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LAND WITHDRAWAL VS. REGIONAL DEVELOPMENT: DOES WITHDRAWAL OF AGRICULTURAL LAND LEAD TO INCREASE IN ENTREPRENEURIAL ACTIVITY AND GENERATE POSITIVE SPATIAL SPILLOVERS? (SLOVAK REPUBLIC)

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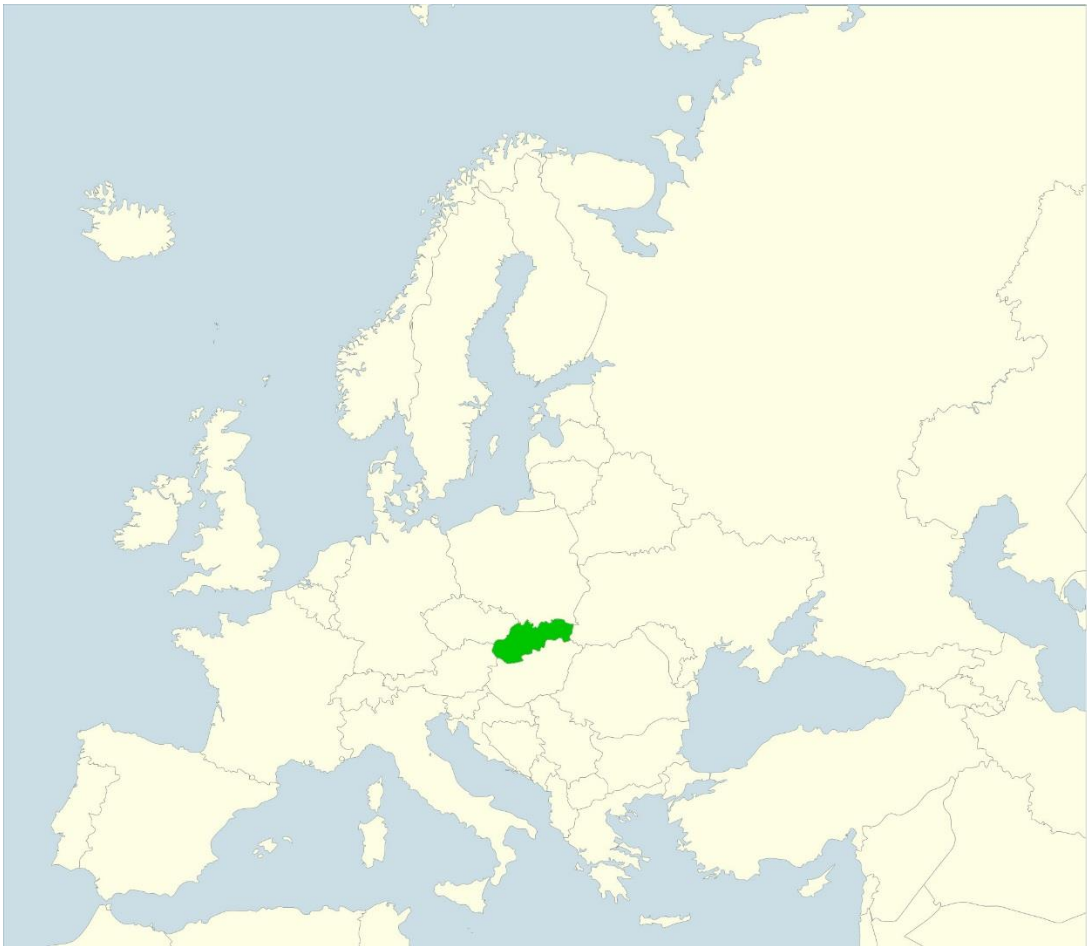

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Abstract: In an increasingly urbanized world, the scarcity of space is a growing problem along with land consumption and soil sealing. To achieve sustainable development and sustainable land use, society has to resolve conflicts between residential, industrial, transport, commercial and green areas while creating a balance between social, economic and ecological targets. However, coordination of sustainable land use is a challenge for policymakers. The paper examines whether the withdrawal of land from the agricultural land fund leads to development, measured both by the increase in domestic entrepreneurial activity, as well as by the increase in foreign direct investments. The results are based on the analysis of panel data on the amount of land withdrawal, newly established firms and inward flow of FDI covering 41 administrative districts of Slovak Republic over 9 years (6 years in case of the FDI, due to the availability of data). Additionally, the spatial Durbin panel model was used to examine, whether land withdrawal and its non-agricultural use generate positive spillover effects on surrounding regions in terms of increased entrepreneurial activity and flow of FDI.

Keywords: withdrawal of agricultural land, regional development, entrepreneurial activity, spatial Durbin panel model, foreign direct investment

Abstrakt: V čoraz viac urbanizovanom svete je nedostatok priestoru narastajúcim problémom spolu s úbytkom pôdy a jej nepriepustným pokrytím. Na dosiahnutie trvalo udržateľného rozvoja a trvalo udržateľného využívania pôdy musí spoločnosť riešiť konflikty medzi rezidenčnými, priemyselnými, dopravnými, obchodnými a zelenými oblasťami a vytvárať rovnováhu medzi sociálnymi, ekonomickými a ekologickými cieľmi. Koordinácia udržateľného využívania pôdy je však výzvou pre tvorcov politík. Príspevok skúma, či odňatie pôdy z poľnohospodárskeho pôdneho fondu vedie k rozvoju meranému tak zvýšením domácej podnikateľskej aktivity, ako aj zvýšením priamych zahraničných investícií. Výsledky sú založené na analýze panelových dát o množstve odňatej poľnohospodárskej pôdy, novozaložených podnikoch a priamych tokoch PZI pokrývajúcich 41 administratívnych obvodov Slovenskej republiky za 9 rokov (6 rokov v prípade PZI, podľa dostupnosti údajov). Navyše, priestorový Durbin panel model bol použitý na preskúmanie toho, či odňatie poľnohospodárskej pôdy a jej použitie na nepoľnohospodársky účel generuje pozitívne efekty prelievania na okolité regióny z hľadiska zvýšenej podnikateľskej aktivity a toku PZI.

Kľúčové slová: odňatie poľnohospodárskej pôdy, regionálny rozvoj, podnikateľská aktivita, priestorový Durbin panel model, priame zahraničné investície

1. Introduction

The land is the bedrock factor of economic growth. Nearly all economic activities require land use to some extent. As these activities grow, the pressures to convert land increase (Harris and Roach, 2015; He et al., 2013; European Environment Agency, 2011b). It is an interaction between natural environment and humans where most changes in land use and land cover take place (Bičík et al., 2015; Veen and Otter, 2001; Palchoudhuri et al., 2015). Soil protection policies and land management are facing different challenges, mainly at the local level. Municipalities are confronted with long-term soil protection against short-term economic development. Most past efforts of development have been based on exploitation of soil but in the long-term soil protection and economic development are complementary rather than competitive because of great importance of soil protection to sustainable economic development (Camp and Heath-Camp, 2015; Edwards et al., 1993; Karlsson and Rydén, 2012; Janků et al., 2016a).

These issues are ever-present, however, they are most pronounced in rural areas. For Slovakia, a country with a high share of rural population, they should be at the forefront not only in academic circles but also in political dialogue, whether on national level or level of specific regions, rural or otherwise. There is no consistent definition of the term “rural area” or “countryside” and different disciplines have different approaches to rural delimitation and typology, and are usually based on the objective they pursue. Sociology defines the countryside and rural space based on a different way of life resulting from different social ties in the village and in the city, and also based on the activities of the population, when most of the economically active population in rural areas work in agriculture or commutes for work. Geography understands the countryside as a territory, which is the sum of the area of the settlements, designated as villages. Villages represent a built-up area with a typical rural structure and architecture as well as a cultural landscape around the village (Cloke, 1985; Hoggart, 1990; Majerová et al., 2005; Binek et al., 2007). In economic theories, the concept of “rural” began to emerge when globalization processes eventuated in imbalances in spatial development, accompanied with the displacement of a significant part of the countryside and the resulting economic, social and environmental consequences.

Although these trends (globalization and vertical coordination of value chains in agriculture, technological advances in agriculture and the associated decline in jobs) are global in nature, the effect they had on depopulation of rural areas in Slovakia (a post-communist country) during the transformation period were, if not more pronounced, then at least more abrupt, which was extensively studied (Gajdoš and Moravanská 2011; Bezák, 2006). Post-1990 transformation period and transition to market economy saw extensive changes in agricultural sector, namely restitution efforts in land ownership, end of price controls, dissolution of trade contracts with former Soviet Union members, while increase in unemployment and falling real wages led to decrease in demand (Turnock, 1996; Bandlerová et al., 2017; Moravčíková and Štefeková, 2017). The most significant net migration gain was identified in intermediary regions, which are the target region of both rural and urban population (European Commission, 2006). It would follow then, based on these findings, that abrupt restructuralization of economy loosened the ties of the population in the most remote rural areas to the agriculture and thus to the land itself on one side. On the other, we could expect that the parallel suburbanization tendencies would put most pressure on seeking alternative land use in more developed regions of Western Slovakia, in rural regions close to major agglomerations. Some of the suburban villages almost entirely lost their production function, and only provide residential function for commuting population (Buchta, 2012). Although it may seem that there are purely economic forces driving the land use transformation in Slovakia in the past three decades, there was a major cultural shift on the overall level of society and specifically in many rural areas. Relatively, socially isolated rural communities with their own culture and strict social norms and a tendency towards conservatism are gradually more and more connected to urban centres and take on elements of urban life and culture (Moravčíková and Klimentová, 2011; Brown and Bandlerová, 2014). This in turn changes their once very strong relationship with agricultural land as well.

In Slovakia, economic and social reasons behind the current state of the affairs discussed in the following chapters of the article go hand in hand. Moreover, they are the product of not only the policies of the previous regime but are also affected by the current focus of many sectoral policies and policies targeted at promoting economic growth and regional development. As one of them, we could point out a strong reliance of Slovakia on FDI (foreign direct investments) as a driving force behind economic growth of the country (Jacobs, 2016), but also lack of inter-sectoral coordination of development projects on local and regional level extensively analysed by Lietava and Fáziková (2017).

Domestic entrepreneurial activity and foreign direct investments are major factors of economic growth and development (Tan, K. G. and Tan, K. Y., 2015; He et al., 2013; Herdegen, 2016). Impact of domestic entrepreneurial activity can be measured mainly through indicators such as GDP growth, employment as a consequence of creating new workplaces and uniform distribution of income (Information Resources Management Association, 2017; Vemić, 2017). They also have indirect effects, for example, GDP growth is projected into a larger amount of available finance for newly established businesses (Rusu and Roman, 2017). The direct effect of foreign direct investments is the stimulation of economic growth, the availability of free funds, modern technologies and the skills of managers (Herdegen, 2016; Moura and Forte, 2010). The indirect effect is the spillover of positive effects from foreign companies that participate in domestic businesses and which create links between domestic and foreign companies while increasing their competitiveness on the market (Kurtishi-Kastrati, 2013).

Sustainable development of the country should be pursued in society, which would support a balance between the decline of agricultural land and the development of the region concerned (Torre and Wallet, 2016). Is there a zero-sum game between the loss of agricultural land for non-agricultural purposes and regional development? Zero Sum Game is every situation where all winnings are compensated by equivalent losses to other parties. The overall level of wealth remains the same, it only exchanges hands (Standardized International Dictionary of Economic Concepts and Organizations, 2016). Balancing must be sought in the efficient use of withdrawn agricultural land. For example, if the withdrawal of agricultural land for non-agricultural use generates positive spillover effects on surrounding regions, it is justified to withdraw it if, however, agricultural land is able to maintain its services in spite of the decline. However, as long as not every region can effectively use the withdrawn land, it is necessary to set strict political measures (Hepperle et al., 2013). In the first place, local authorities must be aware of their authority and responsibility for the issue of impermeable land cover and for providing a guarantee of high quality of life (Prokop et al., 2011; Artmann, 2014a).

As in all developed countries, Slovakia is also experiencing a gradual decline in agricultural land and an increase in forest land and built-up areas. According to the data of the Slovak Statistical Office, between 1950 and 2010, the total decline of agricultural land in Slovakia was 367 000 ha, an average of 6,116 ha per year (Vilček, 2011). At present, approximately 275 ha of land are being taken a day in the European Union (Prokop et al., 2011). In Slovakia, every day we lose about 7–8 ha (Bielek, 2014). These are large land withdrawals, which in most cases also mean a definitive destruction of the soil. Forecasts of agricultural land loss in Slovakia are not optimistic. A year-on-year decrease of arable land is estimated at 4 000 ha, year-on-year increase of forest land and permanent grasslands by 1 000 ha and the year-on-year increase of built-up areas by 1.400 ha (Buday and Vilcek, 2013). In addition, the actual built-up area may be even larger than the construction land records in the cadastral register (Janků et al., 2016b). The real state may differ from cadastral data and so the actual decline of agricultural land in Slovakia may be greater. In the Slovak Republic for the year 2016, from the total land area 4 903 435 ha, the agricultural land occupied 2 385 328 ha (48.65%), forest land 2 022 522 ha (41.25%), arable land 1 409 778 ha (28.75%) and built-up areas and courtyards 236 281 ha (4.82%). There was a decrease in agricultural land by 4 288 ha (Statistical Yearbook on the Soil Fund in SR, 2017).

The gravest problem in the field of agricultural land protection in many European countries is land withdrawal and soil sealing. The soil and its essential services for life are destroyed in an irreversible manner (European Environment Agency, 2011a; Science for Environment Policy, 2016; Ragnarsdóttir and Banwart, 2015). The main reasons for it are economic and social. One of the economic reasons is the reality that many owners prefer a prompt profit from the land which is due to a significant difference between the price of building plots and the price of agricultural land (Kuminoff et al., 2001). Another reason is associated with brownfields non-redevelopment. Redeveloping land degraded by former industries is essential for land protection and so many European initiatives to recycle land incorporate the stimulations (BenDor et al., 2011; European Environment Agency, 2010b; Genske, 2003; Turok and Mykhnenko, 2007). Brownfields can be transformed into lively new spaces which provide critical functions, such as housing, commercial spaces and parks (Silva and Acheampong, 2015; Science for Environment Policy, 2013; Habert and Schlueter, 2016; Hula et al., 2016). Even so, many brownfields in villages and urban areas are not utilized for construction purposes, and are overlooked, while new buildings are constructed on greenfields, because it is less costly than to redevelop brownfields (Hula and Bromley-Trujillo, 2010; Janků et al., 2016b; Hula et al., 2016). Brownfield sites redevelopment generally has a higher cost than that of greenfields, due to the presence of existing construction, complex ownership rights, higher land costs and the need for soil remediation (OECD, 2017; Genske, 2003; Haase et al., 2013). But the most severe economic reason for land withdrawal is the strong investor lobby to build new production facilities and so soil sealing. Nowadays, we can observe an ever stronger building lobby. Suburbanisation, either industrial or residential is the typical system of expansion of municipalities and cities. Although it is typical for the historical development of European cities, at the moment it is unsustainable (Hoymann, 2010). Soil sealing is defined as the permanent covering of soil by impermeable artificial material (Prokop et al., 2011; Artmann, 2014a). It has been tagged as a major threat in the Soil Thematic Strategy of the European Commission (European Commission, 2006), both concerning the permanent loss of soil as a resource and for its important impacts on its functionality (Tóth et al., 2008; Jones et al., 2012; European Environment Agency, 2010a; Gerst et al., 2011; Höke et al., 2011; Scalenghe and Marsan, 2009; Artmann, 2014b; Muňoz and Zornoza, 2017). As for the economic reason, there is also competition between regions/municipalities to attract new activities and developments because of the assumed economic revenues (Prokop et al., 2011; Gardi, 2017; Science for Environment Policy, 2012).

Economic reasons are closely linked to social aspects. Nowadays, the fading out relationship to the land and the countryside (Janků et al., 2016b) is a typical feature of modern societies. Rural planners have to comprehend the values that local residents hold for rural landscape and how these values can differ between long-time residents and new residents from more urban areas (Lokocz et al., 2011; Williams and Schirmer, 2012; Kuminoff et al., 2001). In explaining the place-protective behavior of residents there is a crucial role of place attachment and place identity (Devine-Wright, 2009; Hillyard, 2007; McManus et al., 2013). Moreover, land protection is considered as a barrier for business by many people, for example, local government officials and entrepreneurs. Another reason is the massive import of food, and due to this, many people do not realise the primary role of land, which is food production (Young, 2000). We can also include among social reasons also changing demand for the use of space, when new lifestyles require more space per capita for new activities, like leisure activities (Science for Environment Policy, 2016; Prokop et al., 2011; Gardi, 2017).

Sustainable land management is crucial for local and regional development. Conflicts of land use often lie at the heart of competitive visions of local and regional development and the level to which a balance can be made between economic, social and environmental requirements (Pike et al., 2017; Schmidt et al., 2008; Hoymann, 2010; Hepperle and Lenk, 2009; Artmann, 2015). We recognize three pillars of sustainable development: economy, social and environment. The main objective is to consider all three dimensions: to provide enough space for both industrial and commercial development; to provide people with an adequate living space in size, quality and price; but as well as to save large natural areas in order to preserve biodiversity and recreation areas, and to protect ecological functions of soil, water and climate too (Flint, 2013; Brown et al., 2010; OECD, 2016; Habert and Schlueter, 2016). Coordination of sustainable land use is, however, a challenge for policymakers. Better balanced sustainable development requires greater political attention at the local and regional level and a new view of the conventional distinction between urban and rural issues (Piorr et al., 2011; Schmidt et al., 2008). We need a more holistic and territorially integrated view, especially with regards to economic development, transport, social inclusion, agriculture, landscape and environment (European Commission, 2011; OECD, 2016). The main aim of the paper is to examine whether the withdrawal of land from the agricultural land fund leads to development. For the purpose of this article, we conceptualized the increase of development level as an increase in the quality of the regional environment for the entrepreneurial activity. This was further quantified as an increase in the flow of foreign direct investments, but also as the increase in domestic entrepreneurial activity.

2. Material and Methods

We based our analyses on the panel data set containing the information on the amount of land withdrawn from the agricultural land fund (which is our main explanatory variable of interest), data on newly established domestic firms and inward flow of the FDI covering a total of 41 administrative districts of Slovak Republic over 9 years (2007–2015 in case of domestic entrepreneurial activity) and 6 years (2009–2014 in case of flow of FDI). The shorter time dimension of the panel is due to data unavailability on FDI on the required territorial level in remaining years. To differentiate between the impact of agricultural land withdrawal for different purposes, the data on the amount of land (in hectares) withdrawn was disaggregated into land withdrawn for housing development purpose, industrial development purpose, mining, transportation and other purposes.

Initial empirical model used to estimate impact of agricultural land withdrawal on amount of inward flow of FDI per capita ($inwFDI/inh_{it}$) was conceptualized as follows:

[1] $$inwFDI/inh_{it} = \beta_1 HOUSING_{it} + \beta_2 INDUSTRY_{it} + \beta_3 MINING_{it} + \beta_4 TRANSPORT_{it} + \beta_5 OTHER_{it} + \beta_5 POP\_DENS_{it} + \beta_7 levelFDI/inh_{it} + \beta_8 UNEMPL_{it} + \beta_9 AREA_{it} + \alpha_i + \varepsilon_{it}$$

The main explanatory variables of interest are variables expressing the amount of hectares of agricultural land withdrawn from the agricultural land fund for housing development, industrial development, mining, transport infrastructure development and other (HOUSING, INDUSTRY, MINING, TRANSPORT and OTHER respectively). In order to control for other factors affecting the attractiveness of regions for foreign direct investments, several control variables were incorporated into the model. These variables were chosen based on theoretical and empirical works of authors analysing the localization factors of FDI in different settings. To account for agglomeration (Capello et al., 2011, Barrell and Pain, 1999) and urbanization economies (Dunning, 1977; Berkoz and Turk, 2009), population density variable (POD_DENS) was introduced while unemployment rate (UNEMPL) was used to control for FDI localization factors as described by neoclassical and comparative advantage approach, i.e., the effect of difference in return to capital (Villaverde and Maza, 2012; Hummels and Stern, 1994). Friedman et al. (1992) suggest that availability of labour force, measured usually as an unemployment rate with accompanying willingness to work for comparatively lower wages, attracts FDI to a locality. Availability of labour force is an important indicator of resource-seeking export-oriented FDI (Dunning, 1993) which are typical in the case of Slovakia (Torrisi, 2015). Population density does not account for all sources of agglomeration economies, like intra-industry concentration and upstream and downstream industries concentration (Antonescu, 2015). Due to unavailability of industry-specific data on FDI on the county level, the variable level_FDI/inh (the amount of pre-existing FDI in a region per inhabitant) was used to account for colocalization effects. Furthermore, the use of this indicator is supported by results of Head et al. (1995) who identified a “follow-the-leader” pattern of Japanese investments in the US, supporting the assumption that existing FDI may attract new ones. The variable AREA controls for the size of the region, which serves to adjust for significant differences between certain districts stemming from the fact that many were aggregated. α_i denotes the value of intercept and ε_{it} is the error term of the model.

Initial empirical model used to estimate impact of agricultural land withdrawal on increase in domestic entrepreneurial activity ($newENTRE/inh_{it}$) calculated as the number of newly established firms per capita, was conceptualized as follows:

[2] $$newENTRE/inh_{it} = \beta_1 HOUSING_{it} + \beta_2 INDUSTRY_{it} + \beta_3 MINING_{it} + \beta_4 TRANSPORT_{it} + \beta_5 OTHER_{it} + \beta_5 POP\_DENS_{it} + \beta_7 POP\_WAGE_{it} + \beta_8 AREA_{it} + \alpha_i + \varepsilon_{it}$$

As was the case in the previous empirical model, the main explanatory variables express the amount of hectares of agricultural land withdrawn from the agricultural land fund for housing development, industrial development, mining, transport infrastructure development and others (HOUSING, INDUSTRY, MINING, TRANSPORT and OTHERS respectively). The population density was again used as a control for agglomeration and urbanization economies, which were established as strong predictors of the intensity of entrepreneurial activity (Rosenthal and Strange, 2003; Armington and Acs, 2002; Bosma and Schutjens, 2011). The closely related relevant determinant of entrepreneurial activity is also market potential (Giannetti and Simonov, 2004) however with necessary purchasing power (Backman and Karlsson, 2013). Variable POP_WAGE controls for this effect, calculated as the population size of the district multiplied by the average nominal monthly wage in the district. Variable AREA controls for the size of the district. Analogous colocalization variable (number of incumbent firms per inhabitant) was omitted from the model due to the fact that several studies have shown that local investments have a lower tendency to agglomerate than FDI (Shatz and Venables, 2000). α_i denotes the value of intercept and ε_{it} is the error term of the model.

Since there is some concern that phenomena analysed here could be affected by spatial autocorrelation, both in case of FDI (Casi and Resmini, 2010) and entrepreneurial activity (Acs et al., 2009) and there is a reasonable assumption that agricultural land withdrawal for larger investment projects could affect flow of FDI and entrepreneurial activity beyond the border of the corresponding district, we also conducted spatial diagnostic tests on the initial models. The findings are described in the following section of the paper along with the results of the models adjusted to account for all the findings.

3. Results and Discussion

In this section of the paper, we summarize and analyse the results of models conceptualizing the relationships between the amount of withdrawn agricultural land and a selected indicator of development on a district level in Slovakia. Since logarithmic transformation could not be used due to the incidence of zero values in some variables, z-scores were calculated to rescale the data for comparability purposes. As shown in tables 7 and 9 in the Annex, in both cases some explanatory variables correlate moderately to strongly (in case of FDI model land withdrawal for industrial and other purposes, population density, regional size and level of unemployment and amount of incumbent FDI per inhabitant and in case of the second model land withdrawal for industrial and housing purposes and population density and population size multiplied by average monthly wage). This could pose a problem of multicollinearity of explanatory variables. To identify the potential of multicollinearity problem in explanatory variables, we calculated the variance inflation index (VIF) of the OLS regressions (tables 8 and 10 in the Annex). In both cases, we can dismiss the multicollinearity as a problem, since none of the explanatory variables have higher values of VIF than 10 (Chatterjee and Price, 1991).

3.1 Agricultural land withdrawal and inward flow of FDI

Since we are dealing with panel data, an important decision is to choose between fixed and random effect estimator. Since there are arguments for the use of both fixed and random effect models (Allison, 2009), the usual modus operandi is to consult the Hausman test to choose between the two. However, since the test does not perform well under heteroscedasticity (presence of which was confirmed by the Wald test in Tab.1), we opted to run an auxiliary regression with means of explanatory variables included in the model (Davidson and MacKinnon, 1990; Wooldridge, 2002). Joint test that coefficients of time-averaged explanatory variables are simultaneously zero, provides proof that fixed effects estimator should be used to provide unbiased coefficient estimates. Aside from the heteroscedasticity, we identify other violations of relevant conditions, like cross-sectional dependence/contemporaneous correlation (as indicated by the Breusch-Pagan LM test and Pasaran CD test in Tab. 1). In the presence of cross-sectional dependence, Hoechle (2007) suggests using Driscoll-Kraay standard errors, which generate results robust to the presence of heteroscedasticity, cross-sectional correlation and autocorrelation in panel data.

All three models summarized in Tab. 1 are significant, however, under the previously mentioned condition, only the fixed-effects regression with Driscoll-Kraay standard errors yields unbiased estimates. From all explanatory variables of interest, only the withdrawal of agricultural land on industrial development purposes has a positive impact on the inward flow of FDI in the context of Slovak districts, however, even the significance of the coefficient of this variables falls below the 0.05 significance threshold in the third model (with the p-value of 0.066). Somewhat unexpected is the indication that withdrawal of agricultural land for transport infrastructure development and other purposes. The possible explanation behind this finding is that during the given time period, transport infrastructure was built mainly in less developed regions, while FDI is still heavily concentrated in regions where infrastructure is already built (western and north-western part of the country). Another negative influence, contrary to theoretical assumptions, the random-effects model was identified in the case of population density. This can also be explained by the specificities of inward FDI typical for Slovak regions. Namely that foreign direct investment in Slovakia are typically from industrial sectors, which tend to be skewed towards large firms, for which the more important localization factor is cheap labour and they need large land plots for lower costs for their premises. The same characteristic of Slovak inward FDI explains the highly significant positive effect of localization economies (measured by the level of incumbent FDI per inhabitant), attracting the newcomers with built infrastructure, regionally concentrated specialized workforce and established networks of suppliers and complementary services. To draw a final conclusion, however, we need to test for spatial dependence, which could lead to biased estimates in our initial empirical model.

Tab 1. Results of random and fixed effects panel model – FDI. Source: own elaboration

	Random-effects GLS regression	Fixed-effects (within) regression	Fixed-effects regression with Driscoll-Kraay standard errors
z_housing	0.043	0.084	0.084
	(0.066)	*(0.087)*	*(0.052)*
z_industry	**0.167****	**0.176***	**0.176!**
	(0.069)	*(0.081)*	*(0.075)*
z_mining	0.091	0.032	0.032
	(0.063)	*(0.073)*	*(0.039)*
z_transport	-0.069	-0.078	**-0.078***
	(0.061)	*(0.073)*	*(0.026)*
z_other	-0.01	-0.067	**-0.067*****
	(0.067)	*(0.081)*	*(0.008)*
z_area	-0.034	(omitted)	(omitted)
	(0.069)		
z_level_inh	**0.607*****	**2.904*****	**2.904*****
	(0.118)	*(0.624)*	*(0.449)*
z_pop_dens	**-0.312****	2.471	2.471
	(0.123)	*(3.502)*	*(2.758)*
z_unempl	0.067	-0.021	-0.021
	(0.069)	*(0.316)*	*(0.139)*
cons	3.19E-09	-2.1E-09	-2.10e-09
	(0.058)	*(0.060)*	*(0.037)*
sigma_u	0	4.983	
sigma_e	0.944	0.944	
rho	0	0.965	
Wald Chi^2	**55.15*****		
F test		**5.28*****	**40.11*****
R^2:			
within	0.117	0.177	0.1765
between	0.763	0.5079	
overall	0.189	0.0817	
Hausman test	N/A		
Joint test that coefficients of time-averaged vars are simultaneously zero	**12.86*****		
Breusch-Pagan LM test of independence		966.423***	
Modified Wald test for groupwise heteroscedasticity		3.4e+08***	
Pesaran's test of cross sectional independence		3.307***	
Wooldridge test for autocorrelation in panel data		0.123	

*All variables are recalculated as z-scores; standard errors are given in brackets
*denotes statistical significance on p<0.05 level, ** p<0.01 level and *** p<0.001 level
! under the statistical significance threshold but close

Tab 2. Results of Pooled OLS regression and spatial diagnostics – FDI. Source: own elaboration

	Pooled OLS w/o controls	Pooled OLS with controls
z_housing	0.064	0.043
	(0.068)	*(0.066)*
z_industry	**0.185****	**0.167****
	(0.073)	*(0.069)*
z_mining	0.092	0.091
	(0.066)	*(0.063)*
z_transport	-0.069	-0.069
	(0.063)	*(0.061)*
z_other	-0.037	-0.010
	(0.07)	*(0.067)*
cons	1.09e-09	0.000
	(0.063)	*(0.058)*
z_area		-0.034
		(0.069)
z_level_inh		**0.607*****
		(0.118)
z_pop_dens		**-0.312****
		(0.123)
z_unempl		0.067
		(0.069)
F test	**2.98****	**6.13*****
R^2:	0.058	0.189
Root MSE	0.980	0.917
Spatial diagnostics		
Spatial error:		
Lagrange multiplier	**8.805****	
Robust Lagrange multiplier	2.106	
Spatial lag:		
Lagrange multiplier	**7.189****	
Robust Lagrange multiplier	0.491	

*All variables are recalculated as z-scores; Standard errors are given in brackets
*denotes statistical significance on p<0.05 level, ** p<0.01 level and *** p<0.001 level

Results of spatial diagnostics tests confirm the general findings of Casi and Resmini (2010) about the presence of spatial autocorrelation in the distribution of foreign direct investments in the regional structure of Slovak Republic. Moreover, both types of spatial dependence in the data were detected. While the presence of spatially autocorrelated errors indicates the presence of spatially clustered variables omitted from the model, but having a significant effect on dependent variable (spatial error test in table 2), the statistically significant statistic of spatial lag test poses a greater problem since it leads to bias in estimated regression coefficients of the initial model. In a situation where both types of spatial dependence are present, Elhorst (2010) proposes to use a spatial Durbin Panel Model. According to the author, the proposed model not only produces unbiased coefficient estimates if either of spatial lag or spatial error model represents the true data-generation process but also enables identification of spatial spillover processes, which is one of the main goals of this article. In accordance with all of the facts mentioned, we reformulated the initial model based on the Spatial Durbin Panel Model as proposed by Elhorst (2009) and defined generally by equation (3):

[3] $$Y_{it} = \alpha + \rho \sum_{j=1}^{n} W_{ij} Y_{jt} + \sum_{k=1}^{K} X_{itk} \beta_k + \sum_{k=1}^{K} \sum_{j=1}^{n} W_{ij} X_{jtk} \theta_k + \mu_i + \varepsilon_{it}$$

To account for spatial processes in explanation of analysed phenomena, we introduced into the model described in the equation (1) vector of spatially lagged dependent variable Y, or autoregressive term (Y_{jt} in equation (3)) and vector of spatially lagged explanatory variables X (X_{jtk} in equation (3)), indicating our spillover effects of interest. X_{itk} in equation (3) is a vector of original explanatory variables, with corresponding vector of regression coefficients β_k. The inclusion of spatially lagged variables requires the construction of spatial weights matrix W, which quantifies the "neighbourhood" of spatial units (LeSage, 1999). The matrix W is nxn dimensional matrix, where n is the number of spatial units, in our case Slovak districts. We adopted inverse row standardized weight matrix (1/W) computed based on queen contiguity neighbourhood criterion, meaning that the non-zero elements of the matrix in i-th row and j-th column indicate that district j has a common border with district i. Spatial autoregressive coefficient ρ is referred to as Spatial Rho in table 3, while coefficient estimates of spatially lagged explanatory variables (θ_k in equation (3)) are indicated in the Wx columns. μ_i introduces a time-invariant district-specific unobserved component, while ε_{it} is idiosyncratic error term.

Analogous to the first set of panel model, we first have to choose between fixed effects and random effects estimator. Significant test statistic of Hausman test indicates that fixed effects spatial Durbin panel model generates unbiased coefficient estimates, so we proceed with the interpretation of the results of this model. The effect of agricultural land withdrawal for transportation infrastructure development is almost identical to results of the previous non-spatial models and was already explained. Aside from the positive effects of the withdrawal of agricultural land for industrial development purposes on inward flow of FDI already established, we also identify the statistically significant positive effect of the withdrawal of agricultural land on housing development. We can assume (this assumption being partially supported by land withdrawal for industrial development purposes being a stronger predictor of inward flow of FDI than land withdrawal for housing development purposes) that the latter is a by-product of sorts of the former in the sense that withdrawal of land for industrial development purposes attracts foreign investors, which in turn attract workforce from surrounding regions thus creating demand for housing facilities and pressure to withdraw agricultural land for housing development.

Both these indicators, however, create negative spillover effects on the amount of inward flow of FDI in neighbouring regions (as indicated by the statistically significant negative coefficient estimates of the spatially lagged explanatory variables in question). This, along with the similar effect of the amount of existing FDI per inhabitant on the inflow of FDI, indicates the presence of a repulsive force of the housing and industrial development on inward flow of FDI at the regional mezzo-level. This could be partially explained by the classical growth pole theory (Blair and Carroll, 2009; Leigh and Blakely, 2013), specifically as the result of backwash effects. Secondly, the reason for the negative spillover effect of agricultural land withdrawal on inward flow of FDI into neighbouring regions could lie in the fact that we are dealing with data aggregated into discrete spatial units, which creates the need to take into account different concentration-dispersion tendencies of specific FDI from a sectoral point of view. It could be analogous to the retail industry that has different localization tendencies at different spatial levels (dispersed on the national level, concentrated on the city level, and dispersed again on the level of specific "central business district") if for a somewhat different reason, namely the concentration of workforce not demanded.

Tab 3. Results of Spatial Durbin Panel Model – FDI. Source: own elaboration

	SDM with **random-effects** and Driscoll-Kraay standard errors		SDM with spatial **fixed-effects** and Driscoll-Kraay standard errors	
	Main	Wx	Main	Wx
z_housing	**0.058!**	**-0.218****	**0.065*****	**-0.254*****
	(0.034)	*(0.077)*	*(0.016)*	*(0.041)*
z_industry	**0.181*****	**-0.05****	**0.188****	**-0.09*****
	(0.056)	*(0.016)*	*(0.07)*	*(0.025)*
z_mining	**0.067****	-0.061	0.056	-0.084
	(0.026)	*(0.059)*	*(0.037)*	*(0.071)*
z_transport	**-0.103*****	-0.031	**-0.074*****	-0.049
	(0.024)	*(0.034)*	*(0.021)*	*(0.049)*
z_other	**0.053***	**0.181***	**-0.058!**	**0.269****
	(0.026)	*(0.091)*	*(0.035)*	*(0.098)*
z_area	-0.04	0.077	*(omitted)*	*(omitted)*
	(0.051)	*(0.075)*		
z_level_inh	**0.647*****	**-0.623*****	**3.752*****	**-5.149*****
	(0.183)	*(0.143)*	*(0.546)*	*(1.049)*
z_pop_dens	**-0.261****	**0.883*****	**3.555*****	3.135
	(0.107)	*(0.244)*	*(0.469)*	*(8.157)*
z_unempl	0.028	**-0.048***	-0.178	0.329
	(0.053)	*(0.024)*	*(0.185)*	*(0.302)*
cons	**0.098****			
	(0.033)			
Spatial rho		**-0.102****		**0.049****
		(0.043)		*(0.019)*
lgt_theta		**16.215*****		**0.618*****
		(0.790)		*(0.093)*
sigma^2_e		**0.775*****		
		(0.136)		
R^2:				
within	0.1638		0.2843	
between	0.7111		0.4227	
overall	0.2156		0.0735	
Log-pseudolikelihood	-317.924		-289.897	
Hausman test	**30.12*****			

*All variables are recalculated as z-scores; Standard errors are given in brackets
*denotes statistical significance on p<0.05 level, ** p<0.01 level and *** p<0.001 level
! under the statistical significance threshold but close

3.2 Agricultural land withdrawal and domestic entrepreneurial activity

Similar to the results presented in the previous section, we start with the initial empirical models as formulated in the methodology section of the paper. Statistically significant statistic of the Hausman test indicated the appropriateness of the fixed effects within estimator, while the other diagnostics test conducted on fixed-effects regression indicate the presence of groupwise heteroscedasticity, as well as cross-sectional dependence and serial correlation, so we estimate the final fixed-effects regression model with Driscoll-Kraay standard errors, which are robust to all of the mentioned assumptions violations.

Tab 4. Results of random and fixed effects panel model – ENTRE. Source: own elaboration

	Random-effects GLS regression	Fixed-effects (within) regression	Fixed-effects regression with Driscoll-Kraay standard errors
z_housing	**0.122***	0.067	**0.067****
	(0.057)	*(0.049)*	*(0.018)*
z_industry	0.016	-0.076	**-0.076***
	(0.056)	*(0.047)*	*(0.031)*
z_mining	0.073	0.017	0.017
	(0.047)	*(0.039)*	*(0.031)*
z_transport	0.064	0.034	0.034
	(0.046)	*(0.038)*	*(0.029)*
z_other	0.055	0.025	0.025
	(0.051)	*(0.042)*	*(0.032)*
z_pop_dens	**1.162*****	**2.898!**	**2.898***
	(0.174)	*(1.569)*	*(1.250)*
z_pop_wage	**-0.782*****	**-3.824*****	**-3.824****
	(0.155)	*(0.251)*	*(1.311)*
z_area	**0.335****	*(omitted)*	*(omitted)*
	(0.110)		
cons	3.33E-10	-2.8E-09	-2.8E-09
	(0.074)	*(0.034)*	*(0.176)*
sigma_u	0.310	2.466	
sigma_e	0.650	0.650	
rho	0.185	0.935	
F test		**38.14*****	**54.06*****
Wald Chi^2	**74.67*****		
R^2:			
within	0.239	0.454	0.454
between	0.189	0.034	
overall	0.158	0.001	
Hausman test	**238.17*****		
Breusch-Pagan LM test of independence		**3938.947*****	
Modified Wald test for groupwise heteroscedasticity		**408.96*****	
Pesaran's test of cross sectional independence		**59.371*****	
Wooldridge test for autocorrelation in panel data		**559.817*****	

*All variables are recalculated as z-scores
Standard errors are given in brackets
*denotes statistical significance on p<0.05 level, ** p<0.01 level and *** p<0.001 level
! under the statistical significance threshold but close

Upon examining the results of regression analysis, we find that only land withdrawal on housing development has a statistically positive effect on the increase in domestic entrepreneurial activity, while surprisingly there seems to be a statistically significant negative impact of agricultural land withdrawal for industrial development purposes on domestic entrepreneurial activity. A possible explanation could be found in empirical works on decision-making processes in terms of decision between employment and starting a business. Wage-employment provided by foreign investors could lower the number of new necessity-based entrepreneurs (Wennekers et al., 2005), which is the case in most developing countries. The strongest predictor of increase in domestic entrepreneurial activity is population density, however, the size and purchasing power of regional market has a statistically significant negative impact on new firm creation, which could be the consequence of market saturation as an important entry barrier for new domestic entrepreneurs.

Tab 5. Results of Pooled OLS regression and spatial diagnostics – ENTRE. Source: own elaboration

	Pooled OLS w/o controls	Pooled OLS with controls
z_housing	**0.156****	**0.153****
	(0.061)	*(0.057)*
z_industry	-0.021	-0.008
	(0.063)	*(0.058)*
z_mining	0.055	0.066
	(0.054)	*(0.050)*
z_transport	0.061	0.077
	(0.053)	*(0.049)*
z_other	0.052	0.044
	(0.057)	*(0.052)*
cons	-7.67e-10	-4.4E-10
	(0.051)	*(0.047)*
z_pop_dens		**0.561*****
		(0.121)
z_pop_wage		-0.180
		(0.111)
z_area		0.050
		(0.074)
F test	**3.24****	**11.72*****
R^2:	0.043	0.207
Root MSE	0.985	0.901
Spatial diagnostics		
Spatial error:		
Lagrange multiplier	**85.417*****	
Robust Lagrange multiplier	0.754	
Spatial lag:		
Lagrange multiplier	**85.078*****	
Robust Lagrange multiplier	0.416	

*All variables are recalculated as z-scores
Standard errors are given in brackets
*denotes statistical significance on p<0.05 level, ** p<0.01 level and *** p<0.001 level

As indicated by the spatial diagnostic test run on OLS regression depicted in table 5, there is a similar situation to FDI in terms of spatial processes being an important part of determining the dynamics of the domestic private sector as well (corroborating the findings of Acs et al., 2009). Since we identified both types of spatial dependence, to generate unbiased results, we again opted to reformulate the model described by equation (2) into spatial Durbin panel model as defined in equation (3). Spatial weights matrix remains the same.

Tab 6. Results of Spatial Durbin Panel Model – FDI. Source: own elaboration

	SDM with random-effects and Driscoll-Kraay standard errors		SDM with spatial fixed-effects and Driscoll-Kraay standard errors	
	Main	Wx	Main	Wx
z_housing	0.007	**0.070***	0.010	**0.070*****
	(0.013)	*(0.035)*	*(0.016)*	*(0.013)*
z_industry	**-0.020****	**-0.035****	**-0.030*****	**-0.029!**
	(0.007)	*(0.015)*	*(0.009)*	*(0.017)*
z_mining	-0.015	**0.043****	-0.017	**0.037***
	(0.016)	*(0.015)*	*(0.019)*	*(0.018)*
z_transport	**0.031***	**-0.054*****	**0.03****	**-0.05****
	(0.015)	*(0.015)*	*(0.012)*	*(0.021)*
z_other	-0.005	0.003	-0.003	-0.008
	(0.009)	*(0.015)*	*(0.017)*	*(0.019)*
z_pop_dens	**1.548*****	**-0.886****	**1.601***	**-4.009!**
	(0.236)	*(0.351)*	*(0.790)*	*(2.282)*
z_pop_wage	**-1.194*****	**0.506*****	**-1.779*****	**0.904*****
	(0.242)	*(0.098)*	*(0.434)*	*(0.216)*
z_area	**0.581***	**-0.583*****	*(omitted)*	*(omitted)*
	(0.251)	*(0.124)*		
cons	-0.012			
	(0.143)			
Spatial rho		**0.853*****		**0.846*****
		(0.013)		*(0.008)*
lgt_theta		**-1.510*****		
		(0.140)		
$sigma^2$_e		**0.088*****		**0.075*****
		(0.012)		*(0.010)*
R^2:				
within	0.521		0.536	
between	0.008		0.150	
overall	0.127		0.011	
Log-pseudolikelihood	-194.280		-93.499	
Hausman test	8.1			

*All variables are recalculated as z-scores
Standard errors are given in brackets
*denotes statistical significance on p<0.05 level, ** p<0.01 level and *** p<0.001 level
! under the statistical significance threshold but close

Both models summarized in table 6 generate comparable results, and the Hausman test results indicate that the random-effect model is appropriate and generates unbiased coefficient estimates. We can see that, not only does the negative effect of land withdrawal for industrial development purposes on domestic entrepreneurial activity persist even when we take spatial interactions into consideration; it also creates negative spatial spillovers affecting neighbouring regions. This further corroborates our assumption about the competitive relationship between foreign investors and domestic entrepreneurial sectors across Slovak regions in terms of alternative use of agricultural land. Contrary to the effect it has on the inward flow of FDI, land withdrawal for transportation infrastructure development positively affects the increase in domestic entrepreneurial activity in the corresponding regions, however, it causes negative spillover effect on neighbouring regions. The reason behind this phenomenon can be found again in the fact that infrastructure in recent years is being mostly built in less developed regions. Subsequently, the developed infrastructure can attract economic activities from surrounding regions, depleting them of development potential. Although not significant in case of inflow of FDI, the agriculture land withdrawal for mining purposes generates significant positive spillover effect on the increase of domestic entrepreneurial activity in surrounding regions. Mining, a primary sector industry, is a typical upstream industry, and its positive effect on the increase of entrepreneurial activity could potentially arise as a consequence of opportunities generated for the domestic private sector in relevant downstream industries. All of the control variables in the model are statistically significant (while high population density creates negative centripetal backwash effect, the size and purchasing power of the local market generates positive centrifugal spread effects). Positive spillover effect was also detected in case of the land withdrawal for housing development purposes; however, there could be a more direct link between housing development and domestic entrepreneurial activity. Namely, the effect of housing development on the domestic construction industry.

4. Conclusion

Achieving compromise between residential, industrial, transport, commercial and green areas is a tall order for policymakers in a world of increasing pressure and need for the alternative use of land resources. The conflict between economic, social and ecological priorities is usually thought off as a "zero-sum game", where you have to choose one, or the other. This however also implies that when you choose to withdraw agricultural land from the agricultural land fund, that the objectives, usually defended as necessary for the overall development, actually lead to this (promised) development. This was the main rationale behind the examination of the relationship between land withdrawal from the agricultural land fund and selected indicators of economic growth and development. We identified a strong presence of concentration tendencies with backwash effects dominating in Slovak regions with respect to the impact of land withdrawal for non-agricultural purposes. These effects are more pronounced in case of the land withdrawal for industrial development, which seems to attract foreign direct investment into regions where the land was withdrawn, but it negatively affects both the inward flow of FDI to neighbouring regions, but also dynamics of domestic entrepreneurial activities. These seem to be positively affected by the land withdrawal for transport infrastructure, as well as land withdrawal for housing and mining purposes in neighbouring regions. This indicates that there exists a competition of sorts between foreign investors and the domestic private sector when it comes to alternative land use. This is alarming due to several reasons. Benefits provided to foreign investors in the form of (but not exclusively) agricultural land withdrawal are usually defended with the argument of not only providing direct jobs but also indirect and induced effects on the local economy. In fact, these multiplication effects are the staple of a conceptual approach to regional development based on export base theory heavily oriented on attracting FDI (Stimson et al., 2016). However, the overall results in Slovak case indicate that this is not only the case, but that the FDI (specifically those requiring larger plots of land to be withdrawn) do not create opportunities for the domestic private sector. This apparent competition has a potential to become more dire to the detriment of domestic entrepreneurs, since more and more agricultural land in Slovakia is being bought by foreign entities (according to Lysák et al., 2017 in some Slovak districts share of agricultural land owned by foreign entities exceeds 20–30% and in case of one Western Slovakia region over 45%).

However, at this time, it is hard to formulate policy recommendations based on results presented in this paper. Several methodological issues need to be addressed. The first issue is, that the interaction of herein analysed phenomena can span long periods of time. Namely, that spillover effects (mainly in the case of the land withdrawal for transport development or other large infrastructure projects with lasting impact) usually take time to manifest. There is a way to measure just how these spillovers "travel" in space and time. Using dynamic spatial panel modelling (Debarsy et al., 2012) could allow for measuring the impact of land withdrawal in a given time period on response variables in subsequent years. There is also a "chicken-and-egg" issue, which pertains specifically to the FDI. Localization of FDI and withdrawal of land from agricultural land fund both depend on a decision of specific entities. There is a possibility that the causal relationship between land withdrawal and inward flow of FDI moves in the other direction – the decision of an investor to localize in a specific region is made prior to the decision to withdraw land from the agricultural land fund to accommodate the realization of the investment. Due to the mentioned methodological issues, further research into this rather complicated relationship between agricultural land protection and land management and spatial development is needed.

Slovak countryside is a multidimensional mosaic comprised from variety of types of rural areas; there are smaller and bigger rural settlements, suburban and remote villages. This, not only makes the land use transformation process in Slovakia a complex problem, but it also means that there is no “one size fits all” approach to protection of agricultural land fund from being depleted. The landscape is ever-changing and, so far, institutional, legal and politic frameworks are not keeping up and fail in being responsive enough to the issues raised by the increased competition for land use. The least aggressive approach to tackling this issue could be a two-pronged approach. On one side, there could be more emphasis put on incentives for brownfields redevelopment (e.g., aimed specifically at foreign investors or housing development), and on efforts aimed at promoting increase in value added from economically, socially and environmentally sustainable use of agricultural land on the other. Promoting multifunctional use of agricultural land, and rural landscape in general, by broadening the portfolio of products, services and amenities provided by Slovak countryside (e.g., towards other land based outputs, like biomass and biofuel as alternative source of energy, plant-based remediation of waste material, ecological farming as an answer to the increasing demands for food quality, space for leisure activities for urban population…) could lead not only to an increase in value of agricultural land, but it could partially reinstate it as one of the most important aspects of life of rural communities.

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Annex

Tab 7. Matrix of correlation coefficients of explanatory variables in FDI model. Source: own elaboration

	z_housing	z_industry	z_mining	z_transport	z_other	z_area	z_level_inh	z_pop_dens	z_unempl
z_housing	1								
z_industry	0.3564	1							
z_mining	0.0597	0.2247	1						
z_transport	0.0679	0.0226	0.1295	1					
z_other	0.2258	0.4147	0.2546	-0.0097	1				
z_area	-0.0244	0.0576	0.0302	0.2302	0.0205	1			
z_level_inh	0.1096	0.0327	-0.0246	0.0151	0.0153	-0.3002	1		
z_pop_dens	0.076	-0.0179	-0.0739	-0.0113	0.0529	-0.4288	0.8552	1	
z_unempl	-0.3334	-0.1385	-0.1225	-0.0426	-0.1029	0.25	-0.4011	-0.3568	1

Tab 8. Variation inflation index of explanatory variables in Pooled OLS Regression (FDI model). Source: own elaboration

Variable	VIF	1/VIF
z_pop_dens	4.41	0.226782
z_level_inh	4.07	0.245541
z_unempl	1.39	0.719678
z_area	1.38	0.724458
z_industry	1.37	0.730747
z_other	1.3	0.771364
z_housing	1.29	0.776984
z_mining	1.15	0.871569
z_transport	1.1	0.909901
Mean VIF	1.94	

Tab 9. Matrix of correlation coefficients of explanatory variables in ENTRE model. Source: own elaboration

	z_housing	z_industry	z_mining	z_transport	z_other	z_pop_dens	z_pop_wage	z_area
z_housing	1							
z_industry	0.4989	1						
z_mining	0.1799	0.3083	1					
z_transport	0.1323	0.2028	0.1131	1				
z_other	0.3916	0.3643	0.1698	0.0383	1			
z_pop_dens	0.0152	-0.0028	-0.0275	-0.0131	0.0084	1		
z_pop_wage	0.0671	0.0951	0.0091	0.1011	0.0195	0.7923	1	
z_area	-0.0345	0.0517	0.0297	0.1172	0.0018	-0.4277	0.0476	1

Tab 10. Variation inflation index of explanatory variables in Pooled OLS Regression (ENTRE model). Source: own elaboration

Variable	VIF	1/VIF
z_pop_dens	6.69	0.149539
z_pop_wage	5.55	0.180108
z_area	2.45	0.407353
z_industry	1.53	0.65231
z_housing	1.45	0.688567
z_other	1.25	0.800465
z_mining	1.11	0.897318
z_transport	1.08	0.929438
Mean VIF	2.64	