UNIVERSITY OF ECONOMICS IN BRATISLAVA

FACULTY OF NATIONAL ECONOMY

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REGIONAL ASPECTS OF VOTER SUPPORT FOR POPULIST RADICAL RIGHT PARTIES: A NEIGHBORHOOD EFFECT

Dissertation thesis

2023 **Mgr. Dana Kuběnková**

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Study program:	Economics
Field of Study:	Economics and Management
Department:	Department of Public Administration and Regional Development
Supervisor:	doc. Ing. Štefan Rehák, PhD

Bratislava 2023 **Mgr. Dana Kuběnková**

THESIS ASSIGNMENT

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Thesis's title: Regional aspects of voter support for Populist Radical Right Parties: a neighborhood effect

Goal: The dissertation will aim to examine the influence of composite (socioeconomic structure in the municipality) and contextual (influence of the socioeconomic structure of neighboring municipalities) factors on the preferences of populist radical right-wing parties in Slovakia.

Annotation: In Central and Eastern Europe, support for populist, anti-systemist radical rightwing parties has increased in recent years. The transformation to a market economy in the 1990s, the internationalization of the economy, accession to the EU and the financial crisis brought new opportunities but were also associated with risks, instability and changes in income distribution. These changes in the opportunities and risks in the lives of individuals were subsequently reflected in the political preferences. According to several authors (Gordon 2018; Lee, Morris & Kemeny 2018, Rodriguez Posé, 2018; Dijkstra et al. 2019), the support of populist radical right-wing parties is the result of the long-term economic and industrial decline of the regions in which these people live. The dissertation will aim to examine the influence of composite (socio-economic structure in the municipality) and contextual (influence of the socio-economic structure of neighboring municipalities) factors on the preferences of populist radical right-wing parties in Slovakia.

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ABSTRACT

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The dissertation thesis was composed on the topic of "Regional Aspects of Voter Support for Populist Radical Right Parties: a Neighborhood Effect." The objective of this dissertation was to investigate the link between the proportion of tertiary educated population and the level of voter support for Ludova Strana Nase Slovensko in Slovak municipalities, as well as to analyze the spatial dimension of this relationship. Specific sections of the dissertation focused on the theoretical basis of the concept of Populist Radical Right Parties, the neighborhood effect, and education. The examination was carried out at the level of municipalities, incorporating various spatial regression models - SLX, SAR, SEM, SDEM and SDM. The primary outcome of this dissertation thesis proposes that higher level of proportion of tertiary educated population in a given municipality is linked to lower level of voter support for PRRP in a given municipality and in neighboring municipalities, and vice versa. Therefore, it can be concluded that there is a relationship between tertiary educational attainment and voter support for Ludova Strana Nase Slovensko, which has a spatial dimension. This result persists even after conducting robustness checks, which includes exclusion of the Bratislava region, the consideration of the sorting effect via internal migration of the tertiary educated population and usage of different spatial weight matrix specification.

Keywords: populist radical right parties, discontent, neighborhood effect

ABSTRAKT

KUBĚNKOVÁ, Dana: Regionálne aspekty voličskej podpory populistickej radikálnej pravice: Efekt susedstva. – Ekonomická univerzita v Bratislave. Národohospodárska fakulta; Katedra verejnej správy a regionálne rozvoja. – Školiteľ: doc. Ing. Štefan Rehák, PhD. – Bratislava: NHF EU, 2023, 94 strán.

Cieľom tejto dizertačnej práce bolo preskúmať vzťah medzi podielom obyvateľstva s dosiahnutým vysokoškolským vzdelaním a úrovňou voličskej podpory Ľudovej strany naše Slovensko na úrovni obcí, ako aj analyzovať priestorovú dimenziu tohto vzťahu. Konkrétne časti dizertačnej práce sa zameriavali na teoretický základ konceptu populistickej radikálnej pravice, efektu susedstva a vzdelania. Analýza bola vykonaná na agregovaných údajoch na úrovni obcí. Do priestorovej analýzy sme zahrnuli rôzne priestorové regresné modely – SLX, SAR, SEM, SDEM a SDM. Hlavný výsledok tejto práce naznačuje, že vyšší podiel obyvateľov s dosiahnutým vysokoškolským vzdelaním v danej obci súvisí s nižšou úrovňou voličskej podpory pre Ľudovu Stranu Naše Slovensko v danej obci, ale aj v susedných obciach a naopak. Vzhľadom na tento výsledok možno konštatovať, že existuje vzťah medzi vysokoškolským vzdelaním a voličskou podporou Ľudovej Strany Naše Slovensko. Tento vzťah má priestorovú dimenziu. Výsledok modelu je nemenný aj po vykonaní testov robustnosti, ktoré zahŕňajú vylúčenie Bratislavského regiónu, zohľadnenie efektu triedenia pomocou vnútornej migrácie obyvateľov s dosiahnutým vysokoškolským vzdelaním a použitie inej špecifikácie priestorových váhových matíc.

Kľúčové slová: populistická radikálna pravica, discontent, efekt susedstva

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INTRODUCTION

Populist radical right parties (PRRP), favoring populism, anti-immigrant rhetoric, xenophobic views, and Euroscepticism, have recently enjoyed different levels of voter support across the countries of the European Union (Hainsworth, 2008, Colantone & Staning, 2019). The increasing influence of PRRP in the current geopolitical situation is no longer only a potential threat to the attribute of liberal democracy, as put by Müller (2016), but a real threat to democratic establishments themselves. According to Rodriguez-Pose (2018), from an economic standpoint, PRRP have the potential to cause damage to both economic growth and stability. The rise of PRRP can be linked to the adverse effects of global processes (globalization, financial and migration crises, technological changes, European integration), which have disproportionately impacted vulnerable groups within society (Art, 2011). The spatial dimension of voting for PRRP is often strong as political attitudes and voting behavior are shaped by economic opportunities and regional inequalities (van Leuween & Vega, 2021). In particular, the reduction of prospects in rural areas and former industrial regions, coupled with the concentration of emerging economic opportunities in urbanized regions and cities, can contribute to a sense of economic insecurity and frustration among some segments of the population. As a result of these structural changes, individuals tend to concentrate, sort or migrate to urban areas in search of better job opportunities, higher salaries and better living conditions (Florida, 2017). Regarding a strong spatial dimension this phenomenon results in a small number of winners and a large number of losers. The unfavorable prospects for future development, coupled with the belief that certain regions are doomed, have prompted the growing electoral base of PRRP to rebel against the status quo with an if "*we are sinking approach, we will bring down the entire system*" (Rodriguez-Posé, 2022).

The voter support for Populist radical right parties (PRRP) has been a topic of extensive research in recent years. Scholars have identified various factors that may influence individuals' decision to vote for PRRP, including socio-economic (income, social status) and demographic factors (age, gender, ethnicity). One of the most traditional variables used in eliciting support for PRRP is education. A plausible hypothesis concerning the association between the level of education and voting for PRRP is that people with lower educational attainment are more inclined to support PRRP due to their sense of economic

and social vulnerability (Norris & Inglehart, 2019). In recent years there has been an increase in the number of people with tertiary education, but this increase is not evenly distributed across all regions (OECD, 2019). This increase is rather concentrated in large cities and their surrounding where job opportunities for highly skilled workers are arising. In contrast, rural regions often face brain drain and emigration. Consequently, rural areas face a shortage of highly educated individuals and a lack of skilled workers, which can exacerbate economic and social disparities between urban and rural regions (Florida, 2017). The restructuring occurring in the midst of social inequality, unrest, and dissatisfaction may partially account for voter preferences and their spatial distribution. This is particularly true if we accept the notion that discontent is associated with a trend of spatial segregation that exacerbates political and cultural rifts (Florida, 2017). As a result, the formation of groups of highly educated individuals is a prerequisite for spatial inequality and polarization, since innovative and productive clusters are separated from other regions. From a spatial perspective, this leads to a situation where a small group of winners emerges while a vast number of losers are left behind. CEE countries commonly experience these structural changes in tertiary education (Hardy et al., 2018) and our focus will be on analyzing Slovakia.

Although education is a commonly used variable in PRRP research, its spatial dimension has received scant attention. The role of neighborhood effects in shaping the relationship between tertiary educational attainment and voting for PRRP is underexplored, besides its importance. Previous research on the topic of voter support for PRRP might have produced inefficient and biased estimates by failing to consider spatial effects in the model (Anselin, 1988). Spatial regression models allow us to account for the indirect effects of observed variables and generate more precise estimates not only for the specific area under consideration but also for its neighboring areas. Therefore, this thesis aims to bridge these gaps in the literature by investigating the association between tertiary educational attainment and voting for LSNS in Slovak municipalities, with a specific focus on spatial dimension. We assume based on the finding of Miller (1977) „*people who talk together, vote together*", that spatial spillovers of votes might occur due to spatial social interactions of neighbors. By using a Spatial lag of X model (SLX), Spatial Autoregressive model (SAR), Spatial Error Model (SEM), Spatial Durbin Error Model (SDEM) and Spatial Durbin Model (SDM), this research will provide insight into how educational attainment of neighboring municipalities is linked with voting preferences and how this, in turn, shapes the political landscape. We hope the findings of this dissertation thesis will contribute to common knowledge of the

factors that drive the surge of PRRP and offer some of the examples of effective policy recommendations based on the results.

This dissertation is organized into seven chapters that aim to provide a comprehensive understanding of the relationship between education and support for PRRP, and its spatial dimension, with a focus on the Slovak contexts of PRRP. The first chapter introduces the theoretical background of PRRP, including the individual and regional factors that drive support for these parties, as well as the role of neighborhood effects and social media and concept of spatial social interaction and its relevance to understanding voting behavior. The second chapter presents a literature review on the topic of education and support for PRRP. In the third chapter, we provide an overview of the PRRP in Slovakia, with a focus on the Ludova Strana Nase Slovensko (LSNS). This chapter presents the short history and ideology of LSNS, as well as their electoral success and spatial distribution of votes. The fourth chapter outlines the main objective, research questions, and secondary objectives of the study. The fifth chapter provides insight into the data used in the study, including the sources of data, variables, and their measurement. The sixth chapter introduces the methodological foundations of the study. Specifically, the chapter provides a detailed explanation of the spatial regression models used to analyze the relationship between education and support for PRRP. In the seventh chapter, we present the results and sensitivity analysis of our main spatial model. Finally, the discussion and conclusion chapters provide a discussion of the results, their implications, and limitations of the study. Additionally, the chapter highlights the contributions of the study to the literature on PRRP and education, as well as the potentials for future research.

1. STATE OF THE ART AND THEORETICAL BACKGROUND

1.1 Populist radical right parties

We define PRRP in line with Mudde (2007), who define PRRP as political parties with a core identity that is combination of nativism, authoritarianism and populism. While nativism is an ideology, which holds that states should be inhabited exclusively by members of the native group and that nonnative elements are fundamentally threatening to the homogenous group. Authoritarianism refers to the belief in a strictly ordered society. Populism is understood as a thin-centered ideology that considers society to be ultimately divided into two homogenous and antagonistic groups – the pure people versus, the corrupted elite", arguing that politics should be the volonté generale of the people.

The available literature approach to examine voter support for PRRP can be two-fold. The fundamental concept is oriented on the individual-level factors, such as education, income, age, psychological factors and attitudes towards political institutions are important in shaping voting behavior for PRRP. For instance, several studies have shown that lower levels of education and income are associated with increased support for PRRP (Dijkstra et al., 2021). These findings indicate that among individuals with lower levels of education and income, support for PRRP may be influenced by economic insecurity and a perception of being underrepresented in mainstream politics. Furthermore, PRRP may receive support due to culture individual factors, such as the perceived threat to national identity and cultural loss resulting from globalization and migration. Research has also identified anti-system attitudes and distrust towards political institutions as crucial factors driving individual support for PRRP. Individuals who feel disconnected from mainstream politics and hold a mistrust of political elites are more likely to support parties that position themselves as alternatives to the current political system (Bovens and Wille 2010).

Recent research has brought attention to the significance of regional factors, which are deemed to hold greater importance than individual factors (Rodríguez-Pose, 2018). Regions that experience economic decline or have high levels of unemployment and immigration are more likely to support PRRP. The empirical findings of a research by Rodríguez-Pose (2018), pointed out specifically to the discontent of inhabitants of regions in decline, where is presence of persistent poverty, economic decline, and lack of opportunities. PRRP have been found to enjoy support in areas with low population density

and rural settlement, where the needs of citizens are often neglected by the central government. It is the unfavorable prospects for future development, coupled with the belief that these regions have no future, which has led to a revolt against the status quo through the PRRP growing electoral preference. As opposed to what could have first been assumed, this voter support had a strong geographical foundation. Rodriguez-Pose (2018) also referred to these areas as places that do not matter. The above-mentioned study was conducted on the results of the UK referendum on membership of the European Union, and a similar choice was made by Becker et. al. al (2017), who indicated that patterns of voting outcomes for the 'leave the EU' option at the constituency level coincided with deprivation in education, income, and employment.

Given the results of studies mentioned above, it is plausible to suggest that consideration of spatial and geographic factors is important in analyzing voting outcomes for particular elections. Spatial voting patterns were categorized by van Leuween & Vega (2021) into **contextual** and **compositional factors**. In terms of compositional factors, individuals with similar characteristics and attitudes cluster into similar residential areas based on socioeconomic conditions, resources, and lifestyle preferences. Specifically, we can identify regions with a certain proportion of minority population, a proportion of religious population, a proportion of low-educated and high-educated population as well as a proportion of older or younger population. According to the available research, all these variables have demonstrable effects on voter support for the PRRP. Compositional factors might be also linked to spatial sorting which refers to process wherein individuals and households segregate themselves into different geographical areas based on their preferences for specific amenities, services, and social environments. This process can result in the concentration of certain demographic groups, such as the affluent or the highly educated, in particular regions, while other regions become relatively disadvantaged (Charles, 2003). On the other and, clustering of individuals is not solely due to their personal preferences but can also be attributed to circumstances that limit their mobility. For example, population or economic decline may prevent individuals from relocating, such as being unable to sell their home due to a lack of demand in the area (Franklin & van Leeuwen, 2018).

Contextual factors are built on the assumption that each region provides different opportunities and faces different growth patterns, which in turn causes residents to have different options. Contextual factors can include physical and socio-economic dimension.

More precisely, it takes into account factors like population density, distance from the capital, and the distinction between major cities and rural areas. Due to the lack of respect, attention, and unequal distribution of resources perceived by voters in these places, rural communities that are less populous and far from bigger metropolitan areas tend to lean against system voting (Cramer, 2016). The social and economic dimension lies in the income inequality and ethnic diversity that otherwise similar individuals provide a different context (Leeuwen & Vega, 2021).

Authors van Leuween & Vega (2021) show a clear relationship between presumed spatial characteristics and disparities, voter discontent and voting for PRRP, with the main agent of antisystem voting – feeling of discontent that may prevail on regional level.

1.2 Exploring the Factors that Drive Populist Radical Right Voting

The current literature explains several factors that stimulate voting for populist radical right parties. The following text presents both individual and regional factors.

In terms of migration, when assessing the effect of immigrants in the context of the vote for populist radical right parties, we rely on the PRRP's definition of nativism and its central tenet, which holds that a particular country should be populated solely by indigenous peoples. This ideology subsequently portrays immigration and the resulting minorities, as well as other groups of 'outsiders', as a threat to the national identity, values and material wealth of the people (Rydgren, 2008; Mudde, 2007). Many researchers have pointed to economically frustrated population, whose they refer to as 'losers due to globalization', who in addition have to compete with immigrants for a lack of jobs (Betz, 1994). Mobilizing feelings of injustice with reference to immigration enhances the success of the PRRP, and anti-immigration attitudes are one element of this, that can most often be found in the PRRP's electoral base. However, these anti-immigration attitudes are not entirely relevant to the Central and Eastern Europe (CEE) region. This does not automatically mean that the population in CEE is not nativist; rather, xenophobic nationalist reactions to indigenous ethnic minorities are characteristic of the CEE population (Mudde, 2007).

The role of immigrant populations on voting for PRRP is being examined in light of the spatial concentration of immigrants, which incorporates the contact theory. This theory posits that the more concentrated immigrant populations are in a region, the more likely they will interact with the majority population, leading to more positive attitudes towards them.

Consequently, the presence of ethnic diversity should increase interaction between different population groups and reduce support for PRRP. On the other hand, the group position theory, or "halo effect" theory, explains why xenophobia and anti-immigration views are more prevalent in areas adjacent to regions with large immigrant populations rather than in regions with higher minority populations. This is due to the fear of losing social and economic status among the majority population. These concepts suggest that the success of PRRP is not necessarily tied to regions with higher immigrant populations but rather to regions adjacent to them. (Rydgren and Ruth, 2013)

Based on available research, population density also plays a role. According to the results of Rodden (2019), anti-system voting is closely related to relatively low population density and thus plays a key role. An explanation for this phenomenon is found in the cosmopolitan versus traditional disparity that arises between urban and rural areas, which may lead voters from rural, less dense areas to vote for populist radical right parties.

Age has also a significant role, with the idea being that older individuals are more prone to culturally conventional beliefs since they are less able to comprehend or cope with immigration, economic change and are therefore more inclined towards culturally traditional values. The results of Coffé & Voorpostel's (2010) study are also intriguing in this regard because they assume that parents' disapproval of European integration influences their kids' voting for PRRP. This implies, at least in part, that younger voters can be found supporting populist radical right parties in addition to older voters. Similar results were also conducted by Rehák et al. (2021), who examined voter support for the Ludova Strana Nase Slovensko (2022). The analysis provided in this study showed that LSNS won the highest share of votes in municipalities with a higher proportion of young voters. The authors explained this by the fact that young and less educated voters may be more sensitive to the lack of opportunities in their regions and therefore opt for PRRP as their representatives. In the case of mobilizing a younger voter base, there is also an explanation by Bayer (2016), who explains this phenomenon by the strong “online” presence of the PRRP on social media in CEE and the high success rate of reaching this youth base.

Another important factor is religious affiliation. While older analyses (Lubbers & Scheepers, 2000) assume just a modest probability of the religious share of the population voting for the PRRP, it is believed that they will choose Christian-oriented parties over the PRRP, which encourages intolerance and xenophobia. The current study's findings,

however, indicate a strong positive correlation between religious population and PRRP preference, particularly in the CEE region (Zagorski & Santana, 2021; Voda et al., 2021). Referring to Ivarsflaten (2008), who hypothesizes that this change has occurred because of rising anti-immigration views and sentiments. Specifically, these attitudes and sentiments are prompted by the increase in immigrants professing different religions espousing opposing religious narratives compared to Christian ones.

Socioeconomic dimension in the terms of understanding the PRRP vote includes the most common explanatory variables – unemployment and average income (De Blok & Van der Meer, 2018). Some of the studies suggest that socioeconomic factors are even more important determinants of PRRP voting than anti-immigration attitudes. In the case of unemployment, a substantial number of studies have indicated a positive relationship between the level of unemployment at the local level and the likelihood that people will vote for PRRP (Ford and Goodwin, 2010; Becker et al., 2017). The effect of unemployment on voter support for PRRP is explained through the economic uncertainty hypothesis. This hypothesis is associated with changes in the market over the past decades that have pushed a segment of the population into a less stable economic position. These groups include the unemployed and those who are potentially at risk of unemployment (Halikiopoulou & Vasilopoulou, 2018). As a results, there is a growing insecurity associated with economic deprivation, which leads to greater support for PRRP. Dijkstra et al. (2020) named factors based on previous research – lower education, higher age and lower income form a holy trinity for populist radical right voting.

1.3 Neighborhood effect

Spatial voting patterns exhibit a notable polarization between distinct homogeneous regions. The phenomenon of electoral behaviors becoming more polarized or homogeneous in spatial terms is commonly attributed to the neighborhood effect, as described by Butler & Stokes (1969) and Cox (1969). The definition of neighborhood in the literature is given as a basic concept of proximity that can refer to both geographical and non-geographical types of proximity (Beck et al., 2006). Geographical closeness can be linked to the dissemination of concepts, historically bonded relationships, and behaviors. Apart from geographical proximity, a neighborhood can be defined as a cultural, cognitive, or imaginary identity/ community (Beck et al., 2006). According to the definition given above, we regard a

neighborhood in our work as a place where social interactions between people take place. The neighborhood effect, which holds that social interaction emerge in a given location (residential communities, neighboring villages, neighboring regions) influence people´s political attitudes and voting behavior, has been specifically taken into consideration in the field of election studies. Research has demonstrated that political attitudes and behavior can be influenced by social interactions within one's community, such as family, friends, and neighbors. People who are surrounded by a higher proportion of individuals with certain political beliefs or values are more inclined to adopt comparable beliefs and values (Mutz, 2002). Regarding the neighborhood effect, spatial interaction within a certain proximity seems to be also important. Spatial interaction refers to the movement and flow of people and ideas between different places. The authors Gleaser & Kahn (2004) examine how physical proximity affects social interactions and the dissemination of ideas and argue that individuals who are physically close are more likely to interact and exchange information, which can result in the creation of shared beliefs and opinions. Thus, spatial interaction can facilitate the spread of information and ideas through social networks, leading to the formation of shared opinions and beliefs. They further highlight the role of the physical structure of a city or region in shaping the extent of spatial interaction and influencing opinion formation.

Considering the geographical dimension in terms of voting behavior is not a novelty. Early research established voting patterns and popularized the phrase ,,friends and neighbors voting" which suggested that a voter´s support for a certain candidate depend on the distance between two households (V.O. Key, 1949; Reynold, 1969). Putman (1966) was concerned with the dominance of political views that gained a disproportionate electoral advantage with local communities and offered an explanation for this phenomenon in the neighborhood effects, relying on social interaction theory. Putman's investigation into the processes underlying the seeming influence of local contextual elements on voting behavior has since influenced the study of neighborhood effects in the field of electoral geography. The first study aimed at understanding the effects of neighborhood effects on voting behavior can be traced back to Cox (1969), who first introduced the notion of neighborhood effects in the context of voter preferences. Electorally relevant information (political cues) circulates through social networks and influences reactions in the form of voting decisions. If an individual hears information that primarily supports one political party through conversation, he or she is more likely to vote for that political party, regardless of prior

preferences or personal traits that make them more likely to vote for different party. Therefore, according to Cox (1969), it is crucial to consider the significance of social networks that people belong to when analyzing voting behavior since these networks have a tendency to be spatially concentrated as well as the information flows that move through them. According to this author, the neighborhood effect—whose crucial component is made up of spatial effect—is specifically created by this mechanism.

In practice, this implies that if the vast of majority of person´s social contacts prefer certain candidate or political party, it is quite probable that person will also prefer that candidate/ political party (Cox, 1969; Huckfeldt & Sprague, 1955). Personal contact and social interactions have thus become the main mechanisms of the neighborhood effect in the context of voting behavior, which can be simplistically interpreted as „*people who talk together, vote together*" (Miller, 1977). Although there are some uncertainties surrounding the matter, there is a presence of a significant body of empirical literature that provides credible proof to support the presence of neighborhood effects in voting (McAllister & Studlar, 1992; Pattie & Johnston, 2000).

Contemporary research on the topic of neighborhood effect employs spatial econometric models. Study „Spatial variation in populist right voting in Austria, 2013-2017" by (Essletzbichler, Moser, Derndorfer & Staufer-Steinnocher, 2021) applied Spatial Durbin Model to examine the potential spatial spillovers of PRRP voting across Austrian municipalities in previous election period (2013) accounted for the neighboring municipalities and in actual election period (2017) in an observed municipality. The study was based on the theoretical assumptions of the neighborhood effect and social interactions within local spatial social networks. According to the results, a positive and significant effect was found. This means that if a populist right-wing party had one percentage point higher vote share in neighboring municipalities in 2013, a 0.2 percentage point increase in vote share for that party was expected in the observed municipality in the election period in 2017. The positive effect suggests that social network interactions go beyond municipal boundaries and that there is an increased social acceptability of voting for a radical right-wing party. The study suggests that neighboring municipalities voting for the populist radical right in the past may create a social acceptability effect, which reduces the disincentives to vote for a particular party in subsequent years. This study run into some limitations such as – using a single country, which may limit the applicability of the results to other context.

Furthermore, the study did not investigate the underlying causes of the spatial spillovers in populist right-wing voting, which could shed light on the mechanisms driving these effects. Lastly, the use of aggregated data at the municipality level may obscure meaningful variation in voting patterns within municipalities. Another study by Fiorino, Pontarollo, and Ricciuti (2021) aimed to explore the spatial connections in analyzing voter turnout during the European Parliamentary elections. The authors employed spatial econometric methods to model the factors affecting voter turnout, such as socio-economic and political factors, and to scrutinize the spatial correlation and diversity in turnout trends among European regions. The findings indicate a notable and positive spatial correlation in voter turnout among regions, suggesting the existence of spatial dependence in the patterns of turnout. This indicates the existence of spatial spillovers in voter turnout patterns, where the behavior of voters in one region is influenced by the behavior of voters in neighboring regions. This study as well focused on spatial correlations in voter turnout but does not explore the underlying mechanisms that drive these correlations. The authors Lisanne de Blok & van der Meer (2018) wanted to reflect om the shortcomings of previous studies and break the casual chain of neighborhood effects. The study employed a panel survey design at the individual level, surveying the same individuals before and after the 2012 Dutch parliamentary elections, and combined this data with contextual information at the neighborhood level to explore the impact of residential neighborhoods on individual voting behavior. Multilevel regression models were employed to analyze the spatial spillovers of neighborhood support for the Dutch Freedom Party on individual-level support for the party. Authors discovered that individual-level support for the Dutch Freedom Party is positively and significantly influenced by neighborhood support for the party, even after taking into account individual characteristics like education and income. The effect of neighborhood support is more potent for individuals with weaker neighborhood connections, but stronger for those with stronger connections. Moreover, the study indicates that the spatial impact of neighborhood support for the PVV is due to socialization and exposure to the party's ideas and messages, rather than social influence or neighbor pressure. In the study conducted by Iglesias-Pascual, Benassi & Paloma (2022), the authors utilized spatial modeling techniques to determine the spread of information in relation to voter support for the Spanish PRRP - VOX. The findings emphasize the importance of considering geographical location when investigating voter support. Their study revealed the presence of a spatial diffusion process in the transmission of information.

There is limited research on the relationship between neighborhood effects, tertiary education, and voting. The neighborhood effect in the context of education was proposed as early as 1962 by Friedman, who stated that the education of one child has a positive effect not only that child or only on his parents, but also on other members of society. It was this effect that he referred to as the „neighborhood effect" pointing to the contribution of an educated individual well-being of society through the promotion of a stable and democratic society. Within contemporary research we identified only one study that would include tertiary education in SDM model while estimating the relationship with voting preferences. The study of Posada, Plotnikova & Rubiera-Morollon (2021) examined the relationship between the Brexit referendum results and spatial inequalities at the local level in the United Kingdom. They included in their analysis tertiary educational attainment as a control variable. The study revealed that a higher share of residents with a tertiary degree in a neighboring area was associated with a higher likelihood of voting Remain in the Brexit referendum. In terms of neighborhood effect the study found that a higher share of tertiary educated residents in neighboring areas is linked to high er support for Leave in the observed area. The study also found that education was a stronger predictor of voting behavior compared to income, suggesting that tertiary education may indicate more cosmopolitan and open-minded views. In contrast, areas with lower levels of education and higher levels of deprivation tended to vote Leave. These results indicate that educational attainment and economic inequality are key factors in shaping the political attitudes and behaviors of local communities.

1.4 Social media platforms and social interactions

The presumption regarding the voting behavior, is that voting behavior is result of social interactions. There is ample evidence in the literature, whether from experiments, panel studies, or other forms of quantitative analysis, that social networks created by people influence voting behavior (Klofstad, Sokhey, & McClurg, 2012). The theoretical background behind this presumption focuses primarily on the content of social interaction, with the assumption that conversations about politics activate key exchanges that lead to learning and sharing beliefs. In the previous sections we assumed that people interact within physical space, more precisely within physical neighborhood that is characterized by the proximity. It can be argued that Miller´s (1977) hypothesis is no longer acceptable in the current era of social media platforms, as interactions between people are not limit only to

physical space, but also to meta – space. However, with the emergence of social media, individuals can interact with and obtain information from their friends and other users who are not necessarily in their physical proximity. Social media platforms allow citizens to engage with their “offline” social networks and support each other´s group identities (Pogorelskiy & Shum, 2019).

Facebook, Twitter, TikTok and other social media have become the primary source of information and environment for political discussion for a significant share of the electorate. Such environment poses a potential threat as the information filtering algorithm of social media platforms is set up to show users news and information related to what they or their friends responded to. These algorithms and personalization of content often leads to creating filter bubbles and echo chambers. An "echo chamber" refers to an environment where an individual is consistently exposed to a particular set of information, leading to a reinforcement of their attitudes. This phenomenon occurs when attitude-fitting information, such as news, opinions, and beliefs, is repeatedly presented and amplified, while counter-attitudinal information is absent (Jameson & Cappella, 2008). Given that friends tend to hold similar views, users may find themselves in a „personal filter bubble” on social networking platforms, which in turn reinforces their narrow view. The concept of "filter bubble" describes the potential extreme consequence of implicit personalization, which is not determined by the user, on the Internet (Thurman & Schiffers, 2012). The aforementioned algorithmic filtering facilitates political polarization, as a result of influencing the information that users encounter in the online environment (Levy, 2021). Regarding populist radical right voting, social media platforms are breeding ground of mobilization as it enables the organization of political activities of different target groups without significant financial investments (Youmans & York, 2012). The lack of filtering and control of content by social media´s providers allow relatively free dissemination of radical ideas and provides easy access to extremist views (Van Dijk & Hacker, 2018). From that point, the use of social media increases the likelihood of individuals coming into contact with anti-systemic information. Social media allows PRRP to reach their followers, connect like-minded groups and spread their ideology (Caiani & Parenti, 2013). Therefore, citizens can also actively participate in online discussion, form opinions, and influence each other (Zuckerman, 2015).

In our work, we acknowledge the effect of social media platforms, which is both to make users more likely to be radicalized and to stimulate the formation of online closed

social bubbles where people share the same political ideologies. Thus, we consider that social interactions and spillovers of voter support for the PRRP may not only occur within the physical proximity of neighborhood, but also in the online environment through social media. However, current research on a social networking, echo chamber formation and filter bubbles (Bastos, M., Mercea, D., Baronchelli, A., 2018) suggests that social ties on social media are limited by geographic distances shorter than 100 km (Takhteyev Y, Gruzd A, Wellman B, 2012). At this geographic distance, people are more likely to interact with those who are categorically more similar to them, i.e., they share social identity. Social identity, encompassing factors such as race, gender, and social class, has been found to influence social interactions in numerous ways. Studies indicate that people are more likely to establish social connections with those who share their social identity, ultimately resulting in social segregation and homophily, or the preference for similar others (Brewer, 1991). That might imply that the creation of echo chamber and filter bubble problem is not limited to the social media platforms environment but also to the physical space, which just encourages the creation of homogeneous ties in the online space. This postulate is based on the homophily model, which presumes that individuals inhabiting local communities will interact with people who share similar social characteristics (McPherson & Smith-Lovin, 1987). Such findings support our results, which can be interpreted broadly, without emergence of a limitation in the form of social networks.

2. EDUCATION AND VOTER SUPPORT FOR POPULIST RADICAL RIGHT PARTIES

Studies that investigate voter support for PRRP often use education as one of the most common and widely used factor. Regarding the issue of education and anti-system voting, the line of lower levels of education and growing voter support for anti-system voting is particularly developed. Authors Ivarsflaten and Stubager (2013) pointed out on contradictory results of previous studies that have examined the social structure of the population as a relevant factor for the electoral success of the PRRP. According to these authors, voters create a certain pattern of the similar characteristic, but that can be caused by their level of education rather than by their occupational status. Given the previous findings regarding the correlation between lower levels of education and voting for PRRP, it is reasonable to hypothesize that individuals with lower educational attainment may be more inclined to vote for PRRP.

There are several mechanisms within the research that help to explain the relationship between education and voter support for PPRP (Ford a Goodwin, 2010, Ivarslaften a Stubager, 2013, Roodujin et al., 2017). These mechanisms can be categorized into cultural, economic, and political factors.

The first, cultural factor, suggest that tertiary education provides cognitive tools that stimulate individuals to be more receptive and tolerant of different cultures, which could lead to a lower likelihood of supporting PRRP, which often promotes nationalist and ethnocentric values (Lipset, 1960). In his work, Inglehart (1970) attributed to education the role of „cognitive mobilization" that leads individuals being able to understand more abstract phenomena. Stubager (2008) pointed out that in the process of tertiary education there is a socialization of students into more liberal political principles and norms, thus this characteristic is formed in the process of education. In addition to the familiarization of tertiary students with certain ideas and values, there is also a promotion in adopting a cosmopolitan and tolerant worldview (Hainmueller and Hiscox, 2006).

Under the second factor - economic, education is assumed to influence policy preferences as it relates to individuals' material status. In the context of globalization and PRRP the notion of „losers of globalization" and „winner of globalization" is widely accepted. Regarding the context of education, it is assumed that less educated individuals

are the losers. Authors who refer to this assumption argue that education is one of the many possible variables that maintain and re-generate socio-economic disparities in society. Individuals with lower level of education obtained may be more vulnerable to threats related to globalization and economic crises (Spruyt, Keppens and Droogenbroeck, 2016; Inglehart and Norris, 2016). In the context of the relationship between education and social status, there is a presumption in the literature that lower educated people may be ,,disgusted" by the political dominance and better social status of tertiary educated people. Consequently, giving voice to the PRRP may be a means of expressing an antagonistic attitude towards educated elites (Bovens and Wille 2010; Spruyt, Keppens, and Van Droogenbroeck 2016). In terms of social status, in contrast to less educated individuals, a tertiary individual possesses skills that are in demand in today´s global economy. According to this presumption, tertiary education prepares individuals to compete in a market that is impacted by economic integration. Thus, tertiary educated individuals are expected to be much more optimistic about globalization, employment opportunities in an integrated economy than the less educated (Gabel & Palmer, 1995). This is also linked to the mobility of individuals through which they can benefit from globalization. However, according to Koehn & Rosenau (2002) mobility requires certain internationally competitive skills - cognitive, emotional, creative, behavioral, and functional skills. Nevertheless, these are shaped in the process of tertiary education (Rosenau, 2003).

The third factor regards to political factors. In terms of tertiary education, it is assumed that this level of education can help citizens understand the relationship between political behavior and the preservation of the democratic system. Tertiary education is considered to provide the knowledge, skills, and political understanding necessary for people to traverse the political landscape more effectively (Galston, 2001). Furthermore, research has also shown that individuals with higher levels of education are more likely to be politically active and engaged in the democratic process (Verba, Schlozman, & Brady, 1995). Tertiary educated voter is more likely to possesses skills that are in demand in the current global market and is less likely to support the PRRP. Tertiary education is also associated with reduced rates of Euroscepticism and higher levels of cosmopolitanism, which are linked to higher levels of education (Hakhverdian et al., 2013; Mau et al., 2008). Tertiary education has been demonstrated to increase a person´s exposure to prevailing social standards, as per example duty to vote in elections (Bernstein, Chadha, and Montjoy, 2001). Additionally, it equips a person with the knowledge and abilities necessary to

distinguish between policy options, which in turn reduces the cost of policy issues (Rosenstone and Hansen, 1993). Moretti (2003) has complemented this assumption by the cognitive skills developed through education, which enable the educated voters to make more informed choice on the election day. Therefore, by subsequently choosing the better candidate, they create a positive externality that creates benefit for all citizens. Studies that have analyzed the effect of tertiary educated individuals on voter support for the PRRP confirm each theoretical assumption – tertiary educated individuals are the least likely to vote for the PRRP (Evans, 2005).

3. POPULIST RADICAL RIGHT PARTIES IN SLOVAKIA

The shift from communism to democracy during the 1990s paved the way for the rise of the far-right in post-communist nations (Paulovicova, 2020). According to Bustikova (2018) in Central and Eastern Europe (CEE) the PRRP exhibit animosity towards immigration, ethnic and national minorities, particularly the Roma community. Moreover, with line of Bustiková (2018) there are three key features that distinguish the PRRP in CEE from that of Western Europe. The first pertains to their economic ideology, as the PRRP parties in CEE tend to adopt policies more typical of the left-wing parties than the right-wing ones. The second aspect is their strategy of promoting democratization while also advocating for the rights of minorities, sometimes at the expense of the majority society. Finally, mainstream political parties in CEE have become increasingly radicalized and coexist with PRRP parties. These parties also propagate anti-establishment and populist rhetoric that creates a divide between the "ordinary people" and "corrupt elites". They emphasize the significance of traditional values and the need for strict law and order, as described by Mudde (2007).

Following the collapse of communism in Slovakia, the far-right that emerged can be characterized as a diverse coalition of groups on the periphery of society, non-parliamentary factions, and mainstream political parties (Kluknavska, 2014). In accordance with Bustikova (2018), in Slovakia, which is a society with multiple ethnicities, the far-right parties usually mobilize themselves in a politically charged manner against the larger minority groups, particularly the Roma community. Mudde (2007) has noted that Slovakia is one of the few countries where the electoral success of PRRP has experienced multiple fluctuations. Within the current research on PRRP in Slovakia there is a clear identification of two PRRP – Slovak National Party (SNS) and Ludova Strana Nase Slovensko (LSNS) (Voda et al. 2021; Rehák et al. 2021). Mudde (2007) emphasized the example of SNS, which lost its parliamentary representation in 2002, only to return to victory in 2006 with 11.7% of the valid votes and gain voter support again until 2020, with exception of 2012. The SNS is one of the oldest and most enduring radical right party in Slovakia. Under the leadership of Jan Slota SNS became more radicalized, promoting nationalistic and being highly critical of the Hungarian minority in Slovakia. After unsuccessful and poor electoral performance was Jan Slota in 2012 replaced by Andrej Danko. The party shifted its focus from anti-Hungarian rhetoric to anti-Roma issues and adopted an anti-migrant stance. The SNS also adopted a stance of

defending traditional family values and expressed hostility towards NATO. These shifts in rhetoric assisted the party in regaining its parliamentary representation in 2016. However, these same tactics failed to yield success in the 2020 elections.

Another PRRP party that is often labeled in the current research (see Bustiková, 2018; Voda et al., 2021; Zagórski & Santana, 2021, Kevický, 2022) as populist radical right party is Ľudová Strana Naše Slovensko. Bustikova (2018) labeled LSNS as the party that stand as the most triumphant player within Slovakia's far-right spectrum and is an anti-establishment party that embodies an extreme form of populism, denoted as "the fourth generation" of alternative parties. The party promotes a "radical return" ideology, which includes the endorsement of the values of the wartime regime, Holocaust denial, and the practice of relativizing historical events (Gyarfášová, 2018). Founded in 2010 by Marian Kotleba, a divisive figure with ultranationalist and anti-Semitic views, the LSNS espouses an anti-establishment, anti-immigrant, and anti-globalist agenda that prioritizes Slovakian identity and nationalism. According to its official statutes, the LSNS is a political party that espouses national and Christian values and seeks to introduce principles of direct democracy and absolute freedom of opinion. The party is committed to the rule of law, social justice, and an economy based on private ownership. Additionally, the party strongly upholds democracy, Christianity, and opposes the use of violence (Ľudová strana Naše Slovensko, 2010). The primary topic on its schedule, and simultaneously the most effective method of mobilization, is the utilization of powerful anti-Roma rhetoric. Due to these factors, the party is frequently labeled as extremist by the media. Nonetheless, the LSNS leadership refuses to accept such labels and strives to downplay the notion of extremism by incorporating phrases like "Gypsy extremism" into the discourse of the far-right. The LSNS's second most notable theme in its rhetoric is its condemnation and efforts to discredit established political parties and elites. The party adopts a firm stance against them, depicting them as corrupt and indifferent towards the concerns of ordinary citizens. The party's activist approach emphasizes the need to "take matters into its own hands," positioning its members as protectors of "decent people" (Nociar, 2012).

The LSNS's unexpected success in the 2016 Slovak parliamentary elections can be attributed to their neo-Nazi history, as they managed to secure fourteen seats in the National Council by obtaining 8.04% of the total vote. The party's success was largely attributed to its populist and nationalist policies, which struck a chord with voters who were discontented

with the mainstream political parties and anxious about issues including immigration, corruption, and economic inequality (Mesežnikov & Gyárfášová, 2016). During the 2020 Slovak parliamentary elections, the LSNS strengthened its electoral performance, securing 17 seats in the National Council with 7.97 % of the vote. According to findings of Voda et al. (2021) in their study „*From Trivialized Neo-Nazis to Parliament: Explaining the Electoral Success of the Extreme Right Party LSNS in Slovakia*" the electoral success of LSNS was a result of a combination of internal and external factors. The party went through an internal strategic transformation, moving away from being viewed as a group of trivialized neo-Nazis to a party that was more professional and sophisticated. This was achieved by emphasizing anti-establishment and anti-immigrant messaged to appeal to a wider range of voters. The party´s leader, Marian Kotleba, played a key role in distancing the party from its extremist past and projecting a more mainstream image. The authors attribute the success of the LSNS party to external factors such as the failure of mainstream parties to address critical issues and the impact of the refugee crisis. Voters who were dissatisfied with the mainstream party's inability to address problems such as corruption, unemployment, and social inequality found the LSNS anti-immigrant message appealing. Once more, the party's triumph was linked to its populist and nationalist policies, as well as its adept utilization of social media and online campaigning techniques. The authors also highlight LSNS gained popularity due to its extensive media coverage, despite the low actual news value. The party leader and the LSNS were portrayed in a mixed manner, with the mainstream media highlighting their extremist tendencies as a threat to democracy, while also portraying them as legitimate politicians and defenders of ordinary people. The refugee crisis of 2015 provided a fertile ground for the party's anti-system stance and negative portrayal of the Roma minority. During all four parliamentary elections in which LSNS participated, the party may have benefited from negative public discourse and attitudes towards the Roma. However, the political landscape shifted before the 2016 elections, and LSNS was able to take advantage of the party's reinforced public image and the 2015 refugee crisis. This created favorable conditions for LSNS, which positioned itself as a political alternative and increasingly appealed to anti-establishment sentiments (Voda et al., 2021). Rehák et al. (2021) concluded that while voter support for the traditional right-wing party SNS is based on cultural and nationalistic factors, support for the LSNS rests on regional economic factors such as unemployment rates and wages. According to the authors, the LSNS has been able to capitalize on regional development problems, especially in

economically lagging regions, to gain support. They contend that the party's success in these areas is attributable to its capacity to resonate with local communities that feel neglected and resentful towards the mainstream political parties. An analysis of voting patterns by exit polls in Slovakia in 2016 indicated that it was primarily young, first-time voters who demonstrated a growing tendency to vote for the LSNS (Gyárfašová & Slosiarik, 2016). Which was later proved by the findings of Rehák et. al (2021) in parliamentary elections in 2016 with the explanation, that individuals who are young and less educated may be more vulnerable to the lack of opportunities in their respective regions, and as a result, they may be more likely to turn to extremist political parties. Geographically speaking, it can be inferred that the LSNS experiences higher levels of support in regions located in close proximity to Roma settlements. These are areas where coexistence between the majority population and socially excluded Roma communities is challenging, and the party is able to capitalize on this situation (Kluknavská, 2014). According to Gyárfašová & Slosiarik (2016) the LSNS tends to attract more men than women, as well as individuals with lower levels of education, manual laborers, and those who hold exclusively Slovak nationality in parliamentary election in 2016.

Nonetheless, during the autumn of 2022, Marian Kotleba, the leader of the party, was found guilty of extremism, which resulted in six Slovak parliament members leaving the party the following year. In 2022, due to his conviction for promoting and supporting extremism, Marian Kotleba lost his parliamentary mandate and was given a definitive suspended sentence. As a result of the departure of members from LSNS, new political parties emerged that may exhibit characteristics of new populist radical right parties in Slovakia. We do not consider this a limitation because at the time of writing this thesis, LSNS was the most radical party in Slovakia, and the emergence of new populist radical right parties was not yet evident.

To identify PRRP in Slovakia, we utilized the Chapel Hill 2020 Expert Survey (CHES) database, which is a widely used source for determining the attitudes and positions of political parties across the European Union. CHES is one of the most used sources to determine the attitudes of political parties in different countries of the European Union. The methodology of the survey is based on the principle of selecting experts from the countries included in the survey. The task of these experts is to evaluate the attitudes of political parties, and a relatively wide range of categories is included - ideological positions, questions

related to European integration. The CHES Expert Survey selects political parties based on their relevance in the national political arena. The survey aims to include all parties that are likely to win seats in the national or European Parliament elections. Furthermore, parties that have previously won seats but are currently unrepresented are also included to reflect changes in the political landscape. Additionally, parties that are considered to be ideologically important or intriguing, even if they have a low chance of winning seats, may be included. The selection criteria are regularly reviewed and revised for each survey round. The survey covers over 30 European countries and is carried out both before and after every national election to capture the changing positions of political parties over time. The results of the CHES Expert Survey are widely utilized by scholars, policymakers, and journalists to analyze and comprehend the ideological landscape of European politics (CHES, 2019). When examining the LSNS, we focused on evaluating this party as a PRRP. Mainly based on the scores obtained in the categories - anti-establishment attitudes (salience of anti-establishment and anti-elite rhetoric; 0 = not important at all : 10 = extremely important), attitude towards the narrative of the people versus elected representatives (0 = Elected office holders should make the most important decisions : 10 = 'The people', not politicians, should make the most important decisions), overall ideological position (0 = Extreme left : 5 = Center : 10 = Extreme right) and the party's orientation towards European integration (1 = Strongly opposed; 2 = Opposed; 3 = Somewhat opposed; 4 = Neutral; 5 = Somewhat in favor; 6 = In favor; 7 = Strongly in favor). The selection of each category was made with respect to the definitional postulates of Mudde's (2007) definition of a populist radical right party. Evaluation of the LSNS and comparable results of other political parties based on the CHES can be seen in the Figure 1. For our selection of political parties, we opted for those that achieved success in the 2020 parliamentary election and secured a seat in the parliament. What we can see is that LSNS out of all selected parties is the most radical one.

Figure 1: Evaluation of political parties' stances and position on certain matters in reference year 2019

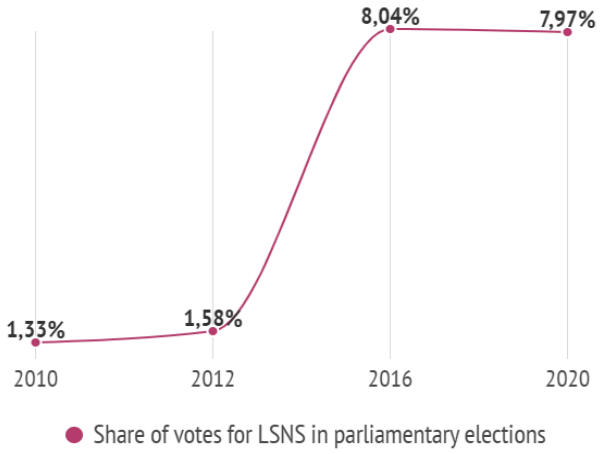
Party Abbrev	Antielite salience	People v. elite	Ideological position	EU position
LSNS	9.25	6.41	9.31	1.31
SME RODINA	8.26	6.15	7.13	3.13

OLaNO	8.31	8.46	5.15	4.75
SaS	4	3.38	4.57	4.12
ZA LUDI	3.73	3.23	6	6.53
SMER-SD	3.33	2.92	4.25	5.18

Source: author based on the CHES survey

The LSNS participated in the 2010 and 2012 parliamentary elections but failed to secure any seats. LSNS was a minor player in national politics, receiving only 1.33 percent and 1.58 percent of the vote, respectively. However, in the 2016 parliamentary elections, the party achieved a breakthrough, winning 8 percent of the vote. In the 2020 parliamentary elections, LSNS once again garnered 8 percent of the vote, securing fourth place, and indicating that its electoral potential has remained constant.

Figure 2: The changes in the share of votes for LSNS

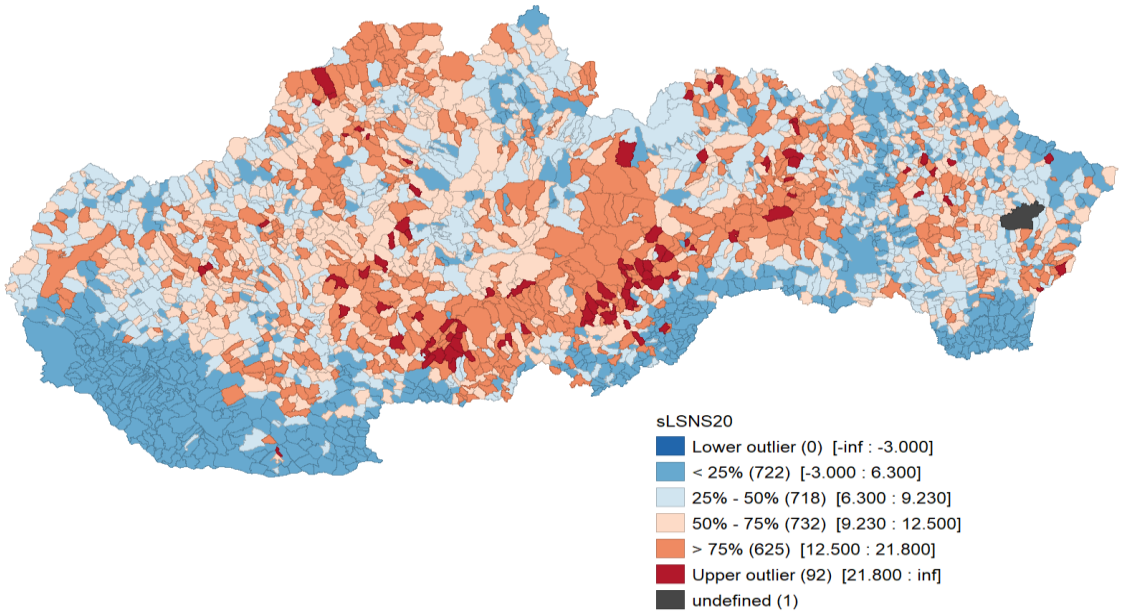


Source: author based SOSR

The map on Figure 2 displays the municipalities with the highest support for LSNS in red, and we have identified that these municipalities are primarily located in central Slovakia where LSNS has a strong voter base. This may be attributed to the fact that Marian Kotleba, the leader of LSNS, was formerly the governor of the Banská Bystrica self-governing region, and also targeted his campaign to this region. Conversely, the Bratislava region in western Slovakia (shown in blue on the map) had the lowest voter support for LSNS. One potential explanation for this phenomenon is that the western region of Slovakia has a high level of economic development and a significant spatial concentration of

individuals with tertiary education, as we will demonstrate in our later analysis. Conversely, the southern region of Slovakia has exhibited the lowest levels of support for LSNS, possibly due to the high representation of Hungarian minority groups in these areas. Additionally, some parts of eastern Slovakia have also demonstrated lower levels of support for LSNS. According to Kavecky's (2022) study, there was a shift in the spatial distribution of votes for LSNS in 2020 when compared to the 2016 election. This shift is attributed to the loss of voter support for SNS in 2020, which caused a change in the voter support for LSNS in western and central Slovakia, previously considered strongholds for SNS.

Figure 3: Spatial distribution of voter support for LSNS on the district level (share of valid votes in %)



Source: author, based on data from ŠÚSR

Figure 3 illustrates that the spatial distribution of voter support for LSNS is not uniform, implying that there may be underlying factors that shape the formation of voting patterns for the party. In addition to the existing studies presented, we aim to make a contribution by examining the spatial dimension of the relationship between educational attainment and voter support for LSNS.

4. THE AIM AND THE CONTENT OF THE THESIS

The aim of this dissertation thesis is to examine the relationship between tertiary education and voter support for LSNS in Slovak municipalities and analyze the spatial dimension of this relationship.

To achieve the primary objective, the following research questions were formulated:

1. *Is there a relationship between tertiary education and voter support for LSNS in Slovak municipalities?*
2. *Does this relationship possess spatial dimension?*

In order to achieve our primary objective, we establish the following secondary objectives:

1. To examine the theoretical foundations of the topic, with a specific focus on the neighborhood effect and its relationship to voting behavior through spatial social interactions. The objective also includes investigating the link between education and support for PRRP voters.
2. Analyze the spatial dimensions of changes in tertiary educational attainment, with a particular emphasis on the explanatory analysis.
3. Analyze the spatial distribution of voter support for PRRP in Slovakia.
4. To identify the most appropriate spatial econometric model to estimate the relationship between tertiary educational attainment and voter support for LSNS.

5. DATA

Our analysis will focus on examining the association between the proportion of tertiary educated population and the level of voter support for LSNS at the municipal level. To achieve this, we will utilize 2,890 observations. In Slovakia there is a presence of 2927 municipalities, which includes 17 urban areas in Bratislava and 22 urban areas in Kosice that have been aggregated into a one unit each for the respective cities in. This approach is intended to yield more comprehensive and reliable results within our analysis. The provided maps will display a black area in the east of Slovakia, which signifies missing data for the military district of Valáškovce.

Our dependent variable is share of votes for Ludova Strana Nase Slovensko (LSNS) and independent variables are – share of tertiary educated population, share of minority population, share of religious population, density of population, population aged 65+, the average internal migration balance of tertiary educated population, average wages and change of employment in tertiary sector. These variables were collected mostly from open access datasets – Statistical office of Slovakia and Population and Housing Census in 2021. We obtain data regarding the internal migration of tertiary educated population based on the official formal request addressed to Statistical office of Slovakia. We will describe the further motivation and description of variables in a following text.

Dependent variable – LSNS

In our work we will analyze PRRP Ludova Strana Nase Slovensko, which has currently parliamentary seats in Slovak parliament. In identifying the PRRP in Slovakia, we relied on the Chapel Hill 2020 Expert Survey (CHES) database as was described previously in the third chapter. This variable represents the share of votes for LSNS obtained in parliamentary elections in 2020 on municipality level.

Main explanatory variable of interest – share of the population with tertiary educational attainment.

Our variable of interest is share of the population with tertiary educational attainment, which we collected from Slovak Population Census 2021. We decided for educational attainment as indicator of tertiary education based on the literature. Using level of educational attainment is the most used within the studies (Eefje Steenvoorden & Eelco

Harteveld, 2018, Eelco Harteveld, Wouter Van Der Brug, Stefan Dahlberg & Andrej Kokkonen 2020).

Control variables

As voting turnout is highly correlated with the tertiary education, we included the voter turnout for parliamentary elections in 2020 as well. The plausible hypothesis based on empirical research is that highly educated are more likely to vote (Nie, Junn, & Stehlik-Barry, 1996; Dee, 2004; Tenn, 2007). Due to these reasons, we need to control for voting turnout in our model. The inclusion of the share of migrants in research of voter support for PRRP is important as it has been demonstrated that attitudes towards migration and minorities can heavily influence voting behavior. Previous research has identified such attitudes as strong predictors of support for far-right parties, such as PRRP (Rydgren and Ruth, 2013). Incorporating the share of religious persons in studies analyzing voter support is crucial, as religious convictions and values can have a noteworthy impact on shaping political attitudes and actions. Studies indicate that people who identify as religious tend to hold conservative values and may be more inclined to support political parties that align with those values. Furthermore, PRRP has gained the support of religious voters by promoting conservative values surrounding family traditions and opposing progressive social policies (Ivarsflaten, 2008). We have decided to include density as a variable based on the findings of Rodden (2019), which suggest a strong association between anti-system voting and low population density, highlighting its significant role. We are incorporating the older population in our research as studies have shown that age is a significant factor in shaping political attitudes. Older individuals are more likely to hold culturally conventional beliefs and may struggle to understand or adapt to immigration and economic change, leading to a stronger preference for culturally traditional values, promoted by PRRP (Coffé & Voorpostel's, 2010). Changes in the wages and in changes of employment in tertiary sector should reflect the regional changes that might regenerate discontent due to social inequalities. Internal migration of tertiary educated population is related to sorting effect as higher rates of sorting may have significantly results in certain degree of inequality within society (Florida, 2017). In this regard, inflow of tertiary educated to certain regions might be a catalyst for the regional growth. Favorably impacted regions might be considered as an improved population structure in terms of human capital. On the other hand, the loss of young, educated individuals in other regions may also be perceived as a loss of highly skilled

labor, which could be a barrier to the ongoing economic development of newly underdeveloped region, which can lead to persistent discontent (Florida, 2008). Additionally, increased sorting within a country can led to reduced redistribution, meaning that wealth and resources become concentrated in specific regions. Furthermore, the reduced exposure of individuals from diverse backgrounds to each other in highly segregated areas can reduce peer effects, limiting the potential for knowledge spillovers and innovation (Duncan & Murnane, 2011).

Figure 4: Description of dependent and independent variables

Variables	**Level of the aggregation**	**Description and expected relationship with the share of votes for LSNS (sign in brackets)**
sLSNS	LAU 2 (2,890 municipalities)	Share of valid votes for LSNS obtained in parliamentary elections in 2020
shighed	LAU 2 (2,890 municipalities)	Share of the population with tertiary education (-);
voter turnout	LAU 2 (2,890 municipalities)	Voting turnout in parliamentary election in 2002 (-);
minor	LAU 2 (2,890 municipalities)	Share of the population belonging to the national minority (-);
relig	LAU 2 (2,890 municipalities)	Share of religious population (-);
density	LAU 2 (2,890 municipalities)	log.population density (-);
spop65	LAU 2 (2,890 municipalities)	Share of population aged 65+ years (+);
Δ*wages*	LAU 1 (79 districts)	Average year-on-year change in average nominal wages 2009 – 2020 (-);
Δ*tertiary*	LAU 1 (79 districts)	Average year-on-year change of employment in the tertiary sector 2009 – 2020 (+);
avmigration	LAU 2 (2,890 municipalities)	Average balance (inflow – outflow on 1000 inhabitants) of internal migration of tertiary educated population 2009-2020 (-).

Source: author

We assume a negative significant effect of the share of population with a tertiary educational attainment in an observed municipality, but also in its neighborhood. Consistent with the literature, we hypothesize that voters based on the economic, cultural and political factors, will be able to recognize the drawbacks of a populist radical right getting a seat in parliament. Similarly, we suppose that someone with a tertiary degree can also impact the opinions of those around him if they perceive him as an informed political debater, in which case they will be persuaded to vote against the PRRP. In case of the share of minority population, we assume a negative effect on the voter support for the PRRP. Regarding the share of religious population, we assume positive relationship. In case of population density, we expect a negative effect on voter support for LSNS, i.e., more denser municipalities will be associated with lower support for LSNS. Population aged 65+ will be linked with a higher support for the LSNS, as this age group holds more traditional and conservative values. Regarding the change in average wages, we assume a positive relationship with the voter support for the LSNS. Change of employment in tertiary sector should have negative relationship with the voter support for the LSNS.

Figure 5: Descriptive statistic of variables

Variable	Level	Obs	Min	Max	Median	Mean	Std. Dev.
sLSNS	LAU 2	2890	0.00	52.632	9.23	9.777	5.581
shighed	LAU 2	2890	0.00	40	11.96	12.24	5.46
voter turnout	LAU 2	2890	22.273	98.543	67.00	65.24	10.02
minor	LAU 2	2890	0.00	97.47	5.18	17.28	25.48
relig	LAU 2	2890	11.16	100	86.34	83.77	11.90
density	LAU 2	2890	0.25	13078.26	59.50	115.14	390.19
spop65	LAU 2	2890	0.00	35.00	12.28	12.52	2.77
Δ*wages*	LAU 1	79	34.471	68.466	44.589	5.27	4.45
Δ*tertiary*	LAU1	79	-423,27	837.727	4.272	9.141	135.631
avmigration	LAU2	2890	-13.156	36.89	-0.368	0.10	2.841

Source: author

6. METHODOLOGICAL FOUNDATION

To begin our analysis, we will present descriptive statistics regarding the spatial dimensions of tertiary educational attainment. Our report will include information on the changes in the proportion of tertiary educated individuals and the changes in the concentration of this population between 1991 and 2021. Additionally, we will provide a cluster map that displays the spatial distribution differences of the tertiary-educated population. To further enhance our understanding, we will also present a map that shows change of employment within the tertiary sector and another map that displays the internal migration patterns of tertiary educated individuals per thousand inhabitants between 2009 and 2021.

After descriptive analysis we will continue with Ordinary Least Squares model (OLS), which is a statistical method used to estimate the relationship between a dependent variable and one or more independent variables, while it assumes linear relationship between these two or more. The OLS approach calculates the values of the slope coefficients that minimize the sum of squared differences between the predicted and observed values of the dependent variable, while taking into account certain assumptions about the error term (Wooldridge, 2010). Therefore, equation of our model can be written as:

$$yLSNS = \beta_0 + \beta_1 Eudcation + \beta_2 X + \varepsilon$$

When observations are gathered from points or regions placed in space, dependence between observations frequently results. Spatial regression models allow us to take this dependence into account (LeSage & Dominguez, 2012). Employing spatial regressions within analysis allow us to examine both direct and indirect spatial spillovers effect, that when are combined produce the total effect of changing the explanatory factors on the dependent variable. In empirical public choice research, this decomposition should be quite helpful (Lesage, 2012). Therefore, before proceeding with further analysis, we will test the residuals of the OLS model using Moran's I to confirm the presence of spatial correlation. In OLS regression model residuals refer to the difference between the observed values of the dependent variable and the values estimated by the regression equation. The presence of spatial autocorrelation in the residuals of an OLS model can be tested using Moran´s I statistic. Such testing is crucial because spatial autocorrelation violates one of the key assumption of OLS regression, namely that the errors are independent and identically

distributed. To conduct this test, our first step is to compute the residuals for each observation. Afterwards, the Moran's I statistic for the residuals will be computed. If the Moran's I statistic yields a significant positive or negative value, it implies that spatial autocorrelation is present in the residuals. When spatial autocorrelation is detected in the residuals of an OLS model, it suggests that the model does not account for some spatially structured variation in the dependent variable. In such cases, spatial regression models or spatially autoregressive models can be utilized to take into account the spatial structure of the data, leading to improved model performance and predictive power (Anselin,1988). We will broaden this analysis by using Local Indicators of Spatial Association (LISA analysis), which is statistical method used to detect spatial autocorrelation. Firstly, we will calculate a spatial weight matrix that specify the spatial relationship between observations – for that purpose we will use Queen contiguity. The results of conducting a LISA analysis for residuals produce a map illustrating the spatial distribution of high or low residual values, along with a scatterplot displaying the Moran's I statistic for each observation (Anselin, 2009).

The equation for Moran´s I statistic can be written as:

$$I = \frac{\sum_i \sum_j w_{ij} z_i . z_j / S_0}{\sum_i z_i^2 / n} \quad ;$$

where *i*, *j* are indexes for each observation in the dataset, z_i and z_j is value of the variable of interest for each observation, w_{ij} is spatial weight between observation *i* and *j*. S_0 is a sum of all spatial weights in the dataset. *N* is the total number of observations. The numerator of the equation calculates the sum of the product of the variable values for each observation and the spatial weight between that observation and all other observations. The denominator scales the numerator by dividing it by the sum of the squared values of the variable of interest, scaled by the total spatial weight in the dataset. If statistically significant spatial autocorrelation in residuals is identified, we will use various spatial regression models. Spatial regression models can help account for spatial dependence in the data and improve the accuracy of the model (Anselin, 1988). For this purpose, we will use spatial regression models that are described in the following text.

The Spatial Lag of X (SLX) model is a basic spatial econometric model that involves extending a linear regression model to include explanatory variables that are observed on

neighboring cross-sectional units. It is the simplest model in spatial econometrics and allows for flexible spatial spillover effects. Additionally, it is easy to parameterize the spatial weights matrix, denoted as W, which describes the spatial arrangement of units in the sample.

$$y = \beta_0 X + W\beta_1 X + \varepsilon;$$

where *y* is the dependent variable, *X* is a matrix of explanatory variables for the observed unit, β is a vector of coefficients, *W* is a spatial weights matrix, $\beta_1 X$ is the spatially lagged values of *X*, and ε is the error term. The SLX model extends the standard linear regression model by including the spatially lagged values of the explanatory variables, allowing for spatial spillover effects.

Spatial autoregressive model (SAR) is a regression model that incorporates spatial relationships among observations. In SAR models, dependent variable is expressed as a function of its own previous values (autoregressive term), the values of the dependent variable for neighboring observations (spatial lag term), and one or more independent variables. The spatial lag term present in a SAR model represents the notion that the value of a dependent variable for a particular observation can be impacted by the values of the dependent variable for neighboring observations. The intensity of this spatial relationship is conveyed by the spatial autoregressive coefficient *(p)*, which quantifies the extent to which values of the dependent variable in neighboring observations are associated. SAR models can be computed through maximum likelihood estimation or generalized method of moments. Nevertheless, like any statistical model, SAR models need to fulfill certain assumptions for the results to be dependable. These assumptions comprise the normality of errors, absence of spatial autocorrelation in the error term, and exogeneity of the independent variables (O'Sullivan, 2014). The equation of basic SAR model with one independent variable can be written as follows:

$$y = \rho W y + \beta X + \varepsilon;$$

where *y* is dependent variable, *X* is independent variable of interest, ρ is spatial autoregressive coefficient, which measures the degree of spatial dependence in the model, *W* is spatial weight matrix, which specifies the spatial relationships among observations, *B* is the coefficient of the independent variable and ε is the error term, which captures the

deviation of the dependent variable from the predicted values based on the independent variables and spatial relationships.

Spatial Error Model (SEM) is regression model that addresses the issue of spatial dependence in the error term. It models the dependent variable as a function of one or more independent variables, a spatial error term, and optionally a spatial lag term for the dependent variable. The spatial error term captures the unobserved spatial factors that affect the dependent variable but are not accounted for by the model´s independent variables. SEM model assumes that the spatial error term is random and normally distributed with zero mean and constant variance. The spatial error term is also assumed to be spatially autocorrelated, meaning that its value at one location is correlated with its value at neighboring locations. SEM model requires some assumptions that must be met. These assumptions include the normality of errors, no spatial autocorrelation in the error term, and exogeneity of the independent variables (LeSage, 2014).

$$y = X\beta + u,\ u = \lambda W u + \varepsilon;$$

where *y* is the dependent variable, *X* is the matrix of independent variables, β is the vector of coefficients for the independent variables, u is the error term, λ is the spatial autoregressive coefficient, *W* is the spatial weights matrix, and ε is the random error term.

As we believe that spatial interactions might impact a creation of opinions and beliefs, we utilize the approach introduced by LeSage (2008) to estimate spatial spillover effects. We describe the precise definition of this specification in the next section and graphical visualization can be found in Figure 6. LeSage (2008) defines spatial spillover as: *„a causal relationship between the r^{th} characteristic/action of the ith entity/agent (X_i^r) located at position i in space exerts a significant influence on the outcomes/decisions/actions (y_j) of an agent/entity located at position j. In the context of a spatial regression relationship where $y_{j,}$ j = 1,. . .., n is a vector of outcomes/decisions/actions of an agent/entity located in region/location j, and X is a matrix of k characteristics/actions of all n regions/entity/agents, a formal definition would be $\partial y_j / \partial(X_i^r) \neq 0$, which implies a spillover/impact from the r^{th} characteristic/action of region/agent/entity I that impacts the outcome/decision/action in region j".*

Consequently, spatial econometrics on the issue of spatial spillovers emphasize the need to distinguish between local and global spatial spillovers effects. In the case of local

spatial spillovers effects, we do not account for the presence of endogenous interaction and feedback reactions. Local spatial spillovers are characterized by connectives with direct neighbors that do not affect higher-order neighboring regions (neighbors of neighbors). Simply put, in the case of local spatial spillovers, if a change occurs in one region *i* this change will only affect the outcomes/ decision/ actions in the regions that are direct neighbors of region *i* and will not affect the region located on the opposite side of the country. In our analysis, this would represent a situation where the proportion of the population with a tertiary degree in the given municipality will only induce a change in the share of votes for the LSNS in municipalities that are direct neighbors of the observed municipality. The Local model - Spatial Durbin Error model is particularly useful for explaining the local aspects of spatial interactions and their influence on the formation of opinions and beliefs.

On contrary, for global spatial spillover effects, the key aspect is the presence of endogenous interactions and feedbacks. Endogenous interactions lead to a scenario where changes in one region/ agent/ entity led to a sequence of adjustments of all regions in the included sample and therefore new equilibrium state emerged. In case of global spatial spillovers, we account those spillovers occurs at the level – neighbors to the neighbors of the neighbors. That is at the level of higher-order neighboring regions – more distant regions. According to LeSage (2008) SDM model is superior out of all spatial regressions in a wide number of applied situations. Spatial Durbin Model can explain how these opinions and beliefs, which are formed through spatial interactions, are diffused.

Several specification approaches can be found in spatial econometrics that allow us to decide between the appropriate model to capture either local or global spatial spillover effects. In our work we follow the specification developed by LeSage (2008), which foresees the imposition of restrictions on the basic models of the Spatial Durbin Model (SDM) or the Spatial Durbin Error Model (SDEM) if certain assumptions are met. If we assume that a model for global spatial spillovers effects is more appropriate for our estimation – we account for endogenous interactions and feedback effects at the level of higher-order regions. The equation of SDM model is defined as:

$$y = \rho W y + \alpha \iota_n + X\beta + WX\beta_2 + \varepsilon$$

The SDM model includes spatial lag of the dependent variable (*Wy*) as well as explanatory variables (WX). Spatially lagged vector *Wy* is a linear combination of the values of the dependent variable observed in neighboring municipalities, as well as matrix of observed characteristic of the given region *X* and matrix of characteristics of neighboring regions (*WX*), which serves as an additional explanatory variable. The specification given above, in case of performing restrictions, implies the use of SLX, SAR, SEM and OLS model. The SDM model is simplified to the SLX model. The SDM specification is simplified to the special case of SAR if $\beta_2 = 0$. The restriction to the SEM model occurs if $\beta_2 = -\rho\beta$. Therefore, using SDM specification we assume that there is a presence of spatial spillovers in the voter support for LSNS, but this spatial spillover of the dependent variable is not only affected by the characteristics of given municipality but also by the characteristics of neighboring municipalities. In other words, SDM model will capture to which extent is the voting for LSNS associated with voting for LSNS in neighboring municipalities.

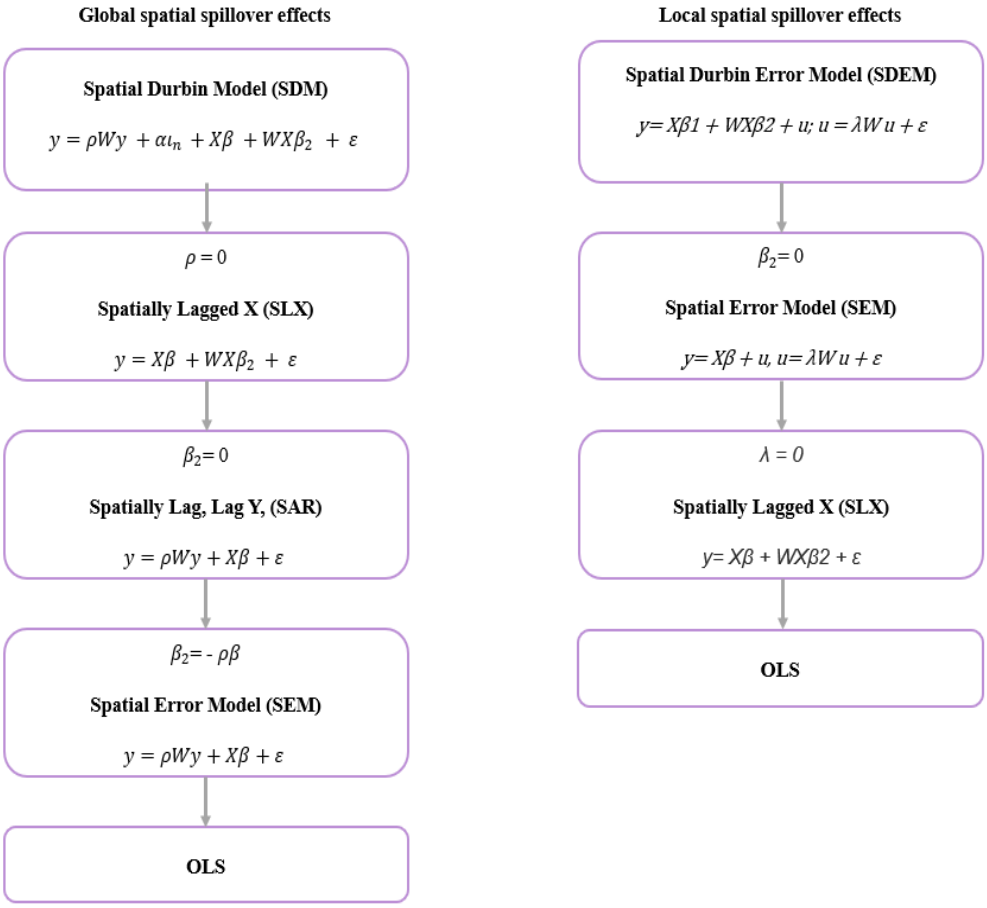
Spatial Durbin Error Model (SDEM) should be use in the case of local spatial spillovers:

$$y = X\beta 1 + WX\beta 2 + u;\ u = \lambda W u + \varepsilon$$

This specification subsumes the SLX and SEM model as special cases that are used when it is demonstrated that restrictions need to be made. If $\lambda = 0$ and no spatial dependence within the disturbances is demonstrated the SLX model is used. The SEM model specification will be used if $\beta 2 = 0$ and local spatial spillover effects are not present. If the case where $\lambda = 0$ and $\beta 2 = 0$ occurs, a simple non-spatial Ordinary Least Squares (OLS) model will be used. By using SDEM model we want to capture how tertiary educated population might have an effect on voting outcome for LSNS in an observed municipality, but also in neighboring municipalities. The use of SDEM model enables the identification of local spatial spillover effects that may be overlooked by conventional regression models. This enhances our comprehension of the determinants of voting patterns in a specific area.

In the modeling frameworks of Spatial Lag X Regression (SLX), Spatial Durbin Error Model (SDEM), and Spatial Durbin Model (SDM), the incorporation of spatially lagged variables is often necessary. Such variables are defined as those that encompass the values of a specific variable for adjacent spatial units, thereby providing a measurement of the spatial interdependence of observations within a given dataset (Rey & Anselin; 2010).

Figure 6: Specification for global and local model with the restrictions



Source: author based on LeSage (2008)

The likelihood ratio test is a statistical technique that enables the comparison of the goodness-of-fit between two models, where one of the models is a subset of the other. The basis of this test is the likelihood function, which measures the degree of suitability of the model to the data. The likelihood ratio test is utilized to assess the goodness of fit of two nested models, where one model is a simplified version of the other. This statistical test compares the likelihoods of the two models and determines whether the restricted model (which is less complex with fewer parameters) is the true model or if the unrestricted model (which is more complex with more parameters) is a better fit. The test statistic is computed by taking the ratio of the likelihoods of the two models. Chi-squared distribution with degrees of freedom equal to the difference in the number of parameters between the two models is used to assess statistical significance under the null hypothesis. If the likelihood ratio test statistic exceeds a critical value, the null hypothesis is rejected in favor of the alternative hypothesis, suggesting that the more complex model provides a better fit to the

data. In such a scenario, the increase in parameters in the more complex model is deemed worthwhile due to the enhancement in the data's fit. However, if the likelihood ratio test statistic falls below the critical value, then the null hypothesis cannot be rejected, and the simpler model is considered preferable (Kutner et al., 2005).

Considering this, we established our two null hypotheses:

$H_{0global}$: *Model SDM should be restricted to simpler model, e.g. SLX/SAR/SEM/OLS.*

H_{0local}: *Model SDEM should be restricted to simpler model, e.g.. SEM/SLX/OLS.*

In our analysis, we will provide the results of both global and local specification of spatial spillovers effects but based on the literature we decided to use as the best fit SDM model. Which we can rewrite as:

$$yLSNS = \rho Wy + \alpha\iota_n + \beta_1 Education + \beta_2 X + W\beta_3\ Eudcation + W\beta_4 X + \varepsilon$$

While ρWy represents the spatially lagged dependent variable – share of votes for LSNS. The spatial lag is captured by the spatial weight matrix *W*, which determines how strongly each observation is related to its neighbors. The spatial autoregressive coefficient ρ measures the strength of spatial dependence in the model, by specifying how much the value of $yLSNS$ for an observation is influenced by the values of $yLSNS$ for its neighbors. In terms of spatial spillovers, the spatial autoregressive coefficient ρ in the SDM model measures the extent to which spatial spillovers occur in the dependent variable $yLSNS$. When ρ is positive, it indicates the presence of spatial spillovers where high values of y are likely to occur in cluster together in space. The strength of the spatial spillover effected is reflected by the magnitude of ρ with larger absolute values indicating stronger spillovers. A coefficient value of zero implies that there are no spatial spillovers in the model, indicating that the value of y for an observation is not affected by the values of y for neighboring municipalities. The term $\alpha\iota_n$ represents the individual-specific fixed effects, which capture unobserved characteristics that are constant over time and space but vary across individuals. These fixed effects could represent for example differenced in cultural norms or political preferences that are specific to certain regions or groups of people. Term $\beta_1 Education$ represents the effect of explanatory variable – share of population with tertiary education on dependent variable $yLSNS$. This coefficient measures how much $yLSNS$ changes in response to changes in the share of tertiary educated population, holding all other control variables constant. A positive

value of β would indicate that higher levels of the share of tertiary educated population. $W\beta_3\ Eudcation$ represents the spatial lag of share of tertiary educated population. This part of equation incorporates the concept that levels of tertiary educational attainment in a particular municipality could be influenced by levels of tertiary educational attainment in neighboring municipalities. The spatial lag coefficient $W\beta_3\ Eudcation$ quantifies the degree of this spatial dependence by indicating the extent to which tertiary educational attainment levels for a given municipality are influenced by educational attainment levels in its neighboring municipalities. Error term is represented by ε, which captures all unobserved factors that influence dependent variable $yLSNS$ but are not captured by the other terms in the model. The error term is assumed to be normally distributed, with mean zero and constant variance. It represents the residual variation in the dependent variable that is not accounted for by the other terms in the model.

Based on assumptions provided in the literature, we might assume that the certain level of tertiary educated population within a particular municipality has an impact on the support for the PRRP not only within that municipality and its immediate neighbors, but also in other non-neighboring villages. However, this impact decreases as the distance from the municipality increases. Simply put, what we will try to capture is if the share of votes for LSNS of one municipality depends on the share of votes for LSNS in neighboring municipality while controlling for our main variable of interest – tertiary educational attainment. We also control for other variables that are linked to contextual factors based on the literature.

In spatial analysis, spatial weight matrices are utilized for capturing the spatial associations among observations by defining the weights or links between pairs of observations, which could be based on spatial criteria such as contiguity, distance, or network connections (Sage & Pace, 2009). In this analysis we define neighborhood as the set of municipalities that are directly adjacent and share a common border. Queen contiguity was chosen as the weight matrix as it is subsumed by contiguity weights and defines neighbors as spatial units sharing a common edge or a common vertex. We focus our analysis at the municipality level, which is the smallest unit of analysis that we can study based on the availability and aggregation of data. The rook criterion only accounts for the presence of a common edge between two spatial units, whereas queen contiguity accounts for both common edges and vertices. We believe that the more suitable weight is queen contiguity,

as individuals can cross borders of their municipality from different points and may commute to every single neighboring municipality, even if one's municipality only shares a vertex with the neighboring municipality. We also considered other spatial weights, such as the selection of the nearest four neighbors and the inverse distance weight but assumed that social connections between people are not restricted to the closest four neighbors and people can travel from the observed municipality to any nearby municipality, no matter how far away, and vice versa. This choice of weight matrix and unit of analysis allows us to capture the full extent of spatial connections and dependencies among municipalities (Anselin, 1992). Nonetheless, we will test the robustness of our main model by using different spatial weight matrix as described below.

To conduct this analysis, we use different packages in RStudio. To be able to load and manipulate with our geospatial data in the format of shapefile we used *rgdal* package and *sf* package. To build spatial weight matrices we use *spdep* package. The *spdep* package offers a variety of functions for creating spatial weight matrices using methods such as distance-based, contiguity-based, and kernel-based approaches. Additionally, the package provides tools for computing various spatial statistics and performing spatial regression analysis. In this package we constructed queen contiguity and inverse distance weight for k-nearest neighbors. For spatial regression we used package called *spatialreg.* We used this package for estimating spatial regression models – SDM, SDEM, SAR, SEM, SLX model .

We will perform several tests to assess the robustness of our primary SDM model. First, we will test the residuals using Moran's I statistics, and then exclude the Bratislava region to determine if the results are not primarily driven by the "Bratislava effect". We will then test the residuals of the adjusted model using Moran's I statistics. Additionally, we will add a control variable, internal migration of tertiary educated population, to the primary model control for the sorting effect. In accordance with our research methodology, we intend to incorporate different spatial weight matrix, in addition to the widely used Queen contiguity matrix. Previous studies suggest that it is advantageous to conduct sensitivity analyses of the model using diverse spatial weight matrices. Hence, we aim to test the robustness of the primary model results (SDM) by utilizing the inverse distance weight matrix for k-nearest neighbors. More specifically, we plan to construct this weight matrix based on the four nearest neighbors of each observation. This approach assigns weights to neighboring observations proportionally to their Euclidean distance from the focal

observation, where nearer neighbors receive higher weights. The inverse distance weight matrix is believed to capture spatial relationships and patterns in the data that might not be apparent in the Queen contiguity matrix. Therefore, utilizing the inverse distance weight matrix might offer additional insights and improve the precision of the model.

6.1 Challenges and Limitations of Methodology: Implications for Interpretation of Results

Ecological fallacy can be defined in accordance with Jargowsky (2005) as: *„ecological fallacy exists if it is assumed that relationships observed at an aggregated level imply that the same relationships exist at the individual level"*. In other words, inferences about individual-level relationships are made based on aggregate data. This practice may be problematic as individuals within a group can possess unique attributes or behaviors that deviate from those of the group, resulting in distorted estimates of the association between variables. We took this limitation in account, and we are aware that positive spillover effects based on aggregate municipal voter results can only be an indicator of the operation of these channels, not proof of their presence, as the demonstration of causal effects would require comprehensive information on people and their social networks. Therefore, we were extra cautious when drawing the conclusions, with the focus on interpreting this relationship on the municipality level rather than individual level. At this point we would like to point out to the research study by Kramer (1983), who stated that individual-level cross-sectional estimates of the effects of welfare changes on voting are prone to significant bias and may not accurately reflect the true behavioral parameters of interest. In the contrary, an aggregate-level time-series analysis can provide relatively better estimates of the underlying individual-level effects. Therefore, in this scenario, it is more appropriate to investigate individual behavior using aggregate-level data instead of individual-level data. Kim et al. (2003) stated that using aggregated data on the municipality level is not causing such problem with ecological fallacy as we still use small spatial units.

Cross-sectional models pose a challenge when it comes to estimating the factors that impact voter support for populist radical right parties, especially when compared to panel models. The main issue with cross-sectional model is that it offers only a momentary view of individuals at a specific point in time, making it challenging to account for unobserved heterogeneity, which in turn can lead to biased estimates of the association between independent variables and the outcome variable. In the case of our analysis, it may be

difficult to determine whether the identified relationship between tertiary educational attainment and voter support for PRRP is due to actual effect of education od political attitudes, or whether is it due to other factors such as regional differences or historical factors, that we not included in our analysis. In contrast, panel models enable the tracking of the same aggregated data over time and facilitate the examination of the relationship between changes in tertiary educational attainment and changes in voter support for populist radical right parties, while controlling for other time-varying and time-invariant factors that may influence both variables. This methodology mitigates the risk of omitted variable bias, which may arise when significant variables that affect both education and voter support for populist radical right parties are not accounted for in the model (Wooldridge, 2010). Additionally, panel models can be used to examine the causal relationship between education and voter support for populist radical right parties, whereas cross-sectional models can only provide associations. Overall, panel models might provide a more rigorous and nuanced approach to understanding the relationship between education and voter support for populist radical right parties, while controlling for other relevant factors over time. On the other hand, we believe that the same relationship would be true while using panel data model.

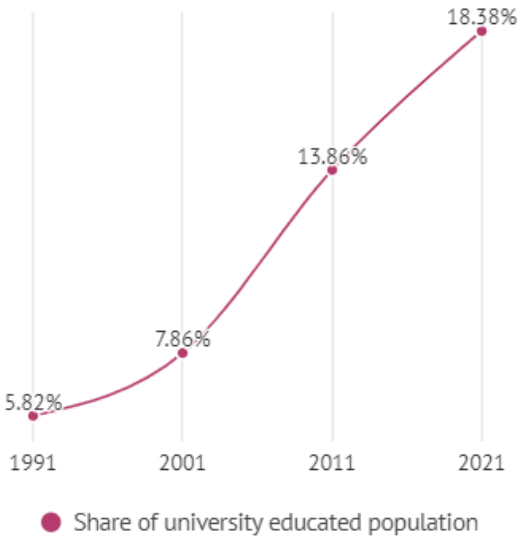
Regarding the choice of our dependent variable, although the LSNS parliamentary caucus has been dissolved due to its leader's public expression of sympathy for the Nazi regime, the authors do not consider this a limitation as their focus is on the demand side of PRRP. Other newly established political parties in Slovakia, such as the Republic Movement and Život NS, may replace the LSNS in the next election period. In conclusion, it should be noted that the political landscape is not static but rather dynamic, meaning that a political party that was considered mainstream in the past may become a PRRP in the present due to internal and external factors (van Leeuwen & Vega, 2021). While we acknowledge these potential changes in party ideologies, we do not view them as a limitation to our research, as our focus is on identifying the regional contextual factors and citizen dissatisfaction that drive demand for PRRP. Therefore, we assume a certain degree of stability and consistency in the conditions that fuel demand for PRRP. This suggests that even with the recent dissolution of the parliamentary caucus of the LSNS, their voter base may simply shift to another PRRP, and the underlying reasons for their anti-system attitudes will not disappear.

7. RESULTS

7.1 Spatial aspects of changes in tertiary educational attainment

Over the last 30 years educational structure in tertiary education has undergone significant changes in Slovakia (Šprocha, 2011; Rafaj & Kuběnková, 2022). Slovakia has witnessed the change in educational structure in terms of growing demand for education, which has been reflected in an increasing proportion of the population with a tertiary educational attainment. The most significant changes can be noted between 2001 and 2011, where according to public census data there was a 6-percentage point increase in the proportion of the population with a tertiary educational attainment. This development can be attributed to the twofold explanation. Firstly, it seems that increase in providers of tertiary education institutions plays an important role in expanding opportunities to acquire tertiary education. Secondly, explanation lies in the changed perception of the need to attain this level of education related to the structural changes of the Slovak economy (Šprocha, 2011).

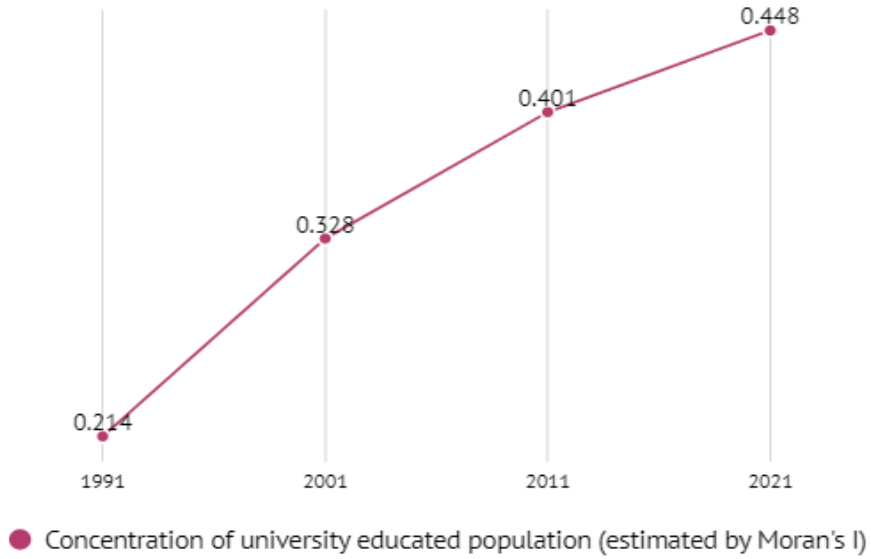
Figure 7: Share of tertiary educated population between 1991-2021



Source: author based on the results from SOSR

Šprocha (2011) in his study identified, that regions characterized by above-average educational structure have gradually emerged as well as areas with high representation of the share of the lowest educational levels. These changes might be linked to internal migration of the population with various levels of education.

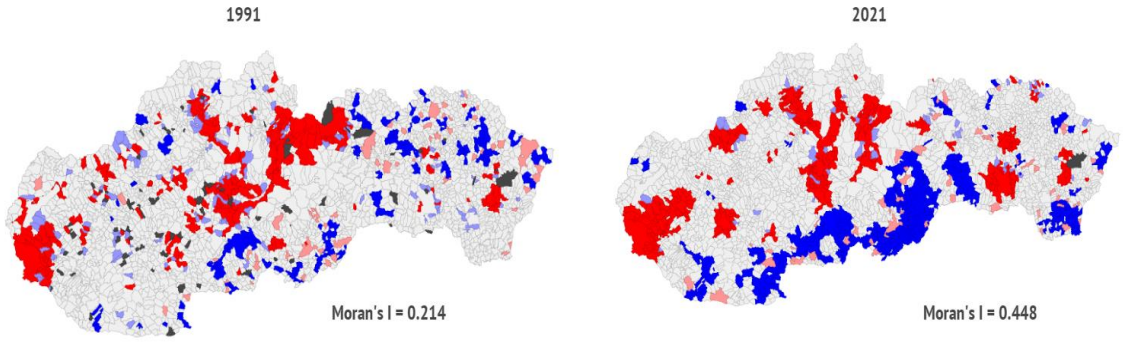
Figure 8: Changes in concentration of the tertiary educated population in Slovak municipalities between 1991 and 2021



Source: author based on the results from ŠÚSR

The increase in educational attainment has been spatially very diverse and has created clusters with a high proportion of residents with tertiary educational attainment (in and around cities) and clusters with a low proportion of residents with tertiary educational attainment, especially in rural localities with a higher representation of ethnic minorities and more economically backward regions.

Figure 9: Cluster map of the tertiary-educated population in Slovak municipalities between 1991 and 2021



Source: author based on the results from SOSR

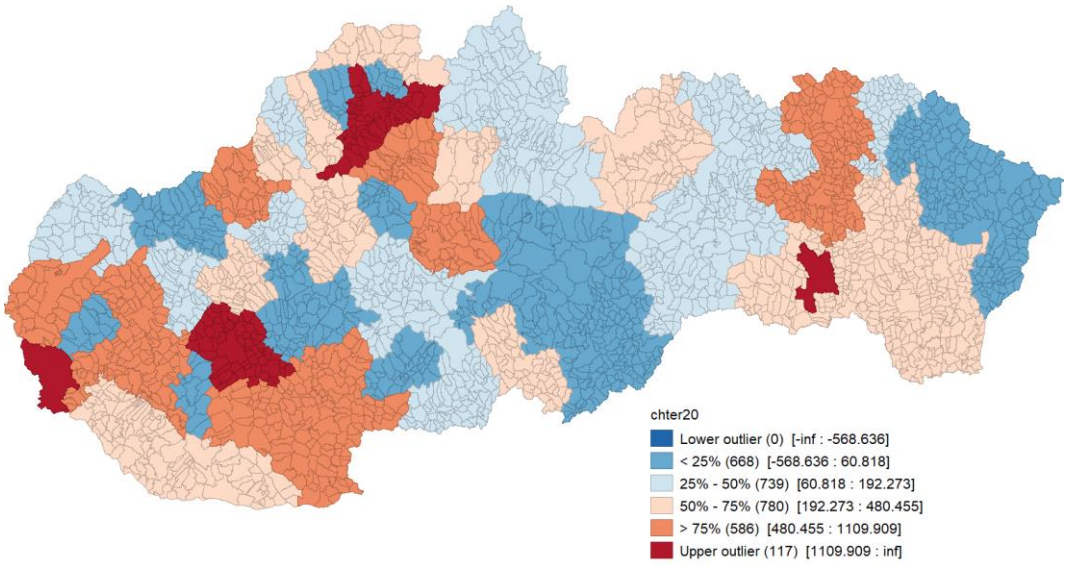
Upon examining the LISA cluster map, it becomes evident that in 1991, the population of tertiary educated individuals was spread more evenly across the country. In 2021, distinct clusters emerge that demonstrate the spatial concentration of the tertiary-educated population. The increased spatial concentration of tertiary educated people in the area is also indicated by Moran's I, which is higher for 2021, but we also capture an increase between census years. This trend suggests increasing spatial autocorrelation of the tertiary educated population. From the spatial perspective Rafaj & Kuběnková (2022) identified the same significant structural change in the stock of tertiary educated population between 1991 and 2021, but their focus is oriented on the spatial perspective of this change. In terms of absolute numbers, the most tertiary educated population can be found in regional and provincial cities, but on the other hand rural regions on the south and east of Slovakia lack the share of tertiary educated population. This can be caused by location of universities in larger agglomerations of Slovakia as well as by attractiveness of these cities for tertiary graduates.

Spatial regional development of Slovakia was mainly influenced by globalization Korec, 2014). After opening the borders of Slovakia, foreign companies invested in places with the potential of maximizing their own profits. In this context, the winners were the places that had adequate and easily accessible infrastructure and a skilled workforce. Bratislava was and is one such place - center of administration a research and development as well as financial center with favorable geographical location to other important capital cities – Vienna and Budapest (Kakaš & Gruber, 2016). Therefore, it is not surprising that SARIO (2013) reported over 68% of foreign direct investment (FDI) in Slovakia was directed towards the Bratislava region in 2010. In contrast, the southern and eastern regions of Slovakia have been chronically lagging regions (Korec, 2014). These regions are characterized by high unemployment rates, low productivity, and limited accessibility to local centers with weak economic performance. The increasing spatial concentration between the underdeveloped regions and the few developing regions has resulted in deepening inequalities (Kakaš & Gruber, 2016).

The tertiary sector is currently one of the main areas of economic growth in Slovakia (OECD, 2021). The most significant increase of employment in tertiary sector employment has been recorded in the capital city of Bratislava and some larger surrounding cities, such

as Pezinok, Senec, Šamorín, and Stupava. Similar trends can also be seen in other regions, such as the Nitra, Žilina, and Košice regions as we can see on the Figure 10 in a red color. On the other hand, in many smaller towns and rural areas of Slovakia, the employment of tertiary sector is still weak and underdeveloped. These regions are often affected by population decline and worsening economic conditions, which are related to a lack of job opportunities and insufficient development of the tertiary sector.

Figure 10: Change of employment in tertiary sector between 2009 - 2021



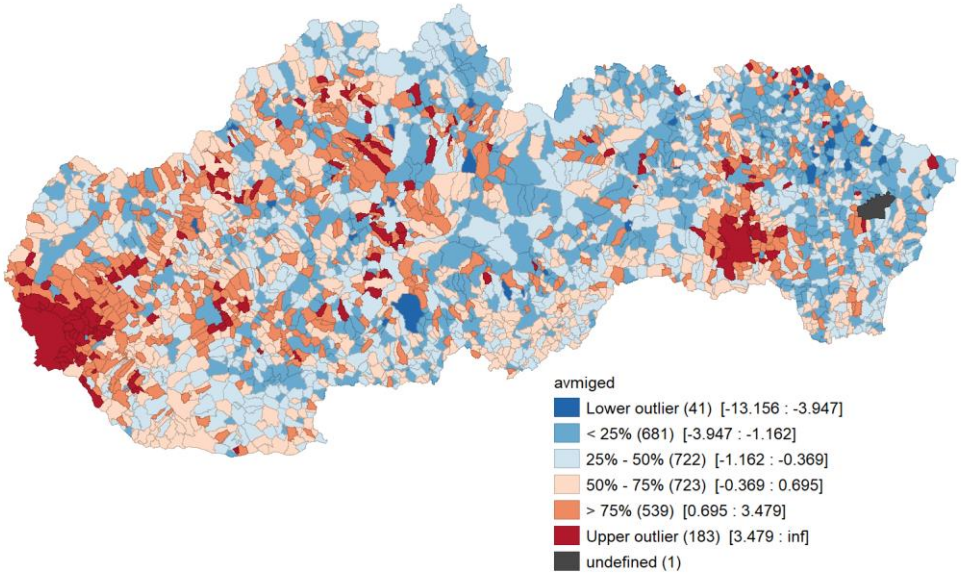
Source: author, based

Typically, migration is seen as a phenomenon contributing to spatial redistribution of population. However, due to its selective nature, migration may result in significant changes in population structure in addition to changes in population size. In terms of internal migration of tertiary educated population data shows that there is a process of moving to larger agglomerations, whilst the most dominant one is – Bratislava and Košice region. Contrary, the east - northern part of Slovakia suffered from significant outflow of tertiary educated population between 2009-2021. Literature on migration of tertiary educated population suggests that migration of tertiary educated population is driven by attractiveness of labor markets for graduates (Venhorsrt, Van Dijk, & Van Wissen, 2010). Considering the developments in Slovakia, it can be postulated that the migration of individuals with tertiary education may be attributed to the expansion of employment opportunities in the tertiary

sector. The other factor that might stimulate this structural change is a providing a better amenities that would motivate tertiary educated population move from the place of origin.

Slovakia is a country, which is economically polarized into the developed west of the country, while east of Slovakia is lagging behind. What studies and our data imply is that over the last years migration at regional level has significantly contributed to the tertiary educated population outflow from central and eastern regions to the south-west as can be also seen on Figure 11. Overall, the data indicated that the concentration of tertiary educated individuals in the region containing Slovakia's capital and largest city is the primary driver of urban growth in Slovakia.

Figure 11: Internal migration of tertiary educated population per thousand inhabitants 2009-2021



Source: author based on SOSR

7.2 OLS model

What we can see from the results provided in the non-spatial regression is that our main explanatory variable share of tertiary educated population is significant and negative. While other independent variables are significant as well, except the case of voter turnout

and the share of population aged 65+. Among the independent variables srelig21, sminor21 and population density are statistically significant and negatively associated to the share of votes for LSNS. This indicated that higher level in these independent variables is associated with a lower level in the share of votes for LSNS. On the other hand, avchaw20 and chteru20 are statistically significant and positively related to the dependent variable. This suggest that an increase in these independent variables is associated with an increase in the share of votes for LSNS. Finally, the adjusted R-squared value of 0.266 means that approximately 26.6% of the variance in the dependent variable can be explained by the independent variables in the model.

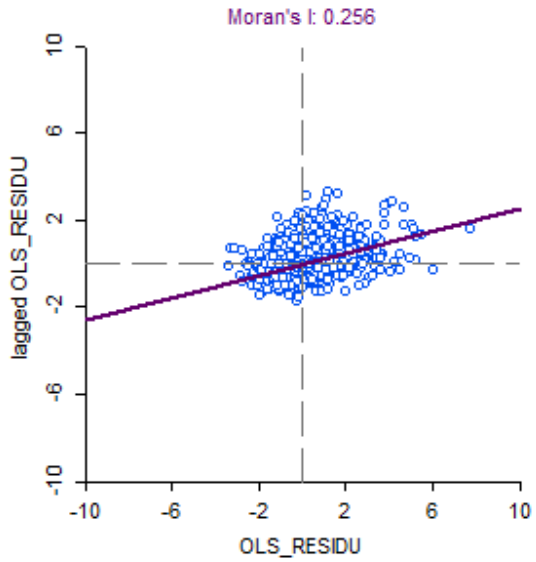
Figure 12: The results of OLS model

	OLS (1)
voter turnout	0.008
	(0.012)
relig	-0.0381***
	(0.008)
minor	-0.1046***
	(0.004)
shighed	-0.2255***
	(0.024)
density	-0.9557***
	(0.108)
population65+	-0.0203
	(0.021)
Δwages	0.0631***
	(0.019)
Δtertiary	-0.0022***
	(0.001)
R^2	0.2722

Source: author

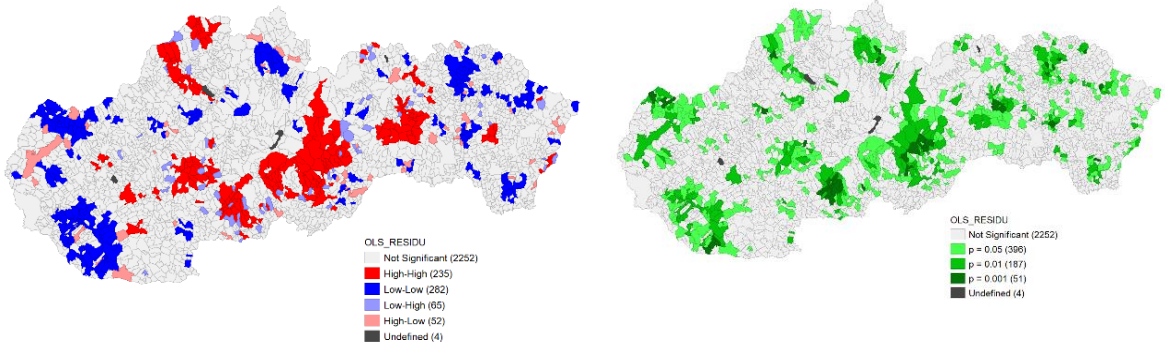
In the following text we will provide the results of LISA analysis and tests for spatial autocorrelation for residuals of OLS model presented in the Figure 13.

Figure 13: Univariate local analysis for Moran´s I for share of votes



LISA Cluster Map

LISA Significance map



Source: SOSR, author´s creation in GeoDa

The value of Moran´s I is positive, which clearly indicates that there is a positive spatial autocorrelation in residuals between municipalities. Moran´s I on the level of 0.256 suggests that there is a moderate level of positive spatial autocorrelation in the residuals of the OLS model, indicating that neighboring observations tend to have similar residual values. This may indicate the presence of spatially correlated omitted variables or spatially varying coefficients in the model, which may have implications for the reliability of the OLS estimates and the validity of the model assumptions (Bivand, 2013). The p-value for 999 permutations is significant, which suggest that there is spatial autocorrelation in the residuals

of the model. In other words, there is non-random pattern in the residuals that can be explained by the spatial relationships between the observations. This can imply that spatial structure in data is not being fully considered by the OLS model and that it might be necessary to incorporate a spatial regression model.

The LISA cluster map represents four quartiles that can be found in the Moran´s scatterplot, with each quadrant expressing either positive spatial autocorrelation (referred to as high-high and low-low spatial autocorrelation). These clusters are referred to as "hot spots" or "cold spots," respectively. We can see that hotspot of similar residuals values where mostly located in the central Slovakia. While cold spots of lower level of similar residual values were located on the west and east of Slovakia.

On contrary, the left upper quadrant and the right lower quadrant refer to negative spatial autocorrelation (denoted as high-low and low-high spatial autocorrelation). These clusters are referred to as "outliers" or „spatial discordances". We observe that the locations of negative spatial autocorrelation are evenly dispersed but in lower levels compared to positive spatial autocorrelation.

The LISA significance map in our case starts at p-value = 0.05 and shows all significance categories that are meaningful for a given number of permutations, in our model it was 999 permutations. The significance map shows us that the most significant relationship (p = 0.01) of spatial autocorrelation (the darkest green) is found in 57 municipalities that are located in various parts of Slovakia. However, on the map we can also indicate non-significant areas (grey color), which stands for the case of nonspatial autocorrelation. We confirm based on the significance of Local Moran´s I the need to include spatial regression models.

7.3 Spatial regression models

The outcomes of our primary model, which comprise all the spatial regression models, are depicted in Figure 14. The results of SLX model suggest in terms of our main explanatory variable that higher level in population with a tertiary education is associated with a lower level in the share of votes for LSNS. This result is statistically significant. In terms of spatially lagged variable of tertiary educated population we can observe negative sign of the coefficient, which indicates that the relationship is negative. That means that

higher level of share of tertiary educated population in neighboring municipalities is associated with lower level of votes for LSNS in a given municipality.

Figure 14: Results from spatial regression models 2-6

	OLS (1)	**SLX (2)**	**SAR (3)**	**SEM (4)**	**SDEM (5)**	**SDM (6)**
voter turnout	0.008	0.0188	0.0152	0.0230	0.0158	0.0196
	(0.012)	(0.014)	(0.011)	(0.012)	(0.012)	(0.013)
relig	-0.0381***	-0.0216**	-0.0228***	-0.0221***	-0.0224***	-0.0181***
	(0.008)	(0.010)	(0.007)	(0.008)	(0.008)	(0.009)
minor	-0.1046***	-0.0554***	-0.0593***	-0.0607***	-0.0558****	-0.0452***
	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.005)
shighed	-0.2255***	-0.1616***	-0.1557***	-0.1608***	-0.1652***	-0.1480***
	(0.024)	(0.024)	(0.021)	(0.022)	(0.022)	(0.023)
density	-0.9557***	-0.6940***	-0.6373***	-0.7813***	-0.7320***	-0.7043***
	(0.108)	(0.128)	(0.096)	(0.112)	(0.113)	(0.117)
population65+	-0.0203	-0.0201	-0.0248	-0.0250	-0.0186	-0.0211
	(0.021)	(0.023)	(0.019)	(0.019)	(0.020)	(0.021)
∆wages	0.0631***	0.0256	0.0301	0.0621***	0.0304	0.0219
	(0.019)	(0.045)	(0.016)	(0.027)	(0.038)	(0.041)
∆tertiary	-0.0022***	-0.0012	-0.001	-0.0018	-0.0015	-0.0012
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
lag.voter turnout		-0.0506*			-0.0299	-0.0367
		(0.022)			(0.025)	(0.020)
lag. relig		-0.0397***			-0.0336***	-0.0153
		(0.013)			(0.015)	(0.012)
lag. minor		-0.0971***			-0.0854***	-0.0375***
		(0.007)			(0.007)	(0.007)
lag.shighed		-0.1996***			-0.1546***	-0.0512
		(0.044)			(0.048)	(0.040)
lag. density		-0.1653			-0.1064	0.2783
		(0.196)			(0.221)	(0.181)
lag. population65+		0.0129			0.0040	0.0156
		(0.039)			(0.045)	(0.035)
lag.∆wages		0.02542			0.0160	0.0028
		(0.052)			(0.051)	(0.048)
lag.∆tertiary		-0.0006			-0.0004	0.0002
		(0.001)			(0.001)	(0.002)
R^2	0.2722	0.3218				
Rho			0.522***			0.476***
Lambda				0.560***	0.476***	
Log-likelihood			-8316.709	-8372.31	-8308.063	-8298.097

Source: author

A statistically significant coefficient indicates that there is a significant relationship between these two variables. In case of control variables – coefficient of voter turnout is on

the level 0.0189 suggesting, that increase in voter turnout is associated with a slight increase in the share of votes for LSNS, but this result is not statistically significant. The coefficient for srelig21 (-0.0216) suggests that higher level of the share of religious population is associated with a lower level of share of votes for LSNS. This result is statistically significant. Coefficient for minor21 (-0.5554) suggests that higher level of share of minority population is associated with a lower level of the share of votes for LSNS, which is also statistically significant. Higher level of the population density is associated with a lower level of the share of votes for LSNS. This result is statistically significant. Increase in the share of population that is older than 65, increase in the average wages and increase in the change of employment in tertiary sector is not associated with statistically significant change in the share of votes. Higher level of voter turnout, share of religious population and share of minority population in neighboring municipalities is associated with a lower level of votes for LSNS in observed municipality. Contrary, spatial lag of population density, change of employment in tertiary sector, average wages and share of population aged 65+ are not statistically significant. The R-squared value of 0.3256 indicates that SLX model explains about 33% of the variation in the dependent variable.

The results of SAR model regarding our main explanatory variable indicate that higher level of the tertiary educated population (-0.1557) is associated with lower level of the share of votes for LSNS. Since the coefficient is statistically significant, with a p-value < 0.05, we can conclude that the relationship between the share of population with tertiary educational attainment and the share of votes for LSNS is unlikely to have occurred by chance, and that the effect is likely to be a true relationship. Increase in voter turnout (0.0152) , average wages (0.0301), change of employment in tertiary sector (-0.001), and population aged 65+ (-0.0248) is not statistically significant regarding the relationship with dependent variable. In the case of SAR model, the estimated Rho value is 0.52257, which means that the dependent variable is positively correlated with its spatial lag (the weighted average of its neighboring values).

The results of SEM indicated negative relationship between tertiary educated population and share of votes for LSNS, indicating that higher level of the share of tertiary educated population is associated with the lower level of the share of votes for LSNS. Voter turnout, change of employment in tertiary sector and population aged 65+ years are not statistically significant. Higher levels of share of religious population, share of minority

population, population density is associated with lower level of share of votes and these relationships are statistically significant. Increase in average wages is associated with increase in share of votes for LSNS. This relationship is statistically significant. The coefficient value of Lamba of 0.560 indicates a moderate to strong relationship between the latent variable and the measured variable. It means that a one-unit increase in the latent variable would result in a 0.560 unit increase in the measured variable.

In case of SDEM model, the higher share of tertiary educated population is associated with lower level of the share of votes. This relationship is significant. In case of spatial lag, the coefficient representing share of tertiary educated population is statistically significant. The Lambda coefficient (0.4765) is statistically significant and indicated the presence of spatial autocorrelation in the error term of the model. The significant and negative spatial lag effect indicates that the concentration of tertiary educated individuals in the neighboring municipalities could potentially influence the voting behavior in the given municipality, leading to a lower level in support for the LSNS party. The coefficient for the share of minority population, share of religious population and density population are statistically significant and negatively associated with the share of votes for LSNS. This suggest that municipalities with a higher proportion of minority population, religious population and population density are linked with a lower level of support for LSNS. Other coefficient of control variables – voter turnout, average wages and change of employment in tertiary sector are not significant. The spatial lag of the share of minority population and the share of religious population is negative and statistically significant implying that increase of religious population and/ or minority population in the neighboring municipalities is linked with lower levels of support for LSNS in the observed municipality. The lambda coefficient (0.47655) is statistically significant and indicates the presence of spatial autocorrelation in the error term of the model. This means that the residuals are not independent and identically distributed.

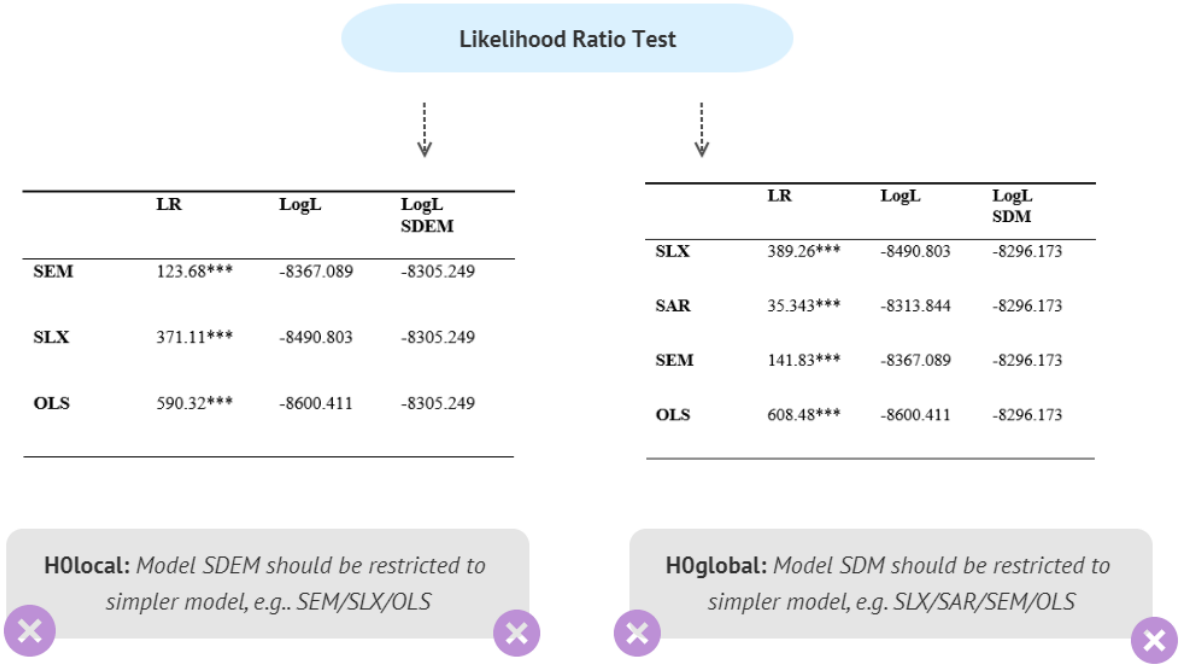
While we should avoid interpreting the primary results effects of SDM model based on the literature. What we can interpret from the Figure 14 is the spatial autoregressive coefficient Rho which reflects how much the value of the dependent variable in one location is influenced by the values of dependent variable in neighboring locations. Rho coefficient is statically significant, which suggests that there is spatial dependence in the share of votes for LSNS even after controlling for the other independent variables in the model. More

specifically, it means that municipalities that are closer together tend to have more similar voting outcomes in case of LSNS, even after controlling for other independent variables in the model. The positiveness of Rho coefficient on the level of 0.476 indicates that the value of share of votes for LSNS tend to be similar in neighboring municipalities.

Out of all the models provided the magnitude of coefficient in the case of OLS is the largest at the level of -0.185. The lowest magnitude of coefficient – the share of tertiary education can be observed in the case of SDM model. The association of the share of tertiary educated population with the share of votes for LSNS stays significant and negative throughout all the models included except for its spatially lagged version in case of the SDM model, where it is insignificant. What we can observe is that this not holds true for all the other explanatory variables. We can see that significance of independent variables dramatically changes when accounting for spatial models. This can prove that if there is a presence of spatial dependence using non-spatial model can cause biased or inefficient estimations. Comparing OLS model and SLX model, we can see that the value of Adjusted R-squared is much larger that in case of OLS, meaning that 32 % of the variance of our dependent variable can be explained by the variance of included independent variables compared to 27% variance of non-spatial OLS model. Based on the results of Log-likelihood we will focus only on the interpretation of global SDM model and its direct and indirect effects. Typically, a model with a higher log-likelihood is considered to be superior. The log-likelihood measures how well the model fits the data, so a higher log-likelihood suggests that the model is a better fit for the data (Gelman, 2007). In this regard SDM with Log-likelihood on the level of -8298.097 seems to be superior.

To ensure the suitability of both global and local models, Likelihood ratio tests must be conducted to accept or reject our null hypotheses for each model. By examining the results in Figure 14, we can determine whether it is necessary to simplify ourmodels, spec ifically the SDM and SDEM. It is evident that simplification is not required for either model as the values of Likelihod Ratio (LR) for all simplification types in both models are statistically significant, indicating the rejection of our null hypotheses.

Figure 15: Results for Likelihood Ratio Test



Source: author

Based on the significant results of Likelihood ratio test presented in Figure 15 we can reject both of our null hypotheses in the case of local and global specification. Therefore, we can conclude that full model of SDEM or SDM model provides a better fit than the restricted simpler models. Based on the comparison of overall likelihood ratios provided, we can also conclude that SDM model would be a superior model in general. Therefore, we will provide the results of direct, indirect, and total effects of SDM model, as well as interpretation of these effects in the following part.

Figure 16: The direct, indirect, and total effects of SDM model

SDM	Direct effects	Indirect effects	Total
Voter turnout	0.0168	-0.0494	-0.0326
	0.0129	0.0332	0.0335
Share of religious population	-0.0206***	-0.0434***	-0.0641***
	0.0092	0.0188	0.0193
Share of minority population	-0.0514***	-0.1069***	-0.1583***
	0.0046	0.0092	0.0094
Share of population with tertiary education	-0.1607***	-0.2202***	-0.3809***
	0.0232	0.0709	0.0764
Density of population	-0.7103***	-0.1041	-0.8145***
	0.1146	0.3059	0.3083
Share of population aged 65+ year	-0.0205	0.0100	-0.0105
	0.0213	0.0619	0.0671
Change in average wages	0.0233	0.0241	0.0475

	0.0379	0.0567	0.0407
Change of employment in tertiary sector	-0.0013	-0.0005	-0.0018
	0.0015	0.0021	0.0014

Source: author

Looking at the Figure 16 of the effects of SDM we can see that direct effect of tertiary education is -0.1607, meaning that municipality with higher share of population tertiary education is associated with lower support PRRP in a given municipality. Despite controlling for the impact of other variables in the model, the negative significant direct effect of the tertiary-educated population on voter support for PRRP persists. This highlights the importance of education as a determining factor for the level of support towards PRRP. The negative coefficient suggests that higher level in the proportion of tertiary educated in a municipality is associated with a lower level in support for PRRP. Plus, this relationship has also spatial dimension based on the indirect effect. Indirect effect coefficient of tertiary educated population was found to be -0.2202 in relation to voter support for LSNS. This negative coefficient suggests that as the proportion of tertiary educated population in neighboring municipalities increases, the support LSNS decreases in the given municipality. Spatial Durbin Model (SDM) significant and negative indirect effect of tertiary education on voter support for LSNS suggests that higher levels of tertiary education in neighboring municipalities are associated with lower levels of support for these parties in a given region, after controlling for other factors that may influence voting behavior. What we can observe is that the magnitude of coefficient of indirect effect (-0.2202) is larger compared to the direct effect (-0.1607). In this case, coefficient of indirect effect can be larger than the direct effect due to spatial spillover effects. Thus, the indirect effect could surpass the direct effect due to the consideration of the influence of the tertiary educated population in neighboring municipalities in the model. It is possible that the tertiary educated population in neighboring municipalities has a more substantial impact on voting behavior in the observed municipalities than the tertiary educated population within that municipalities, contributing to a larger indirect effect coefficient in the SDM model. Another notable observation is that spatially lagged variable of tertiary educated population in the Figure 14 is not significant. This can be caused due to interdependence of observations in spatial data. Spatial interdependence of observations can lead to situations where the spatially lagged variable is insignificant, as it only captures direct effect of neighboring observations on the dependent

variable. However, the indirect effect captures the influence of neighboring observations on the independent variable, which in turn affects the dependent variable. Therefore, the indirect effect is a more accurate measure of true impact of the independent variable on the dependent variable because it accounts for the spatial interdependence of observations (Anselin, 1988). The total effect, which captures overall impact of the tertiary educated population on voter support is on the level of -0.3809 and is significant and negative, as it includes both direct and indirect effect.

A negative and significant direct effect of the share of minority population on voter support for PRRP suggest that municipalities with a higher share of minority population are associated with lower voter support for PRRP. Coefficient of indirect effect of the share of minority population is also negative and significant, which suggest that the presence of minority population in neighboring areas may be associated with lower support for PRRP. The total effect is significant and negative as well. The same results are true for the case of religious population, which has both negative and significant direct and indirect effect. A negative and significant direct effect of density of population on voter support for PRRP suggest that municipalities with higher density population are linked to lower levels of voter support for PRRP.

7.4 Assessing the Robustness of Model Results: A Sensitivity Analysis

In the following SDM model specification we add variable that represents the internal migration of tertiary educated population to control for the sorting effect.

Figure 17: The result of SDM model including the internal migration of tertiary educated population.

	SDM
voter turnout	0.021
	(0.013)
relig	-0.020**
	(0.009)
minor	-0.045***
	(0.005)
shighed	-0.137***
	(0.023)
density	-0.727***
	(0.117)
population65+	-0.032
	(0.021)
∆wages	0.022

	(0.041)
Δtertiary	-0.001
	(0.001)
avmigration	-0.063*
	(0.036)
lag.voter turnout	-0.036*
	(0.020)
lag. relig	-0.019
	(0.013)
lag. minor	-0.035***
	(0.007)
lag. shighed	-0.037
	(0.041)
lag. density	0.292
	(0.181)
lag. population65+	0.010
	(0.037)
lag.Δwages	0.003
	(0.048)
lag.Δtertiary	0.0004
	(0.002)
lag.avmigration	-0.022
	(0.068)
Rho	0.475***
Log-likelihood	-8296.173

Source: author

What we can see from this Figure 17 is that Rho is on the level 0.475 and is statistically significant. This indicates a strong positive spatial dependence in the dependent variable, which means that value of the share of votes for LSNS in a given municipality is highly correlated with the values of the dependent variable in neighboring municipalities. This suggest that there is a positive spillover effect of LSNS support from neighboring municipalities to observed municipality. As a result, we can be assured that the favorable spatial correlation observed in the dependent variable is not a result of arbitrary fluctuations in the data, but instead indicates an authentic pattern of spatial autocorrelation.

Figure 18: The direct, indirect, and total effects of SDM model including the internal migration of tertiary educated population.

SDM	Direct effects	Indirect effects	Total
Voter turnout	0.0180	-0.0477	-0.0297
	0.0125	0.0338	0.0356
Share of religious population	-0.0230***	-0.0508***	-0.0739***
	0.0089	0.0188	0.0186
Share of minority population	-0.0510***	-0.1025***	-0.1536***
	0.0047	0.0097	0.0095
Share of population with tertiary education	-0.1475***	-0.1835***	-0.3310***

	0.0233	0.0692	0.0749
Density of population	-0.7327***	-0.0960	-0.8288***
	0.1139	0.2834	0.2960
Share of population aged 65+ year	-0.0323	-0.0093	-0.0417
	0.0207	0.0616	0.0669
Change in average wages	0.0236	0.0250	0.0487
	0.0369	0.0567	0.0406
Change of employment in tertiary sector	-0.0013	-0.0002	-0.0016
	0.0013	0.0019	0.0013
Migration of tertiary educated	-0.0679*	-0.0930	-0.1610
	0.0366	0.1120	0.1226

Source: author

The inflow in terms of internal migration of tertiary educated population has been significant (on the level of 10% significance) and negative as well, meaning that municipalities experiencing higher levels of inflow of tertiary educated individuals are linked to lower level of voter support for PRRP. Other control independent variables are insignificant, meaning there is no relationship between these variables and voter support for PRRP after controlling for other variables in the model. The significance of the coefficients of variables – share of minority population, share of religious population and density of population has not changed after including migration of tertiary educated population. All other control variables stay insignificant. The magnitude of coefficient of the share of population with tertiary education is lower compared to the results presented in Figure 18 in both direct, indirect, and total effect. However, this difference is negligible and there is still negative association between the share of tertiary educated population and share of votes for LSNS, even after controlling for internal migration of tertiary educated population.

In the Figure 19 we can see the results of Moran´s I statistics for residuals of our main SDM model.

Figure 19: Moran I test under randomization od residuals of SDM model

Moran I statistic standard deviate	-1.8084	
p-value	0.9647	
Sample estimates:		
Moran I statistic	**Expectation**	**Variance**
-0.0205796902	-0.0003465003	0.0001251823

Source: author

The sample estimate of the Moran´s I statistic is -0.0205796902, which is close to zero, suggesting that the residuals are randomly distributed across space. Moreover, the standard deviate of -1.8084 and high p-value of 0.9647 suggest that this result is not statistically significant. The expectation and variance are close to zero, which reinforces the

finding of no significant spatial autocorrelation in the residuals. Overall, this suggests that the SDM model adequately accounts for spatial autocorrelation in the dependent variable and residuals.

Figure 20 presents the results of the SDM model in which the Bratislava region was excluded to examine whether the association between the proportion of tertiary-educated individuals and the percentage of votes for LSNS was influenced predominantly by the Bratislava region. As we can see from the marginal effects the magnitude of coefficient of tertiary educated population (-0.153) has not changed that much compared to the results of our main SDM model presented in Figure 14 (-0.1480). The coefficient of the share of education is even larger after excluding Bratislava region. This association is still significant. The magnitude of Rho is approximately equal compared to our main SDM model presented in Figure 14 (0.476). A value of 0.475 for Rho indicates a moderate positive spatial autocorrelation in the dependent variable, meaning that nearby municipalities tend to have similar values of the dependent variables. The significance of all other control variables is the same as in the case of our main SDM model presented in Figure 14.

Figure 20: Results from regression excluding Bratislava region

	SDM
voter turnout	0.021
	(0.012)
relig	-0.019**
	(0.009)
minor	-0.045***
	(0.005)
shighed	-0.153***
	(0.023)
density	-0.642***
	(0.117)
population65+	-0.019
	(0.021)
∆wages	0.025
	(0.041)
∆tertiary	-0.002
	(0.001)
lag.voter turnout	-0.037
	(0.020)
lag. relig	-0.015
	(0.012)
lag. minor	-0.036***
	(0.007)
lag. shighed	-0.039
	(0.040)
lag. density	0.154
	(0.181)

lag. population65+	0.002
	(0.035)
lag.Δwages	0.003
	(0.048)
lag. Δtertiary	0.001
	(0.002)
Rho	0.475***
Log-likelihood	-8111.239

Source: author

The coefficients for the direct, indirect, and total effects experienced minor changes after the exclusion of the Bratislava region, as depicted in Figure 21. Compared to the main SDM model presented in Figure 14 (0.1607), the direct effect of the share of tertiary educated population was still significant and negative at -0.1655. This indicates that a higher level of the share of population in a given municipality is associated with a lower level of the share of votes for LSNS in neighboring municipalities. The indirect effect was also significant and negative at -0.2025, which shows the same relationship as in the main SDM model (-0.2202) where a higher level of the share of tertiary educated population in neighboring municipalities is associated with a lower level of the share of votes for LSNS in the given municipality. The total effect was significant with a lower coefficient magnitude (-0.3680) compared to the main SDM model presented in Figure 14 (-0.3809). The coefficients for the other control variables remained at approximately the same level as in the main SDM presented in Figure 14 model, with slight changes but the same significance level. The spatial lag of the share of tertiary educated population remained insignificant, just as it was in the main SDM model presented in Figure 14.

Figure 21: The direct, indirect and total effects of SDM model excluding Bratislava region

SDM	Direct effects	Indirect effects	Total
Voter turnout	0.0189	-0.0494	-0.0304
	0.0129	0.0332	0.0335
Share of religious population	-0.0216***	-0.0443***	-0.0660***
	0.0092	0.0188	0.0193
Share of minority population	-0.0519***	-0.1054***	-0.1573***
	0.0046	0.0092	0.0094
Share of population with tertiary education	-0.1655***	-0.2025***	-0.3680***
	0.0232	0.0709	0.0764
Density of population	-0.6586***	-0.2716	-0.9303***
	0.1146	0.3059	0.3083
Share of population aged 65+ year	-0.0202	-0.0126	-0.0328
	0.0213	0.0619	0.0671
Change in average wages	0.0276	0.0279	0.0556
	0.0379	0.0567	0.0407

Change of employment in tertiary sector	-0.0023 0.0015	0.0002 0.0021	-0.0021 0.0014

Source: author

The test results from Figure 22 indicate that the Moran I statistic is -0.018, which is negative, and the standard deviation is -1.569. The p-value is 0.9417, which suggests that there is no significant evidence of spatial autocorrelation in the residuals. The expectation for the Moran I statistic is -0.0003554924, which suggests that if there if there is no spatial autocorrelation, the expected value for the Moran I statistic is close to zero. The variance is 0.0001288863, which represents the variation of the Moran I statistic under the null hypothesis. Overall, these results suggest that the SDM model does not exhibit significant spatial autocorrelation in its residuals, indicating that the model is a good fit for the data.

Figure 22: Moran I test under randomization od residuals of SDM model excluding Bratislava region

Moran I statistic standard deviate	-1.569	
p-value	0.9417	
Sample estimates:		
Moran I statistic	**Expectation**	**Variance**
-0.0181684962	-0.0003554924	0.0001288863

Source: author

Figure 23 presents the results of using a different weight matrix, inverse distance for k-nearest neighbors, compared to queen contiguity. The changes compared to our main SDM model presented in Figure 14 are slight, as the significance and negative sign of several variables such as relig, shighed, density, population65+, and lag.minor remain the same. However, there is a change in lag.shighed, having a significant at the level of $p<0.1$. The coefficient of tertiary educated population has slightly changed from -0.1480 to -0.162 but remains significant. The value of Rho is lower compared to our main SDM model presented in Figure 14, but still statistically significant at 0.312, indicating a moderate positive spatial autocorrelation in the dependent variable. The significance of all other control variables remains the same, with minor changes in the magnitude of the coefficients. Based on the log-likelihood value, we can state that the main SDM model presented in Figure better fits the data with a log-likelihood of -8298.097, compared to the model presented in Figure 23 with a log-likelihood of -8389.764.

Figure 23: Results of SDM using weight matrix inverse distance weight for k-nearest neighbors

	SDM
voter turnout	0.016
	(0.012)
relig	-0.029***
	(0.009)
minor	-0.056***
	(0.005)
shighed	-0.162***
	(0.023)
density	-0.720***
	(0.118)
population65+	-0.016
	(0.020)
∆wages	0.050
	(0.037)
∆tertiary	-0.0009
	(0.001)
lag.voter turnout	-0.013
	(0.016)
lag. relig	-0.004
	(0.010)
lag. minor	-0.039***
	(0.005)
lag. shighed	-0.062*
	(0.031)
lag. density	0.055
	(0.160)
lag. population65+	0.004
	(0.027)
lag.∆wages	-0.025
	(0.040)
lag. ∆tertiary	-0.0005
	(0.001)
Rho	0.312***
Log-likelihood	-8389.764

Source: author

When using a different weight matrix in the SDM model, the coefficients for the direct, indirect, and total effects experienced minor changes. The direct effect of the share of tertiary educated population remained significant and negative at the level of -0.1695, compared to -0.1607 in the main SDM model presented in Figure 14. This indicates that a higher share of tertiary educated population in a given municipality is associated with a lower share of votes for LSNS in neighboring municipalities. The indirect effect was also significant and negative at the level of -0.1584, showing the same relationship as in the main SDM model presented in Figure 14 (-0.2202), where higher rates of the share of tertiary

educated population in neighboring municipalities are associated with a lower rate of votes for LSNS in the given municipality. Despite that, the coefficient magnitude is lower in the model presented in the Figure 24. The total effect remained significant, but with a lower coefficient magnitude of -0.3279 compared to -0.3809 in the main SDM model presented in Figure 14.

Figure 24: The direct, indirect, and total effects of SDM model with inverse distance weight for four nearest neighbors

SDM	Direct effects	Indirect effects	Total
Voter turnout	0.0160	-0.0110	0.0050
	0.0123	0.0223	0.0247
Share of religious population	-0.0306***	-0.0193	-0.0500***
	0.0087	0.0131	0.0128
Share of minority population	-0.0602***	-0.0795***	-0.1398***
	0.0087	0.0065	0.0064
Share of population with tertiary education	-0.1695***	-0.1584***	-0.3279***
	0.0219	0.0401	0.0450
Density of population	-0.7311***	-0.2387	-0.9698***
	0.1158	0.2003	0.0450
Share of population aged 65+ year	-0.0161	-0.0007	-0.0168
	0.0201	0.2003	0.0402
Change in average wages	0.0496	-0.0130	0.0365
	0.0368	0.0436	0.0285
Change of employment in tertiary sector	-0.0009	-0.0011	-0.0021
	0.0012	0.0015	0.0009

Source**:** author

The coefficients for the other control variables remained at approximately the same level as in the main SDM model presented in Figure 14, with slight changes but the same significance level. However, the significance of the indirect effect of the share of religious population changed in this model to be statistically insignificant compared to the main SDM model presented in Figure 14.

8. DISCUSSION

The surge of populist radical right parties (PRRP) in many countries worldwide is a pressing issue that threatens social cohesion and democratic values by promoting xenophobic and exclusionary policies (Bustiková, 2018). The growing voter support for these parties jeopardizes the legitimacy and stability of democracy. Although education level has historically been a major factor influencing PRRP voting, with less educated individuals tending to be more supportive of the party (Lipset, 1960), there has been limited research on the link between tertiary education and PRRP voting from a spatial perspective. Therefore, this study aims to investigate the relationship between tertiary educational attainment and voter support for LSNS in Slovak municipalities, while accounting for spatial dimension of this relationship. Examining spatial interactions is critical in this type of research as they provide valuable insights into political attitude diffusion across communities. The study concentrates on tertiary education as a variable of interest, given previous research indicating that tertiary educated individuals are less inclined to voter support for PRRP due to political, cultural, and economic factors (Moretti, 2003; Evans, 2005).

The are several findings that are provided by our study in line with the main and secondary objectives. Our investigation of the spatial dynamics of tertiary education in Slovakia revealed not only a significant increase in the overall proportion of the population with tertiary education, but also changes in the spatial distribution of this population. We observed that in 2021, the tertiary educated population was more spatially concentrated in larger cities such as Bratislava, Kosice, and the Žilina region, whereas previously they were more spatially dispersed across the whole country in 1991. Furthermore, it has been observed that in 2021, the spatial concentration of the tertiary educated population in the southern part of Slovakia is relatively low. This spatial clustering indicates a clear spatial division between the tertiary educated population and those with lower levels of education. The data regarding the internal migration of individuals with tertiary education indicates a trend of moving towards larger urban centers, particularly to Bratislava and Košice regions. However, the eastern and northern parts of Slovakia experienced a considerable outflow of individuals with tertiary education between 2009 and 2021.

Municipalities with the highest support for LSNS are primarily located in central Slovakia where the LSNS has a strong voter base. One possible explanation for this could

be the fact that the former leader of LSNS, Marian Kotleba was the governor of the Banska Bystrica self-governing region in the past. The Bratislava and Kosice region have lower support for LSNS. Southern regions of Slovakia experienced lower support for LSNS as well possibly due to the high representation of Hungarian minority groups. A shift in the spatial distribution of votes occurred in the 2020 parliamentary elections compared to 2016 due to the loss of support for SNS, causing a change in support for LSNS in western and central Slovakia, previously strongholds for LSNS (Kavecky, 2022).

Our study validated that utilizing spatial regression models produces unbiased and efficient outcomes compared to non-spatial models, particularly when spatial autocorrelation is present. Through comparing the outcomes derived from the non-spatial ordinary least squares (OLS) regression model and the SLX, SAR, SEM, SDEM and SDM, we observed significant discrepancies and inaccuracies in the non-spatial OLS model. Based on the results of Likelihood ratio test SDM model seem to be significantly the best fit for our data.

Regarding our main objective our main findings is that higher level of tertiary educated population in a given municipality is associated with lower voter support for LSNS, which was proved by the direct effect on the level -0.1607. This relationship possesses also spatial dimension which was expressed by the indirect effect of marginal effects of SDM model on the level of -0.2202. The total effect of the share of population with tertiary educational attainment, which is the sum of direct and indirect effect was -0.3809. Results of this model are robust even after testing the model with different specifications. During our analysis, we applied various spatial models to account for the possibility of spillover effects, and we found that these effects were present in all the models. After conducting a likelihood ratio test, we found that the Spatial Durbin Model was the most suitable option for analyzing global spillovers. We conducted several tests to ensure the reliability and robustness of our model. Despite these additional tests, our findings consistently showed a negative correlation between tertiary education and voter support for LSNS, with the spatial dimension of this relationship remaining significant. From both theoretical and empirical perspectives, the relationship between education and voting for PRRP can be explained by cultural, economic, and political factors. They socialize into more liberal norms and beliefs during the process of tertiary education, while they might be exposed to diverse cultures and ideas, which enables them to accept a diversity of viewpoints (Lipset, 1960; Stubager, 2008; Hainmueller and Hiscox, 2006). This exposure may lead to a greater appreciation for

diversity and a rejection of exclusionary or ethnocentric beliefs. From economic perspective this might be the case due to their better social position, which prevents tertiary educated individuals from feeling of discontent due to lack of opportunities and lower income as it is already the case for lower educated people on average (Gabel & Palmer, 1995; Koehn & Rosenau, 2002). Moreover, previous studies have indicated that individuals with tertiary levels of education tend to have higher levels of political participation and involvement in the democratic process (Verba, Schlozman, & Brady, 1995).The spatial dimension of this relationship can be explained by neighborhood effect and spatial social interactions that occur within a given place. The literature suggests that spatial voting patterns may arise from two mechanisms: direct and indirect. The direct mechanism involves the sharing of socio-economic and demographic factors among residents in the same neighborhood, while the indirect mechanism suggests that spatial voting patterns may arise due to spatial social interactions across space. Our study accounts for both socio-economic and demographic variables and therefore suggests that the spatial relationship between tertiary education and voting for PRRP may be attributed to spatial interactions (Huckfeldt & Sprague, 1995).

Our study's results are consistent with previous research on the relationship between tertiary educational attainment and support for PRRP. Even though, the magnitude of significant negative total effect of tertiary education on voter support for LSNS is twice as high compared to results of studies mentioned below. Our analysis revealed a significant negative total effect of tertiary education, which means that a one-unit increase in the share of tertiary educated population is linked to a 3.8% decrease in voter support for LSNS, while controlling for other factors. For instance, Steenvoorden and Harteveld (2017) found that the negative coefficient of tertiary education on support for PRRP in eight European countries was on the level of -0.20. Similarly, Dijkstra et al. (2020) reported a coefficient of -0.169 and significant for the impact of tertiary education on voting for parties strongly opposed to European integration in their study on the geography of EU discontent and anti-system voting. These findings suggest that our study's results are consistent with previous research, adding to the body of knowledge on the relationship between tertiary educational attainment and PRRP.

Our study proved the existence of spatial spillovers of votes for PRRP, as evidenced by a significant spatial regressor Rho parameter at a level of 0.476. This value of coefficient is comparable to the findings of Posada, Plotnika & Rubiera-Morollon's (2021) study, which

investigated the intensity of spatial dependence of the share of Leave votes in Brexit and found a significant Rho parameter at a level of 0.527. Likewise, Iglesias-Pascual, Benassi & Paloma (2022) conducted a study on the support for the far-right party VOX and found a significant spatial lag with a Rho parameter of 0.66. This outcome demonstrates the presence of spatial spillovers in the distribution of votes for VOX. This suggests that studies provide evidence of spatial spillovers, indicating that voting behavior in a given area can be influenced by the voting behavior of neighboring areas. Based on our findings, there is evidence of moderate spatial dependence, whereas the models presented in these studies suggest a stronger spatial dependence. The difference in the value of Rho between the study by Posada, Plotnika, and Rubiera-Morollon (2021) and our findings may be attributed to the use of a different spatial weight matrix specification. Specifically, Posada, Plotnika, and Rubiera-Morollon (2021) used a 15-nearest-neighbors matrix, whereas our study and Iglesias-Pascual, Benassi & Paloma (2022) used a queen contiguity spatial weight matrix.

Out of the existing studies, only Posada, Plotnika & Rubiera-Morollon (2021) investigated the association between tertiary education and anti-system voting and its spatial dimension. However, their findings differ from the findings of our study. Their study found significant negative direct effect (-1.153) of the share of resident with a tertiary educational level on the vote for Brexit – residents with tertiary levels of education were less likely to support Brexit, which is in line with our findings (-0.1607). Nonetheless, the authors also discovered a noteworthy positive indirect effect with a statistical significance of $p<0.1$. Specifically, they found that a greater proportion of residents in neighboring areas with tertiary educational attainment, with a coefficient of 2.948, was associated with increased support for the "Leave" vote in a reference locality. Total effect of tertiary education in the finding of this study was insignificant. The results regarding the significant positive indirect effect of tertiary educated population on leave votes may appear atypical in light of the literature reviewed in our study. However, this finding could potentially be explained by the fact that Brexit was spurred by a manifestation of broader social and economic disparities. While the prevalence of tertiary educated individuals in neighboring regions may indicate a cosmopolitan perspective and lifestyle, marked by a broad and inclusive worldview, it is crucial to recognize that this demographic group can also impact local economic and social frameworks in a manner that can yield both positive and negative results. On the one hand, their presence can encourage the emergence of a dynamic and diverse community, potentially attracting new investments and commercial prospects to the region. Conversely,

their influence may intensify existing inequalities and tensions within the reference locality, especially if they occupy influential positions in the social and economic spheres. From a methodological standpoint, the observed indirect effect in Posada, Plotnika & Rubiera-Morollon's (2021) study may be attributed to the high correlation between the variable of tertiary education and other variables included in the model. Specifically, tertiary education may be closely linked with variables such as income, high-skill occupations, or primary education, all of which were accounted for in the model. It is conceivable that the outcome of the SDM model with respect to tertiary education could be altered if one or more of these variables were excluded. Our analysis demonstrated a statistically significant negative indirect effect with a magnitude of -0.2022. This suggests that the impact of higher levels of tertiary educated population in neighboring municipalities may have a greater influence on lower levels of voting support for PRRP compared to the direct effect. However, their findings differ from our study, emphasizing the need for additional research on this topic using samples from various countries.

Besides our main aim, other interesting findings have been found within our study. A negative and significant both direct and indirect effect of share of minority population on voter support for LSNS could be caused due to greater level of social diversity and tolerance in these areas as was suggested by the literature. The density of population in given municipality is based on our findings associated with the lower levels of voter support for LSNS. This might be caused due to several reasons. Denser municipalities might be linked with more diverse and cosmopolitan communities, where the is a less hostility towards minority groups (Florida, 2017). Another factor can be that municipalities that are more densely populated have better access to mainstream media and information promoting democratic values (Enos, 2017).

Even though socio-economic factors have not been proved as significant in our model, there are vast of literature that imply otherwise (Halikiopoulou & Vasilopoulou, 2018; Dijkstra, 2020). We assume that in our specification the lack of statistical significance regarding these variables might be caused by the level of aggregation, which was a district level and therefore we had lower number of observations compared to observations from municipality level.

This study is not without limitations and shortcomings in terms of its research design, data collection, and unobserved factors. Firstly, the study employs an aggregated data level

and cross-sectional model which could affect the accuracy of the results. Thus, our study was not able to establish causality, but instead, we could only demonstrate a correlation between the variables. Secondly, limitation of this study is its narrow focus on the context of Slovakia. Consequently, the generalizability of the results to other countries or contexts may be limited. Additionally, the study's limitation lies in its focus solely on the level of educational attainment, which may not fully capture the influence of tertiary education on political attitudes and voting behavior due to the potential variation in the scope of education pursued by individuals. The study did not take into account the fact that different fields of study within tertiary education could have varying impacts on political attitudes. For instance, individuals with a technical education may hold different political views compared to those with an education in economics or political science.

For a comprehensive understanding of the association between support for PRRP and tertiary education, it is necessary for future research to examine not only the level of educational attainment but also the particular fields of study within tertiary education. Additionally, it would be beneficial for future research to expand the scope of observations to a larger scale, such as the Central and Eastern European (CEE) region, in order to generate more comprehensive and applicable results. To establish causality, it may be necessary to use experimental research designs and analyze the relationship between education and voting behavior at the individual level.

In summary, this study provides important insights into the factors that influence support for PRRP. It highlights the importance of tertiary education as a potential tool for countering the appeal of these parties and suggests that efforts to promote tertiary education may be an effective strategy for reducing their support. Additionally, the findings of this study highlight the importance of considering the impact of neighboring municipalities in the analysis of voting behavior. Overall, policymakers can strive towards building a society that is more democratic and inclusive, and can resist the growth of PRRP ideologies, through the implementation of a comprehensive set of strategies. The following section will provide more detailed explanations on this matter.

8.1 Proposed Policy Recommendations

Findings of this study support previous research indicating that higher levels of tertiary education are associated with lower levels of voter support for PRRP. This suggests

that increasing tertiary educational attainment may serve as an important strategy to counteract the rise of PRRP. Moreover, the spatial dimension of this relationship bears significant importance and should not be disregarded during policy formulation and implementation.

When analyzing the voting patterns for PRRP, policymakers should consider not only the level of tertiary educational attainment but also the spatial distribution of the population with such level of education. According to our study's results, which highlight the spatial dimension of the relationship between tertiary education and voting for LSNS, higher level in the share of tertiary educated population would have an effect not only on the given municipality, but also on the neighboring municipalities and neighboring municipalities of higher orders. Our research findings indicate that such places would be those with a denser population as these are associated with reduced voter support for PRRP. Therefore, by concentrating on these regions, the effect of tertiary education could diffuse to neighboring municipalities, as demonstrated in our study. By adopting this approach, policymakers can develop effective place-based policies and manage resources efficiently. Within place-based policies a potential measure that could be considered is the implementation of initiatives aimed at raising the level of tertiary education in specific regions. Additionally, support for attracting and retaining graduates in these targeted regions could be a valuable approach to ensure long-term economic growth and development.

The first mentioned measure might be achieved by considering investing more in tertiary educational attainment in targeted regions. Such investments could include increasing funding for universities and other educational institutions, as well as implement policies to promote tertiary educational enrollment. This might involve programs like scholarships, educational grants, and vocational training programs that provide opportunities to tertiary education and economic development.

In the context of second measure, it is imperative to formulate policies that aim to alleviate the emigration of individuals with tertiary education or graduates from their regions of origin, taking into account the importance of the spatial dispersion of this population. Research indicates that individuals with higher levels of education are more likely to engage in both domestic and international migration. This is because they tend to have greater access to information and social networks that facilitate mobility and are more open to new opportunities and experiences (Kulu & Milewski, 2007). To emphasize this, we also

observed some level of statistical significance in an association between inflow of tertiary educated population and lower levels of voter support for PRRP. Therefore, policymakers should focus on implementing policies that can enhance creation of an environment that is more attractive to tertiary educated individuals and would motivate them to return to their hometown after graduating from tertiary that is located in different municipality. That can be done different ways. Tertiary educated people can be encouraged to return in their hometown by offering them chances to start businesses and by creation of job opportunities in their hometown that are relevant to their level of qualification. It is also crucial to create job opportunities that align with the industrial specialization and context of a particular region. This can be accomplished by granting incentives to new firms to locate in the area, as well as by giving entrepreneurs support and resources. In case of Slovakia even a moving of an important state institution to the east of Slovakia might have an effect of overall migration of tertiary-educated population. Helping tertiary educated individuals move back to their hometown by offering housing and relocation aid could be beneficial. This can include programs that provide affordable housing alternatives and relocation aid for people who decide to move back. The amenities of the hometown can be improved to make it a more desirable location to live and work. This may involve enhancing access to key services including transportation, healthcare, and other essential public services. Making the hometown´s cultural and communal characteristics better might make it a more appealing place for people with tertiary education to live. This may entail funding projects that support a strong sense of community and identity, such as events, programs, and the arts projects. Some of this policy implication may lead to process called ,,improving mentality" as was previous suggested by Cavallini et al. (2018). Tertiary educated individuals may face significant barriers when considering relocating to a region due to cultural differences or gender-biased attitudes. Overall, implementing these policies can encourage people with tertiary educational attainment to move back to their hometowns and start their lives there by helping to create an atmosphere that is more appealing to them.

CONCLUSION

In recent years, the surge of PRRP has been a notable phenomenon in many European countries (Colantone & Staning, 2019). The rise of PRRP can be attributed to the negative impacts of various global processes such as globalization, financial crises, migration crises, technological changes, and European integration. These processes have had a disproportionate effect on vulnerable groups within society (Art, 2011). Rural areas and former industrial regions have experienced reduced prospects, while emerging economic opportunities are concentrated in urbanized regions and cities (Florida, 2017). This has led to economic insecurity and frustration among certain segments of the population, prompting individuals to migrate to urban areas in search of better job prospects, higher wages, and improved living conditions (Rodriguez-Pose, 2022). In this regard, in the past few years, there has been a notable rise in the proportion of individuals with tertiary educational attainment. However, the distribution of this increase is not uniform across all regions (OECD, 2019). Rather, this increase is mainly concentrated in metropolitan areas and their adjacent regions, where employment opportunities for highly skilled workers are prevalent. Conversely, rural areas frequently experience emigration and brain drain, leading to a shortage of skilled labor and a deficiency of individuals with high levels of education (Florida, 2008). This situation can further exacerbate economic and social inequalities between urban and rural regions (Florida, 2017). Examining this issue through a spatial lens reveals a situation in which a small subset of individuals experiences advantages while a larger segment of the population is left at a disadvantage. This may result in a rejection of the current status quo through the electoral process manifested by voting for PRRP (Rodriguez -Pose, 2022).

Despite the frequent utilization of education as a variable in research on PRRP, its spatial dimension has been given insufficient attention (Steenvoorden & Harteveld, 2018; Voda et al., 2021). The significance of neighborhood effects in molding the link between tertiary education and support for PRRP is inadequately examined, despite its importance. Therefore, the objective of this study was to investigate the relationship between tertiary educational attainment and voter support for LSNS in Slovak municipalities, while accounting for spatial dimension of this relationship. The results of the global spatial modeling indicate a noteworthy reduction in voter support for LSNS in both the observed

municipality (direct effect) and neighboring municipalities (indirect effect) associated with tertiary educational attainment. These findings are consistent with the theoretical framework that emphasizes the importance of tertiary education in terms of voting behavior. While this relationship was expected due to its underlying cultural, political and economic factors, our study demonstrates that municipalities with higher share of tertiary educated population also has an indirect influence on election outcomes in neighboring municipalities. In order to test the robustness of our findings, we conducted various sensitivity analyses, such as incorporating internal migration of tertiary educated individuals, excluding the Bratislava region and employing different specification of spatial weight matrix. Despite these tests, our results remain consistent, demonstrating a significant negative relationship between tertiary educational attainment and voter support for LSNS, as well as the presence of spatial dimension of this relationship.

The results of our study contribute to the existing body of literature by emphasizing the significance of the association between structural modifications and political consequences, in relation to the radicalization of society caused by the emergence of social inequalities (van Leuween & Vega, 2021; Rodriguez-Posé, 2022). These findings are consistent with the broader patterns observed in post-industrial societies, where education is playing an increasingly central role in determining social status and position. In conclusion, the observable and negative indirect influence of tertiary education on the support for populist radical right parties in elections suggests that educational and regional policies could be effective measures in reducing the backing for such parties and promoting democratic values. Drawing from the findings of our study, we suggest that policymakers prioritize the improvement of educational attainment in specific regions and incentivize the retention of graduates within their regions of origin.

Based on our findings, it is apparent that utilizing a spatial model is a superior approach compared to a non-spatial model, if spatial autocorrelation is present. Our examination of the outcomes obtained from the non-spatial ordinary least squares (OLS) regression model and the spatial Durbin model (SDM) model demonstrated significant overestimation and misestimation in the non-spatial OLS model. Thus, we recommend that future research should take these disparities into account and consider employing spatial econometric models when investigating voting behavior, particularly in the context of populist radical right parties.

The limitations of our study are associated with the ecological fallacy, the use of social media platforms, and the cross-sectional model. The study solely focused on the case of Slovakia, considering only the level of educational attainment as an indicator, without taking into account the specific fields of tertiary education. While we believe that these limitations do not compromise the validity of our findings, they should be considered in future research. Specifically, in order to gain a more comprehensive understanding of the relationship between tertiary educational attainment and support for PRRP, future research must expand beyond solely considering the level of educational attainment. Instead, it is essential to explore the specific fields of study within tertiary education. Additionally, expanding the scope of observation to a larger scale, such as the Central and Eastern European (CEE) region, would generate more comprehensive and applicable results. To establish causality, experimental research designs may be necessary in order to analyze the relationship between education and voting behavior at the individual level. Analyzing the relationship between individuals and their spatial interactions would help in mitigating the issue of ecological fallacy. One possible approach would be to use individual-level data obtained through surveys. Additionally, implementing a two-stage panel model covering two different time periods could bring more clarity into research.

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