

Recession and value of new dwellings: Changes in the spatial structure of Greece, 2003-2015

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Abstract - Recent economic dynamics in southern Europe have been influenced by multifaceted processes with important spatial outcomes. Construction industry has been one of the productive sectors with the most relevant crisis-driven changes in Greece, probably the most affected country in Europe. With the aim to provide a quantitative analysis offering a comprehensive knowledge of regional-scale dynamics in construction industry during expansion and recession times, the present study investigates spatial variations over 2003-2015 in the value of new dwellings, supplemented with other indicators of building activity (number of permits, average building surface, number of floors), at the scale of Greek prefectures. A data mining framework based on principal component analysis and non-parametric correlations with background socioeconomic indicators was developed to identify spatial patterns in building activity during economic expansion (2003-2009) and crisis (2009-2015). According to building permit data, the average value of new dwellings' per surface area increased in a spatially-heterogeneous fashion across the country, with a substantial difference in growth rates between the two investigated time intervals. During expansion, new dwellings' value increased across the country with a slight decline in two regions and a considerable growth in one region. During recession, new dwellings' value decreased in one region and increased markedly in four regions, being relatively stable in the rest of the country. In 2003, the highest values of new dwellings were spatially associated with economically-dynamic districts characterized by agglomeration economies, upper urban functions, and transport accessibility. With crisis, the spatial distribution of dwellings' value was more heterogeneous and not associated to specific background factors, with the highest increase observed in accessible rural districts and coastal areas with tourism specialization. Further investigation on the role of economic cycles in house value spatial trends is particularly required for designing effective post-crisis development measures.

Keywords - *Economic growth, Housing market, Spatial approaches, Southern Europe.*

1. Introduction

Building activity and housing patterns reflect

urban-rural configurations, with construction industry shaping socio-spatial gradients and altering the distribution of economic functions over large regions (Brown and Liu 2001). Because of socioeconomic transformations, construction industry and housing regimes have significantly changed in developed countries since World War II (Castles and Ferrera 1996). Recession has added spatial complexity to changes in construction industry, sometimes impacting negatively building activity more in urban than in rural areas or influencing housing patterns more in tourism-specialized districts or in productive areas specialized in industrial or service activities (Diappi 2013, Cho et al. 2014, Aalbers 2015).

Mechanisms through which recessions may influence construction industry and housing patterns include the effects of population redistribution over large areas, economic uncertainty and job instability, changes in social preferences and lifestyle, as well as mortgage foreclosures, together with factors that influence (directly or indirectly) population structure (Delladetsima 2006, Barr and Cohen 2014, Taltavull de La Paz and Gabrielli 2015). Urban cycles including urbanization, suburbanization, dis-urbanization and re-urbanization, international migration and internal movement of population finally contribute to articulated and non-linear dynamics in local housing markets, indicating the urgent need to a better comprehension of the main factors that may represent the emerging complexity of regional patterns in building activity (Allen et al. 2004, Barras 2009, Whitehead and Williams 2011).

Spatio-temporal trends in construction industry at regional and country scales have been studied in different ways adopting a set of indicators assessing building activity complemented with socioeconomic background indicators integrated in quali-quantitative techniques analyzing single or multiple levels of investigation (Balta and Eke 2011). These approaches - mainly descriptive and spatially-explicit - were supplemented with a specific exploration of factors

influencing building activity at spatially-diverging scales: (i) socioeconomic drivers of change at continental and country scale and (ii) spatially-heterogeneous determinants at regional and local scales, sometimes under specific territorial contexts e.g. along urban-rural gradients (Coiacetto 2006).

Building activity indicators provided by official statistical sources are widely used in the analysis of regional disparities in construction industry and latent changes in housing markets during economic expansion and stagnation. Identifying similarities and differences in construction industry before and during crisis is particularly useful to shed lights on both medium-term and short-term transformations in regional economies and societies. Regional systems confronted with economic crisis are characterized by a varying ability to resist short-term shocks; consequences of these shocks also vary across space, shaping a mosaic pattern of responses to recession (Salvati et al. 2016).

The 2008 global crisis has been regarded as a major turning point in construction industry in developed countries, especially in Europe. Recession has negatively influenced building activity, depressing housing prices and sometimes accelerating the transition towards relevant spatial polarities in affluent and disadvantaged areas. Evidences on the short-term impact of the global crisis on construction industry are restricted to specific socioeconomic contexts, mostly urban areas, and are often mixed, due to diversification in place-specific factors at both European and national scales (Taltavull de La Paz and Gabrielli 2015). Exploring impacts of the 2008 recession on specific aspects of building activity, is particularly interesting in southern Europe, probably the most affected region in the European continent (Arapoglou and Sayas 2009).

Based on these premises, the present study illustrates an original approach providing insight in the spatio-temporal changes of new dwellings' value in Greece over 2003-2015. Value of new dwellings was intended as a specific indicator of building activity sensitive to economic cycles, representative of latent transformations in the geography of urban growth and decline in Greece and possibly, in southern Europe, identifying territorial and socioeconomic factors that shape recent trends in construction industry, as a contribution to designing fine-tuned local development policies. The spatial distribution of new dwellings' values was investigated at three points in time (2003, 2009, 2015),

representative of sequential expansion and stagnation phases in Europe, in more than 50 Greek prefectures, taken as homogeneous regional analysis' unit. Distinguishing local trends in building activity and the main factors of change provides an informative base to evaluate expansion and crisis impacts on regional systems in divided countries.

2. Methodology

2.1. Study area

The investigated area extends the whole of Greece (131,982 km²). We used prefectures ('nomi') corresponding to the NUTS-3 territorial level adopted by Eurostat, the Statistical Office of European Union, as spatial units. Representing an intermediate spatial level between administrative regions and local municipalities, prefectures in Greece are considered a suitable analysis' unit when investigating spatial patterns of population and activities, possibly as a function of relevant geographical gradients. Prefectures well represented the geography of Greece identifying (i) the metropolitan areas of Athens, Salonika and Iraklio (concentrating nearly half of the country's population) as well as (ii) dynamic, tourism-specialized coastal areas including islands in both Ionian and Aegean Sea and (iii) several internal, rural areas exposed to depopulation and economic marginality.

2.2. Indicators

Aggregated data at prefectural scale in Greece were derived from a census survey carried out by the Hellenic Statistical Authority (ELSTAT) in cooperation with municipalities by compiling a questionnaire on any kind and value of building permit released by town planning office. In this study permits referring exclusively to new buildings were considered by evaluating the overall annual stock, surface area (m², 'Sur'), the respective number of floors ('floo') and total value (Euros) at three years (2003, 2009, 2015). Total dwelling value was referring to an overall estimation made up by professional engineers in the Town Planning Offices taking account of construction's cost, average land value and local house market. Dwelling value was standardized by the respective surface area ('Vals').

To profile the regional background context, a dataset was compiled from official statistics using 9 variables: (i-ii) percent annual rate of income growth ('inc0008' and 'inc0813') respectively during economic expansion (2000-2008) and recession (2008-2013), (iii) per-capita disposable income ('incpc', Euros) and (iv) population density ('Dens', inhabitants/km²) both observed in the mid of the time period investigated (2009), (v-vi) percent annual rate

of population growth during economic expansion ('p2002-2010') and recession ('p2010-2016'), distance from (vii) Athens ('distAth') and (viii) Salonika ('distSal'), calculated as linear distance (km) between prefectural centroids, (ix) proximity to the sea coast ('Sea'), calculated as a dummy variable indicating coastal (1) or internal (0) prefectures and presence of upper economic functions and infrastructures such as international airports ('Airport') (x), universities ('Univ') (xi) and tourism attractiveness ('Tou') (xii). Variables (x-xii) were assessed using dummies classifying prefectures with (1) or without (0) the respective function. Finally, the surface area of each prefecture ('Sup', km²) was considered as a control variable (xiii). Variables were derived from official statistics provided by ELSTAT and Hellenic Ministry of Finance or calculated directly from ELSTAT maps using tools available in a Geographic Information Systems package.

2.3. Data analysis

Percent changes over time in the four variables described above were calculated at the regional level in Greece (13 administrative regions and the whole country) for two consecutive time periods (2003-2009 and 2009-2015) respectively representing phases of economic expansion and stagnation. A principal component analysis was run with the aim to explore the multivariate relationship between the background socioeconomic context and percent changes of dwelling value, surface area and number of floors based on building permits released in 2003, 2009 and 2015. Dwelling value per surface area, average surface area of new buildings and number of floors of new buildings were finally correlated - separately for the three years of investigation - with the 13 background indicators (see section 2.2) using non-parametric Spearman rank coefficients testing for significance at $p < 0.05$.

Table 1. Changes over time (%) in selected characteristics of new buildings based on total permits released in Greece, by administrative region and time period.

Region	Number of permits		Surface		Number of floors		Value per surface	
	2003-2009	2009-2015	2003-2009	2009-2015	2003-2009	2009-2015	2003-2009	2009-2015
Greece total	-4.3	-14.0	-5.3	-14.2	-1.6	-2.6	1.1	12.7
Attica	-7.7	-14.7	-7.4	-15.4	-0.9	-5.0	0.3	-0.3
Eastern Macedonia, Thraki	-1.0	-13.6	-3.7	-13.3	-2.5	-0.2	2.1	3.9
Central Macedonia	-3.7	-15.0	-2.7	-15.8	-2.6	-5.2	0.0	1.4
Western Macedonia	-4.6	-15.5	-9.8	-15.1	0.5	-0.2	3.3	13.5
Thessalia	-4.3	-14.2	-2.9	-14.6	-1.4	-2.7	-3.9	65.7
Ipiros	-6.8	-13.6	-5.0	-14.3	-2.5	11.1	-2.4	1.3
Ionian islands	-6.6	-11.3	-7.4	-11.4	1.7	-1.6	-0.8	6.7
Western Greece	-1.2	-13.6	-4.0	-14.9	-1.8	-0.8	2.8	10.1
Central Greece	-1.0	-14.3	-2.6	-14.3	-0.8	-4.2	0.2	2.8
Peloponnese	-3.1	-13.8	-10.0	-12.6	0.4	-2.0	15.8	3.9
Northern Aegean	-5.9	-13.5	-11.0	-13.4	-0.4	-1.9	3.8	3.9
Southern Aegean	-4.4	-12.4	-2.3	-12.1	0.6	-2.4	4.7	7.7
Crete	-1.6	-13.7	1.2	-11.5	-0.7	0.1	1.3	12.1

3. Results

Overall trends in construction activity and specific characteristics of building permits released in Greece for 2003, 2009 and 2015 were presented in Table 1. A general trend over a progressive reduction in building activity was observed in Greece during both time periods, with higher rates observed in the second period (2009-2015) than in the first period (2003-2009). Total number of (new) building permits released by municipalities, the respective surface area and number of floors declined rapidly over time and especially in urban areas, including Attica (the capital region hosting Athens), Central Macedonia (the region hosting Salonika, the second largest city in Greece) and Crete (hosting Iraklio, the third largest city in Greece and some other important towns including Chanià and Rethymno). Changes in all these variables are coherent over time and space. New dwelling's value per surface show a distinct

pattern, with variable increases over both time intervals and a spatially-heterogeneous distribution across the country, showing a substantial difference in growth rates between the two investigated time intervals. During economic expansion (2003-2009), new dwellings' value increased across the country with a considerable decline in two regions (Thessalia, Ipiros) and a marked growth in one region (Peloponnese).

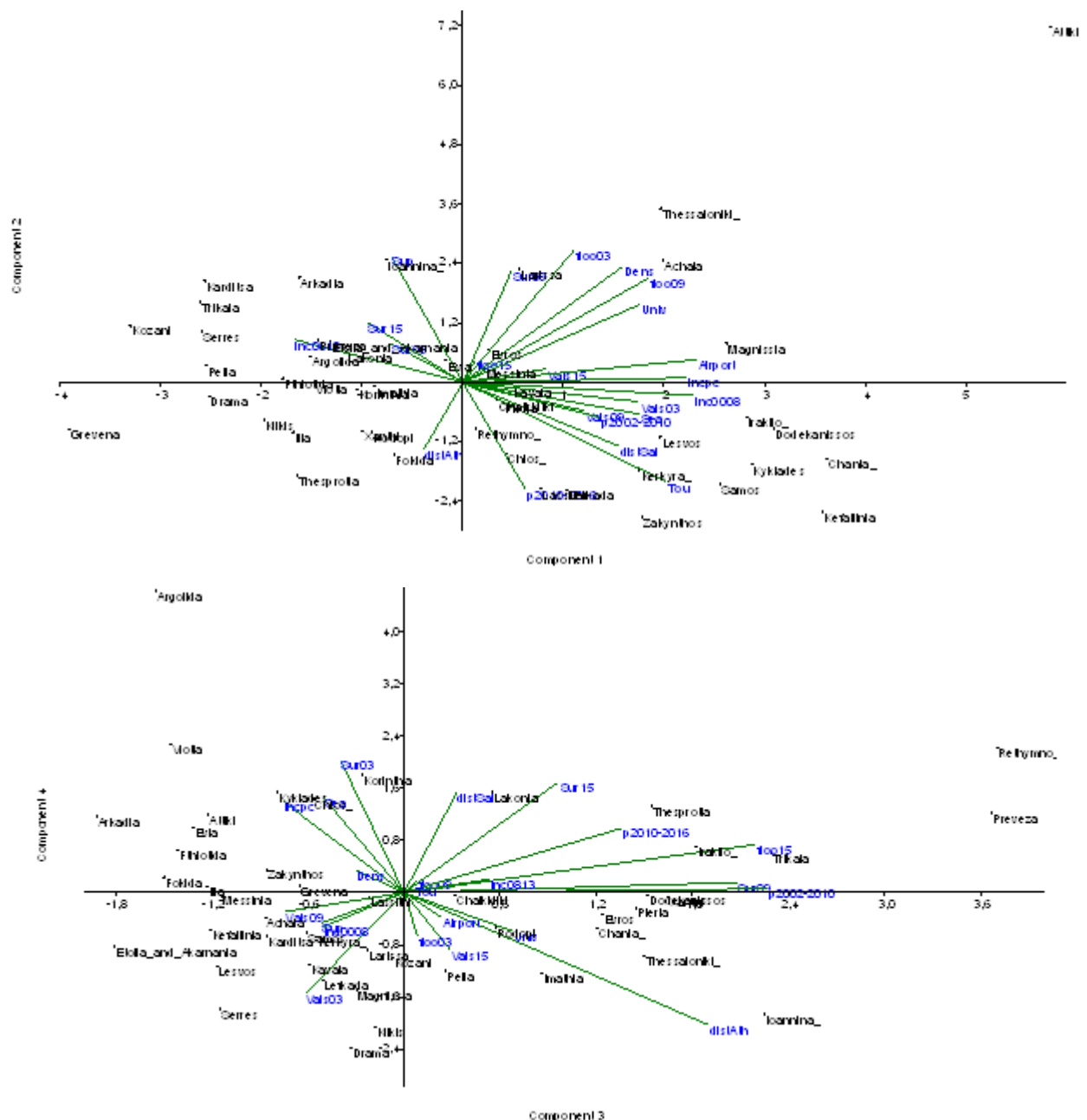
During recession, new dwellings' value decreased in one region (Attica) and increased strongly in four regions (Thessalia, Crete, Western Macedonia, Western Greece), being relatively stable (or slightly increasing) in the rest of the country. This spatial pattern may indicate that, with crisis, building activity concentrated on dwellings with the highest values, and possibly, the largest possibility to be sold in a due time, especially in rural regions. In urban regions, such as Attica and central Macedonia,

dwelling value was relatively stable or decreasing slightly, possibly suggesting that construction activity concentrated mainly on small-size lots and developments with low market value, being accessible to a large part of the population with low propensity to take loans to buying houses.

Principal Component Analysis extracted four relevant factors explaining together 52.4% of the total variance (Figure 1). Component 1 explained 20.6% of the total variance being positively associated with new dwelling's value per surface at the beginning of the study period, vertical profile of new buildings

(2009), income growth during 2003-2009, per-capita declared income, presence of upper economic functions such as airports, universities and tourism attractiveness. Component 1 was negatively associated with income growth during 2008-2013. Component 2 explained 14.9% of the total variance being positively correlated with vertical profile of new buildings in 2003 and 2009, surface area of new buildings in 2009, population density and surface area of prefectures. Component 2 was negatively associated with population growth rate during 2009-2015 and tourism attractiveness.

Figure 1. Biplot of Principal Component Analysis (a) component 1 vs 2; (b) component 3 vs 4.



Based on the PCA biplot, the two principal components identify a gradient separating large cities (positive loadings on both axes, including Attica, Salonika, Larissa, Volos and Patras) from coastal and internal, flat and highly accessible rural districts with moderate-high tourism attractiveness concentrated respectively along the positive and negative axis of component 1 and 2 (Chanià, Iraklio, Dodekanisos, Kefallinia, Zakynthos, Lesvos, Kerkyra, Chios, Rethymno, Chalkidiki, Samos, Kyklades). Economically-marginal rural districts, mainly located in internal districts specialized in the primary sector, were clustered along the negative side of axis 1. Based on the recent evolution of dwelling's value and other characteristics of house market and building activities, these results evidence a multi-polar geography of Greece beyond the traditional polarization in urban and rural areas.

Component 3 explained 8.7% of the total variance assigning the highest positive loadings to surface area of new buildings (2009), vertical profile of new buildings (2015), population growth rate over 2003-2009 and distance from Athens. Component 4 (8.1% of total variance) received positive and negative loadings respectively from surface area of new buildings (2003) and distance from Athens. The biplot representing the relationship between prefectures and indicators over components 3 and 4 illustrated a geographical gradient from highly populated, industrial and infrastructural districts (left quadrants) to socially-marginal areas with an economic base centred on agriculture, livestock and forestry. Taken together, results from multivariate analysis indicate the most relevant factors impacting changes in new dwelling's values in Greece over the two investigated time periods, being based on both economic and territorial dimensions influencing differently construction industry, building activity and local housing markets during expansion and recession.

Results of a non-parametric correlation analysis testing for significant pair-wise relationships between value of new dwellings per surface area and background variables were presented in Table 2. Positive correlations were observed between value of new dwellings in 2003 and income growth rate, presence of an airport and tourism attractiveness. Values of new dwellings per surface area in 2015 were negatively correlated with income growth rate during 2009-2015. All the remaining correlations

were non-significant after Bonferroni's correction for multiple comparisons.

Table 2. Results of non-parametric Spearman rank correlation analysis testing for significance at $p < 0.05$ after Bonferroni's correction for multiple comparisons (bold values).

Variable	Value of new dwellings per surface area		
	2003	2009	2015
Number of floors	0.18	0.23	0.15
Average building surface	-0.36	-0.09	-0.05
Population growth	0.10	0.19	-0.03
Income growth	0.59	-0.22	-0.43
Per-capita income	0.33	0.15	0.33
Population density	0.18	0.16	0.17
Distance from Athens	-0.05	-0.17	-0.03
Distance from Salonika	0.24	0.15	0.20
Proximity to the sea coast	0.30	0.14	0.03
Airport	0.44	0.20	0.28
University	0.26	0.11	0.14
Tourism specialization	0.48	0.19	0.27
Administrative surface area	-0.06	-0.18	-0.13

4. Discussion and conclusions

Understanding latent relationships between construction industry and economic cycles contributes to a better definition of spatial patterns and underlying socioeconomic processes through which urbanization have an impact on building activity and house market reflected in differential dwelling's values at the local spatial scale (Couch et al. 2007). Greece has provided a pivotal example of a 'crisis' country when examining short- and medium-term dynamics of building activity (Delladetsima 2006). Spatially-heterogeneous changes in building activity were observed in Greece, diverging largely during expansion and crisis (Salvati and Gargiulo Morelli 2014). This study identified spatial variations in the distribution of dwelling's value in Greek prefectures, focusing on differential speed and direction of building activity, in relation to specific background indicators (Andreotti et al. 2001, King et al. 2001, Allen et al. 2004).

Results of the empirical analysis run in this study show a differentiation in building activity and new dwelling's value between strictly urban districts, peri-urban/coastal and highly-accessible rural districts and economically-marginal and remote zones based on location factors, declared per-capita income, productive specialization and upper economic functions. Tentative hypotheses were derived to interpret evidences on the effect of the 2008 recession on spatial changes of new dwelling's value in Greece. Being a relevant outcome of a spatially-polarized economic growth, structural divides consolidated in building activity and housing

markets, possibly driven by persisting social inequalities and divergences in population density and growth. Recession was demonstrated to influence building activity in multiple ways, widening spatial polarization in affluent districts with dynamic housing markets and peripheral areas with declining house prices. These conditions were balanced or exalted by unequal distribution of economic investments, human capital, infrastructures, accessibility and amenities (Taltavull de La Paz and Gabrielli 2015).

Our results definitely highlight the increasingly complex geography of building activity and housing markets of Greece, going beyond the traditional urban-rural gradient. Polarization of local house markets in three regional typologies, as described above, indicates a substantial shift towards a decline of urban areas and the continuous rise of rural territories progressively gaining economic and political role in the national arena (Diappi 2013). Coastal areas, islands and internal lowlands hosting small towns and tourism-specialized settlements and characterized by upper economic functions (including airports and universities), accessibility (due to the increasing density of motorways and fast boat lines), medium-low population density and natural amenities are regions with the highest increase in new dwellings' value, especially during economic stagnation (Cho et al. 2014). In this sense, recession determined an enlarged dichotomy between internal, peripheral rural areas and more accessible coastal districts and tourism-attractive islands, assigning a stable (or even slightly declining) role to urban areas, which demonstrated to be largely sensitive to crisis in both housing and job markets (Barr and Cohen 2014). These findings definitely indicate that a stronger integration between socioeconomic indicators is essential to achieve a comprehensive and truly comparative picture of local housing markets under volatile economic cycles in countries with specific urban dynamics.

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References

[1] King, R., De Mas, P. and Beck, J.M. (2001), *Geography, environment and development in the Mediterranean*, Sussex Academic Press, Brighton.

- [2] Aalbers M.B. (2015). The Great Moderation, the Great Excess and the global housing crisis. *International Journal of Housing Policy* 15(1), 43-60.
- [3] Allen J., Barlow J., Leal J., Maloutas T., Padovani L. (2004). *Housing and Welfare in Southern Europe*. London: Wiley.
- [4] Andreotti A., Garcia S.M., Gomez A., Hespanha P., Kazepov Y., Mingione E. (2001). Does a Southern European model exist? *Journal of European Area Studies* 9(1), 43-62.
- [5] Arapoglou V.P., Sayas J. (2009). New facets of urban segregation in southern Europe. *European Urban and Regional Studies* 16(4), 345-362.
- [6] Balta M.O., Eke F. (2011). Spatial Reflection of Urban Planning in Metropolitan Areas and Urban Rent; a Case Study of Cayyolu, Ankara. *European Planning Studies* 19(10), 1817-1838.
- [7] Barr J., Cohen J.P. (2014). The floor area ratio gradient: New York City, 1890–2009. *Regional Science and Urban Economics* 48, 110–119.
- [8] Barras R. (2009). *Building cycles: growth and instability*. London: Wiley.
- [9] Brown S.J., Liu C.H. (2001). *A global perspective on real estate cycles*. Boston: Kluwer Academic Publishers.
- [10] Castles F.G., Ferrera M. (1996). Home ownership and welfare: Is southern Europe different? *South European Society and Politics* 1(2), 163-85.
- [11] Cho S.-H., Kim S.G., Roberts R.K., Lambert D.M., Kim T. (2014). Effects of Land-Related Policies on Land Development during a Real Estate Boom and a Recession. *Growth and Change* 46(2), 218–232.
- [12] Coiacetto E. (2006). Real estate development industry structure: Consequences for urban planning and development. *Planning, Practice & Research* 21(4), 423-441.
- [13] Couch C., Petschel-held G., Leontidou L. (2007). *Urban Sprawl In Europe*.

- Landscapes, Land-use Change and Policy. London: Blackwell.
- [14] Delladetsima P.M. (2006). The emerging property development pattern in Greece and its impact on spatial development. *European Urban and Regional Studies* 13(3), 245–278.
- [15] Diappi L. (2013). Emergent phenomena in housing markets. Gentrification, housing search, polarization. Berlin: Springer.
- [16] Salvati L., Gargiulo Morelli V. (2014). Unveiling Urban Sprawl in the Mediterranean Region: Towards a Latent Urban Transformation? *International Journal of Urban and Regional Research* 38(6), 1935–1953.
- [17] Salvati L., Sateriano A., Grigoriadis S. (2016). Crisis and the City: Profiling Urban Growth under Economic Expansion and Stagnation. *Letters in Spatial and Resource Science* 9(3), 329–342.
- [18] Taltavull de La Paz P., Gabrielli L. (2015). Housing Supply and Price Reactions: A Comparison Approach to Spanish and Italian Markets. *Housing Studies* 30(7), 1036-1063.
- [19] Whitehead C., Williams P. (2011). Causes and Consequences? Exploring the Shape and Direction of the Housing System in the UK Post the Financial Crisis. *Housing Studies* 26(7-8), 1157-1169.