communes involved their full responsibility for spatial order and for determining areas intended for construction as well as transportation and technical infrastructure. The Construction Law Act of 1994 introduced significant changes to the legal norms of the construction process. The Act also adjusted the legal and institutional system of the investment and construction process to the changing model of the economy, to the rules of the market economy and the empowerment of local communities, as well as to the requirements of the European conditions in effect at the time. At the same time, it should be emphasized that this act legally governed not only technical and organizational issues of the construction process, but the normalization of economic and business issues was abandoned, assuming that those issues are, or should be, governed by the civil and tax law, the commercial code (currently the code of commercial companies), etc. It did not include technical details for designing and constructing buildings nor for carrying out construction works. The Construction Law Act of 1994 was amended several times. The quality of changes varied significantly, including amendments of a very high substantive value, but also ones of merely an organizational nature.

The majority of the most recent regulations have been in effect since 28 June 2015, while the others - concerning building registers - entered into force as of 1 January 2016. The new regulations mean less bureaucracy. The amendment to the Act removed the requirement to apply for a permit for the construction (or extension) of detached houses if the affected area does not exceed the area of the plot (or plots) where the buildings are planned to be constructed. It was replaced with an obligation to deliver a notification regarding the planned construction, along with submitting the required documentation. The entire approval procedure should be completed within 30 days, as this is the period within which administrative authorities can raise any objections. In the light of new regulations, notification is required, among others, for detached single-family residential buildings, the impact area of which does not reach beyond the plot or plots where they are constructed. Additionally, investors who undertake re-development works are exempt from the obligation to obtain a permit. Also, the seven-day period for notifying the authority on the planned date of commencing construction works has been abolished; these also add to the days saved in the investment process. At present, construction can start 30 days after submitting a notification of construction and the necessary documentation, as long as a competent authority does not object. The above changes concerning the Construction Act can be expected to result in an increase in single-family development activity.

To summarize, it can be claimed that the development of the Construction Law Act has faced various difficulties for many decades as well as posing numerous controversial problems. Compromise decisions were partially, or even entirely, changed in subsequent amendments. The changes introduced did not always prove appropriate or better. After several years of applying the regulation, subsequent changes were introduced, sometimes returning to the initial form. In the period of system transformation, including administrative reforms and adjusting the law to the requirements of the European Union, numerous changes were necessary due to the changing legal and institutional environment of the Construction Law Act. It should also be noted that the discussed Construction Law Act of 1994 and the above-mentioned Land Development Act imposed some discipline on, as well rationalizing, the construction process, and resulted in reducing the decay of towns and the degradation of open areas of great natural interest.

2. Previous research

Evaluation of the housing market is usually carried out from the perspective of housing stock, therefore, only through the evaluation of the quality and quantity of the stock, with economic evaluation constituting merely a very limited part of research (CEMBALA 2014). The effect of macroeconomic factors on market operation in selected countries has been evaluated, e.g., by ADAMS and FÜSS (2010), on the basis of panel data including 15 countries over 30 years. In turn, the importance and weight of those factors to the condition of the local property market has been emphasized, among others, by RENIGIER-BIŁOZOR et al. (2014). The activity of the property market is influenced, to a significant extent, by a phenomenon involving the interaction between variables describing the macroeconomic environment and factors describing demand, supply and prices (BELTRATTI, MORANA 2010; BEŁEJ, CELLMER 2014). An increase in new housing stock can be the response of investors to growing demand resulting, first of all, from demographic factors and income availability. Demand models presented by ATTANASIO et al. (2012), and EICHHOLTZ and LINDENTHAL (2014) prove that the age structure and educational structure of a population are also of significant importance. On the other hand, BAHADIR and MYKHAYLOVA (2014) emphasize that an increase in new housing stock occurs, as a rule, with some delay, caused mainly by the fact that the construction process is spread out over time. BROITMAN and KOOMEN (2015) also noted these delays.

Construction activity demonstrates high variability in time and space (ORENSTEIN, HAMBURG 2010; ANGEL et al. 2011; INOSTROZA et al. 2013). The results of research on the diversity of construction activity in a spatial perspective have been presented, among others, by BEENSTOCK and FELSENSTEIN (2015) with the use of non-stationary panel data, concerning selected areas of Israel. Property prices and construction costs were, in this case, the main determinants of diversity. Local policy concerning the development of zoning plans, resulting in interactions between subregions, can be an equally important element influencing construction activity in the spatial perspective (BRAMLEY, WATKINS 2016). Spatial diversification of construction activity is also described by BROITMAN and KOOMEN (2015), who indicate various hierarchy levels of spatial division. The results of the presented research prove that suburban and rural areas are characterized by high dynamics of economic and demographic changes in relative terms, as compared to urban areas. This corresponds to so-called Gibrat's law, stating that there is no correlation between the size of a locality in terms of the number of its inhabitants and the growth rate of the number of its inhabitants (ROSENFELD et al. 2011). GLASSER et al. (2005) state that reduced regulations and lower population density facilitate the housing development process and employment growth. On the contrary, excessive regulations, particularly those blocking urban space, as well as increased land prices, lead to high costs of dwelling units.

As it can be observed from the review of literature, the research presented in the article is consistent with the current trend of research on the activity of housing development, which takes into consideration social and economic factors.

3. Data and methods

For the research on housing development in Poland within the time frame of 2005–2014, data gathered by the Central Statistical Office (www.stat.gov.pl) were used. The data included the number of completed houses, their total usable floor area, the number of completed new residential houses and the number of construction permits for the construction of new houses. The area of a district was assumed as the statistical unit. Additionally, data on selected social and economic factors (indicators) were gathered for each district. The list of indicators (variables) chosen for research and their symbols are presented in Table 1.

Table 1

Indicators depicting the social and demographic conditions of a district used in the research and their symbols

Indicator (variable)	**Symbol**
Completed dwelling units per 1,000 population	B_1
Total usable floor area of completed dwelling units per person	B_2
Completed new residential buildings per 1,000 population	B_3
Construction permits for new residential buildings per 1,000 population	B_4
Births per 1,000 population	X_1
Share of mobile working age population in total population	X_2
Population density (person/km^2)	X_3
Marriages contracted by 1,000 population	X_4
Registered unemployment rate	X_5
Migration rate per 1,000 population	X_6
Entities entered into register of business entities (REGON) per 10,000 population	X_7
Commune budget income per inhabitant	X_8
Average usable floor area of a dwelling unit per person	X_9
Average gross monthly remuneration	X_{10}

Source: Own study.

Data marked with symbols B_{01}-B_{04} indicate construction activities (response variables), while those marked with symbols X_{01}-X_{10} (explanatory variables) represent selected factors that can potentially affect the phenomenon under analysis. The data were prepared to represent relative values, which solves the problem of the high correlation with the quantity of the statistical unit. They were also supplemented by absolute values concerning construction activity in order to carry out preliminary analyses and to visualize trends. In total, data were gathered from 380 districts in Poland for the period of 2005-2014.

As part of the research, a preliminary data analysis was carried out for variables analyzed in 2005-2014, helping to visualize results and evaluate the existing trends as well as the spatial distribution of the examined indicators.

Panel data models were used for the time and space analysis of construction activity in Poland. The notion of panel data refers to the data that occur as a result of combining time series of observations for individual entities. They are characterized by a relatively large number of objects in relation to the number of observations over time. Panel data models estimated on the basis of these data assume that the development of the response variable is affected not only by explanatory variables, but also by non-measurable factors, constant in time and specific for a given object, known as group effects, and by factors that are constant in relation to the object, specific for a given period, referred to as time effects (BALTAGI 2008). The importance of panel data models in economic sciences is emphasized, among others, by HSIAO (2003) and GRILICHES and INTRILIGATOR (2007).

One of the basic problems in estimating models based on time and cross-section data is the specificity of the model employed to identify the differences between objects in the same period and between various periods for the same object. The general form of the panel data model is as follows (BALTAGI 2008):

$$y_{it} = \beta_0 + \sum_{k=1}^{k} \beta_{kit} x_{kit} + \alpha_i + \upsilon_t + \varepsilon_{it} \tag{1}$$

In the above model, y_{it} denotes a response variable (indicator of building activity), x_{kit} means an explanatory variable, β_0 is a constant (free term), and β_{kit} is a structural parameter of the model (i denotes an object, t denotes time, while k denotes the number of the explanatory variable). Additionally, a_i denotes an individual effect (part of the variability of variable y characteristic for the i^{th} object, ν_t denotes periodical effects (part of variability of variable y characteristic for period t), while ε_{it} denotes a random confounding factor.

Individual and periodical effects can be fixed effects, i.e. constant in time or for a given entity, and, in such a case, they do not depend on random factors. Such a model is known as a fixed effect model (FE) and takes the following form:

$$y_{it} = \alpha_i + \sum_{k=1}^{k} \beta_{kit} x_{kit} + \varepsilon_{it} \tag{2}$$

Parameter a_i can be then treated as a free term individual for each entity in the model. Its estimation includes the effect of all characteristics not included in the vector of observable variables.

For random effect models (RE), each entity is assigned a certain random variable, the realization of which accounts for an individual effect in a given period. Consequently, individual effects are not treated as parameters. Such a model can be presented in the following form:

$$y_{it} = \beta_0 + \sum_{k=1}^{k} \beta_{kit} x_{kit} + \upsilon_{it} \tag{3}$$

where $\nu_{it} = \varepsilon_{it} + a_i$ is a two-part random component. This model assumes, for each entity, the independence of explanatory variables and individual effects, as well as the independence of the random factor and individual effects. In assuming the constancy of coefficients, it is assumed that the random component covers all differences between objects and periods *(one-way model)*. On the other hand, if we assume that the free term differs for various periods and various objects, then we can obtain a two-way model. Estimation of the panel data model can make use the classical least squares method if the condition of estimator consistency for total error and pure random error is satisfied, and a correlation between an individual effect u_i and explanatory variable x_{it} does not exist. In the model with random effects, the assumption is made that a random component includes both individual and periodical effects. In order to examine whether the variance of random components for all observations is constant, a Breusch-Pagan test is applied based on statistics derived from a sample which takes the following form (Lagrange multiplier test):

$$LM = \frac{nt}{2(t-1)} \left[\frac{\sum_{i=1}^{n} \left(\sum_{t=1}^{t} \varepsilon_{it} \right)^2}{\sum_{i=1}^{n} \sum_{t=1}^{t} \varepsilon_{it}^2} - 1 \right]^2 \tag{4}$$

where n is the number of observations, t denotes the number of time units, while ε_{it} are the residuals of the total regression model. With the truth of the null hypothesis, the above statistics have a chi-square distribution with one degree of freedom.

Inclusion of group and time effects into panel data models results in the need to apply specific estimation methods. The application of classical least square methods is hindered by difficulties resulting from the fact that the Gauss-Markow assumptions concerning the properties of the random factors are not usually satisfied. Since random components in the RE model are correlated, in this situation, a generalized least squares estimator of structural parameters of the following form is used to estimate model parameters:

$$\hat{\beta}_{RE} = \left(X^T \Omega^{-1} X \right)^{-1} X^T \Omega^{-1} y \tag{5}$$

where X is the matrix of explanatory variables, y is a vector of response variables, while Ω denotes a reversible variance-covariance matrix of the total random error (BALTAGI 2008). The decision concerning the choice of the proper form of the model (FE or RE) is taken on the basis of the Hausman test, which consists of the comparison of the values of estimated parameters obtained with the use of both estimators. The null hypothesis H_0 then states that both estimators (FE and RE) are consistent, but in such a situation RE is more efficient, with the alternative hypothesis H_1 under which the FE estimator is consistent and the RE estimator is not, or that an error in the model specification occurred. Test statistics are described with the following formula:

$$H = \left(\hat{\beta}_{RE} - \hat{\beta}_{FE}\right)\left[\mathrm{var}\left(\hat{\beta}_{RE}\right) - \mathrm{var}\left(\hat{\beta}_{FE}\right)\right]^{-1}\left(\hat{\beta}_{RE} - \hat{\beta}_{FE}\right) \tag{6}$$

and have a chi-square distribution with the number of degrees of freedom equal to the number of parameters estimated in both models.

4. Empirical results and discussion

Construction activity in the housing market in Poland is quite strongly related to the business situation and reflects general trends in the property market observed within the last decade. At the beginning of the examined period, an economic increase was recorded, along with a rapid increase in prices and a dynamic development of the entire property market. In 2006-2008, a significant growth in both completed buildings and the number of construction permits for new buildings was recorded (Fig. 1). A characteristic feature of this period was an excess of supply over demand, which, at the same time, favored construction investments, both as regards developers and individuals. In mid-2007 and at the beginning of 2008, the first symptoms of a slowdown in the property market were observed. The supply of dwelling units was maintained at a high level, which resulted from commencing numerous developmental investments or from speculative behaviors originating in the period of the highest market development, while the level of demand clearly decreased. Starting from 2008, a clear decrease in construction activity was recorded. A certain revival could be seen in 2012, but it did not concern the number of construction permits for new residential buildings. For the last three years, a low systematic decrease in the examined factors can be observed. As results from the data published by the Central Statistical Office at the end of 2015, within the first eleven months of 2015, the number of new dwelling units under construction increased by 21.7% in relation to the corresponding period of the previous year, and the number of issued construction permits and submitted notifications concerning the construction of dwellings was 23.4% higher year-to-year (BUDOWNICTWO MIESZKANIOWE, 2015).

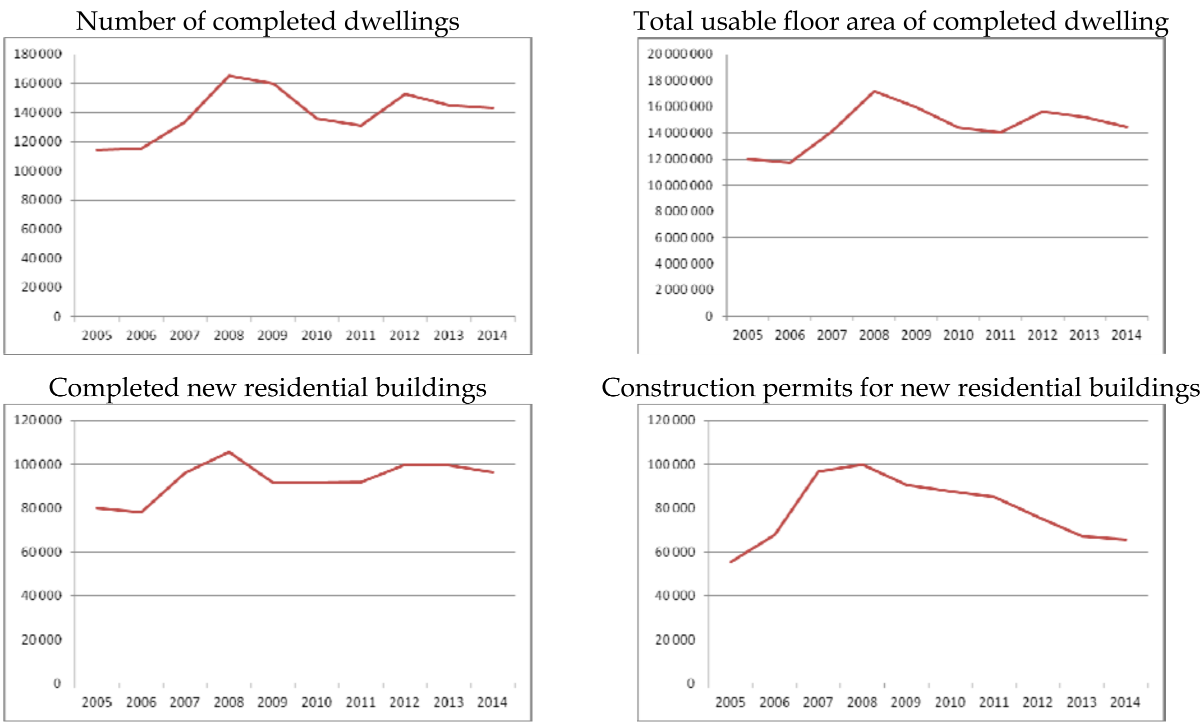

Fig. 1. Dynamics of selected indicators of housing development activity. *Source*: own study.

Every year, more than 50% of the number of newly completed dwelling units concerned buildings constructed by individuals. After the period of growth in 2010-2013, a slight decrease occurred in the last year of the analysis. In the number of dwelling units constructed by housing cooperatives, after a period of clear decrease in 2008-2011, a relatively stable level was observed, and in the last year, this percentage in relation to all completed dwellings amounted to about 2%. Detailed data concerning the number of completed dwelling units split into housing construction types is provided in Table 2.

Table 2

Number of completed dwellings by housing development types in 2005-2014

Year	Co-operative	Company	Council	Social rental	Intended for sale or rent	Individual
2005	8 222	543	3 563	5 412	33 047	63 279
2006	9 032	241	4 513	6 013	37 960	57 594
2007	8 240	429	2 452	5 281	45 653	71 643
2008	8 647	577	2 719	3 205	66 703	83 338
2009	7 260	643	4 202	3 600	72 326	71 971
2010	5 052	290	3 418	3 129	53 505	70 441
2011	3 786	321	2 500	1 980	48 814	73 553
2012	4 194	539	2 389	1 146	63 586	81 050
2013	3 493	442	2 218	1 308	56 447	81 228
2014	3 490	590	2 177	1 715	59 065	76 129

Source: Central Statistical Office.

The spatial diversity of housing development activity shows that it is focused mainly around major cities. The phenomenon of suburbanization can be clearly observed, resulting from a limited supply of land intended for new housing investments in urban areas (Fig. 2) Apart from the main process of suburbanization with regard to the major cities, local mobility processes concerning the movement of population and business entities from the town centers to suburban areas, near smaller, more demographically and economically active towns are also taking place. The relatively high level of development activity in suburban zones can be related, among others, to an increase in the prices of dwelling units constructed in cities, which encourages inhabitants to migrate into rural areas.

This paper assumes the hypothesis that indicators of housing development activity can depend on both the economic and social environment. An appropriate panel data method and a relevant method of estimation were selected on the basis of the Breusch-Pagan test and the Hausman test. The results of tests carried out for models with explanatory variables B_1, B_2, B_3 and B_4, respectively (see Table 1), are presented in Table 3.

Table 3

Results of the Breusch-Pagan test and the Hausman test

Test	Model 1 (B_1)	Model 2 (B_2)	Model 3 (B_3)	Model 4 (B_4)
LM	2872.23 $p<0.001$	2130.42 $p<0.001$	3196.17 $p<0.001$	2999.55 $p<0.001$
H	174.015 $p<0.001$	397.855 $p<0.001$	369.75 $p<0.001$	526.469 $p<0.001$

Source: Own study.

The conducted tests demonstrate that models with fixed effects (FE) are appropriate for describing the examined phenomenon. This means that there are differences between entities that are constant in time, i.e. each examined entity has its own specific part of variability, while it is not advisable to distinguish effects specific to individual periods. Four models were constructed during the research, in which the explanatory variables were, subsequently, the values of $B_{1\text{-}4}$. Table 4 presents the parameters of FE (one-way) models for individual explanatory variables describing development activity.

All four models present significant statistical interdependencies and account for more than 80% variability of the indicators describing developmental activity. In the number of completed dwelling units (model 1), only variable X_9, describing the level at which residential needs were satisfied (average usable floor area of a dwelling unit per person), proved insignificant. The migration rate (X_6) and the share of mobile population in productive age in the total population (X_2) revealed the most significant effect on the response variable. Those variables remain in close relation to the effective demand for residential properties, while the number of completed dwelling units is a response to its relatively high level. What should be noted is that the number of completed dwelling units per 1,000 population is not significantly affected by the average usable floor area of the dwelling unit per person.

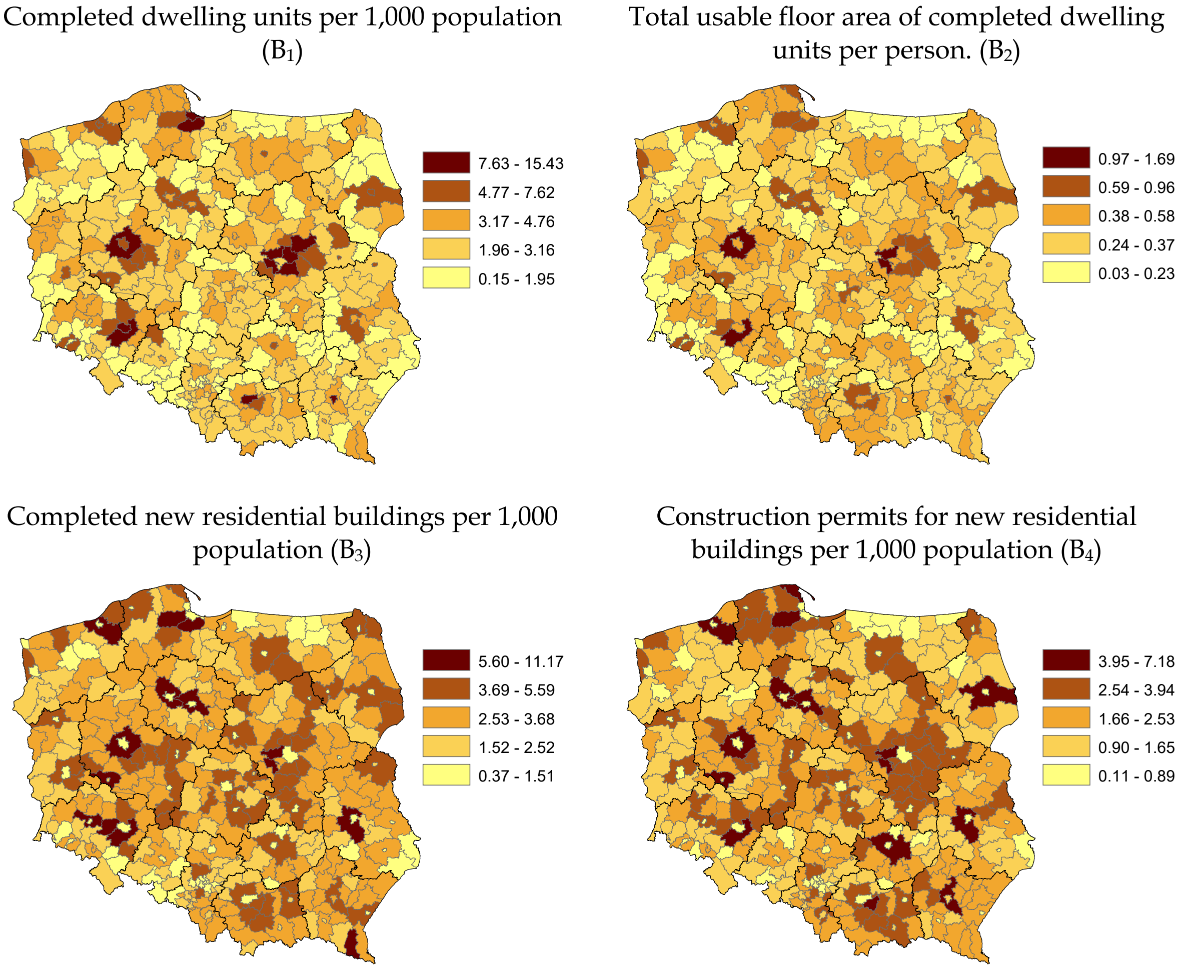

Fig. 2. Housing development activity in a spatial perspective (2014). *Source*: Own study.

Table 4

Parameters of one-way FE panel data models for individual response variables (significance level provided in brackets)

Parameter	Model 1 (B_1)	Model 2 (B_2)	Model 3 (B_3)	Model 4 (B_4)
β_1	0.096 (< 0.001)	0.009 (< 0.001)	0.039 (< 0.001)	0.013 (0.356)
β_2	0.123 (< 0.001)	0.018 (< 0.001)	0.121 (0.011)	0.145 (< 0.001)
β_3	-0.003 (< 0.001)	-0.0001 (< 0.001)	-0.0004 (0.293)	-0.001 (< 0.001)
β_4	0.099	0.005	0.034	0.276

	(0.005)	(0.106)	(0.140)	(< 0.001)
β_5	-0.003 (< 0.001)	-0.004 (< 0.001)	-0.042 (< 0.001)	-0.047 (< 0.001)
β_6	0.119 (< 0.001)	0.010 (< 0.001)	0.060 (< 0.001)	0.118 (< 0.001)
β_7	0.002 (< 0.001)	0.0001 (< 0.001)	0.001 (< 0.001)	-0.001 (< 0.001)
β_8	-0.0002 (0.004)	<0.0001 (< 0.001)	-0.0002 (< 0.001)	0.0004 (< 0.001)
β_9	0.020 (0.544)	0.005 (0.101)	0.093 (< 0.001)	-0.274 (< 0.001)
β_{10}	0.0005 (< 0.001)	<0.0001 (< 0.001)	0.0002 (< 0.001)	0.0004 (< 0.001)
R^2	0.807	0.868	0.832	0.873
Within R^2	0.111	0.159	0.126	0.401
F	9.331 (<0.001)	64.453 (< 0.001)	49.257 (< 0.001)	228.63 (< 0.001)
Std. error	0.989	0.086	0.646	0.576

Source: Own study.

In the second model, determining the relationship between the total usable floor area of completed dwelling units and social and economic factors, the most significant variables proved to be the same factors as in the first model. Insignificant variables include X_4 (marriages contracted per 1,000 population) and X_9. As in the first model, coefficients with variables X_3 (population density) and X_5 (registered unemployment rate) are negative. De-stimulants in this case include population density and registered unemployment rate. Insofar as the unemployment rate can, unquestionably, have a negative effect on demand, the negative effect of population density indicates that a larger usable floor area per number of inhabitants is completed in less populated areas. Results that are similar to the first model may result from correlating variables B_1 (completed dwelling units per 1,000 population) and B_2.

In the third model, the response variable was the number of completed new residential buildings per 1,000 population. In this case, variable X_2 (share of mobile productive age population in the total population) and X_5 (registered unemployment rate) demonstrated the highest significance. Variable X_3 (population density) and X_4 (concluded marriages per 1000 population) proved insignificant. Destimulants, as in the second model, included population density and registered unemployment rate.

The fourth model reflects the relation between the number of construction permits for new residential buildings per 1,000 population and selected social and economic factors. In this model, only variable X_1 (birth rate) proved insignificant, while the highest impact on the response variable was demonstrated by the number of contracted marriages per 1,000 population (X_4) and average usable floor area of a dwelling unit per person (X_9), which, in this case, turned out to be a de-stimulant.

Each entity (e.g. district), according to the formula of the FE (2) model, is ascribed an individual effect α_i, which fulfils the same role as the constant in the multiple regression linear model. This effect indicates the differences between districts, which may result from factors other than those assumed to be analyzed as explanatory variables. Figure 3 presents a spatial distribution of individual effects for particular districts of Poland.

The spatial distribution of individual effects, both for Model 1 and 2, shows that the lowest values can be found mainly in the western part of Poland, excluding areas of larger cities and their surroundings (Poznań, Wrocław, Zielona Góra). For the number of completed new residential buildings (variable B_3), the lowest values of individual effects were observed in districts of the province of Opole in the south-western part of Poland and around major Polish cities. In the model explaining the changes in the number of construction permits issued for new residential buildings (variable B_4), relatively high (as regards the absolute value) negative values were observed in the northern part of Poland, although their distribution does not allow explicit conclusions to be drawn as to the effect of the spatial factor. The diversification of the value of individual effects can present certain trends in space; most importantly, the impact of factors other than those used in the research on the construction activity.

5. Conclusions

The research demonstrated that indicators of housing development activity depend on both the economic and social environment. In each of the analyzed models, the following indicators of development activity proved significant: age structure, unemployment, migration, local entrepreneurship, income of commune budgets and income of inhabitants. Panel data with fixed effect models proved effective for purposes of analysis, and also enabled the analysis of spatial differentiation between the analyzed entities (districts).

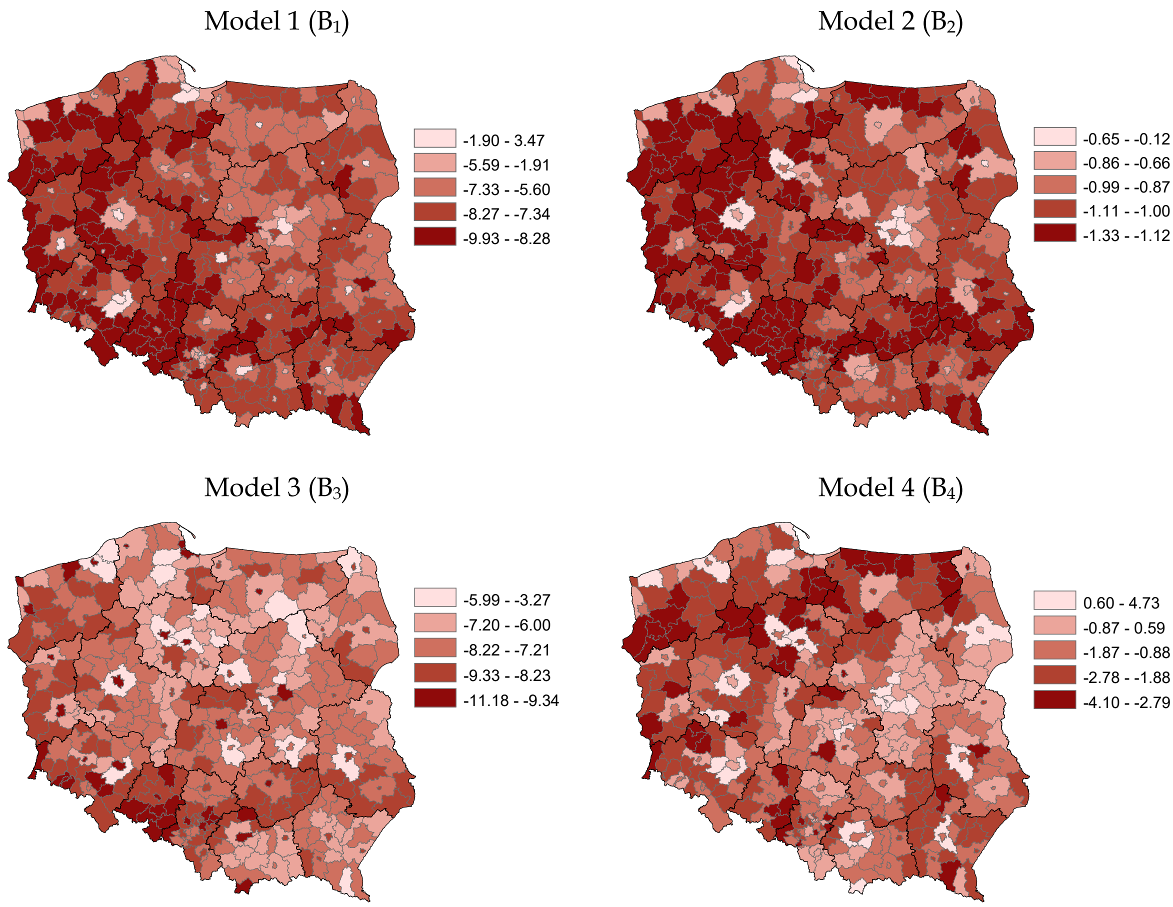

Fig. 3. Spatial distribution of individual effects in FE models. *Source*: own study.

The examined data show that, after the period of turbulent changes in the property market before 2008 and a decrease in prices and indicators of developmental activity in 2008-2010, a relative stabilization occurred in the latest years, which is confirmed by the newest data published by the Central Statistical Office.

The growth in housing development activity can be considered to be a significant measure and, at the same time, an indicator of the recovery of the entire economy, which is confirmed not only by the degree of its relationship with social and economic factors, but also by the broad scope of relations of the entire residential market with multiple production and service branches and industries in the economy. Although housing development, to a significant extent, depends on the environment in which it functions, it can, in turn, in itself affect a series of factors determining the development dynamics of the entire economy.

6. References

ADAMS Z., FÜSS R., 2010, *Macroeconomic Determinants of International Housing Market*, Journal of Housing Economic 19, pp. 38-50.

ANGEL S., PARENT J., CIVCO D. L., BLEI A. M., 2011, *Making Room for a Planet of Cities. Policy Focus Report*, Lincoln Institute of Land Policy.

ATTANASIO O., BOTTAZZI R., LOW H. W., NESHEIM L., WAKEFIELD M., 2012, *Modelling the Demand for Housing over the Life Cycle*, Review of Economic Dynamics 15, pp. 1–18, DOI: 10.1016/j.red.2011.09.001.

BAHADIR A B., MYKHAYLOVA O., 2014, *Housing Market Dynamics with Delays in the Construction Sector*, Journal of Housing Economics 26, pp. 94–108, DOI: dx.doi.org/10.1016/j.jhe.2014.09.005.

BALTAGI B. H., 2008, *Econometric Analysis of Panel Data*, Wiley&Sons, Chichester.

BEENSTOCK M., FELSENSTEIN D., *Estimating Spatial Spillover in Housing Construction with Nonstationary Panel Data*, Journal of Housing Economics 28, pp. 42–58, DOI: dx.doi.org/10.1016/j.jhe.2014.10.002.

BELTRATTI A., MORANA C., 2010, *International House Prices and Macroeconomic Fluctuations*, Journal of Banking & Finance 34 (3), pp. 533–545.

BEŁEJ M., CELLMER R., 2014 *The Effect of Macroeconomic Factors on Changes in Real Estate Prices on Unstable Markets – Response and Interaction*, Acta Scientiarum Polonorum. Seria: Oeconomia 13 (2), pp. 5-16.

BILIŃSKI T., 2009, *Prawo budowlane wczoraj i dziś (Construction Law Yesterday and Today),* Przegląd budowlany No. 2, pp. 24-29.

BROITMAN D., KOOMEN E., 2015, *Regional Diversity in Residential Development: a Decade of Urban and Peri-urban Housing Dynamics in The Netherlands*, Letters in Spatial and Resource Sciences, No. 8, pp.201–217, DOI: 10.1007/s12076-014-0134-y.

Budownictwo mieszkaniowe. I-III kwartał 2015 r. (Housing. I-III quarter of 2015), 2015, Główny Urząd Statystyczny, www.stat.gov.pl.

CEMBALA G., 2014, *Rola mieszkalnictwa w ożywieniu i rozwoju gospodarki w latach 2004–2013 (The Role of Housing in the Recovery and Development of the Economy in 2004-2013)*, Progress in Economic Sciences No. 1, pp. 303-319, DOI: dx.medra.org/10.14595/PIES/01/024.

Dekret Naczelnika Państwa Józefa Piłsudskiego z roku 1919 (Decree of the Chief of State, Józef Piłsudski, of 1919) (Dz. Praw. z 7 lutego 1919 r. Nr 14, poz. 176)

Dekret Prezydenta Rzeczypospolitej z 25 sierpnia 1939 r. o zmianie Rozporządzenia Prezydenta Rzeczypospolitej o Prawie budowlanym i zabudowaniu osiedli (Decree of the President of the Republic of Poland of 25 August 1939 amending the Decree of the President of the Republic of Construction Law and buildings housing) (Dz. U. z 1939 r. Nr 77, poz. 513) (Journal of Laws of 1939 No. 77, item 513)

Dekret Rady Ministrów z 2 kwietnia 1946 r. o planowym zagospodarowaniu przestrzennym kraju (The Decree of the Council of Ministers of 2 April 1946 on spatial economy and planning) (Dz. U. Nr 16, poz. 109) (na podstawie ustawy z dnia 3 stycznia 1945 r. o trybie wydawania dekretów z mocą ustawy (Dz. U. RP Nr 1, poz. 1)– Rada Ministrów postanawia, a Prezydium Krajowej Rady Narodowej zatwierdza co następuje) (Journal of Laws No. 16, item 109 (based on the Act of 3 January 1945 on the mode of issuing Decree-Laws (Journal of Laws of the Rep. of Poland No. 1, item 1) - the Council of Ministers decides, and the Committee of the National Council approves as follows)

GLASSER E., GYOURKO J., SACKS R., 2005, *Urban Growth and Housing Supply*, NBER Working Paper 11097, Cambridge, MA 2005.

GRILICHES Z., INTRILIGATOR M. D., 2007, *Handbook of Econometrics,* v2, Elsevier, North Holland, Spain.

HSIAO C., 2003, *Analysis of Panel Data*, 2nd ed. Cambridge, Cambridge University Press.

INOSTROZA L., BAUR R., CSAPLOVICS E., 2013, *Urban Sprawl and Fragmentation in Latin America: a Dynamic Quantification and Characterization of Spatial Patterns*, Journal of Environmental Management 115, pp. 87–97.

ORENSTEIN D. E., HAMBURG S. P., 2010, *Population and Pavement: Population Growth and Land Development in Israel*, Population and Environment 31, pp. 223–254.

RENIGIER-BIŁOZOR M., WIŚNIEWSKI R., BIŁOZOR A., KAKLAUSKAS A. 2014. *Rating Methodology for Real Estate Markets – Poland Case Study*. International Journal of Strategic Property Management. Vol. 18. Issue 2 , pp. 198-212, DOI: 10.3846/1648715X.2014.92740.

Rozenfeld H. D., Rybski D., Gabaix X., Makse H. A., 2011, *The Area and Population of Cities: New Insights from a Different Perspective on Cities*, American Economic Review, 101(5), pp. 2205-2225, DOI: 10.3386/w15409.
Rozporządzenie Prezydenta Rzeczpospolitej z 16 lutego 1928 roku: Prawo budowlane i o zabudowaniu osiedli (Regulation of the President of the Republic of Poland of 16 February 1928, Construction Law and the Development of Housing Estates) (Dz. U. R. P. Nr 23, poz. 202) (Journal of Laws of the Rep. of Poland No. 23, item 202).
Ustawa z 14 lipca 1936 r. o zmianie rozporządzenia Prezydenta Rzeczpospolitej z 16 lutego 1928 r. o Prawie budowlanym i zabudowaniu osiedli (The Act of 14 July 1936 r. amending the Decree of the President of the Republic on 16 February 1928. on Construction Law and the Development of Housing Estates) (Dz. U. Nr 56, poz. 405) (Journal of Laws No. 56, item 405).
Ustawa z 31 stycznia 1961 r. Prawo budowlane (The Law of 31 January 1961. Construction Law) (Dz. U. Nr 7, poz. 47) (Journal of Laws No. 7, item 47).
Ustawa z 24 października 1974 r. Prawo budowlane (The Act of 24 October 1974. Construction Law) (Dz. U. Nr 38, poz. 229) (Journal of Laws No. 38, item 229).
Ustawa z 7 lipca 1994 r. Prawo budowlane (The Act of July 7, 1994. Construction Law) (Dz. U. z 2013 r. poz. 1409 ze zm.) (Journal of Laws of 2013 item 1409 as amended).