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on Local Sustainability and Governance Challenges

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Preface

We are pleased to present the proceedings of the international seminar Future-Proof Municipalities: Local Sustainability and Governance Challenges, organised by the Faculty of Economics, Technical University of Košice.

The seminar was supported by the Scientific Grant Agency of the Ministry of Education, Research, Development and Youth of the Slovak Republic through two research projects:

- VEGA 1/0681/22 – Cities that Last: Socio-Economic Assessment of Sustainability in the Urban Environment
- VEGA 1/0646/23 – Gender Perspectives versus Economic Results of Local Governments in the Slovak Republic: Municipal Finance and Fiscal Discipline with an Emphasis on the Gender of Local Elected Authority

Both projects address research questions closely aligned with the United Nations Sustainable Development Goals, particularly SDG 11 Sustainable Cities and Communities and SDG 5 Gender Equality. These goals are interlinked and remain pressing challenges for municipalities in Central and Eastern Europe. The seminar focused on these challenges and emerging trends in local and urban development, with particular emphasis on sustainability in its environmental, economic, social, and cultural dimensions.

The proceedings present 16 peer-reviewed papers that offer diverse perspectives on sustainability, including both conceptual and empirical contributions, organised into five parts.

The first section is dedicated to urban sustainability. It opens with a case study from Košice, focusing on circular-economy practices and analysing barriers to establishing a municipal reuse centre through qualitative research. The following paper addresses challenges in air quality policy, highlighting shortcomings in strategic management and inter-municipal cooperation in the Małopolska region. Issues of sustainable urban mobility are explored in a conceptual paper on proximity-driven city design, which discusses its potential contribution to more inclusive and environmentally sustainable urban development. Following paper addresses urban governance and social dimensions of sustainability. A conceptual paper on urban commons examines the reciprocal relationship between shared urban spaces and social capital, highlighting the role of trust, reciprocity, and community engagement in the governance of common urban resources.

The second section focuses on regional disparities. One study analyses regional differences in residents' satisfaction with quality of life and public services across Slovakia. The next contribution examines the effectiveness of climate-related investments financed through European Structural and Investment Funds across EU regions, demonstrating that governance quality and administrative capacity are more decisive than funding volumes.

A substantial portion of the volume is devoted to gender perspectives in local governance. Contributions include a synthesis of a national research project on gender and municipal finance in Slovakia, a comparative EU-wide analysis linking women's representation in local politics to institutional

quality and corruption, and several empirical studies examining gender differences in municipal auditing, spending priorities, and debt levels.

The fourth section addresses financial sustainability in municipalities. One paper analyses municipal financial management in the Czech Republic, while another examines the impact of population ageing on local tax revenues in Slovak municipalities, highlighting interactions between demographic trends, fiscal arrangements, and local governance.

The final section focuses on sustainable public services, particularly in the cultural sector and education. It links together the sustainability and implementation of digital technologies in public sector. The first paper addresses the challenges of digital marketing in cultural institutions, and the second highlights the role of an inclusive approach in designing digital services.

Together, the contributions reflect a multidimensional approach to sustainability, linking urban development, regional cohesion, gender equality, financial governance, and public service provision, and offering insights relevant to both academic research and local policy practice.

We would like to express our sincere thanks to the reviewers for their valuable comments and suggestions, which significantly enhanced the academic quality of the papers. We also gratefully acknowledge the organising team for their excellent technical and editorial support throughout the preparation of this publication.

We hope that this proceedings volume will inspire further research and scholarly debate on sustainability and its application in local and urban contexts.

Miriam Šebová, Lenka Maličká

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Part 1: Urban Sustainability

Municipal Role in Enabling Reuse Centres as a Social Innovation

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Abstract

In mid-sized cities, reuse centres can function not only as waste-prevention infrastructure, but also as forms of social innovation that support local circular economies through access, repair, learning, and community engagement. Yet many municipalities lack clear governance arrangements for enabling such initiatives, particularly where circular services remain fragmented and responsibilities unclear. This paper examines the case of Košice, Slovakia, where no dedicated reuse centre exists despite growing interest in reuse practices and the presence of active local stakeholders. Using a qualitative case-study design, the study draws on semi-structured interviews with local circular economy providers and a focus group with residents to identify key barriers and enabling conditions for municipal involvement. The findings show that the main obstacles extend beyond citizen demand and centre on regulatory and administrative uncertainty, weak coordination across municipal and waste-management actors, limited access to suitable premises and logistics, and issues of credibility and trust affecting donations and participation. The paper proposes a set of municipal design principles for future-proof reuse centres, highlighting the importance of clarified roles, reduced transaction costs for donors and partners, and the integration of education and repair as core public-value functions. The findings offer insights relevant to similar post-socialist urban contexts.

Keywords: Reuse Centres, Social Innovation, Local Governance, Circular Economy, Urban Sustainability, Future-proof Municipalities

JEL Classification: Q01; R58

1 Introduction

Cities play a central role in advancing sustainable development, as they concentrate both resource consumption and the institutional capacity to influence everyday socio-economic practices (Bulkeley & Betsill, 2013). In recent years, reuse centres have become increasingly visible across Europe as local responses to waste generation, overconsumption, and material scarcity, aligning with circular economy strategies aimed at extending product lifetimes and reducing resource extraction (Bocken et al., 2016; Kirchherr et al., 2017). Beyond their environmental function, reuse centres often operate as spaces of social innovation, combining reuse, repair, education, and community engagement while generating social and employment benefits at the local level (Fournier, 2008; RREUSE, 2021).

Despite this potential, the institutional embedding of reuse centres at the municipal level remains uneven. Many initiatives face governance-related obstacles, including regulatory ambiguity, fragmented responsibilities, and limited public-sector support. Critical perspectives on the circular

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economy further note that when circular initiatives are embedded unreflectively within growth-oriented systems, they risk reinforcing patterns of overproduction and waste rather than reducing them (Savini, 2023). This underscores the importance of approaching reuse centres not simply as technical waste-prevention tools, but as locally embedded socio-institutional arrangements that require deliberate municipal engagement.

This paper addresses this gap through a qualitative case study of Košice, Slovakia, a mid-sized city without a dedicated reuse centre. Drawing on semi-structured interviews with local circular economy providers and a focus group with residents, the paper examines how local actors understand the municipal role in enabling reuse initiatives and identifies key barriers and enabling conditions for their development. By framing reuse centres as social infrastructure rather than solely as waste-prevention facilities, the paper contributes analytically grounded design principles for municipalities seeking to strengthen their approach to urban sustainability.

2 Conceptual framing

The circular economy is commonly defined as a set of strategies aimed at reducing waste and maintaining the value of products and materials through reuse, repair, refurbishment, and recycling (Kirchherr et al., 2017; Bocken et al., 2016). Within this framework, reuse occupies a specific position by slowing material flows and extending product lifetimes, often through labour-intensive and locally embedded practices. Reuse centres translate these principles into practice by creating spaces where goods can be redistributed, repaired, and recirculated before becoming waste.

At the same time, circular economy initiatives may retain limited transformative capacity when embedded uncritically within growth-oriented economic systems (Fournier, 2008; Savini, 2023). From degrowth and post-growth perspectives, reuse gains importance not primarily as a source of economic value, but as a means of reducing material throughput while fostering social solidarity, collective responsibility, and sufficiency-oriented practices. From this perspective, reuse centres function not only as environmental interventions, but as socio-institutional arrangements that reshape relationships between citizens, material goods, and local governance.

This paper conceptualises reuse centres as forms of social innovation at the municipal level, situated at the intersection of environmental sustainability, social policy, and urban governance. Their operation depends not only on individual consumer behaviour, but also on institutional conditions such as regulatory frameworks, access to space and logistics, and the capacity of municipalities to coordinate across sectors. Municipal involvement therefore plays a decisive role in determining whether reuse centres remain marginal initiatives or develop into stable elements of local sustainability strategies.

3 Methodology

This paper adopts a qualitative case-study approach to examine the role of municipal governance in enabling reuse centres as social innovation. Košice, Slovakia, was selected as a mid-sized city with active circular economy initiatives but without a dedicated reuse centre, making it a suitable context for exploring institutional barriers and enabling conditions.

Data collection combined two qualitative methods conducted in 2023 as part of a broader research project on circular economy initiatives in Košice. First, six semi-structured interviews were

conducted with providers of circular and sustainability-oriented initiatives, including representatives of social enterprises, non-governmental organisations, and informal initiatives active in reuse, repair, and waste prevention. The interviews focused on perceived barriers, relationships with municipal actors, and expectations regarding public-sector involvement. Second, one focus group discussion was organised with residents of Košice to explore everyday practices related to reuse and perceptions of municipal responsibility in supporting circular initiatives.

The data were analysed using qualitative thematic analysis. Interview and focus group transcripts were coded iteratively, with attention to recurring themes related to governance arrangements, regulatory constraints, spatial and logistical challenges, and issues of trust and legitimacy. Rather than aiming for statistical generalisation, the analysis seeks analytical insight into how local actors understand the municipal role in fostering circular initiatives and how these perceptions shape the prospects of reuse centres as durable elements of local sustainability policy.

4 Findings

This section presents the main findings from the qualitative analysis of interviews with local circular economy providers and a focus group with residents in Košice. Rather than focusing on individual initiatives, the analysis identifies cross-cutting conditions shaping the development of circular and sustainability-oriented activities at the local level. The findings are organised into four interrelated themes that illustrate how municipal governance arrangements influence the feasibility, stability, and public legitimacy of reuse and related circular initiatives.

4.1 Unclear responsibility

Local circular initiatives in Košice operate within a governance context marked by dispersed responsibilities and limited coordination. Activities related to reuse and waste prevention sit at the intersection of several municipal domains, including waste management, environmental policy, and social or cultural agendas, without being clearly anchored in any of them. As a result, no single municipal actor holds explicit responsibility for initiating or coordinating the development of a reuse centre.

Although the municipality publicly endorses sustainability and circular economy objectives, these commitments are only weakly reflected in operational arrangements. Circular initiatives often rely on temporary projects, informal cooperation, or the involvement of individual municipal representatives rather than on stable institutional support. This absence of clearly assigned responsibility complicates strategic planning, as initiatives lack a clear point of contact within the municipal structure for matters related to permissions, space, or funding.

The lack of an assigned coordinating role also limits cooperation across sectors. Waste management companies, social enterprises, and community initiatives tend to operate alongside one another despite shared goals. Without a coordinating function, initiatives centred on reuse and waste prevention remain vulnerable to personnel changes, shifting political priorities, and short project cycles. Fragmented governance therefore constitutes a key obstacle to embedding reuse centres as stable components of local sustainability policy.

4.2 Regulatory and administrative barriers

Regulatory and administrative conditions emerged as a significant constraint for initiatives centred on reuse and waste prevention. In particular, the legal classification of used goods and waste creates uncertainty around what items can be accepted, stored, or redistributed without triggering formal waste-management obligations. This ambiguity discourages both civic actors and potential municipal partners from engaging more actively in reuse-related activities.

Administrative procedures related to permits, liability, and health and safety requirements further complicate the operation of small initiatives with limited organisational capacity. Meeting existing regulatory requirements often requires resources and expertise that small community-based or social initiatives do not have. As a result, reuse-oriented activities tend to be evaluated through regulatory frameworks designed primarily for waste disposal rather than for prevention and reuse.

These constraints are not necessarily prohibitive in themselves but become particularly restrictive in the absence of active municipal mediation. Without guidance, interpretation, or adaptation of existing rules, responsibility for legal compliance is effectively shifted onto civic actors. This places reuse-related initiatives in a grey zone, where uncertainty encourages risk-averse behaviour and limits experimentation. Overall, the findings indicate that regulatory and administrative barriers are closely intertwined with governance arrangements and depend not only on legislation, but on how municipalities interpret and operationalise existing rules in practice.

4.3 Access to space, logistics, and infrastructure

Access to appropriate physical space and logistical support seems to be another central condition shaping the feasibility of local circular and sustainability-oriented initiatives. Activities related to reuse and waste prevention require not only publicly accessible space, but also facilities for storage, sorting, and, in some cases, repair. In Košice, the lack of accessible and affordable premises was described as a key limitation, particularly for initiatives operating outside of commercial models.

Municipal ownership of underused buildings was identified as a potential opportunity for supporting circular initiatives, yet access to such spaces was perceived as uncertain and procedurally complex. Without clear mechanisms for allocating municipal premises to sustainability-oriented activities, initiatives were often confined to temporary locations or small-scale operations that limited their visibility and capacity. This constrained their ability to function as stable, publicly accessible services rather than as occasional or experimental projects.

Logistical infrastructure, such as transport for donated goods, storage facilities, and coordination with waste collection systems, was also closely linked to municipal involvement. In the absence of institutional support, circular initiatives relied on informal arrangements or volunteer labour to manage material flows. This limited both the scale and reliability of activities related to reuse and waste prevention and reinforced their dependence on short-term solutions. The findings indicate that access to space and logistics is not merely a practical issue, but a governance matter that directly affects whether circular initiatives can evolve into durable elements of local sustainability infrastructure.

4.4 Trust, legitimacy, and public value

Trust and legitimacy shape how people engage with local circular and sustainability-oriented initiatives. Concerns about the quality, safety, and handling of second-hand goods influence both the willingness to donate items and the readiness to participate in reuse-related activities. In this context, municipal involvement serves as an important signal of credibility and shared standards.

When circular initiatives operate without visible municipal backing, their reliability often depends on personal trust, informal networks, or individual reputation. This limits their reach and makes broader participation more difficult, particularly among residents unfamiliar with reuse practices. Municipal participation, by contrast, introduces elements of transparency, accountability, and continuity, even when initiatives are implemented by non-governmental or social actors.

Legitimacy is also closely linked to how circular initiatives are framed in terms of public value. Activities related to reuse and waste prevention are understood not simply as alternative market services, but as contributing to environmental responsibility, social inclusion, and community life. When supported as part of municipal sustainability efforts, these activities are more likely to foster long-term engagement and a sense of collective ownership.

5 Discussion

The findings show that the development of reuse centres depends less on individual behaviour or entrepreneurial initiative than on local governance conditions. Reuse centres are shaped by how municipalities organise responsibility, interpret regulation, allocate resources, and frame public value. They are therefore closely tied to the institutional environments in which they operate.

A first key issue concerns municipal responsibility and coordination. When responsibilities are spread across waste management, environmental policy, and social or cultural domains, circular initiatives struggle to move beyond small-scale or temporary arrangements. Municipalities can support more stable development by clarifying mandates, facilitating cooperation across departments, and providing a clear point of contact for initiatives operating at the intersection of reuse, social inclusion, and sustainability.

Regulatory and administrative barriers highlight the importance of municipal mediation rather than regulatory change alone. Existing legal frameworks are not necessarily incompatible with reuse activities, but uncertainty often arises from how rules are interpreted and applied. Municipal guidance, procedural adaptation, and active communication can reduce this uncertainty and make existing regulations more workable for small and community-based initiatives.

Access to space and logistics underscores the role of reuse centres within urban sustainability infrastructure. Municipal control over buildings, land, and material flows allows cities to support circular initiatives through the allocation of underused premises and integration with waste collection systems. Such support increases visibility and accessibility and helps initiatives function as regular public services rather than short-lived experiments.

Finally, trust and legitimacy play an important role in participation and long-term engagement. Municipal involvement contributes not only material support but also institutional credibility,

signalling that reuse-related activities serve collective goals. This is particularly important for initiatives that rely on donations, shared standards, and broad public participation.

Overall, reuse centres contribute to future-proof municipalities not only by reducing waste, but by strengthening local capacities for coordination, inclusion, and collective action. Their development depends less on technical solutions than on municipal willingness to recognise reuse centres as social infrastructure and integrate them into local sustainability strategies.

6 Conclusion

This paper examined the role of municipal governance in enabling reuse centres as part of local circular and sustainability-oriented initiatives, using the case of Košice, Slovakia. Drawing on qualitative interviews with local initiative providers and a focus group with residents, the analysis showed that governance conditions play a decisive role in shaping the development of reuse centres.

While much of the circular economy literature emphasises technological innovation, business models, or consumer behaviour (Bocken et al., 2016; Kirchherr et al., 2017), the findings of this study highlight the importance of municipal coordination, institutional clarity, and public legitimacy. In line with critical perspectives on circular economy and degrowth (Fournier, 2008; Savini, 2023), reuse centres should therefore be understood not only as efficiency-oriented waste solutions, but as social infrastructure embedded in local governance systems. From the author's perspective, neglecting these governance dimensions risks reinforcing fragmented and short-lived initiatives rather than supporting durable sustainability transitions.

The study identified four interrelated factors influencing the feasibility and stability of reuse-related initiatives: fragmented responsibility across municipal domains, regulatory and administrative uncertainty, limited access to space and logistics, and issues of trust and legitimacy. These findings extend existing research by showing how these factors interact at the local level in a post-socialist urban context, where institutional legacies and administrative structures shape circular initiatives in specific ways.

The analysis is based on a single case and a limited number of qualitative interviews, which limits the generalisability of the findings. Nevertheless, the identified governance patterns are likely to resonate with other mid-sized cities facing similar institutional and spatial constraints. For municipalities seeking to become more future-proof, the findings point to the importance of clarifying responsibilities, mediating regulatory frameworks, enabling access to urban resources, and framing reuse as a collective public good within local sustainability strategies.

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Air quality policy in metropolitan areas: a case study from the Małopolska region

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Abstract

Air pollution has been one of the main problems facing the residents of Krakow (southern Poland) for years. Regional and local authorities, with the help of European Union funds, implemented programs aimed at solving this problem through subsidies for the replacement of inefficient heating sources and thermal modernization. This has brought about a partial improvement in Krakow, partly because, in addition to the programs described above, the city has banned the use of solid fuels for heating buildings. However, the problem has not been completely solved, as neighboring towns did not have such restrictive regulations. Meanwhile, polluted air from these municipalities flows into Krakow. The paper examines the problem of public management at various levels (central, regional, and local) in the context of programs aimed at improving air quality and identifies the main problems in this area. Using data from strategic documents, the proposed solutions aim to improve the synergy of the programs. The aim of the paper is to analyze air quality management in Krakow and the surrounding municipalities.

Keywords: Project, Program, Air Pollution, Sustainability, Public Support

JEL Classification: H70; Q56; R11

1 Introduction

Poland is one of the countries that have been struggling with the problem of polluted air for years. It is home to 36 of the most polluted cities in Europe (World Bank, 2019). This issue is of interest to both central, regional and local authorities, as well as the residents themselves. A 2019 study showed that 62% of Poles believe that air pollution is one of the three most important environmental problems, while the global average is 35% (Ipsos, 2019).

An example of a city struggling with the problem of polluted air is Kraków. The city is located in the southern part of Poland, east of industrialized Upper Silesia, and also in the north-eastern part of the Czech Republic. Southern Poland, like the eastern Czech Republic, is characterized by high levels of anthropogenic emissions related to coal burning in the winter months, but above all by unfavorable climatic conditions in these areas (Jędruszkiewicz et al., 2017, Hůnová, 2020). Southern Poland, including Kraków, as well as Ostrava in eastern Bohemia, have been centers of heavy industry for decades. In Krakow, since the 1950s, it was mainly the steel industry. In the 1990s, the situation began to improve due to greater awareness of the problem and technological

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changes that allowed emissions to be reduced (Adamson et al., 1995). However, the problem has not been fully resolved.

For many years, the city authorities have been pursuing an advanced policy to counteract air pollution. In 2019, a total ban on heating buildings using solid fuels, i.e. coal, wood or biomass, was introduced (Małopolska Region, 2016). Although these radical solutions have contributed to improving air quality, pollution is excessive in the winter months. In addition to emissions related to road traffic, a big problem is the "transport" of air from neighboring municipalities, which do not have such restrictive regulations as Kraków. This "transport" is aided by geographical factors. The city's location in the Vistula Valley means that in the autumn and winter, when heating is done using solid fuels in neighboring towns, the air quality in Krakow deteriorates rapidly (Danek et al., 2022).

The city, region and country authorities offer a number of solutions for the modernization of heat sources, but the effect is very slow. These solutions are introduced in the form of programs and projects, i.e. they consist in time-limited, goal-oriented intervention. The aid mechanism is based on subsidies for replacing the heating source with a more modern one, as well as for the thermal modernization of buildings. Most of the funds for this assistance come from the European Union (EU), under the so-called Multiannual Financial Framework (MFF). They consist primarily of EU programs: the European Social Fund (ESF), the European Regional Development Fund (ERDF) and the Cohesion Fund (CF).

Authorities of all EU countries and regions prepare programs responding to local problems, mainly using the three funds mentioned (Cifuentes-Faura, 2022). The vast majority of these programs respond to challenges related to environmental protection, economic development, social inclusion and culture, which is part of the concept of sustainable development (SD). The case discussed in the paper concerns the issue of air protection, which is also related to this concept. SD was defined in the report "Our Common Future" as "development that meets the needs of the present without compromising the ability of future generations to meet their needs" (United Nations, 1987). Currently, it is emphasized that in addition to the environmental, economic and social components, SD also includes the area of culture (Lazar, Chithra, 2021).

In Poland, the implementation of programs and projects regarding support for the replacement of heating sources and thermal modernization is running smoothly. Each level of government: government, regional and local government structures activities in such a way that home owners can obtain financial support with a certain contribution of their own. Moreover, the region's authorities are implementing legal acts that limit the use of high-emission heating devices. However, the problem arises in the context of synchronization of these programs and projects. The example of Krakow and surrounding communes clearly demonstrates the problem of lack of synergy. Although the use of solid fuels for heating is banned in the city, there are no such restrictive regulations in the surrounding communes. A program has been implemented in Krakow that helps the poorest residents financially when it comes to heating costs. This form of support is not available in the surrounding towns, so many households do not decide to replace their heating devices. This problem is compounded by the issue of the essence of sustainable development. While replacing old furnaces is part of the environmental and economic aspects, the social aspect is omitted. It is worth repeating that in order to receive support, building owners must contribute to the costs. This may result in smaller people being unable to upgrade. Firstly, the costs of your own contribution may turn out to be too high, secondly, the use of new devices may involve higher

bills. This means that the programs are most often used by relatively wealthy people. Low-income homeowners are left unsupported, and as a result, continue to contribute to higher emissions and are also more vulnerable to the effects of polluted air. This problem of omitting the issue of social cohesion does not only concern the Małopolska region, it is similar in other areas of the European Union, but the issue of Krakow brings together the main problems of this type of intervention like a lens.

The aim of this paper is to analyze air quality management in Krakow and surrounding municipalities. The analysis will draw on local, regional, and national documents concerning air quality issues. In addition, the transfer of major EU funds will be analyzed in terms of their effectiveness.

2 Literature review

For decades, the EU has been taking measures that fall within the definition of sustainable development. Community policy refers to Agenda 2030 and the Sustainable Development Goals. These goals are implemented through cohesion policy and structural funds, research programs, and support for member states within the framework of development policy. It should be noted, however, that these actions were already being implemented before the UN announced the SDGs. At the same time, a significant part of these actions are implemented in the form of projects. This section will present the evolution of sustainable development policy in the EU, as well as how projects are implemented. This section will describe the mechanisms for implementing sustainable development policy, particularly based on financial instruments from the three main EU funds: the European Social Fund, the European Regional Development Fund, and the Cohesion Fund.

2. 1 Sustainable development in the light of the main EU funds

The areas that are elements of the concept of sustainable development: economic, social, environmental, and then cultural (Burford et al., 2013), did not immediately become the subject of interest in the EU. Initially, the subject of integration was only the economic aspect, but over time, the member countries regulated more and more issues together. Since the adoption of the Single European Act in February 1986, the Community has entered the areas of social policy, environmental protection and culture (Anderson, Jeffrey, 1995). Subsequent landmark EU documents confirmed the status of these issues. The first was the Maastricht Treaty of 1992, which for the first time in primary law included sustainable development as one of the Community's objectives (Treaty of Maastricht of 1992). The next was the Treaty of Amsterdam of 1997, which confirmed the need for sustainable development, but devoted more attention to environmental issues (Treaty of Amsterdam of 1997). The Treaty of Lisbon of 2007 included provisions stating that the Union strives for sustainable development of Europe, based on sustainable economic growth, a stable market economy, high competitiveness, full employment, social progress and a high level of environmental protection (The Lisbon Treaty of 2007 became the basis of the Europe 2020 strategy and the European Green Deal).

The key instrument for supporting these areas are the main European funds. The first of them, the European Social Fund, created in 1957, is intended to support employment, reduce poverty and social exclusion, as well as develop skills and education throughout life (Brine, 2002). Created in 1975, the European Regional Development Fund supports competitiveness, innovation, research, technological development, the green economy, and small and medium-sized enterprises (Bădîrcea

et al., 2025a). The youngest of them, the Cohesion Fund (1994), was created to finance large environmental and transport projects in countries with the lowest GDP (Di Caro, Fratesi, 2022). These three main funds (ESF, ERDF, CF) form the Multiannual Financial Framework (MFF), updated every seven years. MFFs are a key instrument for medium-term planning in the EU and thanks to them the community responds to current challenges and the needs of its inhabitants. Environmental protection activities are implemented through the ERDF and the CF. Social issues are addressed through the ESF. As you can see, these funds are "intertwined" at different levels. Local, regional and national programs are largely based on funds from the ESF, ERDF and CF.

It should be emphasized that the framework for sustainable development was not clearly defined at EU level. The adoption of the United Nations 2030 Agenda and the Paris Agreement in 2015 can be considered a milestone, when regulatory obligations began to increase investor interest in social issues and sustainable development (Bauer, Ruof, Smeets, 2021). Only since 2015 can we talk about a structured sustainable development policy, especially in the financial sphere (Dyck et al., 2019).

Given that the EU's activities have focused on sustainable development policies for a decade, it can be said that the funds described are dedicated to this area. The ESF plays a key role, also in the context of the SDGs. The ESF significantly contributes to reducing poverty (SDG 1), promoting economic growth (SDG 8), and supporting industry, innovation, and infrastructure (SDG 9), particularly in less developed regions. The ESF has been shown to have limited impact on environmental goals such as affordable and clean energy (SDG 7) and climate action (SDG 13). It has been demonstrated that economic priorities often overshadow environmental goals (Bădircea, 2025b).

The ESF is complemented by two other funds: the European Regional Development Fund (ERDF) and the Cohesion Fund (CF). Within these funds, the EU allocates a significant portion of its activities and budget to reducing regional disparities, with particular emphasis on rural areas, areas affected by industrial transformation, and regions facing serious and persistent natural or demographic challenges (Sielker, Rauhut, & Humer, 2021). The problem with these funds is the lack of clear indicators that capture the quality of SD. These funds are intended to help reduce the risks and costs of transformation by combining the interests of sustainable, green, and inclusive growth. Theoretically, this should be achieved by enabling the creation of projects that address these distinct but interrelated goals (Tijanić & Kersan-Škabić, 2025).

The discussion on the synergies between these funds encompasses many aspects, from the typically financial, through administrative, to political. This area is the subject of analysis by both practitioners and researchers. As has been shown, cohesion policy is most effective where there is a favorable combination of strong managing institutions, strategic selection of investment projects, and efficient administration. The mere fact of distributing funds is not sufficient – what matters is the quality and coordination of their allocation and implementation (Casula, 2021). This problem has been recognized by politicians, including at the Polish level (Jagódka, Snarska, 2022). There is general agreement that the programs described have had a positive and significant impact on the economies of EU member states. However, further discussion should focus not so much on financing, but on the distribution of benefits, both territorially and across different SD areas (Crucitti et al., 2023).

2.2 The impact of EU financial instruments on climate protection policy

Support for individual areas of EU intervention, including sustainable development, is provided within the so-called multiannual financial framework (MFF), coinciding with the financial perspectives: 2007-2013, 2014-2020, 2021-2027, etc. During these seven-year periods, programs for public intervention in selected areas are implemented in member states and regions. These programs rely largely on project implementation. For over three decades in the EU, a significant number of projects have been implemented in the form of projects. The adoption of this formula results from the fact that since 1993 the community has been using its own project management methodology called Project Cycle Management (PCM). This methodology recommended by the European Commission is a reference point for the development and implementation of programs and projects financed from Community funds. Thanks to the adoption of PCM, projects are implemented according to a cycle, starting with a general strategy, as a result of which action is planned, which consequently takes the form of a project. The final stage of this cycle is evaluation (European Commission, 2004).

With each subsequent perspective, issues related to SD are increasingly exposed (Rodríguez-Antón et al., 2021). The EU is perceived as a leader in regulatory changes in the field of SD. EU countries have managed to develop a comprehensive framework for sustainable financial development in the context of a broader strategy, in the form of the European Green Deal. The implementation of the EU's financial sustainability framework is expected to influence the financial sector, policymakers and researchers, and may also help shape international sustainability standards (Rant, 2024). The issue of the impact of EU financial instruments on the Sustainable Development Goals has been of interest to researchers for years.

The key instrument for implementing this policy is the European Commission's action through programs. Thanks to the unified structure of intervention under the MFF, the Commission has gained a tool to influence the policy of broadly understood SD. In the discussion among researchers and experts, certain reservations appear regarding "design" imperatives and working conditions in public policy, including: o time constraints (Hodgson et al., 2019). This design approach also implies problems in monitoring sustainability progress. Program evaluation is based mainly on quantitative criteria (Sanyé-Mengual, Sala, 2022). Generally, there is agreement among researchers that there is a need to design more effective sustainable development policies. This is difficult due to the fact that programs are implemented not only at the national level, but also at all regions in the member states. These complex relationships, which make up "the project world of EU funding" (Büttner, Leopold, 2016), require precise evaluation.

However, many analyzes emphasize the fact that the EU has created a solid financial system to promote environmentally sustainable development. The program and project management mechanism effectively helps implement local public policy (Godenhjelm et al., 2015). Each unit increase in financial development is positively correlated with the environmental sustainability index, encouraging investments and projects that prioritize environmental goals. The discussion emphasizes that qualitative growth should be taken into account, relating to issues of social well-being and resource efficiency, which integrates the social and environmental dimensions (Yıldırım et al., 2025). In this context, it is important to take a thorough look at the issue of efforts to improve air quality in Krakow and the Małopolska region as an element of sustainable development management.

2.3 The problem of clean air in Krakow

An example of a city struggling with the problem of polluted air is Kraków. The city is located in the southern part of Poland, east of industrialized Upper Silesia, and also in the north-eastern part of the Czech Republic. Southern Poland, like the eastern Czech Republic, is characterized by high levels of anthropogenic emissions related to coal burning in the winter months, but above all by unfavorable climatic conditions in these areas (Jędruszkiewicz et al., 2017, Hůnová, 2020). The northern regions of Italy are also an area struggling with this problem (Piccoli et al., 2025). Air quality problems are caused by many factors, in addition to the burning of solid fuels, there is also road traffic and industrial activity (United Nations, 2019).

Southern Poland, including Kraków, as well as Ostrava in eastern Bohemia, have been centers of heavy industry for decades. In Krakow, since the 1950s, it was mainly the steel industry. In the 1990s, the situation began to improve due to greater awareness of the problem and technological changes that allowed emissions to be reduced (Adamson et al., 1995). However, the problem has not been fully resolved.

In Krakow, local and regional authorities have been pursuing an active policy for years to improve air quality. The introduced ban on the use of solid fuels has had positive effects, they are most visible during the heating season (Herman et al., 2025). In addition to the ban, national and regional authorities used a system of incentives and financial support. Homeowners could use assistance to purchase environmentally friendly energy sources - such as geothermal energy, heat pumps or solar energy. According to research, these activities, including the integration of renewable energy sources with heating systems in cities, additionally reduce greenhouse gas emissions. The implementation of ecological energy sources on an urban scale leads to a significant improvement in air quality indicators, which translates into the health of residents (Kaczmarczyk, Sowiźdżała, 2025). However, this support system, based on programs and projects, has been constructed in such a way that is unavailable to many people due to the required own contribution and the fear of higher electricity bills in the case of old buildings.

3 Materials and methods

The method used in the paper is a case study based on an analysis of local and national legal documents. The paper integrates sources such as programs (national, regional, and local) as well as executive acts of the Małopolska Region. The integration of this type of documents is necessary due to the division of competences of individual levels of local government. In the context of environmental issues, the provincial government has a key role in introducing restrictions and prohibitions. In order to triangulate the data, existing data on air quality was also used. The case analyzed in the paper concerns the issue of managing programs to improve air quality in Krakow. However, to complete the picture, the surrounding municipalities and the regulations in force in them must be taken into account. In addition, regional and national regulations are important. The intertwining of legal systems, perspectives, and funds required a multilateral analysis of documents. In order to supplement the analysis of air quality policy in Krakow and its metropolitan area, income data, the so-called individual wealth index, was used. Additionally, the structure and share of the main EE funds (ESF, EFDR, CF) in Polish programs dedicated to sustainable development policy were analyzed.

4 Results

This section will present an analysis of air quality management in Krakow and surrounding municipalities. A key issue concerns the division of responsibilities between local governments at various levels and the central government. In this context, the analysis will also cover the financing of programs dedicated to improving air quality, largely financed by the three main EU funds.

To begin the analysis, it is necessary to distinguish three levels at which air protection activities are undertaken: national, regional, and local.

Local level

The local level in Poland is represented by municipal/city authorities. The subject of the analysis will be the local government of Krakow and surrounding municipalities. These local governments, which in most cases border the city (the municipalities of Liszki, Zabierzów, Wielka Wieś, Zielonki, Michałowice, Kocmyrzów-Luborzyca, Igołomia-Wawrzeńczyce, Niepołomice, Biskupice, Wieliczka, Świątniki Górne, Mogilany, Skawina, and Czernichów). These municipalities, along with Krakow, form the Krakow Metropolis Association, which serves as a platform for cooperation on joint ventures and projects, including those in the areas of environmental protection, culture, transport, and infrastructure (The Krakow Metropolis Association, 2024). It's worth noting that the association also facilitates collaboration on air quality. In reality, each of these municipalities has its own regulations for shaping environmental policy. It's worth noting that, under Polish law, municipal governments can only support residents in replacing heating sources or implementing thermal modernization.

In Krakow's case, the first key program to improve air quality was adopted in 2011. This program is the Low Emission Reduction Program for the City of Krakow (City of Krakow, 2011). This document applies only to Krakow residents. The program provided subsidies for residents who decided to switch from solid fuel-based heating systems. The subsidy covered the purchase and installation costs. Both individuals and small businesses were eligible to participate in the program. The program was partially financed by the Regional Operational Program of the Małopolska Voivodeship for 2007-2013 and 2014-2020. Replacing heating sources with emission-free ones allowed residents to prepare for the ban on the use of solid fuels introduced in 2019.

In parallel to the program supporting the replacement of heating sources in 2011-2022 and then 2023-2026, the City of Krakow provided support to the city's most vulnerable residents under the Local Protection Program (City of Krakow, 2023). This support consists of subsidies for residents whose incomes fall below a certain threshold. The subsidies are intended to compensate for the higher costs of home heating. This program is financed from the city's own resources.

As for the municipalities within the Krakow Agglomeration, each may implement individual assistance programs, albeit on a small scale. This support was regulated through the "Smog-free district" program implemented in the Krakow district, which mostly overlaps with the Krakow Agglomeration (Krakow County, 2025).

Regional level

The regional level is represented by the Małopolska Region, represented by the Voivodeship Marshal; the law here is established by the Marshal's Office. It should be noted that, in accordance

with Polish law, the voivodeship authorities create regulations regarding orders, prohibitions, and restrictions. In this case, legal acts aimed at restricting emissions were crucial. The document that regulated the ban on the use of these fuels and had a key impact on air quality policy is the Resolution of the Małopolska Voivodeship Assembly of January 2016, which, as of September 1, 2019, banned the use of solid fuels (coal, wood, and other biomass) in the Krakow area (Małopolska Region, 2016).

Simultaneously, the regional authorities adopted a document restricting the use of inefficient equipment throughout the voivodeship. To this end, a resolution was adopted in 2017 limiting the use of solid fuel stoves to those that meet ecodesign standards (Małopolska Region, 2017). This program is being implemented in stages. The most emission-intensive appliances were to be phased out by May 1, 2024, while solid fuel appliances with the best characteristics (including coal stoves and fireplaces) can still be used.

At the regional level, the Air Protection Program (Małopolska Region, 2023) is also in effect, and is regularly updated. The program assumes broad yet general measures, such as promoting the replacement of heating appliances, supporting the activities of climate eco-advisors, and conducting information campaigns.

National level

The national level, i.e., the Polish government, creates nationwide programs. One such program in the context of this issue is the Clean Air program, launched in 2020 (Ministry of Climate and Environment, 2024). This program, co-financed by the Next Generation Fund, aims to improve air quality and reduce greenhouse gas emissions by replacing heat sources and improving the energy efficiency of single-family homes. Residents across Poland are eligible for this program and are scheduled to run until 2029. Therefore, there is no dedicated support for residents of the Małopolska region, but the funds allocated for the nationwide program are sufficient to cover all interested parties. It's worth emphasizing, however, that the program's income thresholds require the vast majority of homeowners to declare a significant down payment to benefit from the support.

As Table 1 shows, the nationwide Clean Air program provides subsidies for replacing heating sources and thermal modernization of buildings. Programs for municipalities around Krakow, which are largely part of Krakow County, also provide financial support for the purchase of new equipment (without support for thermal modernization). This support, however, is small (usually up to PLN 3,000), but can be combined with the Clean Air Program. Krakow residents, since the introduction of the ban on the use of solid fuels, have not been able to benefit from support for replacing heating sources, although they had this option previously. At the same time, Krakow residents with the lowest incomes can count on subsidies for heating costs. The regional program focuses primarily on promotion and education.

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Table 1, programs supporting air quality improvement by management level

Level	Program	Scope	Possibility of combining with other programs
Local level – Kraków	Low Emission Reduction Program; Protection program for low-income inhabitants	Support for heating sources, support for the poorest inhabitants	No
Local level - neighboring municipalities	Krakow County “Smog-free district”	Subsidies for residents of the Krakow district (municipalities around Krakow) for the replacement of heat sources	Yes
Regional level	Regional air protection program	Promotion of the replacement of heating equipment, support for eco-advisors in municipalities	Yes
National level	Clean Air	Subsidies for replacing heat sources and thermal modernization	Yes

Source: own study.

Figure 1 shows the Kraków Agglomeration, divided into municipalities.

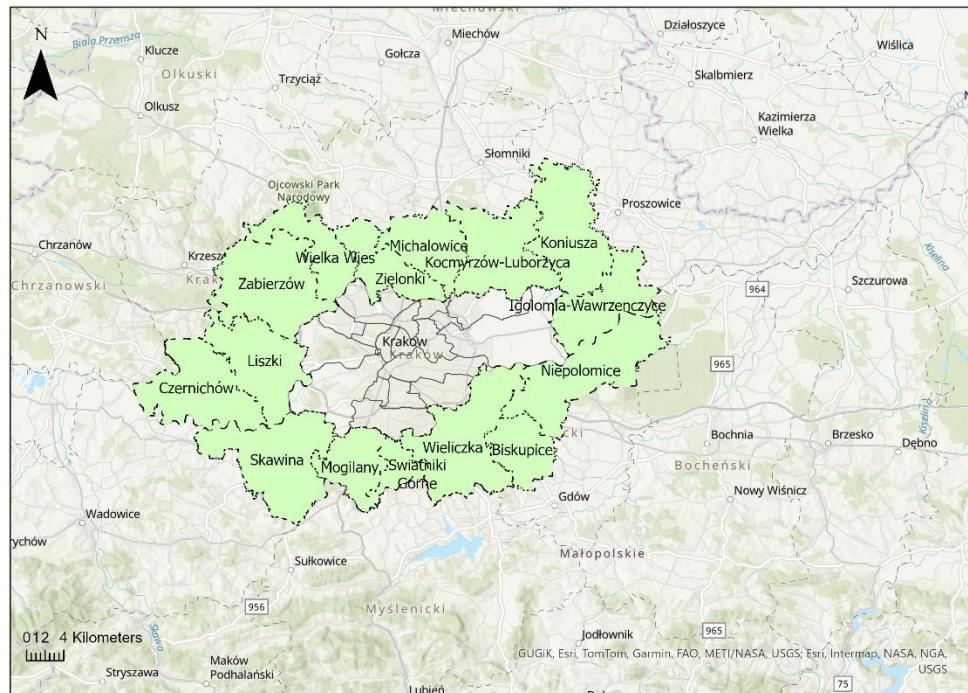


Figure 1 Map of Krakow and its neighboring municipalities

Source: own study

The situation can be summarized as follows:

1. Krakow city authorities implemented a program to replace heating sources with low-emission ones.
2. The authorities of the Małopolska Region introduced a ban on the use of solid fuels in Krakow.
3. Krakow city authorities support the poorest residents with heating costs.
4. Regional authorities have introduced restrictions on the use of solid fuels (through required parameters for heating devices).
5. National authorities are supporting the replacement of heating sources through the Clean Air program.

Table 2 presents this sequence.

Table 2. Programs and legal acts regulating issues related to restrictions on the use of heating sources and support for residents of the city, region and the whole of Poland

Name of the program, year of adoption	Scope of the program/adopting body	Sources of financing	Years of validity	Description of the program/legal act
Low Emission Reduction Program, 2011	Local (City of Krakow) / City authorities	Regional Operational Programme of the Małopolska Voivodeship for 2014-2020/Own funds of the Krakow City Hall	2012-2019	Subsidies for residents to replace old furnaces with eco-friendly heating sources and connect to the municipal heating network.
Local Protection Program, 2011	Local (City of Krakow) / City authorities	Own funds of the Krakow City Hall	2011-2022 2023-2026	Support for residents in financial hardship, including heating subsidies.
Resolution of the Małopolska Voivodeship Assembly on the introduction of restrictions on the operation of fuel combustion installations within the Kraków Municipality, 2016	City of Krakow / Regional authorities	-	Since 2019	Ban on the use of solid fuels (coal, wood and other biomass) in the area of Krakow
Resolution of the Małopolska Region / Regional authorities	Małopolska Region / Regional authorities	-	Since 2017	Limiting the use of solid fuel stoves to those

Name of the program, year of adoption	Scope of the program/adopting body	Sources of financing	Years of validity	Description of the program/legal act
Assembly on the introduction of restrictions and prohibitions on the operation of fuel combustion installations within the Małopolska Voivodeship, 2017				that meet ecodesign standards.
Clean Air, 2018	All of Poland / Ministry of Climate and Environment	National Recovery Plan European Funds for Infrastructure, Climate, and the Environment	2018-2029	Replacing heat sources and improving the energy efficiency of single-family residential buildings.

Source: own study

Two issues should be noted in this diagram. The first is that, apart from Krakow, no municipality prohibits the use of solid fuels for heating. The second is that, apart from Krakow residents, other households cannot count on assistance with increased heating costs. This means that a large number of households still have solid fuel heating sources. This, in turn, causes air from neighboring municipalities to influence the air quality in Krakow. This is evidenced by research conducted by researchers from AGH University, who used data from a network of low-cost sensors (LCS) monitoring PM2.5 throughout the Krakow metropolitan area (Danek et al., 2022). Polluted air reaches Krakow mainly from the west, which is due to the city's location in the Vistula River valley and wind patterns. These municipalities do not have a ban on the use of solid fuels. In these localities, old coal-fired furnaces are still used; the database allows for detailed verification of the number of old, high-emission appliances in a given location (Sabal et al., 2025). While there is no research on the motivations behind using old, emission-intensive heating appliances, it should be emphasized that in many homes, especially those with low thermal standards, new appliances can increase heating costs. Furthermore, the Clean Air Program only partially subsidizes the cost of replacing appliances. It's worth noting that there is no protective program for residents of the region (outside of Krakow). This may make replacing a heating source unattractive for lower-income residents.

The issue of average per capita income may also be of significant importance. For years, there has been a debate in Poland about how to measure and compare affluence indicators. Since 2025, the Ministry of Finance has been using an individual affluence indicator, which is the sum of municipalities' basic tax revenues divided by the number of their residents, based on income from two years ago. Table 3 presents these indicators for municipalities in the Krakow Agglomeration.

Table 3. Individual wealth index 2023

Municipality	Individual wealth index 2023
Liszki	4 818.66
Zabierzów	5 969.21
Wielka Wieś	6 731.01
Zielonki	5 962.23
Michałowice	5 025.38
Kocmyrzów-Luborzyca	4 382.92
Igołomia-Wawrzeńczyce	4 110.88
Niepołomice	5 898.78
Biskupice	4 062.34
Wieliczka	4 708.75
Świątniki Górne	4 656.98
Mogilany	5 850.63
Skawina	5 293.99
Czernichów	4 489.29
Koniusza	3 639.26
Kraków	8 435.26

Source: Ministry of Finance

Based on the presented intervention scheme, one can observe overlapping competences, particularly in the funding for replacing heating sources. Because this form of support requires residents to contribute their own funds, the number of potential beneficiaries is limited. In the case of the city of Krakow, the operational scheme was similar, but two factors were unique compared to other municipalities. First, the city has a district heating network, which made changing the heating source less expensive. Second, the Krakow authorities developed an assistance program that provides assistance to residents with the lowest incomes. Table 2 shows that the wealth index of Krakow residents is much higher than that of the other municipalities analyzed. It should be noted that this proportion in terms of wages is typical for the metropolitan area, but this does not change the fact that residents in neighboring municipalities have lower incomes. There is a group of residents who cannot afford to replace heating sources, so without a protective program, they will not choose to use the subsidy for purchasing a new device.

The final stage of the analysis concerns the participation of the three core EU programs (ESF, ERD, CF) in the described initiatives aimed at improving air quality. On the one hand, this issue is typically "technical", but on the other hand it shows a broader phenomenon.

Table 4. Sources of financing for Polish programs supporting the improvement of air quality

Polish program	European Union program
Regional Operational Programs	European Social Fund European Regional Development Fund
European Funds for Infrastructure, Climate, and Environment	European Regional Development Fund Cohesion Fund
National Recovery Plan	Recovery and Resilience Facility

Source: own study

As the table above shows, Polish authorities at various levels have benefited from similar European Union programs, although slightly different rules have been developed. On the one hand, this is standard practice across all EU countries. EU programs constitute a reservoir of funds reserved for selected areas of intervention (such as the economy, environmental protection, social inclusion, transport, etc.). On the other hand, the example of Małopolska shows that the programs are not compatible with each other, and certain gaps emerge.

As can be seen, Polish authorities at various levels have benefited from similar European Union programs, although slightly different rules have been developed. On the one hand, this is standard practice across all EU countries. EU programs constitute a reservoir of funds reserved for selected areas of intervention (such as the economy, environmental protection, social inclusion, transport, etc.). On the other hand, the example of Małopolska shows that the programs are incompatible, creating gaps. Besides the aforementioned overlap of certain activities within the programs, a significant gap is visible. This is the lack of a clear social welfare program for residents. Such a measure would allow residents with the lowest incomes to decide to change their heating source.

The sequence of actions described in this section indicates a certain consistency, but this primarily concerns the Krakow authorities. These efforts have been undertaken for nearly 15 years. Despite their large budgets, the other levels, i.e., the regional and national levels, are plagued by inconsistency. It's worth emphasizing that the flagship Clean Air program is subject to frequent rule changes, as was evident after the change of government in Poland in 2024 (Infor, 2025). It could be argued that funds from the three core EU funds are being spent inefficiently. On the one hand, the EU project management methodology assumes temporary implementation, and this applies to programs as well. On the other hand, the Krakow authorities demonstrate that the inherent temporary nature of projects does not necessarily impede the continuation of certain objectives.

The problems described are consistent with the theme of sustainable development. Although there is a certain contradiction between the logic of programs and projects (temporary implementation) and actions towards sustainable development (the need for continuation), this can be reconciled through appropriate coordination. For the purposes of this publication, it is worth considering introducing the term sustainable program/project, which will refer to activities requiring continuation. Furthermore, such a sustainable program/project should emphasize not only economic and environmental issues, but also social and even cultural ones. However, such an approach requires better coordination between funds, local governments, and public entities.

5 Discussion

A key challenge in actions aimed at improving the quality of life of urban and regional residents, including air quality, is leveraging synergies. This involves harnessing the potential of significant resources from European funds. However, this would require a different approach to formulating long-term program objectives and greater interconnectedness. This would require addressing the concept of sustainable development more comprehensively (Sauvé, Bernard, & Sloan, 2016; Candan & Toklu, 2024). Establishing separate funds in an operational context is understandable, as it facilitates precise support planning. In practice, however, this creates problems related to the described lack of mutual coordination. A holistic approach is necessary.

In recent years, the EU has decided to support a transformation towards sustainability, based, among other things, on reducing harmful emissions and implementing the principles of a circular economy. However, the success of such an undertaking largely depends on public acceptance. Therefore, it should be emphasized that sensitivity to inclusiveness is crucial for mitigating the transitional burdens on society (Liu et al., 2023). These experiences are worth considering in the context of the new perspective of the European Union. EU-level climate policy measures encourage voters to engage in multidimensional cost-benefit calculations (Kollberg et al., 2025). Currently, even the European Commission clearly states in its Green Deal communications that public support for the profound changes that will inevitably accompany the "green transformation" depends on the social inclusion of stakeholders and social groups (Zimmermann & Gengnagel, 2023). This, in turn, would require some modification to the program formula (Hartley, 2020).

In the described example of air pollution in Małopolska, it is likely that the majority of homeowners who are able to benefit from support, i.e., provide an appropriate down payment, have already benefited from this form of assistance. Further programs with a similar scope may be increasingly ineffective, as those using older, more emission-intensive appliances are not wealthy enough to participate in purchasing new furnaces or thermal modernization. This could be called a "program gap." Efforts toward better coordination can contribute to public acceptance.

The problem described also concerns the coordination of public management between central, regional, and local governments. It is worth noting that Poland is a unitary state, but the principle of subsidiarity applies (Krunková, 2025). In a situation where all three levels of government (local, regional, and central) share the same financial resources, consideration should be given to the need for greater synergy. Contemporary literature on the subject clearly demonstrates that local government performs public tasks. Local governments' use of legal instruments typical of state power is also accepted. One of the fundamental formal assumptions of a system based on the principle of subsidiarity is the autonomy and subjectivity of individuals and respect for their rights. In accordance with the principle of subsidiarity, neither the state nor any wider community can replace the initiative and responsibility of individuals and intermediate institutions.

6 Conclusions

There is no doubt that sustainable development activities are a key challenge not only for public authorities but also for society as a whole. However, we should expect political decision-makers to manage public funds effectively. The UN has provided a framework for implementing these activities in the form of SDGs. Goal 11 reads: Make cities and human settlements safe, stable, sustainable, and inclusive. One of the specific targets (11.6) states: By 2030, reduce the adverse per capita environmental impact of cities, paying particular attention to air quality and the management of municipal waste and other pollutants. One of the international organizations that is very active in this area is the European Union. It offers SD-promoting solutions that could be adopted by companies, individuals, and government institutions to jointly contribute to a more sustainable world where problems such as climate change and pollutant emissions are minimized.

As demonstrated in the publication using the example of the Krakow authorities, it is possible to combine SD with programs and projects. However, in order to do so in a more comprehensive manner, it is necessary to coordinate the activities of other levels of government, as well as consistency and continuity. For individual beneficiaries, a lack of continuity can be a problem, as they are unsure whether they can count on support in the future. A possible solution could be

protective measures, as in the case of Krakow, where the poorest people can count on support. However, in the case of households that are not eligible for social assistance on the one hand, and on the other hand, the costs associated with modernization are too high for them, support in the form of co-financing of a heat source is not enough. Without systematic support, it is difficult to achieve success in this area. An additional problem is the lack of links between environmental and economic aspects and social aspects. Other programs are dedicated to these areas. Failure to view these problems as a whole may result in support reaching mainly wealthier residents who can afford to contribute themselves. Many homeowners, including those in municipalities around Krakow, do not take advantage of the support.

Further, more detailed research is needed in the area of social return on investment (SROI). This is a difficult task due to the fact that the government and local authorities at various levels implement their own programs. At the Polish level, it would be worthwhile to conduct such an analysis. There is also an additional research gap in the broader perspective. It concerns examining the relationship between ESF, ERDF, and CF funding. This could provide insight into how EU financial instruments influence sustainable development goals. The last area that requires further study is the relationship between residents' incomes and the level of support.

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Proximity-driven city design: Enhancing sustainability and quality of life in urban environments

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Abstract

This literature review examines the evolution and contemporary significance of urban proximity as a guiding principle in city development. By tracing major urban planning theories of the twentieth century – from early spatial models and neighborhood concepts to car-oriented modernism, human-scale urbanism, sustainable cities, and smart city paradigms – the paper highlights how changing perceptions of distance have shaped urban form and everyday life. While mass motorization once diminished the relevance of walkability, recent challenges related to climate change, public health, and urban resilience have renewed interest in proximity-driven planning. The article synthesizes evidence on the positive impacts of proximity on quality of life, including improved physical and mental health, stronger social cohesion, reduced stress, and enhanced access to services. It also discusses the role of proximity in sustainable urban development, particularly in reducing transport-related emissions, supporting local economies, promoting compact and resource-efficient land use, and preserving natural and agricultural landscapes. Overall, the paper argues that proximity is not merely a spatial condition but a comprehensive paradigm that places human needs, well-being, and daily experiences at the center of urban design. Proximity-driven city planning thus emerges as a key strategy for creating resilient, inclusive, and environmentally sustainable urban environments.

Keywords: Proximity, Quality of life, Spatial distance, Sustainability, Urban planning.

JEL Classification: R11, R58

1 Introduction

In the history of urban planning theories and concepts, various squares, streets, industrial districts, public buildings, commercial centers, green and blue spaces, transport systems, and, not least, the residents themselves and their needs have been the focal points of interest for urban planners, architects, and city designers. All of these strategic locations and objects of interest, together with many others, form a complex urban ecosystem that is continuously evolving and shaping the quality of life of urban dwellers (Gómez-Baggethun et al., 2013).

Although different places and structures have become central to urban development throughout the years, space and distance have consistently retained a key position within urbanism. Space underscores the necessity of an individualized approach to city development, as each locality is characterized by a specific set of geographic and territorial conditions (Hudec et al., 2009). Distance plays an essential role in the spatial distribution of strategic urban objects and in shaping the complexity of transport structures (Xu et al., 2020).

Urban proximity has gradually become a central topic within discussions among urban planners, and today it is, in one form or another, embedded in nearly every theory or concept

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of sustainable urban development (Marquet & Miralles-Guasch, 2015). Urban proximity refers to the reduction of temporal and spatial distance between people, services, and amenities, which contributes to improved public health, individual well-being, urban sustainability, and ultimately higher quality of life (Guzman et al., 2024). More generally, the term proximity is also used in sociology and psychology in the context of interpersonal closeness and social interactions (Tesch, 1979). It is likewise an important concept in economics, appearing in various localization theories and functioning as one of the key factors shaping the innovation potential of an economy (Buček et al., 2010).

The COVID-19 pandemic has further highlighted the importance of urban proximity in recent years. The crisis underscored its significance for urban resilience, as the availability of essential services within short distances enables urban communities to adapt more effectively to unpredictable circumstances (Kourtit et al., 2022). Insights gained during the pandemic suggest that cities designed according to the principle of proximity are better equipped to face a range of potential future crises (D'Onofrio & Trusiani, 2022).

The main goal of this paper is to examine how the concept of urban proximity has evolved within key twentieth-century planning theories and to synthesize existing literature on how proximity can influence urban sustainability and quality of life.

2 The Evolution of Urban Proximity across Twentieth-Century Urban Planning Theories

Throughout the history of urbanism, numerous attempts have been made to conceptualize an ideal city. Urbanists, architects, and city planners have long held divergent visions of what constitutes a prosperous and well-functioning urban environment. Both contemporary and historical urban planning theories differ significantly in their central planning objectives as well as in the ways they conceptualize distance within the city.

A major turning point in the history of urban development – one that profoundly influenced urban form and redefined perceptions of distance worldwide – was the invention of the automobile. In the decades that followed, the private car became the central element of urban development. Many urbanists considered it, regardless of its later negative consequences, as the “savior” of urban mobility (Brown et al., 2009). With Henry Ford’s introduction of mass production, automobiles became accessible to the wider public, which led to an exponential expansion of urban residential areas (Glaeser, 2019). Population movement into more distant areas enabled the development of suburbs and fundamentally altered the dynamics of urban growth (Glaeser, 2019). As a result, the need for walking virtually disappeared, and vibrant pedestrian-oriented urban districts gradually became a rarity (Glaeser, 2019). Longer distances could be traversed in a relatively short time, and distance ceased to constitute an obstacle to urban development (Glaeser, 2019).

Distance – now a central component of proximity – was understood very differently across the various urban theories that shaped the built environment of the 20th century.

One of the first theoretical models to explain the spatial distribution of socioeconomic groups within the city was the Concentric Zone Model, developed in 1925 and also referred to as the model of the urban core and periphery (Quinn, 1940). Its author, Ernest Burgess, illustrated how distance from the urban core defines the optimal spatial arrangement of different social and economic groups (Burgess, 1925). The primary concentric zones in Burgess’s model include: the central business district, a transitional zone populated by immigrants and the urban

poor, a working-class zone, a residential zone for the middle class, and a commuter zone on the suburban fringe (Burgess, 1925).

In 1929, American urbanist Clarence Perry introduced the Neighborhood Unit Theory as a comprehensive approach to urban planning (Byun et al., 2014). Perry defined the neighborhood as a cluster of housing units located near one another and separated from major traffic corridors, with essential services available within walking distance. Such proximity fosters a resilient, self-sufficient community in which residents know each other (Perry, 1929). Significant emphasis is placed on the physical qualities of the neighborhood, as Perry argues that quality of life depends on factors such as housing type, street appearance, sidewalk condition, the presence of greenery, and adequate lighting (Perry, 1929). Distance is thus a fundamental principle in determining the optimal size and structure of neighborhoods (Byun et al., 2014).

The spatial structure of settlements was also examined by Walter Christaller, who in 1933 proposed the Central Place Theory, based on the hierarchy of goods, market areas, and settlements (Buček et al., 2010). According to Christaller, larger cities (central places) are spaced farther apart and provide more complex services, whereas smaller towns located between them offer only basic services (Christaller, 1933). Distance plays a key role in this theory because it is based on spatial optimization and economic efficiency (Getis, A. & Getis, J., 1966). Christaller worked with travel-cost optimization and demand for services, assuming that central places achieve optimal spatial distribution in a hexagonal grid (Christaller, 1933). Interestingly, despite the existence of the automobile, Christaller did not incorporate it into his model, and he considered travel time to central places a key limitation (Brown, 1993).

As private automobile spread rapidly among the general population, numerous concepts emerged between the 1930s and 1960s in which urban development was planned around the car (Brown et al., 2009). Le Corbusier, a prominent figure of modern architecture and urbanism, perceived 20th-century urban space as overcrowded, chaotic, and inefficiently used, calling for its radical transformation (Fishman, 1977). His solution was the 1930 concept of The Radiant City, based on the functional segregation of urban land into zones for housing, commerce, and industry, connected by underground transport (Fishman, 1977). Corbusier's concept emphasized not only vertical expansion but also horizontal expansion, necessitating extensive reliance on automobiles (Curtis, 1986). Consequently, cities would sooner or later need to adapt to the increasing volume of car traffic, shaping urban development around the automobile. As the car fundamentally transformed perceptions of distance, distance ceased to be a central consideration in Corbusier's Radiant City and related planning theories based on motorized mobility.

From the mid-20th century onwards, criticism grew among urbanists concerning both automobile-centered planning and the proliferation of high-rise developments, which were particularly popular in the 1950s, for example in New York (Mumford, 1961). Jane Jacobs emerged as one of the most influential figures of this era. In contrast to Corbusier's car-dependent vision, Jacobs's theories centered on the lived experience of urban residents (Kidder, 2012). Her well-known statement – “Cities have the capability of providing something for everybody, only because, and only when, they are created by everybody” (Jacobs, 1961) – illustrates her focus on people and community development. In her landmark book *The Death and Life of Great American Cities*, Jacobs criticizes functional zoning and single-use districts, which she argued contributed to the decline of American neighborhoods (Jacobs, 1961). She viewed the city as a dynamic ecosystem shaped by social interactions and community life (Jacobs, 1961). For Jacobs, the core components of a thriving city include mixed-use

development, active and safe pedestrian-oriented streets, and proximity to a variety of services – conditions that strengthen community life (Kidder, 2012). Jacobs was the first urbanist to highlight the need to transform car-oriented cities into human-centered urban environments. Her work laid the foundation for understanding proximity and its effects on social interaction, quality of life, and the functioning of vibrant and safe urban spaces. In subsequent years, her ideas were further developed by influential figures such as Jan Gehl, who also advocated for planning cities at a human scale (Gehl, 2010).

This revolution in urban theory continued with the emergence of the New Urbanism movement, which developed in the United States during the 1980s and 1990s and was conceptually aligned with many of Jacobs's ideas (Ellis, 2002). Key principles of New Urbanism include walkable neighborhoods, mixed land use, housing diversity, high-quality public spaces, support for local economies and small businesses, and a strong emphasis on sustainability (Talen, 2000). However, New Urbanism differs from Jacobs's theory in two fundamental respects. First, while Jacobs advocated a bottom-up approach to urban planning – where cities are shaped by residents – New Urbanism largely relies on a more formal top-down approach shaped by planners and architects (Ford, 1999). Second, although both approaches endorse mixed-use urban districts, Jacobs favored revitalizing existing neighborhoods, whereas New Urbanism often promoted the creation of entirely new districts (Ford, 1999).

By the late 20th century, urban planning theories increasingly focused on sustainability and environmental protection (Stimson et al., 2006). The principal theoretical framework of this movement is the concept of The Sustainable City. Its aim is to establish a comprehensive urban ecosystem that balances environmental, social, and economic aspects of urban development (Hassan & Lee, 2015). According to the United Nations Industrial Development Organization, sustainable cities should serve as centers of innovation, leaders in low-carbon industrialization, and examples of effective climate mitigation (UNIDO, 2016). Key themes associated with the sustainable city include biodiversity, renewable energy, circular economy, social inclusion, community life, affordable housing, sustainable infrastructure, and local economic resilience (Bibri & Krogstie, 2019).

Yet, alongside the growing emphasis on sustainability, urban planners also needed to address rapid technological advancements and digitalization. After 2010, the concept of the Smart City gained prominence as a new planning paradigm rooted in the success of the digital revolution (Cocchia, 2014). While scholars disagree on a unified definition (Camero & Alba, 2019), the overarching goal of the Smart City is to improve urban functioning through information and communication technologies (Batty et al., 2012). One of the earliest research teams studying smart cities defined them as urban environments that monitor the condition of all critical infrastructures – such as roads, bridges, tunnels, railways, water, energy, and strategic facilities – and perform necessary interventions in real time (Hall et al., 2000). Smart cities rely heavily on monitoring sensors, big data, and the Internet of Things (Allam & Dhunny, 2019). Similar to other planning models, the spatial dimension remains essential; smart cities are designed according to the characteristics, priorities, and needs of each specific location (Angelidou, 2014). The conceptual framework of the Smart City encompasses several dimensions, including governance (Tomor et al., 2019), human resources (Luterek, 2020), economy (Vinod Kumar & Dahiya, 2017), environment (Shamsuzzoha et al., 2021), mobility (Benevolo et al., 2016), infrastructure (Al-Hader & Rodzi, 2009), education (Molnar, 2021), and healthcare (Poongodi et al., 2021). Distance remains a relevant aspect, as smart mobility systems can optimize travel routes for both public transit and individual transport, reducing time costs (Vranken et al., 2018).

This overview of shifting perspectives on distance across 20th-century urban planning concepts underscores the complexity of urban proximity. Although the understanding of proximity varies across theoretical paradigms, its importance in shaping urban development has never been disputed. The following subsection highlights the positive impacts of urban proximity on quality of life and sustainable urban development.

3 Impacts of Proximity on Quality of Life and Urban Sustainability

Due to extensive car use, congested road networks, and frequent traffic jams, urban residents have increasingly lost control over their personal time. Ensuring access to essential services within walking distance, however, is expected to generate a significant improvement in urban quality of life (Allam et al., 2022).

Contemporary concepts of urban planning emphasize the role of proximity in shaping the quality of everyday life. Quality of life is a multifaceted indicator used to examine satisfaction across multiple dimensions of human existence, measurable through both objective and subjective indicators (Cramer et al., 2004).

In general terms, quality of life encompasses not only material aspects – such as living standards and access to physical and social infrastructure – but also intangible components such as health and opportunities for leisure (Yuan et al., 1999). When assessing quality of urban life, researchers typically focus on: (1) the physical characteristics of the city (buildings, streets, green and blue spaces, transport infrastructure), (2) social aspects (openness and tolerance, neighborhood relations, safety), (3) the environment (nature, air quality, tranquility/noise, cleanliness), (4) the economy (housing market, labor market, cost of living), and (5) institutions (quality of public services, rule of law) (Węziak-Białowska, 2016).

Within the relationship between urban proximity and quality of life, research often concentrates on physical and mental health (Shannon et al., 2006), as well as social interactions, community cohesion, and neighborhood life (Brueckner & Largey, 2008). In a city of short distances, the accessibility of services and public spaces encourages residents to adopt alternative modes of transport such as walking or cycling, which fosters an active lifestyle and subsequently contributes to both physical and mental well-being (Shannon et al., 2006). Moreover, spending less time in traffic congestion reduces stress, thereby supporting mental health (Gee & Takeuchi, 2004).

The topic of proximity is frequently discussed not only in relation to quality of life but also in the context of sustainable urban development, environmental protection, and the reduction of ecological footprints (Bocca, 2024). Proximity significantly affects urban mobility – one of the largest sources of greenhouse gas emissions and air pollutants associated with negative public health impacts (Nieuwenhuijsen, 2016). Shortening distances between residential areas, workplaces, and service locations is assumed to reduce the need for long commutes and thus decrease dependence on private car use (Naess, 2006).

However, urban proximity entails more than changes in transport behavior or the reorganization of transport structures. It primarily concerns the creation of urban ecosystems that support a fulfilling daily life, positioning the individual – their needs, lifestyle, and perception of the world – at the center of attention (Brueckner & Largey, 2008). More broadly, urban proximity represents a paradigm shift in the understanding of urban quality of life and resident happiness (Moreno, 2024). In a city of short distances, this shift can be achieved by reducing travel time,

allowing individuals to devote more time to slower living, rest, reflection, self-realization, creative pursuits, or leisure activities (Moreno, 2024).

In the context of proximity, population density, and sustainable urban development, it is also important to highlight the protection of natural and agricultural landscapes. Several studies demonstrate a negative correlation between urban population density and the amount of green space (McDonald et al., 2023). However, proximity-driven planning is expected to promote vertical urban expansion, which could ultimately preserve natural areas, forests, biodiversity, and agricultural land that would otherwise be threatened by urbanization (Pont et al., 2021).

The city of short distances should also support local entrepreneurship. A strong local economy that provides diverse services decreases the need for residents to travel long distances to satisfy consumer demands, thereby reducing transport costs and environmental burden (Specht et al., 2014). Additionally, local production reinforces urban self-sufficiency through shortened supply chains, reducing the need for importing goods from remote areas and thus lowering the city's overall carbon footprint (Pradhan et al., 2020).

Proximity therefore emerges as one of the key elements of urban development, contributing to high-quality, sustainable, socially cohesive, and inclusive urban environments. For this reason, it has become one of the core pillars of contemporary urban planning concepts aimed at creating human-centered cities.

4 Conclusion

The evolution of urban planning throughout the twentieth century reveals that proximity – though understood differently across historical paradigms – has consistently remained a central element in shaping the urban experience. While the automobile once transformed perceptions of distance and enabled extensive horizontal growth, contemporary debates on sustainability, resilience, and human well-being demonstrate that such development patterns are no longer adequate for addressing the challenges cities face today. As environmental pressures intensify, populations grow, and social expectations shift toward healthier and more inclusive environments, the value of proximity becomes increasingly evident.

Designing cities around short distances allows urban areas to function more efficiently, equitably, and sustainably. Proximity supports active mobility, fosters vibrant social life, and reduces the ecological burden associated with long commutes and dispersed urban structures. Moreover, it strengthens local economies, enhances resilience in times of crisis, and contributes to the protection of surrounding natural and agricultural landscapes. The integration of digital technologies further expands these benefits, enabling cities to optimize transport, infrastructure, and public services in ways that enhance accessibility and reduce time-related constraints.

Ultimately, proximity-driven city design places residents and their daily needs at the core of urban development. By aligning spatial organization, technological innovation, and sustainability goals, such an approach creates urban environments that are not only more functional but also more human-centered. As cities navigate future uncertainties – from climate change to social transformation – the principle of proximity offers a robust and adaptable framework for shaping high-quality, inclusive, and resilient urban spaces.

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Reconceptualizing Urban Commons: Social Capital and the Governance of Shared Urban Spaces

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Abstract

Cities have become key centres where economic opportunities and services are concentrated, but also where social inequalities, diversity, and environmental challenges intensify. In this context, the question of how to design and sustain spaces that are truly shared has re-emerged. Commons theory, originally focused on natural resources, has in recent decades shifted into the urban environment, where the concept of urban commons now refers to community-governed spaces and infrastructures that are co-created, co-managed, and co-used by residents. This paper examines the connection between urban commons and social capital, showing that their relationship is reciprocal: on the one hand, the functioning of urban commons presupposes trust, social ties, and norms of reciprocity; on the other hand, these shared spaces create new connections, strengthen trust, and foster cooperation.

Keywords: Cities, Urban commons, Social capital, Community, Public space

JEL Classification: H41, O18, Z13

1 Introduction

Places are important. The connection between communities and shared resources has long been a subject of research in fields such as regional economics, sociology, and political science. Cities contain public spaces where people meet, form communities, build relationships, and create social connections. When a group of people who share enthusiasm for a certain issue comes together, unafraid to express their ideas, willing to trust one another, they can create accessible, well-maintained spaces that benefit everyone.

In recent decades, however, cities have faced significant social, economic, and environmental challenges - from rising social inequality (Glaeser et al., 2009) to declining trust in institutions (Putnam, 2000). In this context, the question of how to restore cooperation, participation, and social cohesion in urban environments - often characterized by high mobility and weaker social ties - has become increasingly urgent (Glatz and Bodi-Fernandez, 2020; Brain, 2018).

One of the main goals of cities is to attract as many people as possible. There are several ways to achieve this, and one of them is by providing attractive urban commons - public spaces accessible to the wider public and managed by the community (Perrotti et al., 2020). The term "commons" became widely known thanks to Nobel laureate Elinor Ostrom (2010). According to her theory, commons refer to goods whose consumption is difficult to restrict, essentially a form of shared property. But how can we create urban commons in the neighbourhoods where people live? One option is to strengthen social capital and collective capacity, enabling residents to contribute their knowledge, experience, and ideas to the common environment. According

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to Bourdieu (1986), social capital can be understood as a group of people that is ideally of medium size, within which information and ideas circulate on the basis of trust, and members cooperate toward shared goals.

For urban commons to emerge and function, it is essential that a group of people exists to govern them, people who collaborate, exchange ideas, and create an environment that suits everyone (Ostrom, 1990; Foster and Iaione, 2016). A community characterized by social capital and the existence of urban commons go hand in hand (Eisenberg, 2012; Aldrich and Meyer, 2015). The key question remains: to what extent can social capital meaningfully influence the emergence and collaborative management of urban commons?

One of the most visible trends in recent years is the rise of initiatives that can be understood as forms of urban commons - community gardens, co-managed parks, neighbourhood courtyards, or local sharing initiatives. These practices signal residents' interest in collectively managing shared resources and strengthening participation in the everyday life of the city. Despite significant development in both the social capital literature and the commons literature, surprisingly few studies systematically connect these two areas. This paper therefore focuses on linking social capital and urban commons and explores their importance for the functioning of urban communities.

2 Body of Paper

Urbanization, the migration of populations from rural and peri-urban areas to cities, and the concentration of capital, employment opportunities, and services have made cities key spaces of contemporary society. At the same time, cities face growing social inequality, cultural diversity, and environmental (in)justice, while the traditional public sector has been significantly weakened by processes of privatization, commodification, and the securitization of public spaces (Huron, 2015; Brain, 2018). The city thus becomes a dynamic and conflictually structured area, in which places that are genuinely common and truly accessible to all are increasingly disappearing. In this context, interest in the concept of the commons has re-emerged as a way through which communities can manage shared resources on the principles of cooperation, solidarity, and reciprocity.

To understand contemporary urban commons, it is essential to clearly distinguish the concepts of public goods, public space, and commons, which are often used interchangeably despite representing fundamentally different categories. Public goods are economically defined as non-excludable and non-rival goods, typically produced by the state (Samuelson, 1954). Public space refers to a physical location that is formally accessible to the public, yet often subject to legal and administrative constraints, it may be monitored, regulated, or semi-private (Mitchell, 1995; Németh and Schmidt, 2011). Commons, by contrast, are not defined by ownership or physical form, but by modes of governance. According to Ostrom (1990), commons are resources managed through collectively constructed rules and participatory institutions. For this reason, Foster and Iaione (2016) emphasize that commons "are not things, but institutional arrangements", meaning that a garden, courtyard, building, or energy network may all acquire the character of a commons, provided they are co-created, co-managed, and co-used by a community.

With the extension of the original commons theory from natural resources to urban environments, the need emerged to distinguish between different types of urban commons. The literature identifies ecological commons (urban green spaces, community gardens), social and civic commons (community centers, neighborhood spaces), infrastructural commons (energy

cooperatives, mobility networks), and housing commons, which appear in the form of cooperative housing or communities resisting gentrification (Eizenberg, 2012; Foster and Iaione, 2016). This typological diversity does not weaken the concept; rather, it demonstrates that the logic of the commons is, in many ways, universally applicable across various spheres of urban life.

Urban commons are therefore, above all, social processes. Their functioning is not based on the mere physical presence of a space, but on the community's capacity to collectively manage that space. Ostrom (2009) demonstrated that successful commons governance is possible when clear boundaries, participatory rules, monitoring mechanisms, sanctions, and conflict-resolution procedures are in place. In cities, however, these requirements become more complex due to high population mobility, diverse identities, and neoliberal pressures toward the privatization of space. This is why Huron (2015) describes urban commons as a "space of collective negotiation", in which cooperation, conflict, solidarity, and power struggles coexist.

The ability to create and sustain urban commons is inseparably linked to social capital. Social capital, understood either as an individual source of power embedded in social ties (Bourdieu, 1986) or as a collective resource of trust, reciprocity, and cooperation (Putnam, 1993, 2000), represents a fundamental precondition for collective action. The literature distinguishes three key dimensions of social capital, each of which plays a different role within urban commons. Bonding social capital reflects strong ties among homogeneous groups that facilitate coordination but may also generate closure and exclusion (Portes, 1998). Bridging social capital consists of weaker ties connecting heterogeneous groups, enabling the diffusion of innovation and enhancing inclusion (Putnam, 2007). Linking social capital represents vertical connections between communities and institutions, allowing access to resources, legitimacy, and expert support (Szreter and Woolcock, 2004). When these three dimensions are not in balance, commons either remain overly closed or, conversely, struggle to maintain long-term stability.

Building on these insights, the contemporary Co-Cities framework conceptualizes cities as polycentric systems of co-governance in which communities, municipal governments, universities, and private actors collaborate (Foster and Iaione, 2016). This approach promotes experimental models of urban governance. The most well-known example being the Bologna Regulation on Urban Commons, which enables formal partnerships between the city and local communities in the management of public spaces (Iaione, 2016).

Urban commons have also moved to the center of debates on the right to the city, which Lefebvre (1996) and Harvey (2008) define as the inhabitants' right not only to use urban space but also to participate in decisions about how it is produced. In this sense, commons function as instruments of decentralized democracy and as forms of resistance against the commodification of urban life. At the same time, the literature cautions that urban commons are not inherently inclusive (Hodkinson, 2012). They may reproduce power asymmetries, exclusion, invisible labor, or conflicts within the community (Choffat, 2025). Commons are therefore spaces where cooperation intersects with power dynamics.

The physical configuration of the city plays a crucial role in the emergence of social capital and commons. Urban characteristics such as density, street connectivity, functional mix, and the quality of public spaces fundamentally shape the likelihood of social interaction (Miles et al., 2011; Muzayanah et al., 2022; Qi et al., 2024). Numerous studies show that urban form, social capital, commons, and wellbeing constitute an interconnected system in which the physical

environment fosters social ties, those ties enable the formation of commons, and commons ultimately contribute to residents' subjective wellbeing (Samsudin et al., 2022; Amerian, 2024).

Taken together, these theoretical perspectives show that urban commons cannot be understood as marginal community initiatives. They represent a complex system of social, institutional, and spatial interactions that responds to the pressures of urbanization, privatization, and social fragmentation. Their emergence depends on social capital, their functioning is grounded in collective action, and their existence in turn reinforces trust, cooperation, and a sense of belonging. Urban commons therefore allow us to conceive of the city not as a mere collection of buildings, but as a shared, collectively produced socio-spatial reality.

3 Conclusion

Contemporary cities cannot be understood merely as concentrations of buildings, infrastructure, and economic activity, but as dynamic social systems in which truly shared spaces are becoming increasingly rare. Urbanization and the privatization of space are pushing out forms of public life built on sharing, cooperation, and collective responsibility. It is precisely in this context that the concept of urban commons gains particular importance. Urban commons represent spaces and infrastructures that are not only publicly accessible, but also co-created and co-governed by the community. They are not merely physical objects, but institutions of collective action.

The theoretical overview suggests that social capital is crucial in this framework in a dual sense. First, without a minimum level of trust, social ties, and norms of reciprocity, the emergence and long-term functioning of urban commons is unlikely. Second, where urban commons succeed in being maintained, these spaces in turn strengthen social capital: residents meet, collaborate, exchange information, offer mutual help, and develop a sense of belonging. Urban commons are therefore both a result of social capital and a source of it.

This paper thus contributes to understanding urban commons as a connecting link between space and society. Urban commons emerge as a response to the pressures of urbanization and privatization, are governed by communities grounded in social capital, and simultaneously generate that social capital further. Important questions therefore open up for future research: under what conditions do urban commons genuinely strengthen social capital, when do they instead reinforce inequalities, and how can this dynamic be captured in empirical studies of urban quality of life?

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Part 2: Sustainable development and Regional Disparities

Regional Differences in the Evaluation of Satisfaction with Quality of Life and Social Services

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Abstract

Regional differences in the quality of life can be a significant factor contributing to residents' feelings of satisfaction in various areas of life. In order to analyze the current state of quality of life and residents' satisfaction with public services in Slovakia, a survey was conducted in May 2024. The survey examined the attitudes of residents in all eight self-governing regions with an emphasis on three areas within the self-governing competence of the regions, namely education, social services and tourism. The results point to differences between regions. For a better quality of life, it is crucial to focus investments in quality public services, primarily in healthcare, transport and environmental infrastructure. The survey results also show that respondents perceive Slovakia's membership in the EU as an important factor in eliminating regional differences and improving the competitiveness of regions.

Keywords: Quality of life, Self-governing regions, Regional disparities, Social services, EU Support, Survey.

JEL Classification: I18, R11, R58

1 Introduction

Quality of life and the level of public services provided represent key factors influencing resident satisfaction, which subsequently shape the competitiveness and overall development of individual regions. Regional disparities in quality of life are a significant determinant of subjective dissatisfaction experienced across different geographical areas. Research conducted in the United Kingdom illustrates that perceptions of regional differences are largely driven by variations in productivity and economic prosperity. According to McCann (2020), these disparities generate pronounced feelings of discontent, particularly in less developed areas, thereby negatively affecting their socioeconomic development and political stability. This process leads to the emergence of the so-called geography of discontent.

The phenomenon - regional disparities in quality of life - is also evident in Slovakia. Data from the SK8 survey conducted in May 2024 reveal substantial differences in residents' satisfaction with quality of life and the availability of public services across self-governing regions. Regional disparities manifest particularly in differences in the equipment, accessibility, and quality of public services provided by individual regions. The findings further confirm that residents of regions with lower economic performance and weaker investments in public services tend to report lower satisfaction with overall quality of life. These disparities create room for increasing social inequalities and may contribute to the rise of political extremism.

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Satisfaction with quality of life has long been the subject of many studies. In addition to the fact that satisfaction with quality of life is naturally related to the region in which a person lives, there is also a strong correlation with income (Suriyanrattakorn, Chang, 2022) and satisfaction with services (Gstrein et al., 2014).

The aim of this paper is to analyze the current state of quality of life and resident satisfaction with public services based on the results of the SK8 survey conducted in May 2024. The survey focused on the attitudes of residents across all eight self-governing regions, with particular emphasis on three domains within the competencies of regional governments: education, social services, and tourism. The resulting data provide important insights into regional preferences and needs, offering a basis for strategic decision-making and the development of supportive public policies.

This analysis seeks to answer the following research question: How satisfied are residents with the current quality of life in individual Slovak regions and which areas do they consider crucial for the country's further development?

2 Survey methodology

The survey took place between April 30, 2024, and May 7, 2024, using a combination of CAWI (Computer-Assisted Web Interviewing) and CATI (Computer-Assisted Telephone Interviewing) methods in a 70:30 ratio. Data collection was performed on a sample of 1006 respondents aged 18 and over. Respondent selection was carried out using the quota method to ensure representativeness for the population of the Slovak Republic aged 18 and over. Representativeness was achieved according to the categories: gender, age, education, region, nationality, size of place of residence, and internet usage.

The survey focused on these main topics:

- Resident satisfaction with the current quality of life in the region.
- The benefit of projects financed by EU funds and the impact of SR membership in the European Union on regional development.
- Identifying areas of investment important for regional development.
- Quality and preferences of residents in the area of secondary education.
- Satisfaction and preferences in the area of social services.
- Quality and services in the area of tourism.

3 Satisfaction with Quality of Life: A Look at Self-Governing Regions

In the first part, we look at a comparison of residents' overall satisfaction with the quality of life in their region and the connections between their satisfaction and three selected public services: secondary education, social services, and tourism services.

3.1 Bratislava Region (BSK)

Residents around the capital city Bratislava were the most satisfied with the quality of life in the region compared to the rest of Slovakia. Up to 80% of respondents expressed their satisfaction with the quality of life; people with higher education reported greater satisfaction. Of the three monitored public services, BSK residents were most satisfied with the quality of tourism services, where they again expressed the highest satisfaction in all of Slovakia. In BSK, 70% of respondents are satisfied with the quality of tourism services; the highest satisfaction is among young people up to 39 years old (approx. 78%) and those with university education,

while 23% are dissatisfied. Respondents most prefer holidays abroad (47%), closely followed by the preference for a holiday in Slovakia outside their region (43%). 10% of respondents prefer a holiday in their own region.

47% of respondents are satisfied with the quality of secondary education; the youngest (59%, aged 18-29) and the oldest respondents (62%, aged over 60) are the most satisfied, and 40% of respondents are dissatisfied. Reflecting the needs of the current labor market was rated as excellent or good by 41% of respondents, while 41% rated it as inadequate.

39% of respondents are satisfied with the quality of social services in the region; 54% of respondents aged over 60 expressed satisfaction. 49% are dissatisfied, mostly respondents aged 40-49 (72% of them), and also those with university education (60%). The preferred service for respondents would be community-based services provided in the home environment (50%) or a day care center (21%). 15% of respondents are satisfied with the care for vulnerable groups, while 29% rated it as inadequate. Access to information about social services is considered very good by 18% of respondents, while 34% consider it inadequate. The availability of social services is excellent or very good according to 14% of respondents, while 39% rated it as inadequate.

One third of respondents from BSK consider the role of the EU in eliminating differences between regions and supporting regional competitiveness growth to be significant.

3.2 Trnava Region (TtSK)

The second most satisfied region, almost at the level of Bratislava, was the Trnava Region. Almost 80% of respondents are satisfied with the quality of life in the region, significantly more men (91%) than women (67%), and those with university education (94% expressed satisfaction) predominated over people with basic or vocational education (69%).

TtSK is the region with the second highest satisfaction regarding tourism services; up to 68% of respondents are satisfied with the quality, and 24% are dissatisfied. The most dissatisfied are those aged 18-29 (37%) and those aged 50-59 (38%). Respondents most prefer a holiday in Slovakia outside their region (46%). Holidays abroad are preferred by 33% of respondents. 21% of respondents prefer a holiday in their own region.

Residents of TtSK are also the second region in satisfaction with the quality of secondary education, cited by up to 52% of respondents. From an age perspective, those in their forties (79%) and people over 60 (65%) are the most satisfied with secondary education. 37% of respondents are dissatisfied with the quality of secondary education, the most dissatisfied being young people aged 18-29 (55%) and older people aged 50-59 (58%). Reflecting the needs of the current labor market was rated as excellent or good by 40% of respondents, while 44% rated it as inadequate.

36% of respondents are satisfied with the quality of social services in the region; more satisfied are respondents aged 50-59 (54%). 52% are dissatisfied with the quality of social services, the most dissatisfied being the oldest respondents aged 70 and over (91%) and those with university education (75%). The preferred service for respondents would be community-based services provided in the home environment (42%) or a day care center (24%). 14% of respondents are satisfied with the care for vulnerable groups, while 35% rated it as inadequate. Access to information about social services is considered very good by 21% of respondents, while 34%

consider it inadequate. The availability of social services is excellent or very good according to 17% of respondents, while 47% rated it as inadequate.

38% of respondents consider the role of the EU in eliminating differences between regions to be significant, while 26% consider it insignificant. 33% of respondents state that the EU significantly contributes to the growth of regional competitiveness, while 27% report an insignificant contribution.

3.3 Trenčín Region (TnSK)

Two-thirds of respondents in the Trenčín Region expressed their satisfaction with the quality of life; the most satisfied were the youngest respondents aged 18-29 (83%) and older respondents aged 60-69 (86%).

In the Trenčín Region, respondents reported the second-highest satisfaction with the quality of social services and the quality of secondary education, but the second-lowest satisfaction with tourism services compared to other regions.

46% of respondents are dissatisfied with the quality of social services, primarily those aged 40-49 (63%). Respondents would most accept community-based services provided in the home environment (43%) or year-round residential care (23%). 7% of respondents are satisfied with the care for vulnerable groups, while 37% rated it as inadequate. Access to information about social services is considered very good by 13% of respondents, while 29% consider it inadequate. The availability of social services is excellent or very good according to 18% of respondents, while 38% rated it as inadequate.

52% of respondents are satisfied with the quality of secondary education and 34% are dissatisfied. Reflecting the needs of the current labor market was rated as excellent or good by 38% of respondents, while 44% rated it as inadequate.

Only 55% of respondents are satisfied with the quality of tourism services, mostly those aged 50-59 (85%), and 36% are dissatisfied. A holiday in Slovakia outside their region is preferred by 42% of respondents, closely followed by the preference for a holiday abroad (41.7%). 16% of respondents prefer a holiday in their own region.

23% of respondents consider the role of the EU in eliminating differences between regions to be significant, while 31% consider it insignificant. 21% of respondents state that the EU significantly contributes to the growth of regional competitiveness, while 28% report an insignificant contribution.

3.4 Nitra Region (NSK)

64% of respondents expressed satisfaction with the quality of life in the Nitra Region, which practically does not differ across gender, education, and age. One third of respondents are dissatisfied with the quality of life.

44% of respondents are satisfied with the quality of secondary education, and 40% are dissatisfied. Reflecting the needs of the current labor market was rated as excellent or good by 42% of respondents, while 49% rated it as inadequate.

Only 32% of respondents are satisfied with the quality of social services in the region, which was the lowest among all regions. 60% are dissatisfied with the quality of social services,

mostly respondents aged 30-49 (74%). The preferred service for respondents would be community-based services provided in the home environment (48%) or a day care center (20%). 8% of respondents are satisfied with the care for vulnerable groups, while 33% rated it as inadequate. Access to information about social services is considered very good by 18% of respondents, while 35% consider it inadequate. The availability of social services is excellent or very good according to 13% of respondents, while 46% rated it as inadequate.

In NSK, 57% of respondents are satisfied with the quality of tourism services, and 37% are dissatisfied. A holiday in Slovakia outside their region is preferred by 49% of respondents. Holidays abroad are preferred by 29% of respondents. 22% of respondents prefer a holiday in their own region. 37% of respondents consider the role of the EU in eliminating differences between regions to be significant, while 36% consider it insignificant. 34% of respondents state that the EU significantly contributes to the growth of regional competitiveness, while 32% report an insignificant contribution.

3.5 Žilina Region (ŽSK)

77% of respondents in the Žilina Region expressed their satisfaction with the quality of life; the most satisfied are the youngest respondents aged 18-29 (89%), older respondents aged 60-69 (83%), and those living in municipalities over 5,000 inhabitants (88%). In comparison to other public services, residents of the Žilina Region are the most satisfied in Slovakia with the quality of secondary education, but the least satisfied with the quality of tourism services. Satisfaction with secondary schools is reported by up to 53% of respondents; the most satisfied are the youngest respondents aged 18-29 (61%), and 34% of respondents are dissatisfied. Reflecting the needs of the current labor market was rated as excellent or good by 33% of respondents, while 42% rated it as inadequate.

In the Žilina Region, only 54% of respondents are satisfied with the quality of tourism services - the most satisfied being young people aged 18-29 (83%). 34% of respondents are dissatisfied, mostly respondents aged 30-39 (50%). A holiday in Slovakia outside their region is preferred by 40% of respondents, closely followed by the preference for a holiday abroad (37%). 22% of respondents prefer a holiday in their own region.

40% of respondents are satisfied with the quality of social services in the region. The preferred service for respondents would be community-based services provided in the home environment (46%) or year-round residential care (24%). 11% of respondents are satisfied with the care for vulnerable groups, while 44% rated it as inadequate. Access to information about social services is considered very good by 16% of respondents, while 37% consider it inadequate. The availability of social services is excellent or very good according to 12% of respondents, while 48% rated it as inadequate.

34% of respondents consider the role of the EU in eliminating differences between regions to be significant, while 31% consider it insignificant. 37% of respondents state that the EU significantly contributes to the growth of regional competitiveness, while 25% report an insignificant contribution.

3.6 Banská Bystrica Region (BbSK)

77% of respondents in the Banská Bystrica Region are satisfied with the quality of life; the most satisfied are those in their forties (90%). 24% of respondents are dissatisfied with the quality of life, mostly people aged 50-59 (40%).

48% of respondents are satisfied with the quality of secondary education, 32% are dissatisfied. Reflecting the needs of the current labor market was rated as excellent or good by 34% of respondents, while 37% rated it as inadequate.

44% of respondents are satisfied with the quality of social services in the region; the most satisfied are young people aged 18-29 (59%) and the oldest aged 70 and over (58%). 48% are dissatisfied, the most dissatisfied being respondents aged 60-69 (67%) and those aged 40-49 (60%). The preferred service for respondents would be community-based services provided in the home environment (51%) or year-round residential care (25%). 12% of respondents are satisfied with the care for vulnerable groups, while 42% rated it as inadequate. Access to information about social services is considered very good by 19% of respondents, while 29% consider it inadequate. The availability of social services is excellent or very good according to 10% of respondents, while 43% rated it as inadequate.

In the Banská Bystrica Region, 60% of respondents are satisfied with the quality of tourism services; the most satisfied are those in their forties (75%), and 30% of respondents are dissatisfied. A holiday in Slovakia outside their region is preferred by 47% of respondents, followed by the preference for a holiday abroad (34%). 19% of respondents prefer a holiday in their own region. Innovative forms of entertainment in BbSK are rated as excellent or very good by 12% of respondents.

30% of respondents consider the role of the EU in eliminating differences between regions to be significant, while 25% consider it insignificant. 33% of respondents state that the EU significantly contributes to the growth of regional competitiveness, while 27% report an insignificant contribution.

3.7 Prešov Region (PSK)

65% of respondents in the Prešov Region stated that they are satisfied with the quality of life in their region. The most satisfied are the oldest respondents aged over 70 (82%). 32% of respondents are dissatisfied.

The Prešov Region emerged as the region with one of the highest satisfaction levels in Slovakia regarding social services; up to 50% of respondents in the region are satisfied, and 45% are dissatisfied. The preferred service for respondents would be community-based services provided in the home environment (48%) or a day care center (21%). 14% of respondents are satisfied with the care for vulnerable groups, while 33% rated it as inadequate. Access to information about social services is considered very good by 16% of respondents, while 33% consider it inadequate. The availability of social services is excellent or very good according to 20% of respondents, while 38% rated it as inadequate.

PSK emerged as a region with one of the highest satisfaction levels regarding the quality of secondary education; 51% of respondents are satisfied, and 40% are dissatisfied. The most dissatisfied are the oldest respondents aged over 70 (59%). Reflecting the needs of the current labor market was rated as excellent or good by 40% of respondents, while 36% rated it as inadequate.

In the Prešov Region, 58% of respondents are satisfied with the quality of tourism services; the most satisfied are the youngest aged 18-29 (73%) and the oldest aged over 70 (71%). 31% are dissatisfied. Most respondents prefer holidays abroad (40%), closely followed by the preference for a holiday in Slovakia outside their region (38%). 22% of respondents prefer a holiday in their own region.

37% of respondents consider the role of the EU in eliminating differences between regions to be significant, while 27% consider it insignificant. 40% of respondents state that the EU significantly contributes to the growth of regional competitiveness, while 25% report an insignificant contribution.

3.8 Košice Region (KSK)

In the Košice Region, the fewest residents in Slovakia (only 59%) are satisfied with the quality of life. The most satisfied are the oldest respondents aged 70 and over (70%) and the youngest aged 18-29 (64%).

50% of respondents are satisfied with the quality of secondary education; the most satisfied are young people aged 18-29 (64%). 33% of respondents are dissatisfied. Reflecting the needs of the current labor market was rated as excellent or good by 34% of respondents, while 48% rated it as inadequate.

42% of respondents are satisfied with the quality of social services in the region; 49% of respondents are dissatisfied. The preferred service for respondents would be community-based services provided in the home environment (41%) or year-round residential care (25%). 18% of respondents are satisfied with the care for vulnerable groups, while 42% rated it as inadequate. Access to information about social services is considered very good by 17% of respondents, while 30% consider it inadequate. The availability of social services is excellent or very good according to 13% of respondents, while 54% rated it as inadequate.

In KSK, 58% of respondents are satisfied with the quality of tourism services, and 35% are dissatisfied. Most respondents prefer holidays abroad (39%), followed by the preference for a holiday in Slovakia outside their region (36%). 25% of respondents prefer a holiday in their own region.

35% of respondents consider the role of the EU in eliminating differences between regions to be significant, and 35% consider it insignificant. 37% of respondents state that the EU significantly contributes to the growth of regional competitiveness, while 32% report an insignificant contribution.

4 Areas most important for investment for regional development

Respondents across all of Slovakia would most welcome investment in healthcare (61%), especially older people aged over 60 (67%) and those who expressed dissatisfaction with the quality of life (66%). More than half of respondents (54%) would welcome investment in transport infrastructure, most notably the youngest age category 18-29 (67%) and more men (58%) than women (49%) (see Figure 1).

Furthermore, 42% of respondents would like investments in the environment, the construction of sewage systems, and wastewater treatment plants. 39% want investment in education and schooling. Young people aged 18-29 (45%) and more women (43%) than men (35%) would most like to invest in schooling. Over 30% of respondents would also like to invest in social assistance and housing. The monitored areas of education and social services rank among the top 5 priority areas for investment according to the residents of Slovakia; tourism ranked eighth.

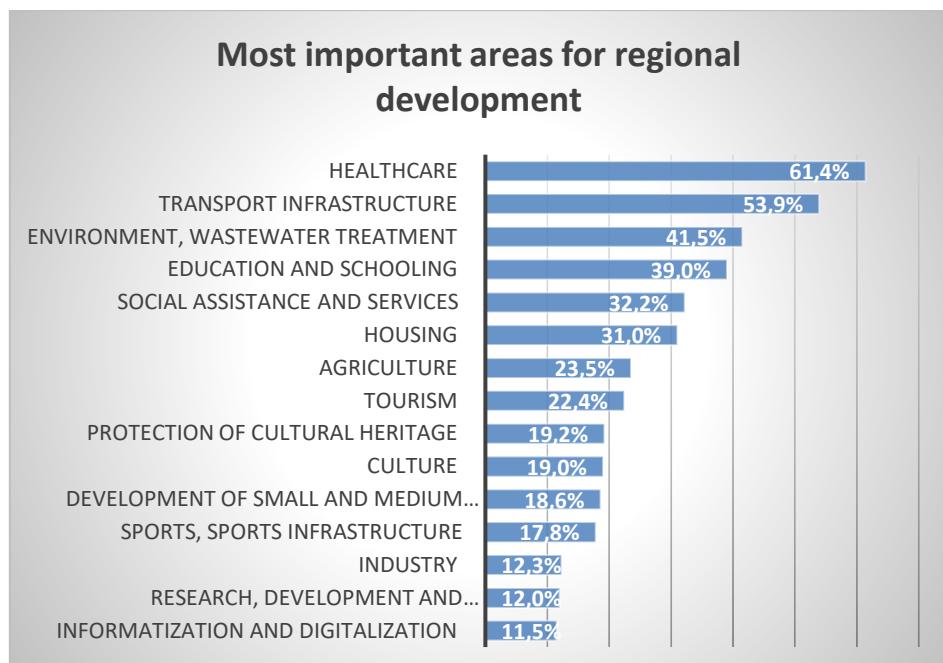


Figure 1 Most important areas for regional development – all respondents (N=1006)

Source: Own processing

5 Conclusions and Key Finding

Based on the selected survey results, conclusions can be formulated in the following areas:

1. Satisfaction with the current quality of life

- The survey results indicate that the majority of respondents (on average around 70%) are satisfied with the quality of life in their regions.
- The highest level of satisfaction is in the Bratislava (80%) and Trnava (80%) regions, while the lowest satisfaction is in the Košice region (59%).
- There are no significant gender or age differences in the perception of quality of life in the region, but the most satisfied are young people aged 18-29, people with higher education, and people from cities over 100,000 inhabitants or from municipalities of 1,000–5,000 inhabitants.

2. Areas considered key for regional development by respondents

- The survey results show that healthcare is clearly the highest priority for residents across all regions, as 61% of respondents designated it as the most important area for development.
- This is followed by transport infrastructure (55%) and, at a distance, the environment, including the construction of sewage systems and wastewater treatment (42%), and the area of education and schooling (39%).
- Conversely, tourism, which was perceived as a priority area for development especially in touristically attractive regions, ranked only eighth overall. This suggests that the current needs of residents are focused more on basic services and infrastructure.

3. Social services in the regions

- Satisfaction with the quality of social services is the lowest among the monitored public services, with only 40% of respondents overall satisfied, while 51% are dissatisfied. The largest regional differences were identified in this area.
- The greatest dissatisfaction with the quality of social services was expressed by residents of the Nitra Region (up to 59% of respondents were dissatisfied with the

quality of services provided), while the situation is slightly better in the Prešov Region (50% satisfied).

- The majority of respondents prefer community-based social services provided in the home environment (48%), while year-round residential social service is preferred mainly by older residents.

4. Secondary education

- Approximately half of the respondents (50%) are satisfied with the current quality of secondary education, and the differences between regions are not large.
- Respondents in the Bratislava Region express the highest satisfaction (47%). The highest dissatisfaction is in the Nitra Region, where over 40% of respondents rated the quality of education as inadequate.

5. Tourism in the regions

- Satisfaction with the quality of tourism services in the regions is higher, with an average of up to 59% of respondents satisfied.
- The Bratislava Region achieves the highest satisfaction (70%), while the Košice Region shows the largest proportion of dissatisfied respondents (35%).

The survey clearly points to differences in satisfaction between regions and identifies the main areas that need improvement. Such findings could serve as a basis for more targeted political interventions aimed at regional equality in the provision of public services. For a better quality of life in Slovak regions, it is crucial to focus investments into quality public services primarily on healthcare, transport, and environmental infrastructure. At the same time, it is essential to focus on improving the quality and accessibility of those services in regions that show a high degree of dissatisfaction. In the interest of balanced development in Slovakia, it is thus important to reflect the differentiated needs of the residents and create strategic plans to support specific regional investments in all regions.

The survey results also indicate that respondents perceive Slovakia's membership in the EU as an important factor in eliminating regional differences and improving regional competitiveness. 40% of residents perceive a benefit from EU-funded projects. Investments from EU funds are a fundamental tool in Slovakia for addressing problems with under-dimensioned public services.

Acknowledgements

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Regional disparities in the effectiveness of implementing allocated ESIF resources in climate change

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Abstract

The article evaluates the effectiveness of drawing on the European Structural and Investment Funds (ESIF) in the 2014-2020 programming period within the climate domain across the member states of the European Union and their regions. The analysis is based on the Cohesion Data database and works with indicators of planned, decided, and absorbed expenditures. The results show significant disparities in implementation. Ireland and Estonia achieved the highest effectiveness, while Denmark reported low absorption despite high allocations. Less developed regions draw the largest volume of climate-related resources, whereas transition regions are the least efficient, while more developed regions demonstrate the highest success rates. The findings confirm that the effectiveness of climate investments depends less on the volume of allocations and more on the quality of governance, administrative capacity, and the monitoring of climate expenditures.

Keywords: climate change, European Union, European Structural and Investment Funds, regional disparity, cohesion policy

JEL Classification: R11, Q54, Q56

1 Introduction

Climate change is increasingly shaping the economic, social, and environmental development across regions in the European Union (EU). The EU is responding by transforming its economic policies in line with the European Green Deal, whose primary objective is to achieve climate neutrality by 2050 (European Commission, 2020). Achieving this goal calls for considerable public investment, and the European Structural and Investment Funds (ESIF) represent one of the main financial tools supporting this effort.

According to Feld and Hassib (2024), cohesion policy has traditionally focused on reducing regional disparities and promoting growth. Since the 2014-2020 programming period, climate-related goals have taken on a much more visible role in cohesion policy, influencing how priorities are set and how funding is organized. In the 2021-2027 period, climate policy has become one of the central pillars of cohesion policy.

Recent studies highlight that the EU's climate ambitions must be aligned with what member states are realistically able to implement. This means not only looking at how climate objectives are incorporated into programming documents but also evaluating the extent to which these funds are being used in practice. The aim of this article is therefore to provide a comprehensive analysis of expenditures allocated to climate objectives within the ESIF, to compare the 2014-

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2020 and 2021-2027 periods, to assess differences in fund absorption across countries and regional categories, and to identify the factors that influence the effectiveness of climate-related interventions.

The article is structured into three main chapters, in which we outline the theoretical background and current state of knowledge on the topic, describe the methodological approach of the research, and present the analytical results that address the established research questions and hypothesis.

2 Literature review

The European Structural and Investment Funds represent a key EU financial instrument supporting the transition toward a climate-resilient and low-carbon economy. Since the 2014-2020 programming period, climate objectives have been incorporated into the so-called climate mainstreaming framework, under which at least 20% of the EU budget was required to be allocated to climate-related measures (European Commission, 2016). In the 2021–2027 period, this target was increased to 30%, with cohesion policy and the ESIF constituting one of the main pillars of financing for the European Green Deal (European Commission, 2022).

In the 2014-2020 period, the climate dimension within the ESIF was primarily embedded through Thematic Objective 4 (TO4) - the low-carbon economy, and Thematic Objective 5 (TO5) - climate change adaptation, both of which required member states to adopt relevant strategies (Climate-ADAPT, 2017; European Commission, 2015). In practice, this meant that climate objectives had to be integrated into the programming, assessment, and implementation of all operational programs. For Slovakia, this is also confirmed by the Strategy on Adaptation to Climate Change (Ministry of the Environment of the Slovak Republic, 2018), which explicitly identifies the ESIF as the main financial source for adaptation measures.

The European Commission introduced a tracking climate expenditure methodology, which assigns coefficients to projects (100%, 40%, 0%) based on the extent of their contribution to climate objectives (European Commission, 2016). However, the Institute for European Environmental Policy (Illés and Medarova-Bergstrom, 2014; Nesbit et al., 2021) and the OECD (2022) caution that this methodology may lead to an overestimation of climate spending, particularly when coefficients are applied mechanically without detailed project-level assessment.

Research consistently shows that ESIF have a positive, though uneven, impact on the green transition. According to Tagliapietra et al. (2019), the implementation of the green transition also brings risks and challenges that require the EU's close attention. Bigerna, D'Errico, and Polinori (2025) demonstrate that higher absorption of climate-oriented ESIF correlates with greater environmental and economic efficiency in member states, meaning an improved ability to grow while emitting less, albeit with significant regional disparities. Tijanič and Kersan-Škabič (2025) note that while country-level analysis suggests a higher absorption rate among less developed states, the effectiveness of ESIF must be complemented by governance reforms and strengthened institutional capacities to minimize risks related to rising inequalities, job losses, and the broader costs of the green transition. Christou et al. (2025), in their assessment of expected impacts of 2021-2027 measures, reinforce the conclusions of Tijanič and Kersan-Škabič (2025), stating that cohesion policy can significantly contribute to the EU's climate objectives, but outcomes will depend heavily on implementation quality. They report that approximately 37% of the cohesion budget is allocated to climate objectives, which include investments in energy efficiency, renewable energy, climate-risk prevention, transport-

dominated by rail and clean urban mobility. Regional allocations remain uneven, with southern and eastern regions benefitting the most. The OECD (2022) likewise concurs with previous findings, emphasizing that the climate effectiveness of ESIF is strongly conditioned by governance quality, administrative capacity, coordination across levels of public administration, and the design of evaluation criteria. Weak governance can undermine outcomes even in countries with high financial allocations. Štreimikienė and Mikalauskienė (2016), comparing the Baltic states, the Czech Republic, and Slovakia, show that ESIF significantly supported renewable energy, energy efficiency, and reductions in carbon and energy intensity of economies. Estonia and the Czech Republic achieved the greatest progress due to intensive support, while less developed economies used the investments primarily for infrastructure modernization. They conclude that ESIF represents a critical decarbonization instrument, but one that requires adequate administrative capacity and effective targeting of investments. Slovakia has been among the countries with a high dependence on ESIF for climate-related investments. The document Slovakia 2030 (Ministry of Investments, Regional Development and Informatization of the Slovak Republic, 2020) underscores the need for better coordination and stronger linkage between ESIF and national climate policies.

The available literature shows that ESIF can make a significant contribution to climate-related measures and climate adaptation. However, their actual impact largely depends on the quality of governance, reliable and transparent monitoring of climate expenditures, the ability of member states to design and implement green interventions, and the further refinement of the climate mainstreaming methodology. Based on the reviewed body of literature, we therefore sought to map the level of allocation and absorption of European funds in the climate domain to analyse the effectiveness of ESIF spending at both the country level and across individual regions.

3 Methodology

The analysis is based on data from the European Commission, specifically the Cohesion Data database (European Commission, 2025), which provides information on the use of ESIF during the 2014-2020 period. It draws on three financial indicators: planned allocations, committed amounts (decided), and actual expenditures (spent). Implementation efficiency is assessed through the ratio of utilized funds to allocated funds, which reflects the capacity to transform commitments into realized investments.

The regional classification follows the EU's typology based on GDP per capita in purchasing power parity, distinguishing:

- less developed regions (GDP < 75% of the EU average),
- transition regions (75–90%),
- more developed regions (GDP > 90%).

The classification of NUTS II regions into individual categories follows the official regional policy framework of the European Commission. Some NUTS II regions may appear in multiple categories, for example a standard category and a VOID category (covering transnational and macro-regional programs for which it is not possible to assign a single specific region). The data are aggregated at the member State level according to the categories to which their regions belong, enabling comparison of implementation performance across different levels of economic development. The analysis focuses exclusively on expenditures classified as climate action which encompass climate change mitigation and adaptation, energy efficiency, renewable energy sources, and the reduction of environmental risks.

Based on the theoretical foundations, we formulated the following research questions:

1. *What is the level of absorption of ESIF dedicated to climate objectives?*
2. *Do regional differences exist in the efficiency of ESIF absorption targeting climate change?*

The research questions were defined to enable an empirical assessment of the effectiveness of resources allocated to climate-related measures. They also allow for the identification of regional disparities in absorption capacity, with the aim of understanding the factors that condition the success of climate-oriented investments, as highlighted in the literature.

Drawing on the above research questions and the reviewed literature, we propose the following hypothesis:

H0: More developed regions exhibit higher efficiency in the utilization of ESIF in climate action.

In interpreting the results, we consider that implementation performance depends not only on the level of allocations and economic development, but also on administrative capacity, the quality of project preparation, and governance stability. These factors are particularly important for technically demanding climate projects. On this basis, the following section presents an overview of climate-related investment absorption.

4 Results and discussion

According to the European Commission (2025), overall utilization of ESIF in the 2014-2020 period shows substantial differences between planned, decided, and spent investments. Although most member states were allocated more resources than initially planned, actual absorption is highly uneven. The most successful countries were Estonia and Bulgaria (94-96% of decided funds spent), followed by Germany and Finland with approximately 86%, and the Netherlands and Poland with around 88-89%. In contrast, Spain spent only about half of its decided allocations, while Greece and Romania also lagged patterns linked to long-standing challenges in public administration and fund management.

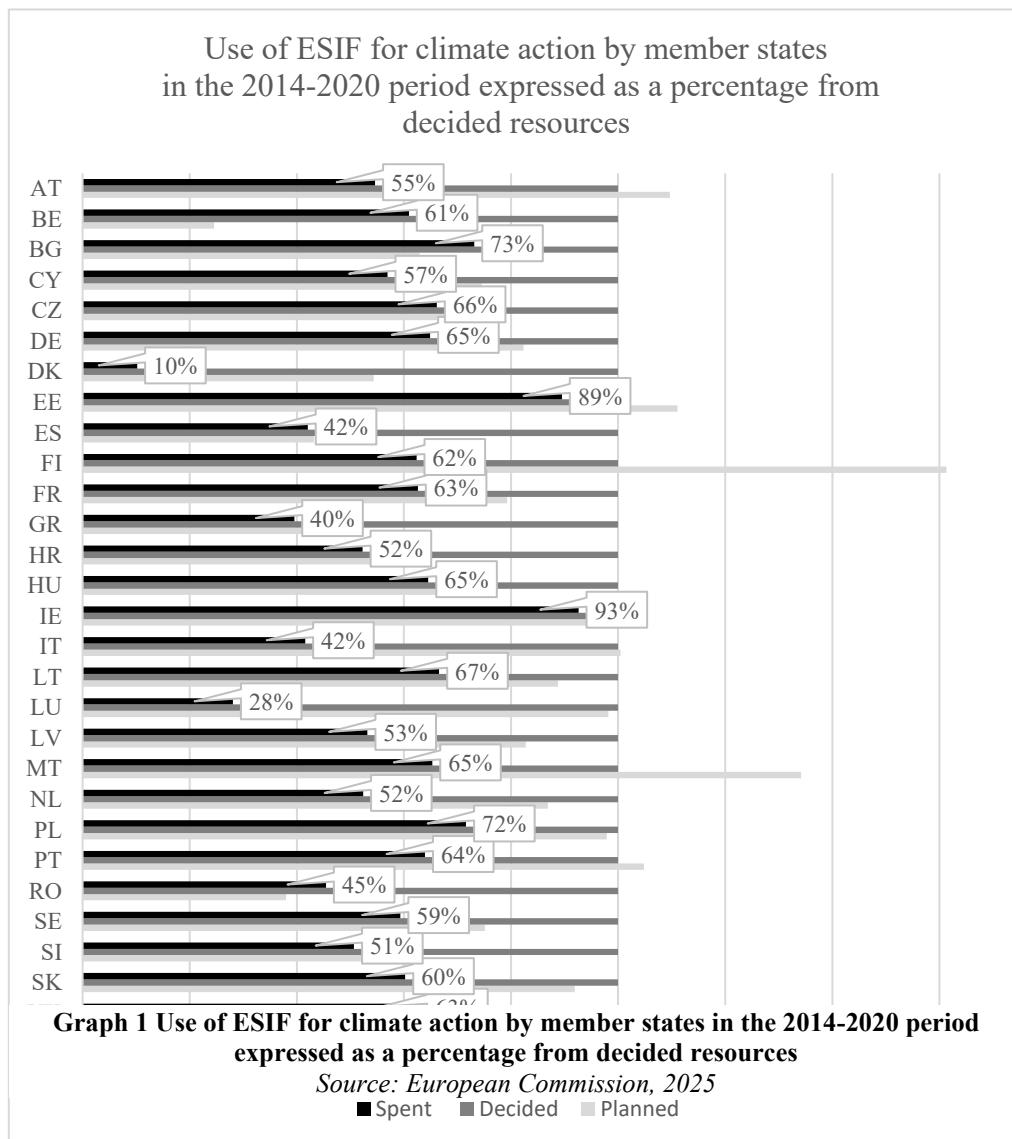
These disparities suggest that the efficiency of ESIF utilization depends less on the size of allocations and more on governance quality, project preparedness, and administrative capacity. The following section focuses specifically on expenditures classified as climate action.

4.1 European structural and investment funds in climate action

In the case of climate-related investments, the differences between member states become even more pronounced. Many countries reported high planned allocations, yet actual spending frequently fell short. As shown in Graph 1, Ireland and Estonia achieved the highest shares of spent funds (around 90% or more), indicating strong absorption capacity and a well-prepared project portfolio. At the opposite end, Denmark exhibited very low absorption, likely due to its robust national climate policies and reduced reliance on ESIF.

Average absorption amounted to 58% of decided resources. Central and Eastern European countries (Bulgaria, Poland, Lithuania, Hungary) display above-average utilization levels (exceeding 65%), reflecting their substantial investment needs in energy transition and climate adaptation. However, absorption is often 10–20 percentage points lower than decided amounts.

Spain, Italy, and Greece repeatedly struggle with fund absorption, including in climate-related projects. Administrative barriers, complex approval procedures, and lower institutional capacity slow implementation even when allocations are sufficient. Finland and Malta recorded



some of the highest ratios of planned to decided funds, which may be explained by several factors. Finland has a long-standing orientation toward ecological and environmental policy, making it a natural candidate for extensive ESIF use in this area. In addition, according to Ernst & Young (2020), both Finland and Malta operate highly developed information systems for overall program management and ESIF utilization.

The overall picture confirms that ESIF absorption is a significant and essential factor in achieving climate-related progress, yet their effectiveness is constrained by differences in national management systems and project preparedness. To better understand these disparities, it is necessary to examine the regional level.

4.2 Regional differences in implementation of ESIF climate investments (2014 - 2020)

A regional perspective reveals that implementation efficiency corresponds more closely to administrative and managerial capacity than to the volume of allocated resources. We analyse three groups of regions: less developed, transition, and more developed regions.

Less developed regions have the highest volume of planned investments in climate-related measures (over EUR 21.6 billion). In many countries, decided funds exceeded the original plans due to reallocations and additional resources (e.g., Romania, where commitments were more than four times the planned amount). Based on Table 1, we can conclude that average absorption reached 63%, though differences between countries are substantial: Bulgaria absorbed as much as 93% of decided funds, whereas Spain absorbed only 31%. Poland, as the largest recipient, demonstrated strong absorption capacity (75%).

Table 1 Planned, Decided and Spent resources of ESIF for climate action in less developed regions – 2014-2020 period

Less developed	Planned	Decided	Spent	Spent/Decided
BG	770 780 645,4	1 364 191 559,2	1 273 121 223,9	93%
CZ	1 839 778 542,2	2 554 929 741,7	1 688 689 166,1	66%
EE	120 198 307,8	36 178 753,7	27 839 428,9	77%
ES	280 721 586,0	523 860 836,8	164 016 077,0	31%
FR	442 272 792,1	489 624 494,3	257 052 673,7	52%
GR	801 084 815,2	1 378 854 059,5	650 935 450,8	47%
HR	772 589 168,2	1 118 267 130,2	713 794 577,2	64%
HU	1 437 528 478,0	2 022 180 634,3	1 519 493 515,9	75%
IT	2 964 908 258,0	3 640 416 128,4	1 765 058 238,2	48%
LT	624 260 869,0	621 723 970,8	393 744 900,3	63%
LV	389 283 899,6	385 558 734,5	263 115 041,1	68%
PL	5 871 563 048,4	5 827 587 783,5	4 382 322 832,3	75%
PT	1 288 771 348,8	1 063 967 671,0	730 875 447,6	69%
RO	1 859 316 517,1	6 768 432 972,3	3 752 466 351,0	55%
SI	166 325 261,2	301 672 067,1	171 283 992,0	57%
SK	1 555 840 354,2	1 604 580 786,4	1 074 055 986,1	67%
UK	446 968 479,8	428 426 489,2	267 964 315,1	63%
Sum	21 632 192 371,0	30 130 453 812,7	19 095 829 217,2	63%
Average	1 272 481 904,2	1 772 379 636,0	1 123 284 071,6	63%
Minimum	120 198 307,8	36 178 753,7	27 839 428,9	31%
Maximum	5 871 563 048,4	6 768 432 972,3	4 382 322 832,3	93%

Source: European Commission, 2025

Transition regions absorb fewer resources (with approximately EUR 5.4 billion planned), but they play an important role as an intermediate stage in economic transformation. From Table 2, we observe that decided funds exceeded EUR 8.3 billion, reflecting growing demand for climate investments, yet average absorption is only 52%, lower than in less developed regions.

Malta achieves the best results (80%), while France and Germany reach around 70%. In contrast, Greece and Spain, with 33% absorption, repeat the pattern of weaker performance. Transition regions thus remain in an intermediate position: although they exhibit higher levels of economic development, they continue to face significant implementation barriers that reduce the effectiveness of climate-related investments.

Table 2 Planned, Decided and Spent resources of ESIF for climate action in transition regions – 2014-2020 period

Transition regions	Planned	Decided	Spent	Spent/Decided
AT	6 211 860,0	6 784 415,9	2 707 656,6	40%
BE	122 307 873,7	505 161 614,0	289 832 162,9	57%
DE	1 617 630 852,8	1 901 398 456,5	1 323 717 374,7	70%
DK	11 270 879,0	9 115 392,2	5 810 063,4	64%
ES	2 036 955 481,4	3 544 736 080,5	1 167 540 962,8	33%
FR	814 713 396,6	1 265 154 381,1	970 839 770,7	77%
GR	279 834 592,4	590 616 756,0	197 011 021,6	33%
IT	136 834 526,9	168 969 164,7	95 312 509,8	56%
MT	38 748 843,2	42 623 075,8	33 923 115,0	80%
PT	35 423 000,0	30 856 887,1	21 403 028,7	69%
UK	301 754 471,0	276 281 408,7	192 247 204,4	70%
Sum	5 401 685 777,0	8 341 697 632,5	4 300 344 870,6	52%
Average	491 062 343,4	758 336 148,4	390 940 442,8	59%
Minimum	6 211 860,0	6 784 415,9	2 707 656,6	33%
Maximum	2 036 955 481,4	3 544 736 080,5	1 323 717 374,7	80%

Source: European Commission, 2025

More developed regions, as presented in Table 3, manage a smaller absolute volume of planned resources (approximately EUR 6.5 billion), yet they exhibit the highest implementation efficiency. Decided funds exceed EUR 9.3 billion, and the average absorption rate is around 67%. Ireland achieves 93%, while Sweden, the Netherlands, Poland, and France also record high values, whereas Greece and, to some extent, Romania and Italy lag.

These regions absorb smaller volumes of funding, yet they do so with the highest efficiency and with relatively minor differences between countries. This finding confirms the stated hypothesis, and the results further demonstrate that administrative capacity, high-quality project preparation, and stable governance constitute key prerequisites for successful ESIF absorption, including in climate investments.

The final regional classification is the VOID category, which includes transnational and interregional programs. In this category, more than EUR 29 billion was allocated overall, but only slightly over EUR 16 billion was absorbed, corresponding to an absorption rate of approximately 57%.

Table 3 Planned, Decided and Spent resources of ESIF for climate action in more developed regions – 2014-2020 period

More developed	Planned	Decided	Spent	Spent/Decided
AT	108 956 116,0	105 589 150,7	71 580 318,8	68%
BE	67 124 585,7	379 830 939,2	270 229 392,5	71%
CY	35 448 042,0	57 166 311,3	35 237 170,6	62%
CZ	42 107 225,4	49 384 736,6	35 184 497,5	71%
DE	1 159 165 824,8	1 479 536 952,7	1 079 766 690,7	73%
DK	46 566 339,0	39 667 192,8	21 337 192,2	54%
ES	1 188 026 496,3	2 179 541 077,4	1 169 034 412,4	54%
FI	225 493 304,6	71 509 574,2	52 344 832,5	73%
FR	918 165 247,4	1 148 743 906,5	898 366 263,1	78%
GR	241 469 321,6	581 030 287,1	205 813 630,8	35%
HU	51 386 829,6	47 081 619,5	27 255 177,3	58%
IE	61 435 029,0	64 233 942,0	59 489 018,8	93%
IT	635 807 839,4	988 614 080,2	590 022 218,3	60%
LU	9 126 418,2	9 553 881,4	6 612 811,6	69%
NL	117 962 675,0	155 115 038,2	118 622 027,4	76%

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PL	412 866 691,4	395 634 227,9	309 251 961,5	78%
PT	53 575 868,0	68 250 411,7	51 149 645,1	75%
RO	179 664 407,8	565 449 675,3	319 444 865,0	56%
SE	179 025 882,6	152 352 693,7	123 218 270,7	81%
SI	78 954 237,0	187 618 991,7	132 402 806,0	71%
SK	32 712 392,9	40 850 045,5	24 162 662,3	59%
UK	655 005 129,4	607 821 926,1	364 592 034,9	60%
Sum	6 500 045 903,1	9 374 576 661,6	5 965 117 899,7	64%
Average	295 456 632,0	426 117 121,0	271 141 722,7	67%
Minimum	9 126 418,2	9 553 881,4	6 612 811,6	35%
Maximum	1 188 026 496,3	2 179 541 077,4	1 169 034 412,4	93%

Source: European Commission, 2025

5 Conclusion

The European Structural and Investment Funds (ESIF) play a crucial role in financing climate measures within the EU, with their impact visible across regions of varying economic development. Climate mainstreaming establishes the obligation for EU member states to integrate climate considerations into all stages of ESIF programming and implementation. Although the European Union has set clear conditions, the effectiveness of fund absorption varies significantly across countries and regions.

By analysing absorption patterns across EU member states, we addressed Research Question 1 and found that the level of climate-related investment absorption is uneven across the EU. Most member states succeeded in committing a high share of planned resources, yet actual spending is in many regions 10-30% lower than the amounts allocated. The highest efficiency is observed in countries such as Estonia, Ireland, Bulgaria, Poland, Germany, and Malta. In contrast, Denmark, Spain, Greece, Italy, and Romania lag despite high allocations, confirming persistent challenges related to administrative capacity and fund management.

Through a more detailed regional analysis, we addressed Research Question 2 and found substantial variability in absorption efficiency across regions. Less developed regions, despite receiving the highest volume of allocated funds, did not exhibit the highest absorption efficiency. Transition regions delivered the most unexpected result, showing the lowest absorption efficiency likely due to their specific position. On the one hand, they no longer receive the same level of intensive financial support as less developed regions, yet on the other, they have not yet reached a sufficient level of administrative capacity and stable governance. The results from more developed regions confirm the stated hypothesis, as these regions demonstrate the highest efficiency in fund absorption.

It is also important to acknowledge the limitations of the analysis. The European Commission's methodology for tagging climate expenditures may overestimate or underestimate their actual impact. The study relies on data, which does not capture local disparities, and financial indicators do not directly measure the environmental effectiveness of investments.

Despite these limitations, the findings indicate that ESIF remains a key instrument of the EU's green transition, with the greatest potential for improvement lying in strengthening administrative capacities, enhancing governance, and ensuring more rigorous monitoring of the quality of climate-related investments.

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Part 3: Sustainability and Gender Equality

Applying a Gendered Lens to Local Public Finance in Slovakia – Summary of the Research Project's Main Outcomes

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Abstract

The paper summarizes the main outputs of the research project VEGA 1/0646/23 Gender Perspective vs. Economic Outcomes of Local Governments in Slovakia: Management and Fiscal Discipline of Local Governments with Emphasis on the Gender Affiliation of Local Elected Authorities, conducted with the support of the Scientific Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic and the Slovak Academy of Sciences. The research addresses the observed unequal gender representation in politics at both national and local government levels. International research generally concurs that gender stereotypes shape distinct behavioral tendencies among women in various domains of local governance, including the use of repayable financial resources and the composition of public expenditures. The lack of empirical studies focused on the Slovak context created an opportunity to examine the characteristic behavior of women in local financial management and its implications for municipal financial performance. The objective of the VEGA project is to investigate the determinants of women's representation in local politics in the Slovak Republic and to analyze the relationship between female mayors and fiscal discipline, as well as the volume and structure of local public expenditures in Slovak municipalities.

Keywords: Local Government, Local budget, Gender Equality, Women's representation, Indebtedness, Corruption.

JEL Classification: H77, J16

1 Introduction

Persistent gender disparities in political representation, with substantial cross-country variation, have prompted extensive discussion and scholarly inquiry into the forms of women's political participation and how their governance practices differ from those of male political leaders at both national and local levels. Research generally concurs that gender stereotypes shape distinct behavioral patterns among women in various domains of local government, including the utilization of repayable financial resources and expenditure structures.

The absence of empirical studies addressing these dynamics in the Slovak context presented an opportunity to examine the characteristic behavior of women in local financial management and its implications for municipalities' financial performance. The objective of the project VEGA 1/0646/23 is to investigate the determinants of women's representation in local politics in the Slovak Republic and to analyze the relationship between female mayors and fiscal discipline, as well as the volume and composition of local public expenditures in Slovak municipalities.

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The objective of this paper is to summarize the main findings of the outputs of the conducted research within this project.

2 Research Background

In the past, women have been excluded from public life. Recently, there has been an increase in the representation of women in many areas, including the political sphere. Many authors report that women remain underrepresented in politics (e.g., Alberti et al., 2021; Funk, 2020; Cardenas Acosta, 2019). In many countries, the so-called gender quotas, intended to respect the principle of gender equality in politics (Cardenas Acosta, 2019; Bird, 2003), and the representation of women in politics have subsequently increased (Funk & Philips, 2019). However, related research focuses less on the local level of government (Sundström & Stockemer, 2015; Escobar-Lemmon & Funk, 2018; Funk & Philips, 2019) than research focusing on the national government level.

Nevertheless, the evidence at the local level can be found in many countries (e.g., Segard et al., 2022 - Denmark; Segard & Saglie, 2021 - Norway; AACT, 2021 - Austria; Devroe et al., 2020 - Belgium, Cardenas Acosta, 2019 - Mexico, Brollo & Troiano, 2016 - Brazil, Johnson, 2015, and Bean, 1991 - Australia, Barnes & Burchard, 2013 - Africa, Alibegovic et al., 2013 - Croatia, Giger, 2009 – Western Europe; Bochel & Bochel, 2008 - UK; Childs & Krook, 2008 - USA; Bird, 2003 - France).

2.1 Main local government gender-related research focal points

Part of gender-parity research in local politics focuses on differences in the attitudes of women and men toward leadership and decision-making, arising from general patterns of behaviour (Saltzstein, 1986). Thus, several lines of research can be observed in foreign studies:

- **Attitudes towards risk:** A branch of research is based on the hypothesis that women are averse to risk (Watson & McNaughton, 2007; Booth & Nolen, 2012; Balaguer-Coll & Ivanova-Toneva, 2021). Balaguer-Coll & Ivanova-Toneva (2021) confirmed that female leadership in local governments contributes to improved financial sustainability, budgetary stability, and compliance with the legal debt limit. Under women's leadership, municipalities in Spain adopt more pessimistic tendencies, underestimating incomes and increasing spending, leading to a more favourable financial situation for these municipalities (Cuadrado-Ballesteros et al., 2021). Same assumptions are under scrutiny in Cabaleiro & Gómez (2017), and Cabaleiro-Casal & Buch-Gómez (2020).
- **Attitudes towards corruption:** A gender-related literature also focuses on different attitudes of women executives toward corruption (Goetz, 2007; Esarey & Chirillo, 2013; Barnes & Beaulieu, 2018; Bauhr & Charon, 2020a; Bauhr & Charon, 2020b). Women mayors are less prone to corruption (Brollo & Troiano, 2016), and municipalities' websites are more transparent (Herrero-Gutiérrez et al., 2021). Some authors focus on savings in public procurement that might be influenced by unfair practices, which are differently practiced by men and women. It is observed that women are less involved in informal networks than men because of societal roles, e.g., family issues. The examined fiscal implication is that savings in public procurement are higher when women mayors represent the contractors (Bauhr & Charon, 2020a).
- **Attitudes towards expenditure structure:** Other research investigates the impact of the gender of a local elected authority on the structure and size of local public spending (Bolzendahl, 2009; Smith, 2014; Slegten, Geys, & Heyndels, 2019; Jung, 2022). The research assumes that women mayors are more inclined to social fields and education. Cuadrado-Ballesteros et al. (2021) found that variations in local government expenditure

and revenue are affected by the percentage of women in Spanish local politics. The influence of the mayors' gender on the structure and volume of local expenditures, with an emphasis on social areas, is with different intensities in a plethora of studies, e.g., Alberti et al. (2021), Funk (2020), Barnes et al. (2020), Funk & Philips (2019), or Funk (2015).

- **Barriers to entering politics:** Part of the research focuses on women's barriers to entering local politics, identifying socio-economic, institutional, and cultural barriers (Sztwiertnia & Hellová, 2012), institutional and demographic barriers (Holman, 2017), the presence of men's domination (Submas, 2019), and barriers related to re-election (Brollo & Troiano, 2016; Maškarinec et al., 2018; Maguire, 2018).
- **Flexibility and adaptation in the decision-making:** Recent research has also examined the responses of female representatives to the COVID-19 pandemic. Women implemented preventive measures proactively and faster than men (Funk, 2020).

2.2 Slovak gender-related research on local governments – the starting point of the research

In Slovakia, there are still few women in local politics (Maškarinec et al., 2018; Maškarinec et al., 2020). Men predominate in local government leadership, especially in larger cities, which are attractive to them for power and financial rewards (Bitušíková, 2005; Crowder-Meyer et al., 2015). According to Bitušíková (2005) and Klimovský (2015), the state of gender equality in local politics in Slovakia is unfavourable, characterised by a long-standing, unchanging legislative framework and a persistent reluctance to fulfil international commitments on gender equality. These authors consider the representation of women in Slovak politics marginalised and identify a space for political discussion on the introduction of mandatory quotas for the representation of both sexes at the local or national political level (Kouba et al., 2013). Although the area of mandatory quotas is unresolved, a positive trend in the success of female candidates has been identified in Slovakia. In a sample of Czech and Slovak municipalities, Maškarinec & Klimovský (2017) identify a greater inclination to vote for women in larger municipalities, due to more liberal electoral preferences. Few studies are dealing with the representation of women in the local government in Slovakia, and they reflect only a small sample of Slovak cities (Maškarinec & Klimovský, 2017; Maškarinec et al., 2018; Maškarinec et al., 2020 - analyze 71 district towns in 1994-2014), whereas the research on the influence of the gender of the local elected authority on the decision-making of local elected authorities is still absent. Filling that gap was the project's motivation and main benefit.

3 Research main outcomes

The analyses and scientific outcomes of project VEGA 1/0646/23 address several underexplored research questions in Slovak local circumstances, including women's representation over a longer period, across more election periods; determinants of local election and re-election outcomes; women mayors' impact on local indebtedness; and the structure of local public expenditure. The main results are recognizable in the following topics:

- **Women mayors' representation in the Slovak Republic:** Research outcome focusing on the representation of women mayors in Slovakia is presented by Lukáčová and Malická (2023). The paper examines the numerical representation of women mayors across 2,926 Slovak municipalities during the period 2002–2022, encompassing six electoral cycles and accounting for variation by municipal size. The analysis reveals an accelerating increase in the number of women serving as mayors; however, municipal size remains a significant factor. The presence of a woman mayor is assessed in relation to selected socio-economic, demographic, political, and geographic variables using logistic regression. The results from both logit and probit models support the research hypothesis that the likelihood that a woman

is elected mayor decreases as municipal size increases. This negative relationship is driven by the disproportionately higher share of women mayors in small municipalities, whereas in larger municipalities, women occupy mayoral positions only rarely. These findings corroborate the expectation that men continue to predominate in the leadership of large municipalities.

- **Gendered attitudes toward corruption:** The data on corruption are available at the national level rather than on the local government level. The research presented by Maličká (2024a) focuses on the gender-based assessment of corruption that commonly finds a negative association between the presence of women in political office and the overall level of corruption. Nonetheless, existing research also acknowledges that this relationship may take the opposite direction under certain conditions. The mentioned paper replaces the conventional expectation of a negative linear relationship between women's political representation and corruption with a non-linear conceptual framework that reflects the heterogeneous initial economic and political conditions across EU member states. The analysis encompasses 27 EU countries over the period 2001–2021 and further distinguishes between subsamples of new and old member states. The findings indicate that women's representation in politics must reach a particular threshold before its potential effects on corruption become observable. A similar pattern emerges within the subsample of new EU member states.
- **Relationship between women mayors and local indebtedness:** Among the research on gendered fiscal outcomes, the literature on indebtedness presents a significant part. Within the project on gendered fiscal outcomes in Slovakia, several studies analysing the gendered perspective on indebtedness also address this question, e.g., Maličká (2024a), Maličká (2024a), Maličká (2025).
 - In Maličká (2025), the impact of women politicians at the national government level on public debt in the EU countries is examined. This research states that women are increasingly participating in decision-making processes. The dismantling of long-standing glass ceilings is reinforced by empirical evidence showing that women in leadership roles exert a positive influence on economic outcomes, including those in public finance. This study builds upon that premise. Employing a dynamic panel data model, it examines the relationship between the share of women in public authority positions and the level of public debt across 27 current EU member states over the period 2003 - 2022. It is a timeframe marked by several external shocks that adversely affected national economies. During this period, women's representation in national governments has increased across EU countries. Simultaneously, many member states have experienced rising public debt. The empirical findings indicate that the relationship between women's participation in national-level public decision-making and public debt is positive, thereby failing to support the initial assumption. However, as mentioned in Maličká (2025), this outcome must be interpreted in light of the dynamic nature of the period under investigation. In times of deteriorating economic conditions, policymakers are inclined to adopt measures that promote redistribution and macroeconomic stabilization. Consequently, increases in public debt represent an expected policy response.
 - The gender lens applied to the local indebtedness as a local fiscal outcome for the sample of EU countries is a focal point of research presented in Maličká et al. (2024). Gender-based differences in local financial management are, according to empirical evidence, a tangible phenomenon that contributes to variation in the fiscal performance of municipalities governed by women and men. Although the role of female leaders in public administration - and their

influence on revenue generation, expenditure structures, and indebtedness - has gained scholarly attention in recent years, the gender dimension of these dynamics remains insufficiently explored and warrants more rigorous analysis. The primary objective of the paper of Maličká et al. (2024) is therefore to investigate the relationship between women's representation in local politics (specifically mayors and councilors) and local indebtedness, with particular emphasis on the hypothesis that municipalities led by female authorities exhibit stronger fiscal discipline. Econometric estimations using a panel data approach are conducted on a sample of 27 EU countries for the period 2011-2021, using the shares of female mayors and female local councilors as key explanatory variables. Additionally, the study examines the moderating effects of the timing of EU accession and the degree of fiscal decentralization to provide deeper insight into the research problem. The findings support the hypothesis of an inverse relationship between the presence of female mayors and local indebtedness, whereas the share of female local councilors shows no statistically significant effect. Further results indicate that both the extent of women's participation in local politics and the level of fiscal decentralization should be taken into account when assessing this relationship.

- In Maličká (2024b), the determinants of local indebtedness in Slovakia are investigated in a sample of Slovak municipalities by applying machine learning techniques based on decision-tree methods. The dataset includes all 2,926 municipalities for the period 2005–2022. Using the QUEST, CRT, CHAID, and exhaustive CHAID tree-growing algorithms, the analysis reveals that current expenditure, subsidies, municipality size category, and periods of economic crisis exert significant effects on local indebtedness. Variables identified as important by the decision-tree models are subsequently incorporated as regressors in logit and probit econometric estimations to assess their statistical significance. The results of these estimations align with the findings of the decision-tree analysis and provide additional insight into the key determinants of local indebtedness in Slovakia. The research also includes the women mayor variable in the set of potential regressors. However, the women mayor variable is not statistically significant in any of the decision trees and/or logit/probit regressions. This observation corresponds to previous findings, e.g., those of Lukáčová and Maličká (2023), that women mayors in general lead small municipalities. In the context of local indebtedness, small municipalities enter financial markets hardly due to low future revenue, which is usually a measure of the bonity. Thus, small municipalities in Slovakia tend not to be indebted.
- **Gender perspectives in the re-election prospects:** Maličká and Mourao (2025) research the determinants of the re-election prospects of mayors in the Slovak local public sector. Drawing on a comprehensive dataset covering all 2,926 Slovak municipalities, the study analyses local election outcomes from 2005 to 2022 and provides original empirical insights specific to the Slovak context. The findings indicate that an older electorate, a higher proportion of male residents, and greater municipal expenditure are associated with an increased likelihood of incumbent re-election. The analysis also uncovers a gender gap in electoral success, revealing that female mayors face greater challenges in securing re-election compared to their male counterparts. Furthermore, the results suggest that being an independent candidate or affiliated with a right-wing political party, governing a municipality with elevated unemployment levels, or serving in a geographically large municipality reduces the probability of re-election in Slovak municipal elections.

- **Gendered local public spending:** Vejačka & Paľová (2025) published a study that investigates budgetary spending patterns in Slovak municipalities governed by female mayors and compares them with those led by male mayors. Their paper aims to assess whether women leaders allocate a greater share of resources to areas typically associated with female policy preferences. International scholarship frequently highlights education, health care, and social protection as priority domains for women in political office; however, existing findings on gender-based differences in public spending remain inconclusive. The study employs statistical tests to examine whether expenditure allocations differ significantly between male- and female-led municipalities. The analysis reveals no statistically significant differences across the expenditure categories considered. An important limitation arises from the institutional setting, as municipal budgets must be approved by local councils, which constrains the mayor's direct influence on spending priorities. The findings indicate that mayoral gender does not reliably predict budgetary preferences in Slovak municipalities. Instead, local spending patterns appear to be shaped by other factors, including the political composition and authority of municipal councils, mandatory expenditure obligations, and party policy orientations. This study contributes to the literature on gender and governance by offering Slovak-based evidence that diverges from several international findings.

4 Conclusion

This paper summarizes the key findings of the VEGA 1/0646/23 research project, which explores how the gender of the political authority in the decision-making process influences local public finance in Slovakia. The project's motivation stems from the observed systematic gap in the gender-related literature on local public finances.

Main findings include i) women's representation - female mayors have increased over time but remain concentrated in small municipalities and larger municipalities continue to elect mostly men; ii) corruption attitudes - a nonlinear relationship between women's political presence and corruption is identified at the national level in the EU, suggesting that women's impact appears only after reaching a critical threshold; iii) public indebtedness – in the EU countries sample at the national level, women's representation is positively correlated with rising public debt, though this reflects crisis-driven fiscal policies rather than gender effects, on the same sample the female mayors are associated with lower local indebtedness, while female councillors show no significant effect, in Slovakia, women mayors are not statistically significant determinant of local indebtedness because women mayors generally lead small municipalities that rarely borrow; iv) re-election prospects - female mayors face lower re-election probabilities than men and v) local public spending - no statistically significant gender-based differences in budget categories were found.

Overall, the papers and thus project findings suggest that while gender matters in political representation and some fiscal outcomes, structural, institutional, and contextual factors play a stronger role in shaping local financial performance in Slovakia.

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Woman in local politics and quality of government in European Union: Evidence from EIGE and EQI data.

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Abstract

Women's descriptive representation at the municipal level has increased across the European Union, yet substantial cross-country differences persist. This paper documents EU-wide patterns in the share of women in municipal councils and examines how these patterns relate to institutional quality and corruption. To our knowledge, this is the first study that links local-level gender representation across EU member states to the newest rounds of the European Quality of Government Index (EQI). Using an original merged dataset for 27 EU countries over four waves (2013, 2017, 2021, 2024), combining EIGE indicators on women in municipal councils with EQI measures of quality of government, impartiality, and bribery experience, we track trends over time and estimate simple panel associations using country-year data. The EU average share of women councillors rises steadily from 2013 to 2024, but variation remains large, with Nordic and several Western European countries consistently leading. Across the EU, women's representation is positively associated with EQI scores and negatively associated with reported bribery experiences, while the link with trust in parliament is positive but weaker. These relationships are robust in the EU sample but considerably less stable and often statistically insignificant within the V4 subgroup, likely reflecting limited within-group variation and small sample size. Overall, the findings establish clear descriptive correlations—rather than causal effects—between local gender representation, perceived institutional quality, and corruption experiences in the EU.

Keywords: Gender equality; Women in politics; Local government; Corruption; Quality of government; European Union

JEL Classification: J16, D73, H83

1 Introduction

Advancing gender equality in political decision-making has been a long-standing objective of the European Union. Despite substantial progress in national parliaments and governments, women remain under-represented in local council positions. Recent EIGE briefs show that as of late 2024 women accounted for approximately one-third of members of local and municipal councils across the EU-27, with very large differences between countries (EIGE, 2023, 2025). Local politics matters for democratic legitimacy, the quality of public services and everyday contact between citizens and the state. Municipal councils are also the level where clientelism and informal exchanges often materialise most directly, which makes them a relevant arena for

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studying gender–corruption links. Understanding what conditions favour or hinder women’s presence in municipal councils is therefore crucial.

A growing literature has explored links between women’s political representation, corruption and the broader quality of government. Some studies argue that women’s empowerment can improve governance through different socialisation, networks and responsiveness to citizens’ concerns, particularly in contexts with functioning institutions (Bauhr, Charron, & Wängnerud, 2020; Merkle, 2022; Ríos, 2023). Others caution that in highly corrupt environments women may be drawn into existing clientelist practices and that the “women are less corrupt” narrative can be misleading (Mechkova, 2024; Salamon, 2025). Recent research using European regional data suggests a two-way and context-dependent relationship between women’s political empowerment and quality of government (Ríos, 2023).

This article contributes to this debate by focusing specifically on local politics in EU Member States. Using harmonised EIGE data on the share of women among municipal councillors and the latest rounds of the European Quality of Government Index (EQI) (Charron, Lapuente, & Bauhr, 2024, 2025), we ask three questions:

1. How has women’s representation in municipal councils evolved in EU countries between 2013 and 2024?
2. Is there a systematic association between women’s representation and indicators of quality of government and corruption?
3. Do these relationships look different in the Visegrad (V4) countries compared to the EU as a whole?

We show that while women’s presence in local councils has increased in most Member States, gaps remain substantial. Countries with higher EQI scores and lower prevalence of self-reported bribery tend to have higher shares of women councillors. At the same time, the V4 region combines rising women’s presence with persistently lower quality of government, highlighting the importance of country-specific political dynamics alongside institutional quality.

2 Theoretical background

2.1 Women’s representation and quality of government

The relationship between women’s political representation and the quality of government has been theorized along several lines. One strand emphasizes gendered socialization and networks: women are argued to be less embedded in traditional patronage structures, more responsive to citizens and more risk-averse regarding illegal practices, which could reduce corruption and improve the impartiality of public administration when more women hold office (Bauhr et al., 2020; Merkle, 2022).

Another strand focuses on institutional and contextual conditions. Mechkova (2024) shows that women’s representation is associated with better governance primarily in contexts with at least moderately functioning democratic institutions; in highly corrupt settings women representatives may be subject to the same clientelist pressures as men. Ríos (2023), using European regional data, presents evidence for a bidirectional relationship where quality of government fosters women’s political empowerment and vice versa.

The European Quality of Government Index provides a composite measure of citizens’ perceptions and experiences with corruption, quality and impartiality of public services across regions and countries in Europe (Charron et al., 2024, 2025). By combining this index with data on women’s representation at the local level, we can situate gender equality within the broader

governance environment rather than treating it as a purely political or cultural phenomenon. This allows us to test whether women's representation co-varies with overall EQI as well as with its corruption-experience and impartiality components.

2.2 Gender, corruption, and local politics

Empirical studies on the gender–corruption nexus offer mixed but increasingly nuanced results. Reviews generally find that women's presence in politics is often correlated with lower levels of perceived corruption, but the magnitude and direction of the effect depend on institutional quality, political competition and gender norms (Mechkova, 2024; Merkle, 2022; Ríos, 2023). Bauhr et al. (2020) show that women and men differ in their perceptions and tolerance of corruption, which may shape both political behaviour and support for anti-corruption reforms.

At the local level, representation can be particularly important. Municipal councils oversee services such as education, social care and urban planning, which directly affect gendered roles and everyday life. Local politics also serves as an entry point into political careers. Comparative work on local and regional government shows that women face multiple barriers in this arena, including harassment, hostile council cultures, limited resources and work–family conflicts (CEMR, 2024; EIGE, 2023). These factors may interact with corruption: in environments where local offices are valuable patronage resources, women may be crowded out by male-dominated networks or face higher personal costs for resisting corrupt practices. At the same time, the relationship may run in the opposite direction. Countries with more impartial public services and lower corruption may provide a more open and less clientelistic environment for women to enter politics. In this sense, women's descriptive representation can be partly an outcome of institutional quality rather than its cause.

The Central and Eastern European context adds another layer to these expectations. In the V4 countries, shared historical trajectories and institutional similarities may reduce cross-country variation in both governance quality and women's representation. As a result, empirical associations may appear weaker or statistically unstable within the V4 subgroup even if they are visible in the broader EU sample.

In sum, existing literature suggests that higher quality of government and lower corruption could be conducive to greater women's representation, while greater women's presence may in turn strengthen accountability and integrity. The direction of causality is contested and likely bidirectional. Our contribution is descriptive and econometric rather than causal: we map these associations for EU local politics using up-to-date data.

Empirically, we therefore expect (i) a positive association between women's representation in municipal councils and perceived quality of government, especially its impartiality and service-quality dimensions; and (ii) a negative association between women's representation and citizens' bribery experiences. We further expect these descriptive relationships to be weaker or more unstable within the V4 countries due to limited within-group variation and small sample size. The following sections evaluate these expectations using panel correlations and regressions.

3 Research methodology

3.1 Data

We construct a panel dataset for EU Member States by merging three sources:

1. EIGE Gender Statistics Database – indicator Women and men in decision-making: politics, local/municipal councils – members of municipal council (percent of total), Women (EIGE, 2023, 2025).
2. European Quality of Government Index (EQI) – regional survey data on quality, impartiality and corruption in public services, aggregated to country level (Charron et al., 2024, 2025).
3. QoG EQI categorical dataset (eqicati) – national indicators including the share of respondents who report having paid a bribe at least once (Any_bribe) and average confidence in the national parliament (Parl_conf) (Charron et al., 2024).

Women's representation is measured as the percentage of women among municipal councillors (0–100). EQI_mean is a standardised country-level EQI score, with higher values indicating better perceived quality and impartiality of public services. Any_bribe captures the share of respondents reporting having paid a bribe at least once (0–1), which we report in percentage points in figures for easier interpretation. From the EIGE database we extract the percentage of women among members of municipal councils (women_local_pct) for all available years since 2010. To match the timing of EQI surveys, we focus on four waves: 2013, 2017, 2021 and 2024. For each of these years we obtain country-level EQI scores by averaging regional values and merge them with EIGE data by country and year. The merged dataset covers 27 EU Member States with up to four observations per country, yielding slightly fewer than 100 country-years because of limited data availability in some cases. For a subset of analyses, we also define a V4 subsample consisting of the Czech Republic, Hungary, Poland and Slovakia (15 country-years in total, as Slovak local data start in 2017).

3.1.1 Descriptive analysis and correlations.

We begin with a descriptive overview of women's representation in municipal councils across EU member states. Using the EIGE indicator, we report EU-wide averages and country ranges for each EQI survey wave (2013, 2017, 2021, 2024), and we compare these trends with the V4 subgroup. We then examine bivariate relationships between women's representation and key governance indicators by computing Pearson correlation coefficients separately for each wave between women's representation, overall EQI scores and their main subdimensions, reported bribery experience, and trust in parliament. These year-specific correlations are complemented by scatter plots based on country averages over all available years, providing a long-run cross-country snapshot of the associations. This descriptive step motivates the regression specifications that follow and helps assess the stability of relationships over time and across regional subgroups.

3.2 Methods

Our empirical strategy combines descriptive statistics, correlation analysis and simple ordinary least squares (OLS) regressions. All models capture associations rather than causal effects.

1. **Descriptive trends.** We compute the mean, minimum and maximum of *women_local_pct* across countries for each year and visualise the evolution of the EU-wide average. We also report country rankings for 2024 and a separate descriptive summary for the V4 region.

2. **Correlation analysis.** For each year we calculate Pearson correlations between *women_local_pct* and the main governance indicators: *EQI_mean*, *Any_bribe* and *Parl_conf*.
3. **Panel regressions with year fixed effects.** To exploit the time dimension, we estimate two pooled OLS models with dummy variables for each survey year:

$$women_local_pct_{ct} = \alpha + \beta_1 EQI_mean_{ct} + \beta_2 Any_bribe_{ct} + \beta_3 Parl_conf_{ct} + \gamma_t + \varepsilon_{ct}$$

where t denotes year and γ_t capture common shifts over time (for example EU-wide trends in gender equality). Given the limited number of countries, we report heteroskedasticity-robust standard errors clustered by country. In addition to pooled OLS, we also estimated country fixed-effects and random-effects versions of these panel models. Fixed effects purge all time-invariant country characteristics, while year dummies capture common shocks across EQI waves. However, the EQI-based indicators display much more variation between countries than within countries over time. As a result, the country fixed-effects estimates are very imprecise and even change sign relative to the pooled OLS models, reflecting the limited within-country variation over four waves. Random-effects models, in turn, rely on strong exogeneity assumptions about the correlation between country effects and governance indicators, which are unlikely to hold in this context. For transparency, we therefore focus on pooled OLS with year fixed effects in the main text and report the country fixed-effects specification as a robustness check in Table A4 in Appendix.

4 Results

4.1 Descriptive patterns in the EU

Across the four survey waves, the EU-wide average share of women in municipal councils increased from roughly 27.0% in 2013 to 27.8% in 2017, 29.3% in 2021 and 30.7% in 2024. The trend line shows a gradual but steady progression. At the same time, dispersion between countries is striking: in 2024, the share of women ranges from 8.9% in Romania to nearly 43% in Sweden, Spain and France. The full ranking is reported in Table A1 in the Appendix.

The structure of the top and bottom performers mirrors broader patterns of gender equality and governance in Europe (EIGE, 2023, 2025). Nordic and several Western European countries combine high EQI scores with high women's representation, while a number of Southern and Eastern Member States lag behind. According to our merged data, Sweden, Spain, France, Finland and Belgium form the top group with around 39–43% women in municipal councils in 2024, whereas Romania, Greece, Cyprus, Germany and Ireland lie at the bottom, between roughly 9% and 26%.

Our V4 tables show that the four Central European countries follow the upward EU trend but start from a lower base. Women's representation in V4 countries by wave is summarized in Table A2 in the Appendix. The average share of women in municipal councils in the V4 rises from about 24% in 2013 (Czech Republic, Hungary, Poland) to 30% in 2024. Poland leads the region with around 33% women councillors in 2024, followed by Hungary (about 31%), the Czech Republic (29%) and Slovakia (27%). Slovakia thus slightly underperforms the V4 average, consistent with its relatively low EQI and high corruption experience (Charron et al., 2024, 2025).

4.2 Correlations and regression results for the EU

Correlation matrices by year reveal a consistent moderate positive association between the share of women in municipal councils and the European Quality of Government index with Pearson coefficients around 0.4–0.5 in all four waves. Figure 1 visualizes the relationship between women's descriptive representation in municipal councils and the European Quality of Government Index (EQI) using country averages computed over all available years in the dataset. Each point represents one EU member state, positioned by its mean share of women councillors (x-axis) and mean EQI score (y-axis). The upward-sloping fitted line indicates a positive association: countries with higher long-run female representation at the municipal level tend to exhibit higher average quality-of-government scores.

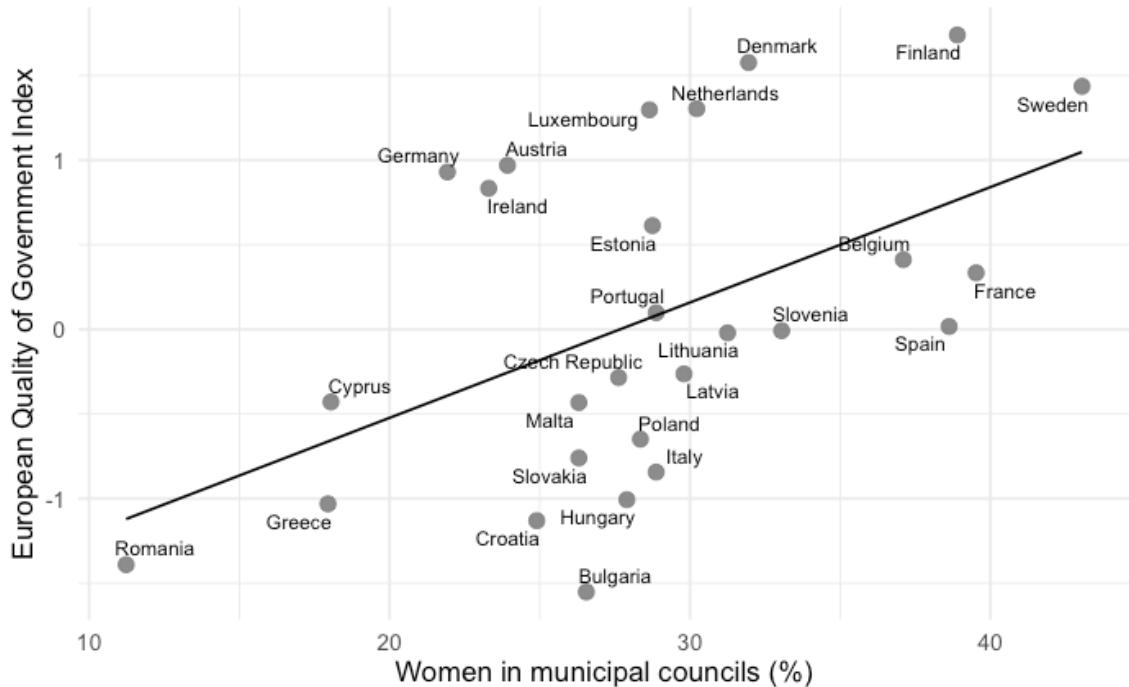


Figure 1. EQI vs. Share of Women in Municipal Councils
Source: own processing

In contrast, the share of women serving in municipal councils is negatively correlated with the bribery indicator, especially in 2013 and 2024, while the association with trust in parliament is positive but somewhat weaker.

Taken together, these correlations point to a consistent descriptive pattern: higher women's representation in local councils is more common in countries where citizens perceive public services as more impartial and where experiences with bribery are less frequent. To summarize this relationship in a single long-run cross-country snapshot, Figure 2 below plots country averages over all available years in the dataset, relating the mean share of women councillors to the mean prevalence of reported bribe experience. The downward sloping fitted line highlights the negative association across EU member states, indicating that higher long-term female representation at the municipal level tends to coincide with lower average bribery incidence.

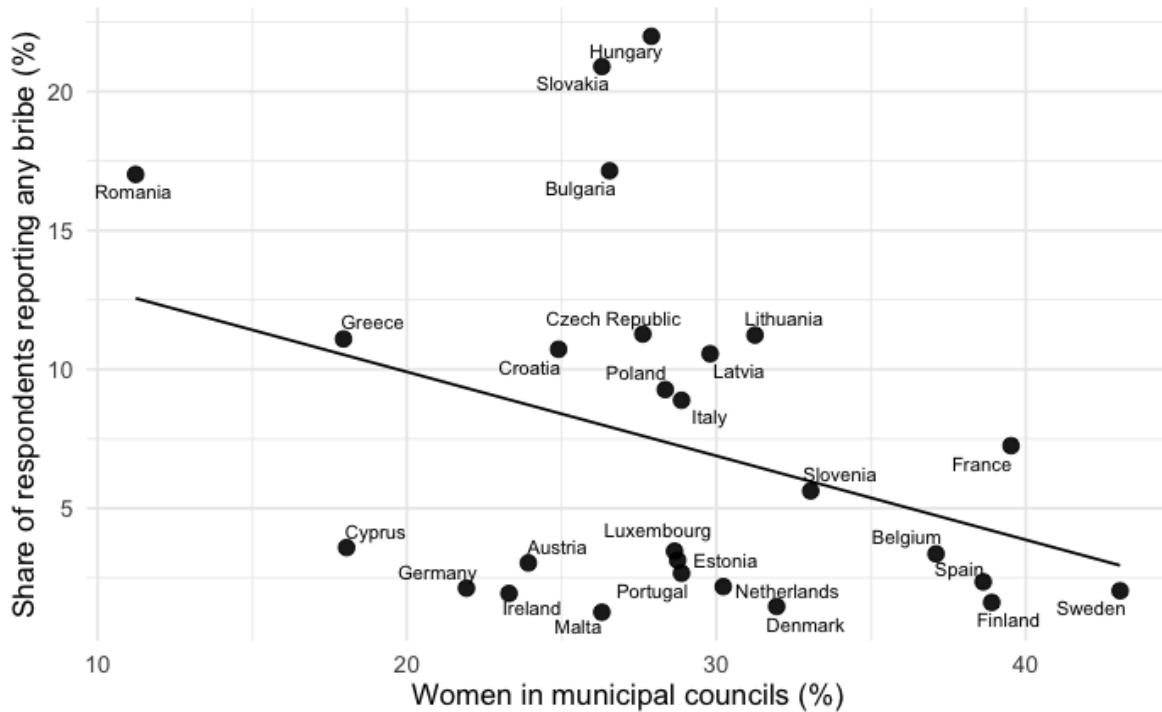


Figure 2. Women's Representation in Municipal Councils and Reported Bribe Experience
Source: own processing

Panel OLS models formalise these descriptive relationships. Regression estimates are reported in Table 1 below. Models m1–m3 report separate specifications with year fixed effects for EQI, bribery experience, and trust in parliament, while Model m4 includes all three predictors jointly.

A one-unit increase in *EQI_mean* – roughly corresponding to the difference between the EU average and a high-performing country such as Finland – is associated with an estimated 3.4-percentage-point increase in the share of women councillors, and this coefficient is statistically significant at the 5% level.

Panel regressions using the full 2013–2024 dataset yield very similar substantive results. In the model with *EQI_mean* and year fixed effects, the coefficient on *EQI_mean* is about 3.5 percentage points and statistically significant at conventional levels. The year dummies show an additional upward shift over time, indicating that even after controlling for changes in quality of government, there is a gradual structural increase in women's representation across the EU.

Since bribery experience is measured as a 0–1 share, a 0.10 increase corresponds to a 10-percentage-point rise in bribery prevalence. The panel model with *Any_bribe* paints the mirror image: here the estimated coefficient is approximately –34, meaning that a 10-percentage-point increase in reported bribery experience is associated with about 3–4 percentage points fewer women in municipal councils. This result is statistically significant and aligns with theoretical expectations that corruption-prone environments may be less welcoming to women in politics, both due to exclusionary informal networks and higher personal costs of integrity (Bauhr et al., 2020; Mechkova, 2024). Country fixed-effects versions of these models, reported in Table A4 in Appendix, yield much larger standard errors and even reversals of the coefficient signs, which is consistent with the very limited within-country variation across the four EQI waves.

Table 1: Panel OLS with year fixed effects (SE clustered by country)

	m1	m2	m3	m4
	EQI model	Bribery model	Parliament trust model	Joint model
Dependent Var.:	Share of women (%)	Share of women (%)	Share of women (%)	Share of women (%)
EQI	3.541** (1.272)			4.841* (2.053)
Any bribe		-34.30*(18.05)		0.5968 (20.45)
Trust in parliament			2.058(1.137)	-1.375 (1.545)
Fixed-Effects:	----- -	-----	-----	----- --
Year	yes	yes	yes	yes
S.E. Clustered	by: country	by: country	by: country	by: country
Observations	92	92	73	73
R2	0.24813	0.13386	0.11119	0.24867
Within R2	0.22123	0.10287	0.09419	0.23429

Note (a): Significance levels are denoted as follows: *** p < 0.01, ** p < 0.05, * p < 0.10

Note (b): Models m1 – m4 are pooled panel OLS with year fixed effects. Standard errors are heteroskedasticity-robust and clustered by country. Sample size differs across models due to missing values in trust in parliament (Parl_conf).

Source: Own processing

Taken together, the EU-level analysis suggests a robust empirical pattern: better quality of government and lower corruption experience go hand in hand with higher women's representation in local councils. The magnitude of the association is moderate but non-trivial, and it persists when exploiting the limited time variation between 2013 and 2024.

4.3 The specific case of the Visegrad countries

When we turn to the V4 region, the picture becomes more nuanced. All four countries exhibit rising shares of women in municipal councils, roughly in line with the EU average increase. Yet their EQI scores remain consistently below the EU mean, and citizens report comparatively high levels of bribery experience, especially in Slovakia (Charron et al., 2024, 2025). To summarize this gap, Table 2 below compares long-run averages for the EU as a whole and for the V4 subgroup.

Table 2: EU (overall) vs V4 averages over all available years

group	women_avg	EQI_avg	Bribe_avg
EU average	28.94	0.08	7.31
V4 average	27.63	-0.67	15.52

Source: Own processing

Because the V4 subsample contains only 15 observations, panel regression estimates are unstable and often statistically insignificant (see Table A3 in Appendix). Although simple country fixed-effects models can be estimated for N = 4, the very limited within-country variation across four waves makes these estimates purely illustrative. Coefficients on EQI_mean and Any_bribe have the expected signs—higher quality of government and lower bribery are associated with more women—but large standard errors prevent strong conclusions. This illustrates an important methodological point: small-N regional analyses can easily

produce misleading inferences, particularly when there is limited variation within the group. Figure 3 below visualizes this limited within-V4 variation by plotting country averages of women's representation against bribery experience.

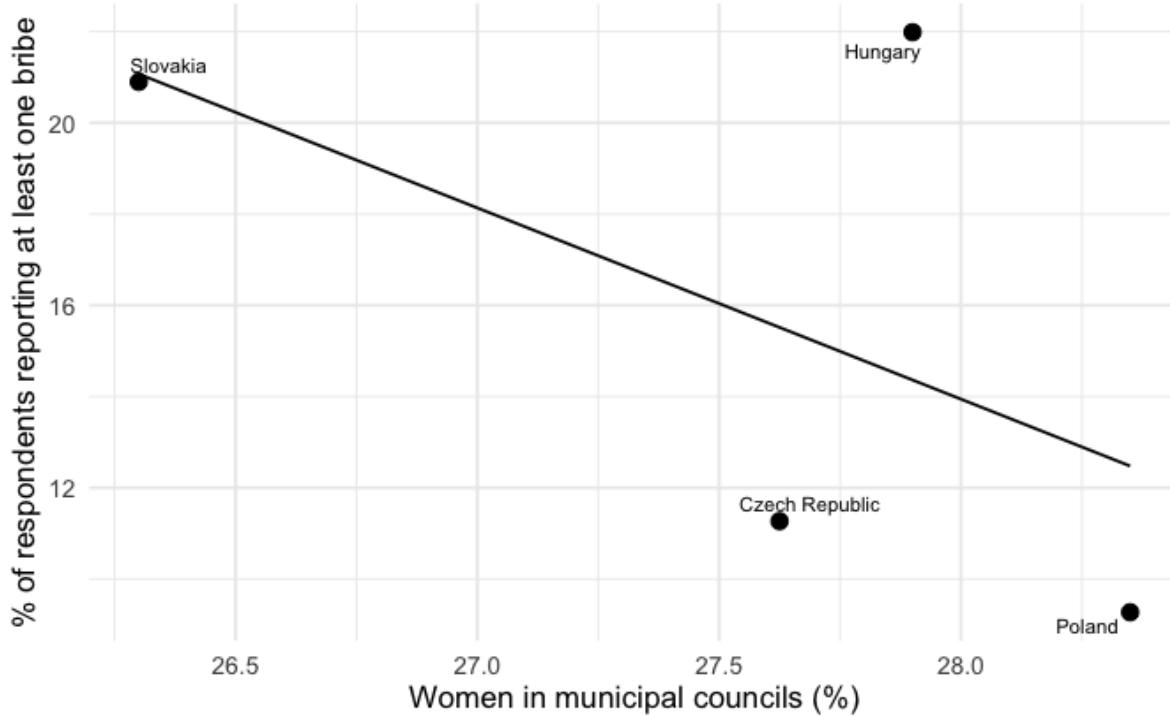


Figure 3. Bribe reported vs. Share of Women in Municipal Councils within V4 countries
Source: own processing

Substantively, the V4 case underlines that institutional quality alone does not fully explain gendered patterns of local representation. Poland combines relatively low EQI scores with the highest share of women councillors in the region, reflecting national-level gender quotas and party strategies (CEMR, 2024; EIGE, 2023). Conversely, Slovakia's combination of low EQI, high bribery experience and relatively low women's representation suggests that anti-corruption and gender-equality reforms have not yet fully reached the local level. National electoral rules, party candidate selection and socio-cultural norms therefore remain critical levers alongside improvements in governmental quality.

5 Discussion

This study adds new EU-wide evidence on the relationship between women's representation in municipal councils and the quality of government. Across four EQI waves, countries with higher perceived quality and impartiality of public services tend to show higher shares of women in local councils, while countries where citizens more often report bribery requests display systematically lower women's representation. In this sense, our descriptive patterns and panel estimates at the local level echo a broader comparative literature that has repeatedly found negative associations between women's political presence and corruption or poor governance outcomes (Dollar et al., 2001; Swamy et al., 2001; Schwindt-Bayer, 2024). By relying on the 2013–2024 EQI regional surveys, we extend these arguments to the most recent round of subnational governance data in Europe (Charron et al., 2024, 2025; Quality of Government Institute, 2025). The cross-country gradient we observe also mirrors persistent spatial divides

in women's local representation documented in EU gender-equality monitoring, where Nordic and parts of Western Europe remain ahead of Southern and Eastern member states (European Institute for Gender Equality [EIGE], 2024, 2025).

At the same time, the Visegrad subsample illustrates both substantive and methodological caveats. Substantively, V4 countries converge upward in women's local representation but remain below the EU average, and their weaker governance profiles fit the broader EU pattern. Yet within-V4 relationships are unstable, reflecting limited variation and very small N. This suggests that institutional quality alone does not fully account for gendered representation locally. Domestic-level factors—gender quotas, party gatekeeping strategies, and entrenched socio-cultural norms—can amplify or dampen women's entry into municipal politics even under similar quality-of-government conditions, helping explain why Poland combines relatively low EQI with the highest women's share in the region, while Slovakia underperforms alongside higher bribery experience (EIGE, 2024; CEMR, 2024).

Several limitations follow. First, the analysis is associational: EQI waves are snapshots, and the short panel cannot establish causal ordering between corruption and women's representation. Second, EQI relies on citizens' perceptions and experiences, which, while widely used and uniquely comparable at the regional level, may still reflect broader national narratives (Charron et al., 2024; Quality of Government Institute, 2025). Future work could test mechanisms more directly by combining municipal-level institutional features (quota adoption, electoral rules, party nomination practices) with subnational EQI variation, and by examining whether improvements in impartiality and anti-bribery enforcement precede increases in women's local descriptive representation over longer time horizons.

6 Conclusion

This article has explored the links between women's representation in local politics and the quality of government in EU Member States using harmonized data from EIGE and the European Quality of Government Index. We document three main findings.

First, women's presence in municipal councils has increased gradually but unevenly across the EU between 2013 and 2024. On average, women now hold slightly more than 30% of local council seats, yet some countries have achieved near-parity while others remain below 20% (EIGE, 2023, 2025).

Second, we find consistent and statistically significant associations between women's representation, quality of government and corruption experience at the country level. Countries with higher EQI scores and lower shares of citizens reporting bribery tend to have more women in local councils. Our OLS models suggest that moving from average to high quality of government is associated with roughly 3-4 additional percentage points of women's representation, while a 10-percentage-point increase in bribery experience is associated with a similar reduction. These patterns are robust across four survey waves and survive the inclusion of year fixed effects (Charron et al., 2024, 2025).

Third, the Visegrad countries illustrate both convergence and divergence. While the region follows the EU trend of increasing women's representation, overall quality of government remains below the EU average and corruption experiences are more widespread. Within this context, national institutional reforms such as gender quotas, party strategies and local electoral

rules appear particularly important in shaping outcomes, as shown by Poland's relatively strong performance despite modest EQI scores (CEMR, 2024; Merkle, 2022).

Our analysis has limitations. The small number of countries and survey waves restricts the use of more sophisticated econometric designs, and the observational nature of the data precludes strong causal claims. Endogeneity between women's representation and quality of government is likely, as both are driven by deeper socio-political factors. Future research could exploit sub-national variation, longitudinal municipal data and quasi-experimental reforms to better disentangle these mechanisms. Nevertheless, the results provide a clear message for policymakers: inclusive, transparent, and less corrupt local institutions tend to be those where women have a stronger voice. Efforts to improve the quality of government and to remove barriers to women's participation in local politics are therefore mutually reinforcing goals, not competing priorities.

Acknowledgements

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Appendices

Table A1. Women's representation in municipal councils by country and EQI wave (%)

Country	2013	2017	2021	2024
Sweden	43.0	43.0	43.3	42.9
Spain	35.2	35.6	40.9	42.8
France	35.0	38.7	42.4	42.0
Finland	36.2	39.1	40.2	40.1
Belgium	35.6	35.5	38.6	38.7
Denmark	31.8	28.5	32.4	35.1
Netherlands	26.6	28.6	30.9	34.8
Portugal	28.4	26.6	26.6	33.9
Slovenia			32.3	33.8
Poland	24.2	26.4	29.5	33.3
Italy	20.8	30.4	31.7	32.6
Lithuania			30.2	32.3
Luxembourg			25.9	31.4
Hungary	20.1	30.1	30.9	30.5
Croatia	19.8	19.8	30.0	30.0
Latvia			29.8	29.8
Czech Republic	26.4	27.1	28.0	29.0
Estonia			28.6	28.9
Bulgaria	25.6	25.4	27.2	28.0
Slovakia		25.8	26.0	27.1
Malta			26.3	26.3
Austria	22.1	23.0	24.6	26.0
Ireland	20.0	21.8	25.5	25.9
Germany	19.1	21.0	23.0	24.6
Cyprus			15.3	20.8
Greece	16.5	17.3	18.2	19.8
Romania		12.4	12.4	8.9

Note: NA indicates missing observations in the EIGE data

Source: Own processing

Table A2. Women's representation in municipal councils in V4 countries by EQI wave (%)

Country	2013	2017	2021	2024
Poland	24.2	26.4	29.5	33.3
Hungary	20.1	30.1	30.9	30.5
Czech Republic	26.4	27.1	28.0	29.0
Slovakia		25.8	26.0	27.1

Note: NA indicates missing observations in the EIGE data
(Slovak local data available only from 2017).

Source: Own processing

Table A3. V4 panel OLS regressions of women's municipal representation on EQI and bribery (year fixed effects)

	v4_eqi	v4_bribe	v4_parl
	EQI model	Bribery model	Parliament trust model
Dependent Var.:	Share of women (%)	Share of women (%)	Share of women (%)
EQI	-2.209 (1.228)		
Any bribe		-5.631 (11.75)	
Trust in parliament			0.6508 (1.437)
Fixed-Effects:	-----	-----	-----
Year	yes	yes	yes
S.E.type	Heteroske.-rob.	Heteroske.-rob.	Heteroske.-rob.
Observations	15	15	12
R2	0.58295	0.55238	0.25141
Within R2	0.09893	0.03287	0.02043

Note (a): Significance levels are denoted as follows: *** p < 0.01, ** p < 0.05, * p < 0.10

Note (b): Models are pooled panel OLS with year fixed effects. Sample size differs across models due to missing values in trust in parliament (Parl_conf)

Source: Own processing

Table A4. EU country fixed-effects panel regression (robustness check)

	m fe EU
Dependent Var.:	Share of women (%)
EQI	-3.256 (2.003)
Any bribe	9.383 (5.750)
Trust in parliament	0.8909 (0.4990)
Fixed-Effects:	-----
Country	yes
Year	yes
S.E.type	By: country
Observations	73
R2	0.96858
Within R2	0.13132

Note: Country and year fixed effects included. Standard errors clustered by country. Due to limited within-country variation and missing data, coefficients are unstable and reported for robustness purposes only.

Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.10.

Source: Own processing

Distance aspects and gender issues in auditing of small municipalities in Slovakia

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Abstract

The paper aimed to evaluate the radius of distances that auditors must travel when performing a mandatory audit of municipal financial statements. We also focused on the gender issue of willingness to travel longer distances and access to audit risk. We analysed a set of small municipalities with up to 2,000 inhabitants. We included all small municipalities in the Eastern Slovak region, i.e. municipalities in the Košice and Prešov self-governing regions, in the analysis. We conclude that within the Eastern Slovak region, a distance of up to 30 km is the most acceptable distance between auditors. When evaluating the gender issue, we find that in the Košice region more women travel longer distances, and in the Prešov region significantly more male auditors travel longer distances.

Keywords: auditor distance radius, individual auditors, audit firms, gender issue in auditing

JEL Classification: M42, M48, H72

1 Introduction

The distance auditors travel from their seats to audit locations is not sufficiently explored in the literature. Also, auditors' approaches and attitudes toward audit risk from a gender perspective are examined in articles by several authors. In this paper, we try to overcome this gap with our research in the Košice and Prešov self-governing regions of the Slovak Republic. The issue of the distance of auditors' seats and audit firms was addressed by Bandyopadhyay and Kao (2010). Other authors have addressed the attitudes of female and male auditors to audit risk and the impact of risk on the formulation of auditors' opinions (Charness & Gneezy, 2012; Ittonen & Penni, 2012; Carrera & Mareque, 2023).

2 Literature review

Bandyopadhyay & Kao (2010) investigated how many auditors have an audit contract in municipalities' vicinities. They found that 90 per cent of the auditors are located within 62 kilometres of the audited municipalities. Several authors point out that female auditors perceive audit risk more sensitively than male auditors. Barber & Odean (2001) found that men are more willing to bear the financial risks and invest more than women. Huang & Kisgen (2013) and Powell & Ansic (1997) find that male managers make more acquisitions and issue more debt than female managers. Cameran et al. (2018) investigated the impact of audit team diversity on audit quality and effectiveness. According to them, female auditors are more accurate in their statements and less susceptible to client influence. The fact that female auditors are more conservative when issuing audit opinions was confirmed by Carrera & Mareque (2023).

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Similarly, Karjalainen et al. (2018) claim that female auditors issue more modified audit reports. Also, Charness & Gneezy (2012) confirmed that women are more receptive to financial risks than men. Garcia-Blandón et al. (2019) found that companies with female auditors tend to have higher quality financial reporting. In the case of clients in financial difficulties, female auditors are more cautious in their opinion on compliance with the going-concern principle (Hossein et al., 2018). On the other hand, firms with female audit partners have higher audit fees (Ittonen & Peni, 2012). This is related to a more cautious approach to risk and a higher level of audit preparation. Greenwood & Zahn (2019) examined the audit of adjustments in the area of distortion of surpluses and deficits in public administration. They concluded that audit adjustments mitigate management's susceptibility to distortion of surpluses and deficits. Hardies et al. (2012) investigated gender differences between male and female auditors in terms of increased self-confidence. The authors did not find any significant differences in this area. The same authors examined the attitudes of male and female auditors towards risk-taking. They did not notice any significant differences in their attitudes (Hardie et al., 2013). Female auditors demonstrated higher audit quality in terms of issuing a going-concern opinion (Hardies et al., 2016). Hardies et al. (2021) examined the impact of audit partner characteristics on audit quality. They found that the characteristics - industry specialisation and client importance - have a significant impact on other characteristics. Paanen et al. (2021) hypothesised that weak economic performance, high decision-making decentralisation, and intense political competition in municipalities are associated with a higher number of modified audit reports. The hypotheses were confirmed, and the authors found that up to one-third of audit reports were modified. One-third of audit reports in the municipal area found Paanen et al. (2021), Paanen (2016) modified. They found cause in low economic competition and high political ties in municipalities.

3 Methodology

The paper aims to evaluate the distances that auditors travel during the mandatory audit of municipal financial statements and to assess the gender issue of willingness to travel for higher education.

We monitored data over the last 5 years, sourced from the publicly available Register of Municipal Financial Statements.

To achieve the goal, we set the following research questions.

RQ1: Are male auditors more willing to travel longer distances for a municipal audit engagement?

RQ2: What is the average distance of municipalities from their auditors?

RQ3: Are female auditors more sensitive to audit risk, which will be reflected in their opinion?

We analyse small municipalities, i.e. municipalities with up to 2000 inhabitants. We included all municipalities in the Košice and Prešov regions in the analysed set. There are 393 municipalities in the Košice region with up to 2,000 inhabitants. 2.56% of them do not have their financial statements audited. The analysed set included 383 municipalities. There are 597 municipalities in the Prešov Region with up to 2,000 inhabitants. Of these, 9.23% do not have their financial statements audited. The analysed set included 542 municipalities.

4 Results and discussion

We created a radius of five intervals of distances between municipalities and their auditors (Table 1).

Table 1 Number of municipalities by distance in km from the seats of their auditors

Region			0-10	11-30	31-50	51-75	76 and more	TOTAL
Košice region	AI	female	52	96	27	0	0	175
		male	9	18	0	0	0	27
	AC	female	10	51	9	0	9	79
		male	26	51	18	7	0	102
TOTAL			97	216	54	7	9	383
Prešov region	AI	women	0	39	50	40	0	129
		men	31	49	82	0	18	180
	AC	women	45	93	10	11	0	159
		men	0	13	55	0	6	74
TOTAL			76	194	197	51	24	542

Notes: AI – auditor individual, AC – auditing company

Source: own processing

In the Košice region, the most municipalities audited by individual female auditors are in the 11-30km distance interval, accounting for over 25% of all audited municipalities. This distance interval is the most frequent, and the most municipalities audited by audit companies are also found here, with an equal number of male and female auditors. The 0-10 km interval is also significant for female individual auditors. Only female auditors from audit companies travel to distances greater than 76 km.

Most audits are conducted in municipalities within 30km. In general, women are more willing to travel longer distances than male auditors. Over 50 km, this is 2.35% of women and 1.83% of men. Female company auditors cover these longer distances. Individual auditors do not travel more than 50 km. Individual auditors cover municipalities within a 30 km radius; as a rule, they are female.

In the Prešov Region, the most audited municipalities are those audited by female auditors from audit companies within an 11-30km radius, accounting for more than 17% of all audits. This is followed by audits by male individual auditors within a 31-50km interval. In the Prešov Region, the number of audits in more remote municipalities is significantly higher compared to the Košice Region. In the 51-75 km interval, audits are exclusively conducted by female auditors: individual auditors, up to 7.38%; female auditors from audit companies, 2.03%. However, in the interval of over 76 km, only 4.43% of audits were conducted by male auditors.

For better clarity, we also present the results in percentages (Table 2) and in a graph (Graph 1).

In the Košice region (Graph 1), the most audits are conducted at distances of 11-30 km from the auditor's seat; female individual auditors predominantly conduct these. In the Prešov region, the most audits are carried out in equal numbers in two intervals: 11-30 km, predominantly by female auditors from audit companies, and 31-50 km, predominantly by male individual auditors.

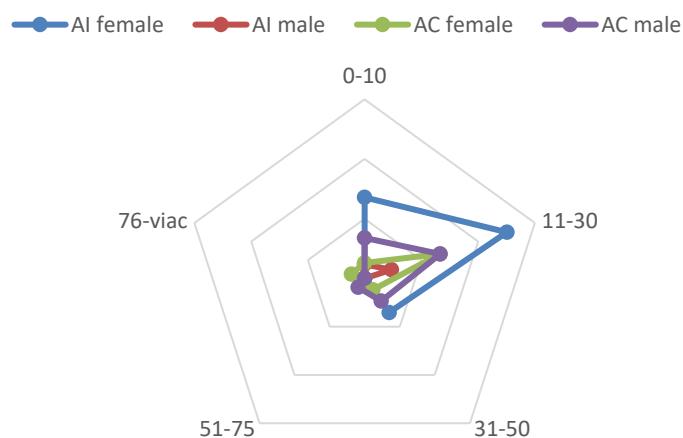
Table 2 Number of audits in % by distance of auditors' seats from municipalities in km

Region		0-10	11-30	31-50	51-75	76 and more
Košice region	AI	female	13,58	25,07	7,05	0,00
		male	2,35	4,70	0,00	0,00
	AC	female	2,61	13,32	2,35	0,00
		male	6,79	13,32	4,70	1,83
TOTAL		100%	25,33	56,40	14,10	1,83
Prešov region	AI	female	0,00	7,20	9,23	7,38
		male	5,72	9,04	15,13	0,00
	AC	female	8,30	17,16	1,85	2,03
		male	0,00	2,40	10,15	0,00
TOTAL		100%	14,02	35,79	36,35	9,41
						4,43

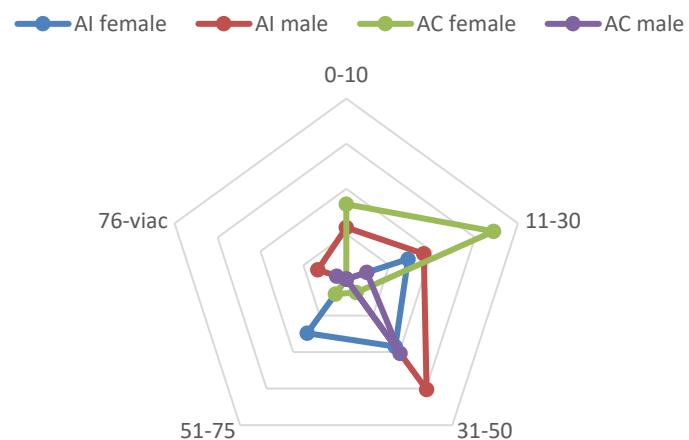
Notes: AI – auditor individual, AC – auditing company

Source: own processing

Košice region



Prešov region



Graph 1: Number of audits by distance of municipalities from the seats of their auditors by region

Source: own processing

In RQ 1, we investigated whether male auditors are more willing to travel longer distances. We find that in the Košice region, 11.75% of men and only 6.53% of women travel distances over 30 km; in the Prešov region, it is 29.71% of men and only 20.49% of women. The answer to RQ1 is positive. In RQ 2, we investigated the average distance between auditors' seats and municipalities. We find that the vast majority of all audits (81.73%) in the Košice region are carried out in municipalities within 30 km, in the Prešov region it is 49.81%. The average value of distances within 30 km for the entire region of Eastern Slovakia is 65.77%.

Table 3 Share of opinions by gender out of the total number of modified audits

Modified audits		Košice region	Prešov region
	female	69,34%	52,38%
	male	30,66%	47,62%

Source: own processing

In RQ 3, we investigated whether female auditors are more sensitive to audit risk, which will be reflected in their opinion. We conclude that female auditors are more sensitive to audit risk. This is reflected in the share of modified audit reports issued. This is more significant in the Košice region, where the share of female auditors in all modified reports issued is 69.34%. In the Prešov region, this is less significant, where female auditors issued 52.38% of all modified audit reports.

5 Conclusion

In the Košice region, the most audits are carried out in municipalities within 30 km, totalling 81.73% of all audits. In the Prešov region, the number of audits within 30 km is 49.81%. We conclude that within the Eastern Slovak region, this is the most acceptable distance between auditors' seats and municipalities. Regarding the gender issue, 11.75% of men and 6.53% of women travel over 30 km in the Košice region. In the Prešov region, the figures are 20.49% for women and 29.71% for men. We conclude that although more women travel longer distances in the Košice region, there are significantly more male auditors in the Prešov region. These results are similar to the research study by Bandyopadhyay and Kao (2010). The question of audit risk perception in gender terms confirmed that female auditors are more sensitive to risk, as reflected in their opinions. More than half of all modified reports were expressed by female auditors. Almost the same results were reported in studies by Charness and Gneezy (2012), Ittelson and Penni (2012), and Carrera and Mareque (2023).

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A Gendered Spending Gap: Analyzing Healthcare Expenditure Priorities Under Female Mayoral Leadership

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Abstract

In order to determine if female mayors allocate more funding to the healthcare sector, this contribution compares the budget expenditure trends of Slovak municipalities with female mayors to those with male mayors. Research suggests that one of the primary areas of choice for female mayors is healthcare, despite the fact that previous findings on gender-based spending discrepancies are still contradictory. The study evaluates the significance of the differences in healthcare spending between Slovakian municipalities managed by men and women using statistical tests. The results show no differences that are statistically significant. One important limitation that can limit mayors' direct authority over spending priorities is the need for council approval for municipal budgets. The findings show that the gender of the mayor has no discernible effect on how Slovak communities allocate their healthcare budget. Municipal spending decisions appear to be influenced by additional factors such as council political power, mandatory expenditures, and party policy alignment. By using data from Slovakia that differs from many global conclusions, this study extends the knowledge on gender and governance.

Keywords: Gender Equality, Female Mayors, Municipalities, Expenditure Priorities, Budget Spending.

JEL Classification: H72, I18, J16

1 Introduction

Women's representation has recently increased, despite the fact that they are still underrepresented in almost every nation and at every level of government globally (Jalalzai, 2013; Sundström and Stockemer, 2015; Escobar-Lemmon and Funk, 2018). The Gender Equality Strategy 2020–2025 of the European Union (European Commission, 2020) aims to increase the percentage of female leaders in local government and their participation in regional and local municipal budgets. For the democratic goals of equality and justice to be realized, women must be sufficiently represented in these political organizations. Women are important even if their behavior is similar to that of men. The presence of women can influence significant opinions and have symbolic implications (Hinojosa et al., 2017).

Recent increases in women's political activity have raised questions about whether greater representation of women in political institutions and in politics has an impact (Dolan et al., 2021; An et al., 2022; Davidson-Schmich, 2023). The argument for increasing women's representation will only strengthen if women behave differently from males (Aldrich and Lotito, 2020). This is because electing women will have different results than electing men.

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Increasing the percentage of women in politics has repercussions that extend beyond the nation (Paxton et al., 2020).

Increases in women's representation have the potential to significantly alter the nature of women's substantive representation at the local level (Barnes and O'Brien, 2025). Particularly in decentralized countries, the distribution of government spending, tax collection, public service delivery, and administrative supervision are all essential duties of local governments. Increasing the number of women elected to office may improve the actual representation of women and unintentionally affect the behavior of female politicians (Funk and Philips, 2019; Wahman et al., 2021). Examining whether the election of women to the mayorship has affected local fiscal financing of the healthcare sector is important.

2 Literature Review

Coessens (2024) asserts that women's representation has a major effect on government spending goals, which increases financing for policies and programs that support women's interests. Nonetheless, there are more variables that could affect how government expenditure and women's representation are related. Policies that govern people's daily lives and attend to their wants and wishes are part of local politics. The most fundamental administrative divisions in Slovakia are municipalities, whose mayors are chosen for four-year periods. When it comes to how they use urban space, men and women have different demands. The dominant male hierarchy and gender trends are the root causes of the issue with women's participation in municipal politics and local administrations. Women's status in the EU has somewhat improved, it still doesn't meet the goals stated in Zamfir (2024).

With a 17.4% mayorship rate, women are still underrepresented in local and regional governments, according to the latest recent data in Coessens (2024). Slovakia, with a female share of 26.5%, is in a better position. While the top three countries are Iceland (39.1%), Estonia (37.2%), and Sweden (36.2%), the countries with the lowest percentages are primarily in Eastern and Central Europe (such as Greece 6.7%, Austria 10.5%, and Poland 12.0%). Policy agendas are reflected in local government spending. If the representation of women has a major impact on the distribution of spending, then women also influence the importance that governments place on particular policy problems. Furthermore, because administrations do not have limitless resources, changing the allocation of spending occasionally necessitates making trade-offs. As a result, cutting spending in one area frequently entails cutting spending in another. Another way that government finances are distributed is through representation, which is a routine and necessary government function. Local government spending has an impact on policy results as well. Expenditures are expected to have a significant impact across policy domains, even though some kinds of representation may just be symbolic or depend on the funds available for proper implementation and enforcement.

Additionally, because government budgets typically undergo incremental changes, small adjustments to allocations may eventually have a major impact (Funk and Philips, 2019). This influence is likely to last over time if female policymakers alter spending in a single year. Therefore, expenditure distribution can serve as a crucial tool for long-term representation of a variety of social groups, including women. This raises the question of whether women in positions of authority manage their finances differently than men. Previous studies on government spending and gender representation have produced conflicting results, with the majority believing that the link fluctuates depending on the circumstances.

Women representatives' capacity to represent women in a gendered institution may be limited by the gendered norms and regulations of political office (Funk and Philips, 2019). Female executives may behave "like men" since executive positions are gendered. Women must fight stereotypes and overcome obstacles related to their gender's credibility, while men are expected to have the traits often associated with a top executive, such as competence and aggression (Eagly and Karau, 2002) (Funk, 2015). Since male and female mayors may actually have equal spending preferences, there might not be any noticeable disparities in the distribution of spending.

According to the equity notion of women's representation, if women are truly equal participants in politics, they can affect change in more than one area of policy. Since they have attained equality, the few elected female mayors may be able to work on a range of issues in a manner similar to that of men. Because they seek to serve all voters, female mayors prioritize spending on both women's and non-women's policy issues, notwithstanding their appreciation of women's issues. As a result, there might not be any appreciable distinctions between male and female mayors' approaches to financial allocation (Funk and Philips, 2019). Politicians may choose to use government resources in quite different ways depending on the policy goals and attitudes of men and women. There is proof that women's representation affects how government funds are distributed. According to Halim et al. (2016), state legislatures in India that have a higher proportion of female legislators invest more in healthcare. International research indicates that the representation of women in national legislatures influences spending on social welfare and health (Lukáčová and Maličká, 2023). The representation of women significantly influences local government expenditure.

Evidence suggests that an increased presence of women in state legislatures around the US correlates with elevated health care expenditures (Courtemanche and Green 2017). Similarly, Braendle and Colombier (2016) discovered that in Switzerland, healthcare spending increased in tandem with the proportion of women on local government boards. Male and female leaders may not always act in ways that reflect their gender preferences, despite gender inequalities in policy, according to a number of academics (Ferreira and Gyourko, 2011). Rigon and Tanzi (2012) used a sample of Italian municipalities and external heterogeneity imposed by a federal rule that implemented gender quotas to evaluate the effects of female involvement in local governments. They discovered no impact on the expenditure mix.

Elected women mayors in India implement infrastructure investments based on gender preferences through the use of female quota laws, which arbitrarily mandate that certain Indian communities limit the role of mayor to women (Chattopadhyay and Duflo, 2004). However, several research (Funk and Philips, 2019; Ferreira and Gyourko, 2011; Schild, 2013) demonstrated that government spending was strongly impacted by the participation of women.

3 Research Methods

Our study examined how much money female mayors spent on healthcare (as defined by the UN Classification of the Functions of Government) vs how much money male mayors spent on the same area. The study provides a thorough sample of Slovak towns led by mayors and backed by municipal councils by incorporating data from all 2,926 municipalities in Slovakia between 2005 and 2022. The data utilized in this study came from the Ministry of Finance's DataCentrum database and the Statistical Office of the Slovak Republic's DataCube database. Examining spending for healthcare expenditures required calculating, combining, or aggregating some of the variables or subtotals.

The average percentage budget expenditures for these combined categories for both male and female mayors by year were calculated using Microsoft Power BI data. For statistical analysis, IBM SPSS software's Independent Sample Test and basic ratios were employed. The Independent Sample T test was a suitable test because the Shapiro-Wilk test showed that the data distribution was normal and Levene's test confirmed that the variances were homogeneous in both groups. Furthermore, the observations are independent as men and women are fundamentally distinct groups. Therefore, the purpose of this study is to examine, assess, and contrast the budgetary spending on healthcare in Slovak towns over the available time period between the groups of male and female mayors who oversee these expenditures.

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4 Results and Discussion

Data on budget expenditures from all Slovakian municipalities that were available were connected to the gender of the mayors (male or female) in each of the investigated years (2005–2022). The healthcare expenditures did not constitute a significant component of the mayors' budgets (just an average of 0.22% throughout the entire monitored period) but showed the most notable disparities in spending by the mayors' gender, with women spending more on health care throughout the course of the period (an average of 0.28% versus 0.17% for men) than men. Observed low shares of healthcare expenditures on total local expenditures mirror the assignment of healthcare competencies among different government levels in Slovakia, when local government disposes only of limited competencies, with a considerable body of healthcare competencies being assigned to regional governments. The statistical significance of these disparities was examined as the descriptive study showed that men and women in the office of mayor had different healthcare expenditure plans. Thus, statistical testing was performed on the data.

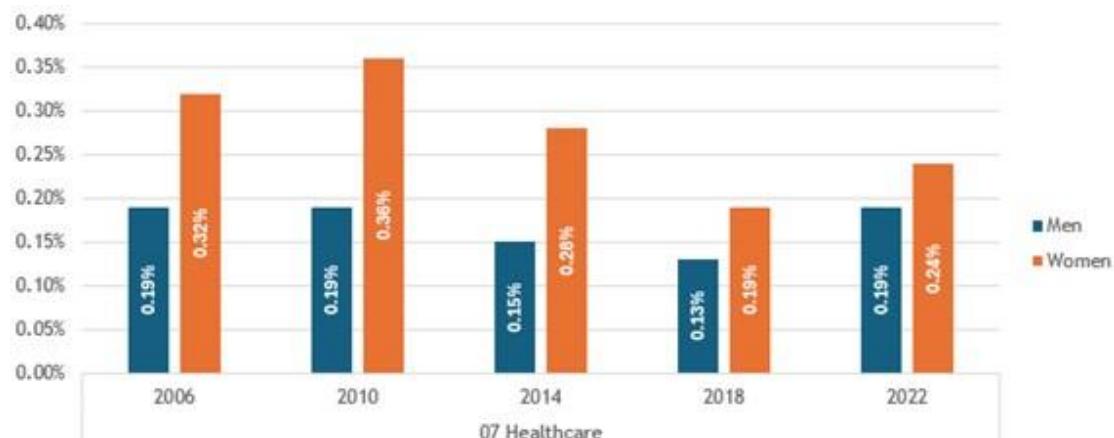


Figure 1 Comparison of mayors' budget expenditures on the COFOG category 07 – Healthcare, based on gender (in percentage)

Source: Data processed from DataCube database of the Statistical Office of the Slovak Republic (2025)

Both the homogeneity of variances and the normality of the distribution of the data collected for healthcare expenditures were examined using Levene's test and the Shapiro-Wilk test, respectively. The following table displays the outcomes of these tests.

Table 1 Tests of normality and homogeneity of variances

	Shapiro-Wilk test		Levene's test	
	Statistic	Significance	Statistic	Significance
Healthcare	0.902	0.063	0.040	0.842

Source: own processing of data

Given that the data distribution was normal, and the variances were homogeneous, the Independent Sample T Test was an appropriate test. Additionally, since men and women are inherently distinct groups, the observations are independent. The findings of an independent sample test on the disparity in municipal budget expenditure priorities between male and female mayors are displayed in the following table.

Table 2 Results of an Independent Sample T Test on the difference between women and men mayors' local budget expenditures on healthcare

	F	Significance	T	Significance (2-tailed)	Mean dif.
Healthcare	0.040	0.842	-1.203	0.237	0.064

Source: own processing of data

The findings of the independent Sample T Test indicate that there are no significant differences between the municipal budget expenditures on healthcare for men and women mayors (with significance 0.842 being above the level of significance $\alpha=0.05$).

Similar findings were found in multiple other countries across the world, indicating that there is no discernible variation in the amount and makeup of local public spending based on the mayor's gender. Similar findings were made by Casarico et al. (2022) in Italian municipalities, who observed no discernible gender-related disparities in local revenue and expenditure levels. Ferreira and Gyourko (2014) discovered that there is no correlation between female mayors and municipal spending, employment, or crime rates in US cities. Gago and Carozzi (2020) found a similar conclusion for Spain, where party affiliation correlated with policy decisions, but the mayor's gender did not. Bagues and Campa (2021) observed that the amount of money spent on areas that are most important to women is unaffected by the gender of Spanish municipal delegates. Similarly, Schild (2013) discovered that, according to statistics from Bavarian municipalities, electing a female mayor has no discernible impact on the size of the government budget, taxation, or the distribution of spending.

However, Brollo and Troiano (2016) showed that in mixed-gender election campaigns in Brazil, cities with female mayors had higher health statistics, receive more federal funding, and are less likely to have fraudulent public contracts. In Brazil, Funk and Philips (2019) found that women spend less on areas that influence men, like urban development and transportation, and more on themes that affect women, including healthcare. Additionally, compared to other policy areas, spending on healthcare increases with a higher percentage of female council members, suggesting that women's legislative participation significantly affects the distribution

of funds. However, in Slovakia, mayors are mostly answerable to the council and generally have little control over budget distribution.

While Baskaran et al. (2024) show that Indian districts that elect women have higher growth rates than their counterparts, Baskaran and Hessami (2018) show that a larger percentage of female council members in Bavarian municipalities favorably improves the availability of childcare. In an international setting, the findings about the impact of female mayors on budget expenditures are therefore inconsistent. The percentage of female mayors in Slovakia may limit our findings. The approval of councils, which did not take the percentage of women into account, also has an impact on finances. Budgetary restrictions, such as mandates and fixed expenses that leave little space for discretionary spending, also frequently have an impact on local budgets. It might be impossible to implement a mayor's preferred policy in such limited settings.

Furthermore, budget expenditures might also be impacted by the political allegiance of mayors. Significant policy consistency or unanimity may be fostered by the political environment, even at the municipal level. Similar demands from residents and other funding sources may be faced by all mayors, regardless of gender, leading to similar spending trends.

5 Conclusion

By examining whether the presence of women in municipal elected offices influences the distribution of government expenditure in the area of healthcare, this study adds to the growing body of research on the implications of women's representation.

Even though women in Slovakia have the same legal rights as males, their representation and participation in politics are still lacking in reality. The mayor oversees fiscal policy with the executive committee and has the power to make independent decisions about spending and revenue. The local council must authorize the mayor and executive committee to carry out the recommended fiscal policy.

The ability and space to come to an agreement also impacts the final policy outcome, even if the mayor has a big say in local public finance decisions. If men and women have different policy goals, a woman mayor may only be able to implement the desired policy if she gets enough support, which may rely on the gender makeup of the entire political body, particularly the city council, which must approve the mayor's recommendations.

Even though women's representation in the Slovak Republic is steadily rising between elections, it is still quite low; as a result, even if they have an impact on how healthcare budgets are allocated, it is not enough to be statistically significant. Furthermore, the makeup of the council always has an impact on Slovakia's acceptance of local budgets. In a similar vein, municipal budget expenditures may be impacted by mayors' (and council members') political party affiliations. These effects might open up new avenues for study in this field.

The research limitations rely on observed low proportions of healthcare expenditures within total local government spending that reflect the distribution of healthcare competencies across levels of government in Slovakia. Specifically, local governments are vested with only limited responsibilities in the healthcare sector, while a substantial share of healthcare competencies is assigned to regional governments.

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Female Gender Representation Effect on Municipal Debt Levels

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Abstract

This study examines gender inequality in the Slovak Republic and its implications for municipal governance, with a focus on female representation and local debt patterns. The Global Gender Gap Index shows that the Slovak Republic consistently lags behind the European average, with Political Empowerment remaining the weakest subindex and deteriorating in 2025. Despite gradual improvements in some dimensions of gender equality, in particular in access to education and health services, women remain significantly underrepresented in political leadership, particularly in larger municipalities. Using panel data from 2926 municipalities for the period 2005-2022, the study highlights that only 22.5% of mayoral positions were held by women, and that the municipalities with the highest debt service levels were exclusively led by men. However, the findings indicate that this pattern does not imply a direct relationship between mayoral gender and municipal indebtedness. High debt levels are concentrated in large centers that undertake extensive infrastructure and investment projects – municipalities that, in the Slovak Republic, are overwhelmingly governed by men. These patterns suggest that the absence of women in highly indebted municipalities reflects broader structural factors, such as municipality size, administrative complexity, and the greater resources required to win executive office in large municipalities.

Keywords: Female Political Representation, Fiscal Behavior, Gender Inequality, Municipal Debt, Risk Aversion, Slovak Municipalities.

JEL Classification: J16, H72, H74

1 Introduction

Municipal debt accumulation plays a crucial role in local governance, affecting public investment, fiscal sustainability, and economic stability. Women in leadership positions are often associated with greater risk aversion and a preference for long-term financial stability, which could impact municipal borrowing behaviors. Women tend to exhibit more risk-averse behavior, which could translate into lower tolerance for excessive borrowing and debt accumulation in municipal governance. The female policymakers often place greater emphasis on long-term sustainability, social investment, and fiscal prudence compared to their male counterparts. But, greater female representation could also amplify demand for social spending and welfare-related investments, potentially leading to higher debt levels if these initiatives are financed through borrowing.

This paper aims to analyze gender inequality in the Slovak Republic and examine whether female representation in municipal governance leads to differences in debt patterns. The relationship between gender representation, municipal debt levels, and social expenditures is

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particularly salient at the local government level. Municipalities are directly responsible for delivering essential services such as education, health, housing, and social care. Therefore, examining how gender diversity in political leadership influences these outcomes provides valuable insights into the role of institutional design and representation in shaping community well-being and fiscal responsibility.

2 Literature review

A growing consensus in economy and public finance suggests that women's representation in governing institutions can influence policy priorities, fiscal outcomes, and the allocation of public resources. While the majority of the literature has focused on national legislatures and central governments, the role of gender representation in local politics remains comparatively understudied, despite the fact that municipalities constitute critical arenas of governance where policy choices have direct and tangible consequences for citizens' daily lives. In particular, municipal borrowing and debt accumulation represent policy domains with significant long-term implications for fiscal sustainability, intergenerational equity, and local development strategies.

Our analysis of the literature on female gender representation in municipal politics showed that scholars argue that political institutions are not gender-neutral; rather, the composition of governing bodies can directly shape both fiscal outcomes and policy priorities. Also, Hessami & da Fonseca (2020) analyzed the literature in this topic and concluded that in developing economies, the expansion of women's participation in political institutions has been associated with enhanced provision of public goods, particularly in the domains of education and health. In contrast, in developed countries, greater female representation has not produced significant alterations in fiscal policy outcomes when evaluated through expenditure patterns. Nevertheless, recent empirical findings indicate that women's presence in legislatures has influenced parliamentary debates and contributed to the adoption of targeted policy measures such as the expansion of public childcare services that may not be fully captured by aggregate spending indicators. Furthermore, increased political representation of women has been linked to improvements in institutional integrity, including reductions in corruption and the extraction of rents by political elites.

A large body of empirical evidence indicates that female politicians tend to prioritize social policy areas, particularly health, education, and family services. This is often explained through the "care orientation" hypothesis, which suggests that women, on average, are more inclined toward policies that support vulnerable populations (Hessami & da Fonseca, 2020).

Representation is often theorized through two main lenses: descriptive representation, which concerns the numerical presence of women in decision-making positions, and substantive representation, which refers to the extent to which women advance policies and outcomes that reflect the preferences and needs of women and other marginalized groups (Funk & Philips, 2019). This distinction is crucial because it allows researchers to evaluate whether female political presence merely symbolizes inclusivity or leads to tangible shifts in budget allocations and fiscal health.

Recent studies suggest that leadership characteristics, including gender, may influence financial decision-making (Huang et al., 2025). Huang et al. (2025) conduct an empirical analysis to explore the impact of CEO gender on corporate debt structure. Their findings indicate that firms led by female CEOs tend to issue lower levels of debt compared to those managed by male CEOs. This negative association between female leadership and firm leverage is attributed to the greater risk aversion exhibited by female CEOs relative to their male counterparts. Additionally, the study reveals that the influence of CEO gender on

corporate debt decisions is more pronounced in firms with younger CEOs, higher litigation risk, and greater market competition. Regarding debt structure, firms under female leadership demonstrate a preference for maintaining positive debt capacity and having longer debt maturities. Overall, their findings highlight the existence of gender-based differences in corporate borrowing decisions.

Strong, C. O. (2024) examines the impact of finance ministers' personal attributes on debt-to-GDP ratios. The analysis reveals that tenure, gender, and educational background of African finance ministers significantly shape public debt outcomes. Notably, longer tenures are linked to a diminished capacity to influence government debt levels, whereas female finance ministers tend to be associated with lower debt-to-GDP ratios in comparison to their male counterparts. These results remain consistent even when controlling for institutional quality and the personal characteristics of heads of state, underscoring the robustness of the findings.

Cabaleiro-Casal & Buch-Gómez (2024) aim to examine whether gender diversity – defined as gender balance – within municipal political leadership influences levels of municipal indebtedness. Additionally, they explore the moderating roles of mayoral gender and the economic conditions of the municipality. The findings indicate that greater gender diversity within municipal government teams is associated with lower levels of municipal debt. Moreover, right-wing government ideology and female mayoral leadership serve as significant moderators, reinforcing the effect of gender diversity on institutional indebtedness. In their previous article they conclude that a higher proportion of women councillors are associated with weaker fiscal outcomes in Spanish municipalities. These findings stand in contrast to the expectations derived from the dominant theoretical literature. Additionally, right-leaning female councillors appear to exacerbate short-term budgetary imbalances, while female mayors from the same ideological background are linked to lower debt per capita (Cabaleiro-Casal & Buch-Gómez, 2021).

Suzuki & Avellaneda (2018) investigate the impact of women's presence in elected offices (mayor and council) as well as in administrative roles (mid-level managers) on fiscal decision-making across 764 Japanese municipalities. The results indicate that a higher proportion of female councillors is linked to more cautious financial behaviour: municipalities with greater female representation in local legislatures are less likely to issue bonds. In contrast, the gender composition of executive offices (mayor and vice-mayor) appears to have no significant influence on financial outcomes.

The authors Braga & Scervini (2017) examine whether the gender of elected local politicians in Italy causally affects political outcomes at the municipal level. While they find no impact on general quality-of-life indicators, greater female political presence leads to improved effectiveness of policies related to families and women and contributes to more efficient local public administration. Balaguer-Coll and Ivanova-Toneva (2021) demonstrate that female leadership at the municipal level can positively influence local financial performance. Specifically, the presence of women mayors, particularly when governing alongside a relatively high proportion of female councilors in accordance with quota legislation, increases the likelihood of budgetary stability, financial sustainability, and adherence to statutory debt restrictions. Furthermore, the study reports that women mayors exhibit lower tendencies to engage in pre-electoral fiscal strategies aimed at securing re-election. Cuadrado-Ballesteros et al. (2024) research adds to the existing literature by exploring how female representation influences municipal debt dynamics. The analysis is based on a dataset covering 141 Spanish municipalities with populations exceeding 50,000 between 2008 and 2020. The findings

indicate that municipalities governed by women mayors generally exhibit lower debt levels. Moreover, the results suggest a nonlinear, inverted U-shaped association between the share of female council members and municipal debt. In other words, greater representation of women on councils is linked to reduced indebtedness, but this beneficial effect becomes evident only when women constitute a sufficiently large proportion of councilors.

Kuliomina (2021) investigates whether personal attributes of local politicians, such as gender, educational attainment, and professional background, affect patterns of municipal budget allocation. Employing a regression discontinuity design based on Czech local election outcomes and municipal budgetary data, the study contrasts municipalities where candidates with specific characteristics narrowly won or lost. The findings reveal that electorates tend to prefer more educated candidates, while women are comparatively disadvantaged. Nevertheless, no substantial or robust effect was detected regarding the election of additional women, highly educated councilors, or candidates with entrepreneurial backgrounds on overall budget allocation, deficits, or municipal debt. This holds true even in smaller municipalities, where the marginal influence of an additional councilor should, in theory, be greater. One exception identified was a reduction in capital revenues when marginally elected women formed a majority. Another strand of research assesses whether the election of women to municipal office alters expenditure patterns in ways that advance women's interests. Evidence suggests that female mayors allocate relatively more resources to policy domains conventionally associated with women's issues, such as education, healthcare, and social assistance, while comparatively reducing allocations to traditionally male-oriented domains, including transportation and urban development. The presence of a larger share of female councilors reinforces this pattern, leading to increased expenditure on social policies aligned with women's substantive representation. Findings from Brazil in particular underscore the role of women in municipal government in redirecting resources toward historically female-concerned policy areas.

García and Hayo (2023), using a difference-in-differences estimator with data from municipalities in the Madrid region (2010–2019), evaluate gender effects on social service expenditures surrounding a legal reform. Municipalities with fewer than 20,000 inhabitants served as the control group, whereas those above this threshold were affected by the reform. While average social spending declined in treatment municipalities, outcomes varied substantially depending on the gender composition of local governments. Male-dominated councils reduced social spending by approximately 20% of the total budget, whereas female-dominated and gender-balanced councils did not follow this pattern. Notably, gender-balanced councils led by female mayors increased social spending by 40% relative to their male-led counterparts, suggesting that female politicians display heightened commitment to protecting social expenditures, even under restrictive legal frameworks. Steklov et al. (2025) argue that women tend to prioritize social services – a domain predominantly overseen by local governments. While female representation is often viewed both as an indicator of descriptive equality and as a mechanism for advancing substantive representation, empirical evidence remains mixed. Their analysis of Israeli municipalities over nine budget cycles indicates that women's representation in councils only affects education expenditures and only in contexts where a female mayor is also in office. The study concludes that female representation within councils alone is insufficient to advance women's policy priorities without complementary executive leadership.

Cabaleiro and Buch (2024) analyze the relationship between gender diversity in municipal government teams and levels of municipal indebtedness. Their results indicate that greater

gender balance within governing teams reduces local government debt. They also show that political ideology and the gender of the mayor moderate this effect, with right-leaning governments and female mayors strengthening the influence of gender diversity on debt outcomes. By contrast, Jung (2022) finds limited evidence of a link between female representation and municipal economic indicators. The study concludes that the gender of the mayor does not significantly affect the development or execution of gender-responsive budgets. These findings suggest that the impact of women's representation in local leadership positions is contingent upon broader socioeconomic contexts. The relationship between debt level and women's gender representation is also explained by stereotypes. Schneider & Bos (2014) analyzed stereotypes of female politicians and their results show that female politicians seem to be "losing" on male stereotypical qualities while also not having any advantage on qualities typical of women.

A number of scholars have examined not only the influence of women on the economic indicators level during their representation in government bodies, but also their behavioral aspects, in particular the ability to supply more public goods than men (Andersen et al., 2008). Aidt's & Dallal's (2008) analysis demonstrates that the introduction of women's suffrage was associated with a short-term increase in social expenditures amounting to approximately 0.6–1.2% of GDP. In the long run, however, the estimated impact is substantially greater, ranging from three to eight times the short-term effect (Aidt & Dallal, 2008).

Funk & Philips (2019) in their analysis of the impact of female mayors on the spending structure of local governments in Brazil, the researchers included the following control variables: mayor's political party (identification with left or right-wing parties); municipality population size (number of residents); per capita income level (economic indicator of well-being); urbanization level (degree of urban development and infrastructure).

We analyze the results of the researches whether female political representation affects municipal debt levels and the dynamics of debt accumulation at company, municipal, and state levels (Table 1).

So, the literature suggests that gender may influence leadership styles, risk preferences, policy priorities, and ultimately public financial management. Studies have shown that women in political office often exhibit different spending patterns, greater prudence in financial decisions, and stronger preferences for social policies, although findings vary across institutional contexts and stages of economic development. Although evidence increasingly links female representation to fiscal behavior, important gaps remain.

Table 1 Comparative overview of empirical studies on gender representation and fiscal outcomes across governance levels

Author	Data and period	Methodology
<i>Companies level</i>		
Huang et al. (2025)	1500 companies from S&P and 28,389 effective firm-year observations from 1993 to 2021	Panel regression, propensity score matching (PSM) regressions and post-match diagnostic regressions
<i>Municipal level</i>		
Cabaleiro & Buch (2024)	144 Spanish municipalities with populations exceeding 50,000 residents over the period 2013–2022	Generalized Method of Moments (GMM) estimators

Author	Data and period	Methodology
Kuliomina (2021)	Czech Republic, period 2002-2010	Panel data with fixed effects
Casarico et al. (2022)	Italian municipalities in the period 2000–2015	Sharp regression discontinuity
Funk & Philips (2019)	Compositional expenditure data from more than 5,400 Brazilian municipalities over eight years	Panel data
Jung, H. (2022)	Korean cities between 2016 and 2020	Various econometric models
Steklov et al. (2025)	Israeli local government over nine budget years	Correlation
Cabaleiro & Buch (2024)	A sample of 144 Spanish municipalities with more than 50,000 inhabitants for the period 2013–2022	GMM estimators on two dynamic models
Suzuki & Avellaneda (2018)	764 Japanese city-level governments from 2007 to 2012	Panel data set, random-effects model
<i>State level</i>		
Strong (2024)	Data spanning 1980 to 2020 across 23 African nations	GMM estimation
Balaguer-Coll & Ivanova-Toneva (2021)	Spain, period 2013-2016.	
Singh & Sahu (2024)	54 developed and developing countries from 2000 to 2019	Panel data methodology

Source: own processing of data

The literature offers limited insight into the threshold effects or nonlinear dynamics of gender composition, such as whether a critical mass of women is required to produce measurable changes in debt levels or whether marginal increases in representation matter equally. More comparative and causal studies are needed to clarify when and how gender diversity affects municipal debt levels and long-term fiscal sustainability.

3 Results

The Slovak Republic ranks 70th out of 148 countries in the world presented in the Global Gender Gap Report 2025. The comparison of the Global Gender Gap Index in the Slovak Republic with the minimum and maximum values from all analyzed countries presented in the Global Gender Gap Report is shown in Figure 1.

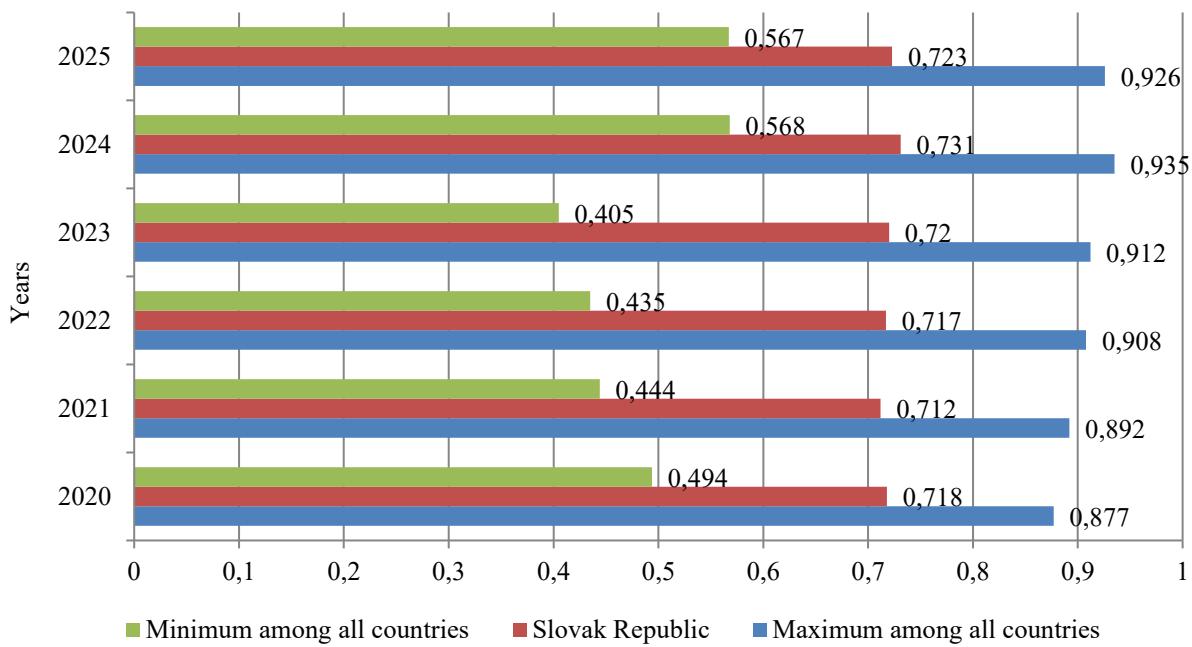


Figure 1 Comparison of Global Gender Gap Index in the Slovak Republic with the minimum and maximum values from all analyzed countries

Source: own processing based on Global Gender Gap Report (2020-2025)

For comparison of the Slovak Republic with countries in the Europe region, the mean, minimum, and maximum values were calculated (Figure 2).

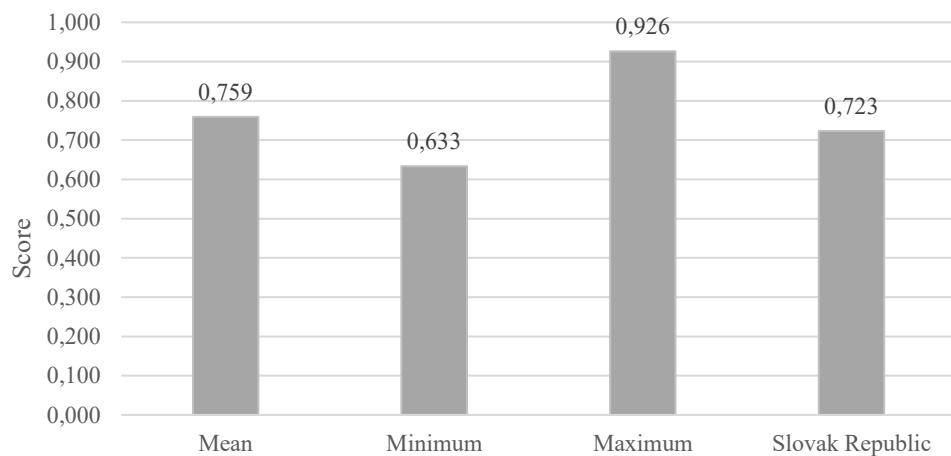


Figure 2 Statistics of the Global Gender Gap Index in the European countries and comparison with the Slovak Republic

Source: own processing based on Global Gender Gap Report (2025)

The Global Gender Gap Index value in the Slovak Republic is 0.040 lower than the average value for European countries. The maximum value for Europe was 0.912 (in Iceland); while for the Slovak Republic, it was 0.720, i.e. 0.192 lower than the maximum in Europe.

In the Slovak Republic the political empowerment subindex is the lowest among all subindexes (0.231 in 2020 and 0.201 in 2025). In 2025 the situation even worsened compared to 2024. Economic Participation and Opportunity exhibits an overall positive trend, increasing from 0.663 in 2020 to a peak value of 0.720 in 2024, followed by a slight decline in 2025. Educational Attainment remains fully closed at a score of 1.000 in all years, while Health and Survival is consistently high and stable at 0.980 across all years. (Figure 3).

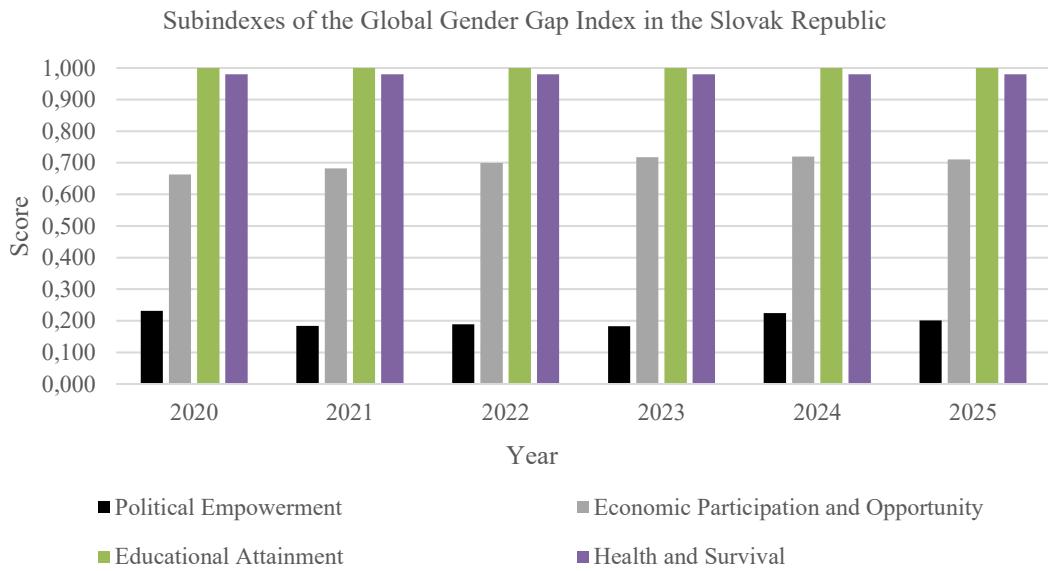


Figure 3 The subindexes of the Global Gender Gap Index of the Slovak Republic

Source: own processing based on Global Gender Gap Report (2020-2025)

So, the most problematic area in the Slovak Republic is Political Empowerment. This means that the political sphere remains the most “male” one. There is a significant gender gap in the political representation of women. At the same time, the countries of Northern Europe (Iceland, Norway, and Finland) have high results in Political Empowerment, because women there regularly occupy key state and municipal leadership positions. The results suggest that further progress in gender equality in Slovakia will depend less on social sectors and more on targeted reforms in political participation and leadership.

In order to examine the female gender representation – municipal debt level across the municipalities of the Slovak Republic, this study performs a panel data analysis from 2926 Slovak municipalities for the period 2005-2022. We analyzed 2926 municipalities over 18 years (2005-2022), i.e. a total of 52668, of which 52351 had available data and 317 were missing, the number of municipalities headed by women was 11772 municipalities (22.5%), and the number of municipalities headed by men was 40579 (77.5%), which is approximately 3.45 times more than those headed by women (Figure 4).

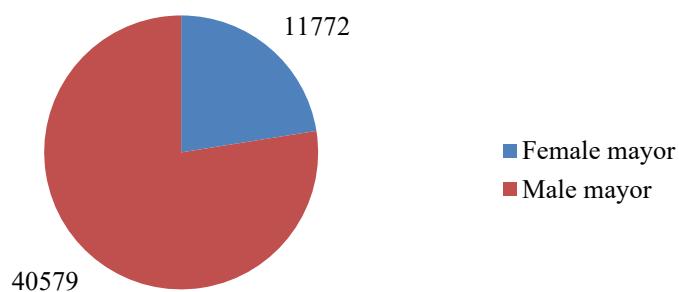


Figure 4 Representation of men and women in the position of mayor in municipalities of the Slovak Republic

Source: own processing

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Regarding the debt levels of municipalities, descriptive statistics for the debt indicators – principal payments (FOVU820), interest payments (BVU650), and revenue financial operations (loans and returnable financial aids received) (FOPU500) for the period 2005–2022 are presented in Table 2.

Table 2 Descriptive statistics of the debt indicators of the Slovak municipalities

Characteristic	Indicators		
	FOVU820	BVU650	FOPU500
Min.	-3141	0	-256
1st Qu.	0	0	0
Median	2880	433	0
Mean	59340	7391	76487
3rd Qu.	27000	4054	8890
Max.	71878000	7663801	69378000

Source: own processing

The descriptive statistics indicate a very high variability in the debt levels of Slovak municipalities over the period 2005–2022. There is a high differentiation in the debt level in the sample. Maximum principal payments were in Bratislava main city in 2011, maximum interest payments were in Bratislava main city in 2008, revenue financial operations – loans and returnable financial aids received in Bratislava main city in 2014. So, the extreme maximum values, consistently recorded in Bratislava, confirm that municipal debt in Slovakia is highly concentrated in large cities.

From the analyzed 2926 municipalities in the Slovak Republic for the period 2005–2022, we sorted the top 20 municipalities by the highest debt service indicators – principal payments (FOVU820) and interest payments (BVU650). In all of these municipalities, which are characterized by the highest levels of debt servicing, the mayors were men (Table 3).

Table 3 Top 20 municipalities in the Slovak Republic by the highest debt service indicators

No.	Municipality Name	Year	FOVU 820	Woman Mayor	Municipality Name	Year	BVU650	Woman Mayor
1	Bratislava main city	2011	71878000	0	Bratislava main city	2008	7663801.093	0
2	Bratislava main city	2014	71878000	0	Bratislava main city	2007	5864420.828	0
3	Bratislava main city	2008	58158352.24	0	Bratislava main city	2006	4443164.734	0
4	Bratislava main city	2015	42433500	0	Bratislava main city	2009	4438067	0
5	Žilina	2011	24802413	0	Bratislava main city	2012	2333191.07	0
6	Košice	2006	23537048.97	0	Bratislava main city	2011	2164848	0
7	Žilina	2007	22173647.91	0	Žilina	2008	1948515.548	0
8	Košice	2011	21172049	0	Bratislava main city	2013	1894847.58	0

No.	Municipality Name	Year	FOVU 820	Woman Mayor	Municipality Name	Year	BVU650	Woman Mayor
9	Košice	2019	19266244.2	0	Bratislava main city	2014	1878777.97	0
10	Žilina	2016	12045024.21	0	Žilina	2007	1662532.193	0
11	Nitra	2021	11841799.79	0	Žilina	2005	1526002.125	0
12	Banská Bystrica	2012	10615098.6	0	Žilina	2006	1437473.153	0
13	Nitra	2013	10256157.49	0	Košice	2005	1412872.801	0
14	Košice	2014	8870323.92	0	Žilina	2009	1390229	0
15	Bratislava main city	2021	7897333.34	0	Bratislava main city	2010	1374217	0
16	Bratislava main city	2022	7897333.34	0	Košice	2008	1360934.454	0
17	Trenčín	2012	7642159.08	0	Košice	2006	1329843.213	0
18	Liptovský Mikuláš	2016	7291160.89	0	Košice	2007	1299399.07	0
19	Nitra	2020	6950489.46	0	Žilina	2011	1039900	0
20	Trenčín	2015	6785773.07	0	Košice	2012	1010673.6	0

Source: own processing

The data show that highly indebted municipalities tend to be led exclusively by men in these years. The top-20 highest debt service values are dominated by Bratislava main city. Košice. Žilina. Nitra. Trenčín. Banská Bystrica. Liptovský Mikuláš. which are among the largest cities in the Slovak Republic. Large cities often borrow more for urban infrastructure. public transportation. strategic long-term investments. etc. Therefore. we cannot directly equate the high level of debt with the leadership of men in these municipalities. It is impossible to draw causal or correlational conclusions about the effect of mayoral gender on debt levels using only top-20 highest debt service values.

4 Conclusion

Using panel data from 2926 municipalities for the period 2005-2022. we found that women remain significantly underrepresented in mayoral positions. especially in larger municipalities where debt levels are naturally higher. The absence of female mayors in the most indebted municipalities appears to reflect broader governance patterns in the Slovak Republic. where large cities. which naturally incur higher debt. are almost always governed by men. Prior research indicates that women in the Slovak Republic tend to be more frequently elected in smaller municipalities with lower budgets and simpler administrative structures. The results further indicate that the relationship between gender and debt cannot be isolated from structural municipal characteristics. particularly city size. administrative capacity and historical political competition. The largest cities. which naturally incur higher long-term debt for infrastructure. transport systems. and capital investments. have historically been dominated by male political elites. Thus. the observed lack of female representation among high-debt municipalities is likely attributable to the interaction between gendered political opportunity structures and municipality size. rather than to debt levels themselves. In the Slovak Republic. women are elected predominantly in smaller municipalities. whereas their presence in larger municipalities remains considerably limited. Big municipalities tend to be governed mostly by men. Winning

the mayoral seat in a large municipality requires higher political resources. stronger party backing. and long-standing networks. etc. Combining these two facts explains the pattern: high debt appears mostly in large municipalities. and large municipalities elect almost exclusively male mayors.

Our findings highlight the importance of considering political opportunity structures when assessing gender effects on fiscal outcomes. Future research should explore the conditions under which women gain access to leadership in larger and more fiscally complex municipalities.

The study has several limitations. First. mayoral gender is treated as a binary variable and does not capture differences in leadership style. experience. political affiliation. etc.. which may also influence municipal debt outcomes. Second. the strong concentration of debt in large cities limits the ability to separate the effect of gender from structural factors such as budget capacity. investment needs. etc. Third. this study focuses primarily on debt indicators; therefore. broader fiscal performances (e.g. service quality. social orientation. or investment efficiency) also must be taken into account to provide a more comprehensive understanding of the relationship between gender representation and municipal financial management.

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Education as Financing Priority of Women Mayors

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Abstract

This contribution analyzes the budget expenditure trends of Slovak towns with female mayors to those with male mayors to ascertain if women mayors devote more funds to the field of education. Although prior findings on gender-based expenditure disparities are still conflicting, research indicates that education is one of the main areas of preference for female leaders. The study uses statistical tests to assess the relevance of the discrepancies in education spending between Slovakian towns run by men and women. There are no statistically significant differences found in the results. The requirement for council approval for municipal budgets is a significant restriction that may restrict mayors' direct control over spending priorities. According to the results, mayoral gender is not a consistent predictor of how Slovak towns prioritize their education spending. Other factors including party policy alignment, mandated expenditures, and council political power seem to influence municipal spending decisions. This study contributes to the body of knowledge on gender and governance by presenting data from Slovakia that deviates from numerous global findings.

Keywords: Women Mayors, Municipalities, Gender Equality, Financing Priorities, Budget Spending.

JEL Classification: I28, J16, H72

1 Introduction

Although women are still underrepresented in practically every country and at every level of government worldwide, their representation has increased lately (Jalalzai, 2013; Sundström and Stockemer, 2015; Escobar-Lemmon and Funk, 2018). The European Union's Gender Equality Strategy 2020–2025 (European Commission, 2020) seeks to boost the proportion of women in local government leadership positions and their involvement in regional and local municipal budgets. Women must be adequately involved in these political structures in order to realize the democratic ideals of justice and equality. Even if women behave in the same way as men, they are still significant. Women's presence can have symbolic effects and affect important opinions (Hinojosa et al., 2017). The subject of whether, more women in political institutions and significant representation of women have an effect on politics, has been brought up by the recent rise in women's political engagement (Dolan et al., 2021; An et al., 2022; Davidson-Schmich, 2023). If women behave differently from men, then the case for boosting women's numerical representation will only become more compelling (Aldrich and Lotito, 2020). This is due to the fact that electing women will yield different outcomes than electing males. The effects of increasing the proportion of women working in politics are not limited to the country (Paxton et al., 2020).

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The character of women's substantive representation is a key outcome that could be profoundly transformed at the local level through an increase in women's representation (Barnes and O'Brien, 2025). The distribution of government expenditures, revenue collection, provision of public services, and administrative oversight are all vital responsibilities of local governments, especially within decentralized nations. Raising the number of women elected to office may inadvertently influence the conduct of female officials and enhance the real representation of women (Funk and Philips, 2019; Wahman et al., 2021). It is meaningful to investigate whether the election of women to the position of mayor has also influenced local fiscal financing of education area within our country.

2 Literature review

According to Coessens (2024), women's representation plays a significant role in determining government expenditure objectives, which raises funding for laws and initiatives that advance the interests of women. However, there are other factors that may influence the relationship between government spending and women's representation. Local politics includes policies that regulate people's daily lives and address their needs and desires. In Slovakia, municipalities are the most basic administrative units, and their mayors are elected to four-year terms. Men and women have different needs when it comes to how they use urban space. The problem of women's engagement in local governments and municipal politics stems from the dominating male hierarchy and gender trends. Although women's status in the EU has improved somewhat, it still falls short of the objectives outlined in Zamfir (2024). According to the most recent data in Coessens (2024), women continue to be underrepresented in municipal and regional governments, with a 17.4% mayorship. Slovakia has a better situation, with a 26.5% female share. The nations with the lowest percentages are mostly in Eastern and Central Europe (such as Greece 6.7%, Austria 10.5%, and Poland 12.0%), whereas the top three are Iceland (39.1%), Estonia (37.2%), and Sweden (36.2%).

Spending by local governments reflects policy agendas. If women's representation significantly affects how expenditure is allocated, then women also affect how much weight governments give to specific policy issues. Furthermore, altering the way expenditure is distributed sometimes requires making trade-offs because administrations do not have infinite resources. Therefore, increasing spending in one area often means reducing spending in another. Representation is another method of allocating government funds, and it is a regular and essential government duty. Spending by local governments also affects the outcomes of policies. Even though some forms of representation might only be symbolic or rely on the resources available for proper implementation and enforcement, expenditures are anticipated to have a substantial impact across policy areas.

Furthermore, minor modifications to allocations may eventually have a big impact because government budgets usually undergo incremental changes (Funk and Philips, 2019). If female policymakers change expenditure in a single year, this influence is likely to persist over time. As a result, expenditure distribution can provide an important means of long-term representation for various social groups, including women. This poses the inquiry of whether women who occupy positions of responsibility allocate their money differently from males. The findings of earlier research on government spending and gender representation have been mixed, with most of them concluding that the relationship varies depending on the situation.

The gendered norms and rules of the political office may restrict women representatives' ability to represent women in a gendered institution (Funk and Philips, 2019). Female executives may act "like men" due to the gendered nature of executive roles. While men are assumed to possess

the qualities commonly associated with a chief executive, such as aggressiveness and competence (Eagly and Karau, 2002), women must work to combat stereotypes and overcome challenges connected to their gender's credibility (Funk, 2015).

There may not be any obvious differences in the distribution of spending since male and female mayors may actually have similar spending preferences. The equity concept of women's representation holds that women can influence change in multiple policy areas rather than just one if they are really equal participants in politics. The few women who are elected mayors may be able to work on a variety of topics in a way that is comparable to that of men since they have achieved equality. Although they may appreciate women's issues, female mayors prioritize expenditure on both women's and non-women's policy concerns because they want to serve all voters. Consequently, there may not be any discernible differences between the budgetary allocation practices of male and female mayors (Funk and Philips, 2019).

Due to differences in policy aims and attitudes between men and women, politicians may decide to deploy government resources in rather different ways. There is evidence that the allocation of government funding is influenced by the representation of women. In India, state legislatures with more female members make greater investments in early childhood education and health care (Halim et al. 2016). In a comparable way, Braendle and Colombier (2016) found that when the number of women on local government boards rose, so did education spending in Switzerland. Despite gender differences in policy, several scholars noted that male and female leaders might not always act in ways that reflect their gender preferences (Ferreira and Gyourko, 2011). In order to assess the effects of female participation in local councils, Rigon and Tanzi (2012) employed a sample of Italian municipalities and external variability imposed by a federal rule that enforced gender quotas. They found no effect on the mix of expenditures.

Increased female presence in state legislatures is linked to a greater chance of passing laws addressing issues impacting women, families, and children, according to Thomas (1991). Swedish municipalities' polls show that women would rather spend money on childcare and education than on elder care (Svaleryd, 2009). Using female quota laws that arbitrarily require that some Indian localities restrict the position of mayor to women, elected female mayors in India make investments in infrastructure according to gender-specific preferences (Chattopadhyay and Duflo, 2004). Nonetheless, a number of studies (Funk and Philips, 2019; Ferreira and Gyourko, 2011; Schild, 2013) showed that the representation of women significantly affected government spending.

3 Research Methodology

Our research compared the budget expenditures of female mayors in local budgets with the same expenditures of male mayors on the education (as defined in the UN Classification of the Functions of Government classification). The study includes data from all 2,926 municipalities in Slovakia from years from 2005 to 2022, providing a comprehensive sample of Slovak towns headed by mayors and supported by municipal councils. The Statistical Office of the Slovak Republic's DataCube database and the Ministry of Finance's DataCentrum database are the sources of the data used in this study. Some of the variables or subtotals had to be calculated, summed up, or aggregated to examine spending for individual budget chapters.

Using Microsoft Power BI data were processed as the average percentage expenditures in the budget for these aggregated categories for both male and female mayors by year. Basic ratios and the Independent Sample Test in IBM SPSS software were used for statistical analysis. Since the Shapiro-Wilk test demonstrated the normality of the data distribution and Levene's test

verified the homogeneity of variances in both groups, the Independent Sample T test was an appropriate test. Additionally, because men and women are inherently separate groups, the observations are independent. Thus, this study aims to investigate, evaluate, and compare budgetary expenditures on education in Slovak towns over the available time between the groups of male and female mayors in charge of these expenditures.

4 Results and Discussion

The gender of the mayors (male or female) in each of the relevant years (2005–2022) was linked to data on budget expenditures in all Slovakian municipalities that were accessible.

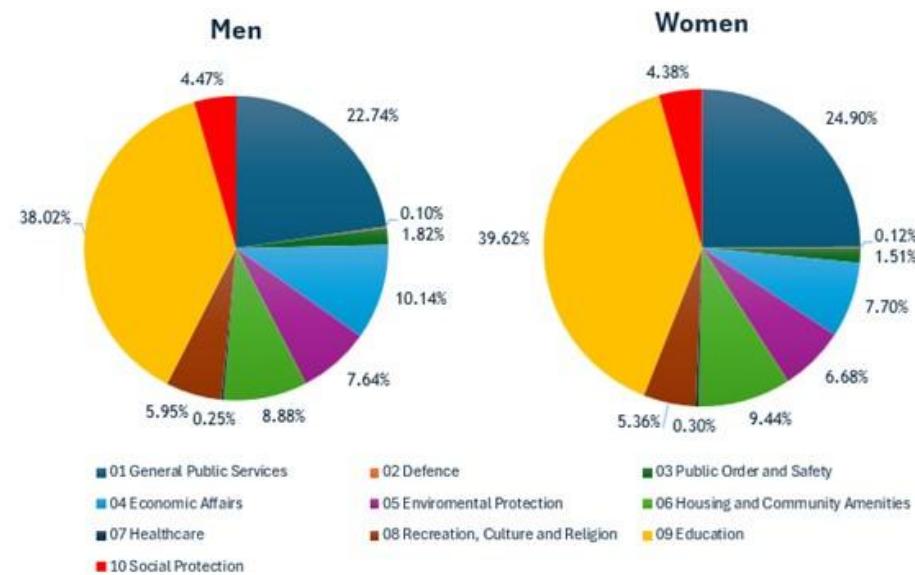


Figure 1 Percentage share of individual expenditure chapters according to COFOG by gender of mayor

Source: Data processed from DataCube database provided by the Statistical Office of the Slovak Republic (2025)

The spending percentages of men and women in each of the COFOG chapters from Slovakia's examined era are displayed in the accompanying figure, which shows a comparable distribution in both groups. Additionally, only the field of education is taken into consideration because it is a major priority issue for women mayors.

There were some variations in the financial habits of mayors between 2006 and 2022 according to gender. Education has always received the highest portion of public spending, roughly 39.62% in towns run by women and 38.2% in municipalities run by men. This finding suggests that, irrespective of the mayor's gender, funding for education is a top priority. The pattern of rising percentual expenditures in this area over time for both genders is seen in Figure 2, which shows a little increase in the relative share of spending of female mayors (about 1.04 times the expenditures of male mayors).

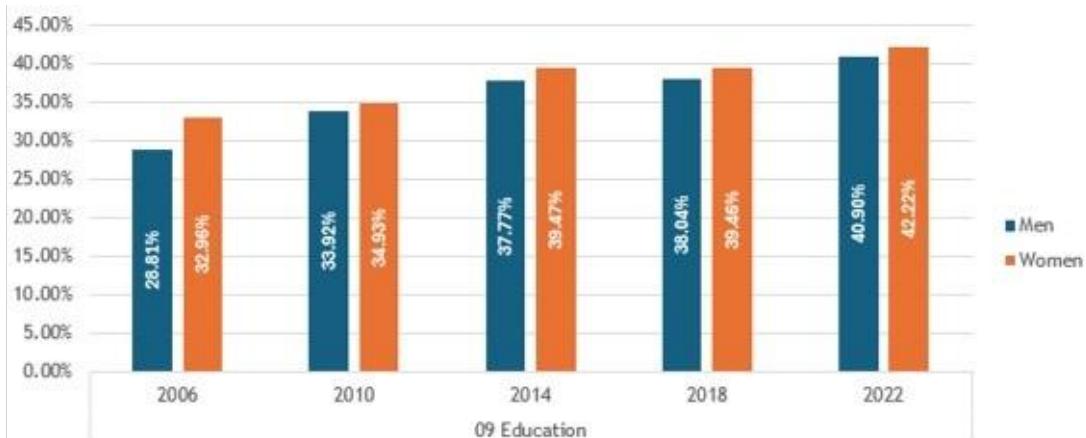


Figure 2 Comparison of mayors' budget expenditures on the COFOG category 09 – Education, based on gender (in percentage)

Source: Data processed from DataCube database provided by the Statistical Office of the Slovak Republic (2025)

The statistical significance of the minor differences between the spending policies of men and women in the role of mayor was investigated further. Thus, statistical testing was performed on the data. The normality of the data distribution was examined using the Shapiro-Wilk test, and the homogeneity of variances was examined using Levene's test. The following table displays the outcomes of these tests.

Table 1 Tests of normality and homogeneity of variances

Education	Shapiro-Wilk test	Levene's test
Statistic	0.949	1.220
Significance	0.095	0.277

Source: own processing of data

Given that the data distribution was normal, and the variances were homogeneous, the Independent Sample T Test was an appropriate test. Additionally, because men and women are inherently separate groups, the observations are independent. Then, research hypotheses were formulated as follows:

H_0 : There is no significant difference in the average percentage of expenditures on education in local budgets between the male and female mayors in Slovakia.

H_1 : There is a significant difference in the average percentage of expenditures on education in local budgets between the male and female mayors in Slovakia.

The findings of an independent sample test on the disparity in municipal budget expenditure priorities between male and female mayors are displayed in the following table.

Table 2 Results of an Independent Sample T Test on the difference between women and men mayors' local budget expenditures on education

	F	Significance	T	Significance (2-tailed)	Mean difference
Education	1.220	0.277	-1.754	0.088	-2.148

Source: own processing of data

There were no significant differences in the data examined, as the significance (p -value=0.277 above) was found above the significance level ($\alpha=0.05$). The results of the independent Sample T Test indicates that there is no statistically significant difference in the municipal budget spending on education between male and female mayors, therefore null hypothesis is retained.

Similar findings were found in several other nations across the world, indicating that there is no detectable variation in the amount and makeup of local public spending based on the mayor's gender. Similar findings were made by Casarico et al. (2022) in Italian municipalities, who found no discernible gender-related disparities in local revenue and expenditure levels. Ferreira and Gyourko (2014) discovered that there is no correlation between female mayors and municipal spending, employment, or crime rates in US cities. Gago and Carozzi (2020) found a similar conclusion for Spain, where party affiliation correlated with policy decisions, but the mayor's gender did not. Bagues and Campa (2021) found that the amount of money spent on areas that are most important to women is unaffected by the gender of Spanish municipal delegates. Similarly, Schild (2013) discovered that, according to statistics from Bavarian municipalities, electing a female mayor has no discernible impact on the size of the government budget, taxation, or the distribution of spending.

However, Brollo and Troiano (2016) showed that in mixed-gender election campaigns in Brazil, cities with female mayors had higher health indicators, receive more federal funding, and are less likely to have fraudulent public contracts. In Brazil, Funk and Philips (2019) found that women spend less on areas that influence men, like urban development and transportation, and more on themes that affect women, including social assistance, healthcare, and education. Additionally, compared to other policy areas, spending on social assistance, healthcare, education, and traditionally feminine issues increases with a higher percentage of female council members, suggesting that women's legislative participation significantly affects the distribution of funds. However, in Slovakia, mayors are mostly answerable to the council and generally have little control over budget distribution.

While Baskaran et al. (2024) show that Indian districts that elect women have higher growth rates than their counterparts, Baskaran and Hessami (2018) show that a larger percentage of female council members in Bavarian municipalities favorably improves the availability of childcare. In an international setting, the findings about the impact of female mayors on budgetary spending are therefore inconsistent. The percentage of female mayors in Slovakia may limit our findings. The approval of councils, which did not take the percentage of women into account, also has an impact on finances.

Budgetary restrictions, such as mandates and fixed expenses that leave little space for discretionary spending, also frequently have an impact on local budgets. It might be impossible to implement a mayor's preferred policy in such limited settings. Furthermore, budget expenditures might also be impacted by the political orientation of mayors. Significant policy consistency or unanimity may be fostered by the political environment, even at the municipal level. Similar demands from residents and other funding sources may be faced by all mayors, regardless of gender, leading to similar spending trends.

5 Conclusion

By examining whether the distribution of government spending on education is impacted by the presence of women in local elected posts, this study adds to the growing body of research on the consequences of women's representation. Even though women in Slovakia have the same legal rights as males, their representation and participation in politics are still lacking in reality.

The mayor oversees fiscal policy with the executive committee and has the power to make independent decisions about spending and revenue. The local council must authorize the mayor and executive council to carry out the recommended fiscal policy.

Furthermore, major part of competences in the education financing in Slovakia is shifted from the central government to municipalities and is financed via earmarked conditional transfers from the central government, therefore a municipality is an agent of the central government or subordinate entity of the central government, delivering state services locally. Another part of competencies, so-called original competencies, is financed from local budgets. Therefore, small municipalities have limited fiscal space for adjustments in the field of education. As pointed out by Lukáčová and Maličká (2023), women mayors lead predominantly small municipalities. Thus, in Slovakia, there is insufficient space for additional gender-influenced expenditure.

The ability and capacity to come to an agreement also impacts the final policy outcome, even if the mayor has a big say in local public finance decisions. If men and women have different policy goals, a woman mayor may only be able to implement the desired policy if she gets enough support, which may rely on the gender composition of the entire political body, particularly the municipal council, which must authorize the mayor's recommendations. Even though women's representation in the Slovak Republic is steadily rising between elections, it is still quite low; as a result, even if they have an impact on how funds are allocated to education, it is not enough to be statistically significant. Furthermore, the makeup of the council always has an impact on Slovakia's acceptance of local budgets. In a similar vein, municipal budget expenditures may be impacted by mayors' (and council members') political party affiliations. These effects might open new directions for study in this field.

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Part 4: Financial Sustainability at the Municipal Level

Financial Management at the Local Level in the Czech Republic

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Abstract

The article deals with municipal finances in the Czech Republic. Currently, municipal revenues are increasing significantly thanks to a relatively favorable tax redistribution system. As a result, municipalities are unable to fully utilize these funds (e.g., in the form of higher capital expenditures) and often accumulate them in bank account and create fiscal savings. This article maps the current financial situation of municipalities and, in the broader context of asset management, highlights the currently discussed problems of using available funds.

Keywords: assets, municipalities, tax sharing, fiscal reserves, capital expenditures

JEL Classification: H70, H77, R51

1 Introduction

Redistribution of tax revenue across different levels of government is based on the theory of fiscal federalism (Bakoš et al, 2019). Musgrave (1971, 1997a, 1997b) and Oates (1991, 1999, 2008) were pioneers in fiscal federalism, writing papers that brought many open questions about optimal fiscal decentralization. A newer paper (Aslim and Neyapti, 2017) delivered the same matter in the new model. Current developments show that seems to be a shift from the original view of building ideal system to the question of how to advance the system and make it more effective, especially in the sense of provision of public services (Bakoš et al, 2019). In addition, the issue of horizontal and vertical fiscal equalization is being addressed. Boadway (2001) reports the issue of inter-governmental relations, mentions that the interdependency of national and subnational governments (including municipalities) in affecting redistribution. Some authors highlight that higher-level governments share revenues from the taxes that they legislate and administer with lower-level governments (Bakoš et al, 2019). As affirmed by Bahl and Cyan (2011), the economic theory of tax assignment leads to a statement that the level of subnational government (SNG) taxes should agree the level of SNG expenditures that are in accordance with local advantages. However, there are opinions (McLure, 2001) that perceive tax sharing more like a form of a grant, and not a method of tax assignment because individual lower-level governments have no control over any fundamental questions about tax bases and rates, including the administration of taxes.

The most recent paper (Agrawal et al, 2024) nicely summarizes the issues surrounding fiscal federalism. One of the conclusions of the paper is that there is a general increase in

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decentralization in individual states, which, given globalization, climate change, new infectious diseases, and growing income inequality, brings with it new potential threats.

That is why it is still possible to analyze fiscal federalism, especially in the specific conditions of the Czech Republic. They are specific because in recent years, there has been a significant increase in available funds, thanks in part to a relatively favorable tax sharing system that benefits municipalities. Several studies e. g. Wolf (2022), Kalabiška (2022), Sedmihradská (2023) currently point to this problem. This is also referred by the Czech Fiscal Council (2022; 2025), the body that monitors the state of public finances in the Czech Republic. It is possible to ask questions that explore this issue in greater depth. What are the benefits of accumulating funds in accounts? Conversely, what are the risks?

Therefore, the aim of this article is to map the current development of municipal financial management in the Czech Republic regarding asset management and to highlight possible challenges for municipalities.

2 Municipal Revenues and Asset Management in the Czech Republic

The Czech Republic belongs to a group of countries that respect the principles of tax-sharing arrangements (Bakoš et al, 2019). The system operates in accordance with existing legislation which is represented by the Act on Budgetary Allocation of Tax Revenues to Territory Self-governing Units and Selected State Funds (Act No. 243 from the year 2000 on tax assignment), which has been in effect since 2001. The Act sets rules for the redistribution of tax revenues among public budgets, i.e. the state, regions, and municipalities.

The specific amount from the national gross tax yield (value-added tax + corporate income tax + personal income tax) is redistributed to each municipality based on four main criteria (Act 243/2000 Coll.): cadastral area of the municipality; simple number of inhabitants; modified number of inhabitants according to gradual transition coefficients which take into account municipality size; and the number of pupils. The criteria used underwent historical development that gradually corresponded with the required changes in the tax sharing system at both the national and SNG. Although technical amendments to the law are made relatively frequently, particularly regarding the percentage redistribution of individual taxes in relation to SNG levels, substantive changes to the law (that would change the way redistribution works) are a relatively sensitive issue and do not undergo dramatic changes, even though such changes are discussed from time to time. For example, adding a criterion that would reflect the aging population and the associated problems of financing public services at the municipal level. In addition, gambling tax is also shared, which represents a significant source of income for selected municipalities. Besides this tax sharing, currently, there is also discussion about property tax, which is an exclusive source of revenue for municipalities.

This tax setting and the gradual increase in the percentage allocated to municipalities has led to a significant increase in municipal finances in recent years, as illustrated in the following figure.

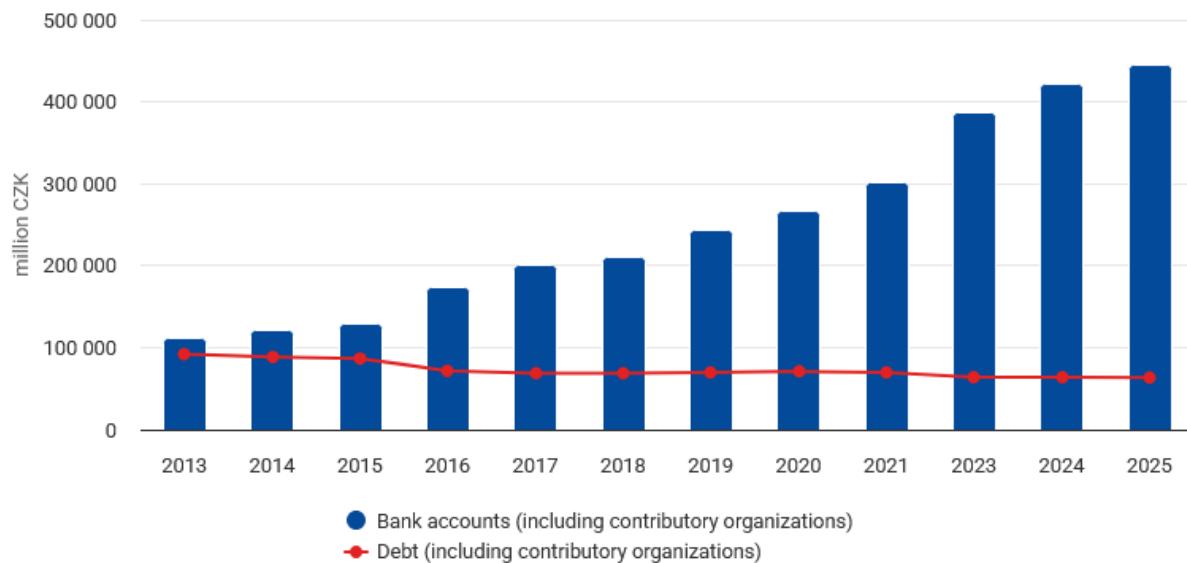


Figure 1 The total debt and deposited funds in bank accounts of municipalities 2013 – June 2025

Source: Ministry of Finance (2025)

Income from shared national taxes represents on average 60% of the total income of municipalities (Bakoš et al, 2019). Municipalities can obtain according to current legislation other revenue through subsidies (grants), non-tax revenues such as loans, rental income, local fees (in some countries as local taxes), and other sources. In this sense, municipal autonomy is relatively low and greatly dependent on negotiations with the central government.

Furthermore, it should be noted that municipalities vary significantly in terms of assets, which is mainly due to historical developments, geographical location, but also other factors such as long-term municipal management. See next table 1.

Table 1 Assets by size category of municipalities

Size categories	Total Assets (2021) in billions of CZK.	Assets (2021) CZK per capita	Increase (%) 2021/2017
1-199	35,5	203 039	26
200-499	118,5	180 981	30
500-999	169,9	174 944	31
1000-4999	399,0	164 654	27
5000 and more	804,4	156 422	13
Total (excluding Prague)	1527,3	163 060	20

Source: Kameničková, (2022) based on information from Ministry of Finance

Total assets amount to approximately CZK 1.5 billion (in year 2021), excluding Prague, where municipalities with more than 5,000 inhabitants have the largest assets. On the other hand, small municipalities have a higher share per capita.

A more detailed look at the structure of municipal assets can give us an interesting insight into municipal finances. See the following table.

Table 2 Structure of total assets 2019-2023 (in bil. CZK) without contributory organizations

	2019	2020	2021	2022	2023
Total Assets	1864	1947	2036	2139	2267
Fixed Assets	1609	1660	1708	1777	1844
Long-term intangible assets	7	7	7	7	7
Long-term tangible assets	1434	1485	1534	1600	1668
Long-term financial assets	159	158	156	158	158
Long-term receivable	10	10	11	12	12
Current Assets	255	287	328	362	423
Stocks	1	1	1	1	1
Short-term receivable	46	54	57	63	67
Short-term financial assets	208	232	271	298	355

Source: Monitor, Ministry of Finance, 2025

The value of fixed assets increases over time. However, long-term financial assets are stable over time. The last row illustrates something that is also evident from the first graph, namely that municipalities generally accumulate financial resources in bank accounts. The creation of financial reserves by municipalities is commonly discussed in the literature. As pointed out by the study by Arapis et al (2017), the creation of financial reserves is a common strategy of local governments and is determined by several factors—both revenues and spending obligations, as well as socioeconomic factors and demographics. Sedmihradská (2023) sought factors explaining the creation of financial reserves by municipalities, whether caused by the inactivity of local governments or their precaution. Based on her study, it can be argued that the creation of reserves is not due to inactivity, but is rather influenced by precaution, which is conditioned by both a lack of professional financial managers and preparation for unexpected situations or a speculative approach in terms of potential investments.

An element that is often associated with municipal assets and finances is municipal investment activity in the form of capital expenditure. The extent to which municipalities invest and whether increased revenues lead to increased investment is therefore monitored. This is illustrated in the following table.

Table 3 Current and capital expenditure 2019-2024 (in billions of CZK)

	2019	2020	2021	2022	2023	2024
Current Expenditure	243	252	262	294	322	335
Capital Expenditure	92	98	97	118	116	131

Source: Monitor, Ministry of Finance, 2025

The table clearly shows that there has been no significant increase in capital investment by municipalities over time. It is likely that the implementation of investments is not only dependent on available financial resources, but also on other factors, such as the regulatory environment.

3 Conclusion

The aim of this paper was to map the current development of municipal finances regarding their financial capabilities and assets. It shows that, over time, there has been a significant increase in both available financial resources and assets thanks to the relatively favorable redistribution of taxes in favor of municipalities. As Sedmihradská (2023) claims: “There is a clear trade-off between bank deposits and the growth of fixed assets – the higher the growth of fixed assets, the lower the deposits, i.e., money is either kept or transformed into fixed assets.” However, this is not entirely confirmed by previous development (Sedmihradská, 2023). In other words, municipalities are not investing as much as they could.

As already mentioned by Sedmihradská (2023) there may be various reasons for keeping finances in bank accounts. This may be for budgetary reasons, in preparation for longer-term investments, or simply as a response to unexpected situations (as demonstrated by the COVID pandemic). The study pointed out that some municipalities may not have sufficient professional capacity.

However, holding capital in bank accounts can also have disadvantages. The interest rate may not be high enough and may not even cover inflation. As the authors of a study by the Czech Fiscal Council (2025) point out, it is possible to find better ways to use the available funds, e.g., through the CNB and term deposit account with the Treasury that offers better interest rates than standard checking accounts.

In addition, the state is accumulating debt and municipalities generally manage surpluses. This is probably not an ideal situation, which will certainly be the subject of discussion in the future and a reason to seek new solutions.

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Ageing Communities and Local Tax Revenues: Case of Slovak Municipalities

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Abstract

In this paper, the effect of an aging population on local tax revenues in Slovakia is examined using regression analysis. The sample covers 2,926 Slovak municipalities from 2005 to 2023. The impact of an ageing population on local tax revenue is investigated across several tax groups. The local tax revenue based on shared income tax is influenced by changes in labor supply at the national level, when determining the “common pool”, and by population size at the local level, because the tax yield is allocated to municipalities predominantly according to the number of inhabitants. Local tax revenue based on property tax is influenced by the size of the tax base, which is typically owned by older, wealthier taxpayers. Results of models based on the old-age dependency ratio confirm the expectations. Besides, the estimation results highlight the interplay among demographic aging, political leadership, and population structure in determining local development outcomes.

Keywords: Local Government, Local Taxes, Demography, Population Ageing.

JEL Classification: H77

1 Introduction

An ageing population is considered a global demographic trend (Clemens et al., 2017) that has replaced the trend of rapid population growth (Bloom & Zucker, 2023). Bodnár and Nerlich (2022) even mention a “drastic change” in the demographics of advanced economies and discuss the need for fiscal policies to address changes on the expenditure and revenue sides of public budgets, including tax revenue, that affect fiscal sustainability. Population ageing is also projected to occur rapidly in emerging-market economies with still growing populations (Koutsogeorgopoulou & Morgavi, 2025; Borrallo, Párraga Rodríguez, & Pérez, 2021).

The main reason for ageing populations stems from increasing life expectancy and declining fertility rates (e.g., Koutsogeorgopoulou & Morgavi, 2025; Bodnár & Nerlich, 2022; Aksoy et al., 2019; Rouzet et al., 2019; Clemens et al., 2017; etc.), known as the demographic transition, which has been evident in the last decades (Morgavi, 2025; Luo, 2022; Bodnár & Nerlich, 2022). Its macroeconomic and fiscal impacts are thus systematically examined in the fiscal sustainability literature, and the field of tax revenues became one of the most discussed (e.g., Rawdanowicz et al., 2021; Borrallo, Párraga Rodríguez, & Pérez, 2021; Rouzet et al., 2019; Luo, 2019 and 2023).

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The expected adverse effect of an ageing population on tax revenue has roots in the assumption that shrinking working-age populations affect government tax revenues mainly through decreasing labor income tax revenues (Koutsogeorgopoulou & Morgavi, 2025; Borrallo, Párraga Rodríguez, & Pérez, 2021; Luo, 2019). However, as the evidence shows, the type of tax matters (Bodnár & Nerlich, 2022; Luo, 2019 and 2023; Dolls et al., 2017; Ball & Creedy, 2014).

In Slovakia, the major part of local tax revenues is created by the shared tax, which is personal income tax (labor income tax). Shared taxes represent, on average, 80% of local tax revenues. Especially small municipalities, which represent around 70% of all Slovak municipalities (Maličká & Mourao, 2025), depend on revenues from the shared tax. The local tax revenue based on shared personal income tax is influenced by changes in labor supply at the national level, when determining the “common pool”, and by population size at the local level, because the tax yield is allocated to municipalities predominantly according to the number of inhabitants.

Property tax revenues (immovable property tax revenues) are another important source of local budget own revenues of Slovak municipalities in line with statements of Slack and Bird (2014). Immovable property taxes represent, on average, 14% of local tax revenues. Property tax-based local tax revenue promotes local autonomy and accountability, and it is considered a “good” local tax because of its immovable tax base, which implies the elimination of tax evasion. In Slovakia, when considering the immovable property tax, expected long-run increases in housing prices and the discrepancy between the income stream of the elderly and property value (Crowe et al., 2022) are eliminated. Additionally, the increasing tendency among older individuals to reside in single-person households rather than multigenerational settings (Bodnár & Nerlich, 2022), and the observation that immovable property owners are generally older and wealthier (Crowe et al., 2022), increase the tax base and the number of taxpayers contributing to higher immovable property tax collections.

In this paper, we examine the relationship between ageing populations in Slovak municipalities and fiscal categories tied to local tax revenues. We distinguish between different local tax revenues, emphasizing their importance in the local budget – we employ personal income tax revenue and property tax revenues that represent the primary source of local tax revenues of Slovak municipalities. Based on the literature review, we follow the expectation of an inverse impact of an ageing population on personal income tax revenues and a positive impact on immovable property tax revenue.

2 Research anchoring

Aging is a problem worldwide, e.g., in the EU, USA, OECD, New Zealand, Korea, and Japan (Koutsogeorgopoulou & Morgavi, 2025; Bloom & Zucker, 2023; Bodnár & Nerlich, 2022; Luo, 2022; Borrallo, Párraga Rodríguez, & Pérez, 2021; Aksoy et al., 2019; Rouzet et al., 2019; Ball & Creedy, 2014). The literature agrees on a two-fold impact of ageing populations on public finance sustainability (decline in tax revenues and increase in public spending; e.g., Borrallo, Párraga Rodríguez, & Pérez, 2021; Luo, 2019 and 2023) and discusses the possible scenarios of the adaptation to population ageing concerning the mitigation of ageing by supporting fertility and immigration (e.g., André et al., 2024; Bodnár & Nerlich, 2022; Borrallo, Párraga Rodríguez, & Pérez, 2021), while the effect of immigration is considered uncertain (Bodnár & Nerlich, 2022). Additionally, policies will differ across countries due to differences in spending levels and in the structures of overall taxes, debts, and political economy considerations

(Koutsogeorgopoulou & Morgavi, 2025). Finally, as noted by Luo (2022), the adoption of fiscal policy changes also depends on the political incumbent's willingness to seek popularity.

Several authors (e.g., Koutsogeorgopoulou & Morgavi, 2025; Crowe et al., 2022; Bodnár & Nerlich, 2022; Borrallo, Párraga Rodríguez, & Pérez, 2021; Aksoy et al., 2019; Clemens et al., 2017) mention long-term implications of ageing populations for public finances. They identify various channels connecting population ageing and public finance:

1. Influence on labor supply and labor utilization – lower rates of working age population on total population, slow increases in employment growth, influencing the potential growth (Koutsogeorgopoulou & Morgavi, 2025).
2. Influence on labor productivity - two-fold perspective – knowledge of seniors might increase productivity, but erosion of skills occurs in later ages. From the macroeconomic point of view, positives are labor-saving technologies, and negatives are increases in age-related spending that crowd out productive-enhancing activities (Koutsogeorgopoulou & Morgavi, 2025).
3. Increases in dependency ratios affect the age-related government spending and thus have an impact on the budget balance (e.g., Guillemette & Château, 2023; Bodnár & Herlich, 2022; Clemens et al., 2017). According to Guillemette and Château (2023), the interrelated implication is that over the coming decades, countries would be required to raise tax burdens by a comparable magnitude to prevent an increase in government debt-to-GDP ratios.
4. Negative influences of the ageing populations on the share of labor income tax on GDP, as mentioned also (Crowe et al., 2022; Luo, 2019 and 2023; Clemens et al., 2017)
5. Reduction of output growth (GDP growth) and investment (Rouzet et al., 2019; Aksoy et al., 2019; Clemens et al., 2017).
6. Impacts on savings and investments, thus impacting the real interest rate, too, leading to interest rate drops because of the increase in precautionary savings. Lower real interest rates help public debts (Koutsogeorgopoulou & Morgavi, 2025; Bodnár & Herlich, 2022). However, the negative impact of an ageing population on public debt, driven by age-related expenditure, has been discussed more extensively (e.g., Rouzet et al., 2019).

To conclude, when focusing on the impact of an ageing population on tax revenues, the main expectation observed in the literature on the nexus of ageing populations and tax revenues is that there is an adverse relationship between them (Koutsogeorgopoulou & Morgavi, 2025; Borrallo, Párraga Rodríguez, & Pérez, 2021; Luo, 2019 and 2023; etc.). However, the evidence shows ambiguous results when considering different types of tax revenues. In the case of a significant rise in wages, the adverse effect might not occur because of the increase in the tax base (Dolls et al., 2017). Another issue is the impact of an ageing population on tax revenue structures by shifts in consumption from durable goods to specific long-term care services with tax reductions, exemptions, and price regulations (Bodnár & Nerlich, 2022). Ball and Creedy (2014) examine the effect of an ageing population on income taxes and consumption taxes, discussing the age-income profiles, changes in the age distribution of the labour force, including the gender perspective, and changes in the expenditure patterns during the life-cycle, which is also influenced by the tax system, determining the disposable income. In the case of real estate, on which local governments usually levy property taxes, Bodnár and Nerlich (2022) mention an increasing tendency among older individuals to reside in single-person households rather than multigenerational settings. It increases the number of taxpayers and might contribute to higher property tax collections. Moreover, higher life expectancy and healthier ageing are likely to reinforce these dynamics (Bodnár & Nerlich, 2022). Kim and Lee (2025) mention that an increase in property taxes does not have a harmful effect on the elderly. Crowe et al. (2022) discuss that immovable property owners are generally older and wealthier. Slack and Bird

(2014) consider local property tax policies crucial for local governments. On the other hand, reforming property taxation is a challenging issue due to the fact that older homeowners present a type of political capital that allows them to negotiate special taxation conditions, such as tax deductions and reliefs (Crowe et al., 2022; Slack & Bird, 2014). Tax deferral programs are usually adopted when the immovable property tax rate is tied to the immovable property's value. The ability of elderly people to pay taxes is reduced because their incomes are lower than those they had while economically active. However, in Slovakia, the immovable property tax rates do not consider the value of land and property, so the increase in the tax base due to long-run increases in housing prices is irrelevant.

Resilient fiscal policies and resilient tax systems to population ageing (Kim & Lee, 2025; Rawdanowicz et al., 2021; Borrallo, Párraga Rodríguez, & Pérez, 2021) thus play a key role in fiscal sustainability at all levels of the government.

3 Methodological framework

From a methodological standpoint, following the literature review, we present the general empirical equation we intend to use. This empirical specification adopts the structure of a panel data model, suitable for assessing the profile of the fiscal revenue component of each Slovak municipality i in year t as a function of the associated aging profile, controlled by several sets of control variables. The panel consists of 2,926 cross-sectional units (all Slovak municipalities reported by the Ministry of Finance of the Slovak Republic, hereinafter abbreviated as MF SR). The time span is 2005-2023. Data were collected from several resources. Local budget fiscal items were required from the MF SR (2025). Demographic and geographic variables are collected from the Statistical Office of the Slovak Republic (hereinafter SO SR; SO SR, 2025a). Variables related to mayors' characterization were derived from unstructured data obtained from the SO SR websites on local election results (SO SR, 2025b).

The dependent variable related to tax revenues has two alternatives. First, we employ the personal income tax revenues of Slovak municipalities, noted as revenue group 111 in the economic classification of public revenues and expenditures. It is a shared tax and dominates in local revenues. Second, we employ the revenues from the immovable property tax (noted as 121), which are the second most important local tax revenue. Additionally, it shows the degree of local fiscal autonomy. The fiscal revenue component of each municipality (dependent variable) will be evaluated in logarithmic scale (to allow inferences supported by elasticity estimates) and also as a proportion of total fiscal revenues. The literature consulted - especially Baltagi (2021), Wooldridge (2007), and Lee & Mason (2017) - supports this configuration. Among several tested specifications, we present the following four models as the most appropriate for inference. General Empirical Equation is:

$$\ln(FiscalRev_{it}) = \alpha + \beta_1 AgeProfile_{it} + \sum_{k=1}^K \gamma_k Control_{kit} + \mu_{it} + \lambda_t + \varepsilon_{it} \quad (1)$$

Where:

- $\ln(FiscalRev_{it})$: logarithm of the fiscal revenue component for municipality i in year t .
- $AgeProfile_{it}$: indicator of demographic aging (e.g., share of population aged 65+).
- $Control_{kit}$: vector of control variables (economic, demographic, geographic).
- μ_i : municipality-specific fixed effect.
- λ_t : time-specific effect (to capture macro shocks).
- ε_{it} : idiosyncratic error term.

We also considered the Alternative Specification (Proportion Form of the studied tax component):

$$FiscalShare_{it} = \alpha + \beta_1 AgeProfile_{it} + \sum_{k=1}^K \gamma_k Control_{kit} + \mu_{it} + \lambda_{t+\varepsilon_{it}} \quad (2)$$

Where:

- $FiscalShare_{it}$ is the proportion of a given tax component in total municipal revenues.

In the literature on ageing populations, several ageing indicators are employed, such as dependency ratio (population ages 65 and older plus population ages less than 14 to population ages 15 to 64), the old-age dependency ratio or retirement fraction (population ages 65 and older to population ages 15 to 64), the portion of people over age 65 years, working-age population (population aged between 15 and 64) and the ageing index (population ages over 65 to population ages less than 14 *100) (Koutsogeorgopoulou & Morgavi, 2025; Borrallo, Párraga Rodríguez, & Pérez, 2021; Luo, 2019 and 2023; Rouzet et al., 2019; Clemens et al., 2017; Dolls et al., 2017). In this paper, the old-age dependency ratio and the ageing index are employed. As Luo (2019 and 2023) noted, the old-age dependency ratio (retirement fraction) is preferred to the dependency ratio. A high old-dependency ratio indicates that the current workforce has a high potential support burden. A high ageing index tells that the population shift is profound and long-lasting, as the pool of future workers (children) is smaller than the pool of retirees, indicating rapid aging and a significant future challenge. Together, they offer a comprehensive view - the old-age dependency ratio highlights the strain on social systems today and in the near future, while the ageing index captures the fundamental, long-term change in the population's age composition.

For variables related to the aging of the population, the 5th lag is used. The 5th lag may capture a cyclical or highly correlated relationship that recurs approximately every 5 years, although this is less common and less pronounced in the typically slower-moving demographic series than in economic or financial data.

The available literature on fiscal sustainability and ageing populations inspired the choice of control variables. The set comprises economic, demographic, and geographic variables in line with related research (e.g., Crowe et al., 2022; Clemens et al., 2017; etc.). The descriptive statistics are displayed in Table 1.

Table 1 Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ldp111*	55 360	11.9068	1.3919	6.8100	19.2194
ldp121**	54 968	9.8893	1.4176	1.5994	17.6952
pcdp111*	55 362	0.8032	0.1251	0	1.0184
pcdp121**	55 340	0.1375	0.1084	-0.3297	0.9553
Male Candidates	14 630	2.0489	1.4765	0	15
Mayor Party Orientation	55 257	0.2908	0.4541	0	1
Old-Age Dependency	55 590	3.0844	0.3623	0.5306	5.7038
Ageing Index	55 587	118.6016	119.5776	0	5000
Female in Productive Age	55 594	65.2750	5.5906	0	100
Share of Productive Population	55 594	68.2938	4.4083	23.08	100
Woman Mayor	55 255	0.2268	0.4188	0	1
Independent Mayor	55 254	0.3745	0.4849	0	2
Male Median Age	55 594	37.9683	5.1952	13	73.5

Variable	Obs	Mean	Std. Dev.	Min	Max
Crude Marriage Rate	55 575	4.8577	5.0547	0	444.444
Crude Divorce Rate	54 397	1.5510	2.9515	0	416.667
Population Density	55 594	113.19	394.9854	0.75	14 206.93
Total Population Increase	55 451	2.2836	65.1143	-1582	4862
Elections	55 594	0.2631	0.4404	0	1
Reelected	55 143	0.6690	0.4706	0	1
Year	55 594	2014	5.4773	2005	2023

Notes: *111 stays for personal income tax revenues, **121 stays for immovable property tax revenues

Source: own processing

4 Results and discussion

The four fixed-effects (FE) models presented provide a comprehensive view of demographic and political determinants influencing local development indicators.

Model 1, with an exceptionally high within R^2 (0.93), demonstrates strong explanatory power when incorporating time effects. The coefficient for *Old-Age Dependency (Lag 5)* is negative and highly significant, suggesting that aging populations exert downward pressure on the dependent variable (ldp111). Similarly, *Share of Productive Population* shows a strong negative effect, reinforcing the demographic sensitivity of local development. Political variables such as *Independent Mayor* and *Reelected* exhibit positive and significant impacts, indicating that leadership continuity and independence may foster stability.

Table 2 Model 1: FE with ldp111 + year

Dimension	Coefficient	Std. Error	t	p	95% CI Lower	95% CI Upper
Male Candidates	0.000099	0.000643	0.15	0.877	-0.001161	0.001359
Mayor Party Orientation	0.003195	0.004003	0.80	0.425	-0.004650	0.011041
Old-Age Dependency (Lag 5)	-0.090512	0.009861	-9.18	0.000	-0.109839	-0.071184
Female in Productive Age	0.000118	0.000835	0.14	0.888	-0.001520	0.001755
Share of Productive Population	-0.012136	0.001019	-11.91	0.000	-0.014133	-0.010139
Woman Mayor	0.001026	0.003563	0.29	0.773	-0.005957	0.008009
Independent Mayor	0.011485	0.003387	3.39	0.001	0.004846	0.018124
Male Median Age	0.004451	0.000775	5.74	0.000	0.002932	0.005971
Crude Marriage Rate	0.000719	0.000332	2.17	0.030	0.000069	0.001370
Crude Divorce Rate	0.000049	0.000546	0.09	0.929	-0.001022	0.001119
Population Density	0.003562	0.000071	50.43	0.000	0.003423	0.003700
Total Population Increase	-0.000070	0.000032	-2.18	0.029	-0.000134	-0.000007
Elections	-0.023029	0.001916	-12.02	0.000	-0.026785	-0.019273
Reelected	0.005403	0.002100	2.57	0.010	0.001286	0.009520
Year	0.070525	0.000432	163.31	0.000	0.069679	0.071371

Notes: R^2 within = 0.9328 Observations: 10603 | Groups: 769 | R^2 (within): 0.9328

Source: own processing

Model 2 shifts focus to aggregated data (ldp121), where the R^2 drops to 0.38, reflecting greater variability. Here, *Old-Age Dependency* reverses sign and becomes positive, implying elasticity in aggregated contexts. Gender-related variables and marital indicators remain largely

insignificant, while *Woman Mayor* shows a negative and significant effect, warranting further exploration of gender dynamics in governance.

Table 3 Model 2: FE with ldp121 + year

Dimension	Coefficient	Std. Error	t	p	95% CI Lower	95% CI Upper
Male Candidates	0.000089	0.001234	0.07	0.942	-0.002330	0.002508
Mayor Party Orientation	-0.003741	0.007684	-0.49	0.626	-0.018803	0.011320
Old-Age Dependency (Lag 5)	0.123652	0.018932	6.53	0.000	0.086545	0.160758
Female in Productive Age	0.002501	0.001604	1.56	0.119	-0.000642	0.005644
Share of Productive Population	-0.003926	0.001956	-2.01	0.045	-0.007759	-0.000092
Woman Mayor	-0.021661	0.006836	-3.17	0.002	-0.035060	-0.008262
Independent Mayor	0.017846	0.006503	2.74	0.006	0.005101	0.030592
Male Median Age	0.001738	0.001488	1.17	0.243	-0.001179	0.004655
Crude Marriage Rate	-0.001124	0.000638	-1.76	0.078	-0.002373	0.000126
Crude Divorce Rate	0.000978	0.001049	0.93	0.351	-0.001077	0.003034
Population Density	0.001705	0.000136	12.58	0.000	0.001439	0.001971
Total Population Increase	-0.000090	0.000062	-1.45	0.146	-0.000211	0.000031
Elections	-0.012542	0.003679	-3.41	0.001	-0.019752	-0.005332
Reelected	-0.001426	0.004033	-0.35	0.724	-0.009331	0.006479
Year	0.027192	0.000829	32.80	0.000	0.025567	0.028817

Notes: R² within ≈ 0.3786. Observations: 10603 | Groups: 769 | R² (within): 0.3786

Source: own processing

Model 3 (pcdp121) confirms the aging effect with a positive and highly significant coefficient for *Old-Age Dependency*. Interestingly, *Population Density* exerts a negative influence, contrasting with previous models, which may reflect resource strain in densely populated areas. Electoral cycles (*Elections*) appear to slightly increase the dependent variable, suggesting short-term policy shifts during election periods.

Table 4 Model 3: FE with pcdp121 + year

Dimension	Coefficient	Std. Error	t	p	95% CI Lower	95% CI Upper
Male Candidates	0.000055	0.000211	0.26	0.794	-0.000358	0.000469
Mayor Party Orientation	-0.000992	0.001313	-0.76	0.450	-0.003565	0.001581
Old-Age Dependency (Lag 5)	0.038215	0.003235	11.81	0.000	0.031875	0.044555
Female in Productive Age	-0.000149	0.000274	-0.54	0.587	-0.000686	0.000388
Share of Productive Population	0.001231	0.000334	3.68	0.000	0.000576	0.001886
Woman Mayor	-0.006469	0.001168	-5.54	0.000	-0.008758	-0.004180
Independent Mayor	0.000067	0.001111	0.06	0.952	-0.002110	0.002245
Male Median Age	0.000047	0.000254	0.19	0.853	-0.000451	0.000545
Crude Marriage Rate	-0.000244	0.000109	-2.24	0.025	-0.000458	-0.000031
Crude Divorce Rate	0.000162	0.000179	0.90	0.367	-0.000189	0.000513
Population Density	-0.000278	0.000023	-11.98	0.000	-0.000323	-0.000232

Dimension	Coefficient	Std. Error	t	p	95% CI Lower	95% CI Upper
Total Population Increase	0.000001	0.000011	0.07	0.946	-0.000020	0.000021
Elections	0.001660	0.000629	2.64	0.008	0.000428	0.002892
Reelected	-0.000331	0.000689	-0.48	0.631	-0.001681	0.001020
Year	-0.005508	0.000142	-38.89	0.000	-0.005786	-0.005231

Notes: R² within ≈ 0.4084. Observations: 10605 | Groups: 769 | R² (within): 0.4084

Source: own processing

Finally, **Model 4**, excluding year effects, maintains robust significance for the demographic variables, particularly *Male Median Age* and the *Ageing Index*, both of which are strongly positive. This model underscores the structural role of aging in shaping local development, even when temporal dynamics are removed. Political factors, such as an *Independent Mayor*, remain influential, while marital and divorce rates show mixed but minor effects.

Table 5 Model 4: FE with ldp111 + ageing index (lag) without year

Dimension	Coefficient	Std. Error	t	p	95% CI Lower	95% CI Upper
Male Candidates	0.001041	0.001232	0.84	0.398	-0.001375	0.003456
Mayor Party Orientation	0.003566	0.007668	0.47	0.642	-0.011462	0.018595
Ageing Index (Lag 5)	0.000972	0.000083	11.75	0.000	0.000809	0.001134
Female in Productive Age	0.015943	0.001581	10.09	0.000	0.012845	0.019041
Share of Productive Population	-0.075044	0.001811	-41.45	0.000	-0.078593	-0.071496
Woman Mayor	0.008857	0.006826	1.30	0.194	-0.004522	0.022235
Independent Mayor	0.039643	0.006471	6.13	0.000	0.026960	0.052325
Male Median Age	0.085349	0.001139	74.94	0.000	0.083117	0.087582
Crude Marriage Rate	0.004424	0.000635	6.97	0.000	0.003180	0.005669
Crude Divorce Rate	-0.002116	0.001047	-2.02	0.043	-0.004168	-0.000064
Population Density	0.004839	0.000135	35.76	0.000	0.004573	0.005104
Total Population Increase	-0.000298	0.000062	-4.84	0.000	-0.000419	-0.000178
Elections	-0.035644	0.003662	-9.73	0.000	-0.042822	-0.028465
Reelected	0.018838	0.004021	4.68	0.000	0.010956	0.026720

Notes: R² within ≈ 0.7520. Observations: 10603 | Groups: 769 | R² (within): 0.752

Source: own processing

Overall, these results highlight the interplay between demographic aging, political leadership, and population structure in determining local development outcomes. The consistency of aging-related variables across models suggests that demographic transitions are a critical policy concern, while political stability and independence offer complementary benefits.

5 Conclusion

In this study, we investigate the impact of population ageing on local tax revenues in Slovakia by employing a series of econometric regression models. The analysis is conducted on a panel encompassing 2,926 Slovak municipalities over the period 2005–2023. The focal point of the paper is to examine the effect of demographic ageing on different categories of local tax revenues – personal income tax, which is a shared tax, and immovable property tax.

Empirical results based on models utilizing the old-age dependency ratio as the key explanatory variable confirm the hypothesized impact of population ageing on local tax performance.

Moreover, the findings underscore the complex interactions among variables in demographic dynamics, local political leadership, and the socioeconomic structure of municipalities. These interdependencies collectively shape local development trajectories and highlight the importance of incorporating demographic factors into long-term fiscal planning and municipal policy design.

Further research might focus on distangling the mechanisms through which ageing influences municipal fiscal capacity in Slovakia. It will contribute to shaping fiscal policies and tax systems that are resilient to population ageing, which play a key role in fiscal sustainability at all levels of government.

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Part 5: Sustainability and Digitalisation in the Public Sector

A Framework for Digital Marketing Research in Cultural Institutions

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Abstract

Digital transformation has fundamentally reshaped how cultural institutions communicate with their audiences, design visitor experiences, and build long-term relationships. While digital marketing has evolved from simple online extensions of traditional methods to complex, data-driven ecosystems, recent advances in artificial intelligence (AI) have accelerated this shift. This article develops a conceptual framework for digital marketing research in cultural institutions by synthesizing theoretical foundations, key digital marketing tools, and current empirical evidence on AI applications in the cultural sector. A review of relevant studies demonstrates that AI technologies—such as personalized content delivery, chatbots, visitor segmentation, IoT-enabled systems, and interactive devices—can significantly enhance visitor satisfaction, engagement, and intention to revisit. The findings highlight the growing strategic importance of AI-driven solutions for creating adaptive, personalized, and interactive cultural experiences. The article concludes by outlining research implications and identifying opportunities for future exploration of AI-supported marketing communication in cultural institutions.

Keywords: Digital marketing, Artificial intelligence, Cultural institutions.

JEL Classification: M31, M37, O33

1 Introduction

Digitalization has fundamentally altered the operational, communicative, and relational dynamics of cultural institutions with their audiences. In recent decades, the swift advancement of digital technologies, online platforms, and data-centric tools has not only transformed consumer behavior but also elevated the expectations for museums, galleries, and other cultural organizations. The emergence of mobile devices, social media networks, and interactive digital spaces has established a new competitive environment where cultural institutions must continuously innovate to maintain relevance and visibility. Nevertheless, the cultural sector frequently trails behind other industries in the adoption of sophisticated digital marketing strategies and in fully harnessing the technological capabilities available.

In recent times, artificial intelligence (AI) has surfaced as a significant driver of transformation in marketing communication. AI-enabled personalization, chatbots, behavior-based segmentation, and predictive analytics present distinct opportunities to enrich the visitor experience and enhance the efficacy of audience engagement. Although numerous studies investigate the use of AI in business or tourism contexts, there is a scarcity of systematic research that specifically addresses cultural institutions. This gap underscores the necessity to

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consolidate theoretical frameworks, pinpoint current digital marketing instruments, and compile empirical data concerning AI application in the cultural sector.

Despite these advancements, the practical adoption of AI varies significantly across organizations. Cultural institutions often face structural, financial, or organizational barriers that limit their ability to integrate new technologies into their communication and operational practices. This creates a gap between theoretical potential and real-world implementation.

Against this backdrop, the present article combines a theoretical overview of digital marketing and AI tools with an empirical case study of the East Slovak Gallery. By analyzing financial data, digital platforms, and the current state of technological adoption, the study aims to assess the gallery's readiness for AI integration and identify opportunities for strengthening its digital communication strategies. Through this dual perspective, the article contributes to a deeper understanding of how cultural organizations can leverage digital tools to enhance audience engagement and adapt to the evolving digital landscape.

2 Digital marketing and its theoretical foundations

Digitization is not solely reliant on technology. The aspect of change is crucial. For over 25 years, since the inception of the World Wide Web, it has significantly influenced the digital landscape. However, throughout these years, we have witnessed remarkable advancements in digital media and marketing technologies, offering businesses innovative methods to engage with customers throughout their entire lifecycle. Currently, over 3 billion individuals globally utilize online services to seek products and entertainment, which has profoundly transformed both consumer behavior and the manner in which companies interact with consumers and other businesses (Chaffey, Ellis-Chadwick, 2019).

The main component of digital marketing is not just websites, but a whole range of interactions with the audience that we need to understand and then manage. This includes the use of “5D digital marketing interaction management,” which helps us assess consumer acceptance and the ways in which companies can manage it to meet their marketing goals. Chaffey and Chadwick defined it in their book as:

- *Digital devices* – the main communication link through which the public interacts with society has become a combination of smartphones, tablets, laptops, desktop computers, televisions, gaming devices, virtual assistants (such as Amazon Echo) and other connected devices that make up the Internet of Things (IoT);
- *Digital platforms* – interactions on these devices take place via a browser or applications from major “platforms” or online services such as Facebook, Instagram, YouTube, LinkedIn, etc;
- *Digital media* – various communication channels are available to reach, interact with, and engage audiences. It is also possible to include certain forms of advertising, email and messaging, search engines, and social networks;
- *Digital data* – representation of information in a format or language that machines can read and understand. This gives companies a profile of their audience and individual interactions with companies. Ethics play an important role here, which, in terms of consumer protection, is regulated by law in most countries;
- *Digital technology* – this is marketing technology (Martech) that businesses use to create interactive experiences, from websites and mobile apps to in-store kiosks and email campaigns (Chaffey, Ellis-Chadwick, 2019).

Parsons, Zeisser, and Waitman (1996) argued that for businesses to be successful, they need to combine traditional methods with online space to more accurately meet customer needs. A few years later, Chaffey (2013) added to this by stating that it is about achieving marketing goals through the application of digital technologies. Just as the term “digital marketing” itself has undergone certain developments over the years, so too has its content changed. Today, in digital marketing, we build on Parsons (1996), where we combined traditional methods (the human mind) and the online space (technology) into one, into what is known as artificial intelligence (Parson, Zeisser, Waitman, 1996) (Chaffey, 2013) (Kotler, Kartajaya, Setiawan, 2021).

2.1 Digital Marketing Tools

The first approaches to marketing in the digital sphere were defined as a projection of conventional marketing, its tools, and strategies onto the internet. The peculiarities of this digital world have led to the development of channels, formats, languages, tools, and strategies that are unthinkable in offline mode. It is a phenomenon that combines personalization and mass distribution to achieve marketing goals. Technological convergence and the proliferation of devices have opened up new ways of thinking about internet marketing and pushed the boundaries towards a new concept – one that is user-focused, more measurable, ubiquitous, and interactive (Machado, Davim, 2016). The following digital marketing development tools offer great potential for brands and organizations:

- **Search Engine Optimization (SEO)** - is a process that increases the “findability” of information about a particular subject, company, or person in search engine results. Google, Seznam, and Bing are not the only search engines. Any software used for searching the internet – YouTube, Facebook, App Store – can be used for SEO. The company wants to ensure that its website is displayed at the top of the search results when a user searches for a relevant term. This increases website traffic, but also the number of users who fulfill our goals through their activity on the web. The problem may seem to be that Google regularly updates its algorithms to display only relevant results. From this perspective, many experts claim that SEO is dead and the effort is futile. The truth, however, is that Google's goal is to prevent manipulation of algorithms and filter out sites that do not deserve to be at the top of SERP (Search Engine Results Page). It is the most cost-effective marketing tool that will bring organic traffic to your business (Bala, Verma, 2018)(Performics a kolektív autorov, 2021).
- **Search Engine Marketing (SEM)** - represents a diverse, complicated, and complex set of tools for increasing a company's traffic, primarily through paid efforts. That is why it is also called “paid search marketing.” Depending on its business structure, a company can choose between the “pay-per-click” (PPC), “cost-per-click” (CPC), or “cost-per-thousand impressions” (CPM) models. The most popular platforms for implementing SEM are “Google AdWords” (on the Google network) and “Bing Ads” (on the Yahoo Bing network). SEM also includes display advertising, search retargeting and remarketing, mobile marketing, and paid advertising on social networks (Bala, Verma, 2018).
- **Content marketing** - is a type of communication that primarily involves the dissemination of valuable content. Its primary goal is not to sell, but to generate interest in the brand, its products, and services. This relationship should ultimately lead the consumer to make a purchase. Content can be presented in various formats (Bala, Verma, 2018)(Performics a kolektív autorov, 2021). We have illustrated these in Figure 1.



Figure 1 Content marketing format
Source: Team, 2020

It is important to adapt content to different platforms based on their characteristics. An example is content for mobile phones, which should be sharp and short. Effective presentation will attract consumers and leave them interested in learning more. Quality content tends to be shared and is the best way to build a company's brand (Bala, Verma, 2018) (Performics a kolektív autorov, 2021).

- **Email marketing** – this tool uses commercial messages as a means of communication with potential and existing customers. Effective email marketing software can maintain email lists and differentiate them based on several factors, including customer preferences, their motivation, and spending habits. According to the 2019 DMA Marketing Email Tracker study, the average return on investment per email exceeds \$42 for every dollar invested. Behind these results lie personalization and design. Visualization represents the company as such, and the correct use of elements in emails has a significant impact on the performance of each individual mailing (Bala, Verma, 2018) (Performics a kolektív autorov, 2021).

2.2 AI tools for more effective marketing

Artificial intelligence (AI) is intelligence demonstrated by machines, intelligent agents that perceive their environment, to achieve goals. Russel and Norvig (2016) define artificial intelligence as the ability of machines (computers) to replicate the cognitive and affective functions of the human mind. This statement reflects the concept of machine learning (ML). These two concepts (AI and ML) are essential for improving and expanding the functions of business intelligence (Russell, Norvig, 2016).

Khalaf Daoud et al. (2023) assert that the incorporation of AI enhances the efficacy of marketing tools and strategies. Their research findings indicate a robust positive correlation between the degree of AI integration and the effectiveness of digital marketing tools. In essence, as AI integration increases, the performance of digital marketing tools tends to improve. A similar correlation is observed in the utilization of Big Data (BD). This implies that the effective combination of artificial intelligence and big data can significantly enhance the effectiveness of marketing tools beyond their individual use. In summary, these results highlight the potential of integrating AI and BD to boost the effectiveness of digital marketing tools. The collaboration between these technologies can result in more effective marketing strategies, deeper customer insights, and enhanced business performance (Khalaf Daoud et al., 2023).

The utilization of artificial intelligence in marketing enhances decision-making processes, the design of strategies, and the development of digital initiatives that prioritize the effectiveness of executed actions and content through the examination of extensive data sets. Prompt decision-making, informed by recognized patterns and algorithms, can transform how businesses engage with their customers and market their products or services. Furthermore, AI can significantly aid in formulating marketing strategies that involve data analysis, personalization, automation of repetitive tasks, chatbots and virtual assistants, optimization of advertising campaigns, forecasting trends, price optimization, and additional applications (Arce et al., 2023).

An example of an AI tool that contributes to more effective marketing is **Generative AI (GAI)** – it refers to a class of AI systems that can generate new content in various formats, including text, images, and other media. According to Dwivedi (2023), GAI is becoming the primary catalyst for the comprehensive adoption of AI across enterprises. Figure 2 illustrates the specific steps involved in formulating a marketing strategy, along with the potential application of suitable GAI tools that enhance the efficiency of each activity (Kshetri et al., 2024).

Certain tools fall under the category of fundamental generative artificial intelligence (GAI) models, such as GPT-4, DALLE2, and Midjourney. In contrast, other tools are tailored versions of these models specifically aimed at marketing applications, including Jasper.ai and Copy.ai. Marketing professionals find systems like Copy.ai, Jasper.ai, and Peppertype.ai especially beneficial for producing text-oriented marketing materials. Additionally, DALL-E2 possesses the ability to create realistic images and artwork derived from text-image prompts (Kshetri et al., 2024).

AI tool	Use in marketing
ChatGPT GPT-4	<ul style="list-style-type: none"> • brainstorming and stimulating the creative process; • creating marketing content; • developing personalized solutions.
DALL-E2	<ul style="list-style-type: none"> • creating your own images and art based on a prompt.
Sandbox	<ul style="list-style-type: none"> • creating different variations of a copy; • generating backgrounds using text prompts; • cropping images.
Midjourney	<ul style="list-style-type: none"> • creating your own images based on a text prompt.
Jasper.ai	<p>Generating marketing content such as:</p> <ul style="list-style-type: none"> • blog posts, • product descriptions, • company bios, • advertising copy.
Peppertype.ai	<ul style="list-style-type: none"> • creating shortened, contextual copies; • generating product descriptions.
Copy.ai	<ul style="list-style-type: none"> • creating advertising copy; • creating marketing content.

Figure 2 Artificial intelligence tools and their use

Source: (Kshetri et al., 2024)

3 Studies dealing with AI in cultural institutions

The following Table 1 provides a summary of relevant scientific studies dealing with the use of AI in the marketing of cultural institutions. The included works were selected based on their relevance, methodological quality, and contribution to the issue at hand. The table includes information about the authors, year of publication, methods used, sample, and main findings, offering a comprehensive overview of current knowledge in the field.

Table 1 Overview of studies

Authors	Article title	Year of publication	Methods	Conclusion
Rosen Ivanov	<i>ExhibitXplorer: Enabling Personalized Content Delivery in Museums Using Contextual Geofencing and Artificial Intelligence</i>	2023	Visitor segmentation, geofencing and AI, push notifications	The system significantly increased visitor satisfaction (55% satisfied, 45% very satisfied). AI enabled dynamic content personalization, improving the overall museum experience. The combination of explicit and implicit segmentation allows for more accurate delivery of content to different target groups (children,

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				researchers, regular visitors).
Shinta Puspasari; Indah Agustien Siradjuddin; Rachmansyah; M. Ade Fahtu Rahman; Ditho Haversyalapa	<i>IoT and AI-Driven Conceptual Model of Museum Ecosystem</i>	2023	Interviews and observations in three museums; Analysis of existing digital solutions and their shortcomings	The proposed model emphasizes the need for a comprehensive digital transformation of museums for the Society 5.0 era. Digital technologies increase interest in repeat visits and improve the educational experience. The integration of IoT and AI provides added value in terms of comfort, efficiency, and attractiveness for visitors, especially digitally savvy generations.
Giuliano Gaia, Stefania Boiano and Ann Borda	<i>Engaging Museum Visitors with AI: The Case of Chatbots</i>	2019	Design Thinking (Empathy with the user in order to understand their needs; Defining the problem; Proposing solutions; Creating prototypes; Testing solutions.	The combination of chatbots and gamification can effectively appeal to young, digitally oriented generations, offering them a new and interactive way to engage. Chatbots can be operationally successful in the short term. This success depends on their alignment with the museum's goals.
Vanessa Ratten	<i>Art Galleries Usage of Artificial Intelligence</i>	2024	Qualitative research based on interviews with art gallery managers from various countries.	AI is changing the visitor experience in galleries; AI supports the digitization and global accessibility of art collections.
Pengyu Cai, Kuan Zhang, Younghwan Pan	<i>Application of AI Interactive Device Based on Database Management System in Multidimensional Design of Museum Exhibition Content</i>	2023	Simulation and experiments with AI interactive devices in museums.	AI significantly increases visitor satisfaction (satisfaction of the experimental group 8.92/10); AI optimizes visitor management and resource allocation in museums.

Miguel Orden-Mejía, Mauricio Carvache-Franco, Assumpció Huertas, Orly Carvache-Franco, Wilmer Carvache-Franco	<i>Modeling Users' Satisfaction and Visit Intention Using AI-Based Chatbots</i>	2023	Quantitative research using structural equation modeling (SEM); Experiment; Analysis of factors such as informativeness, empathy, interactivity	Chatbots can increase tourist interest in destinations and improve user experience; higher satisfaction leads to a greater intention to visit the destination ($\beta=0.48$).
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Source: own processing

The overview of the analyzed studies shows that the implementation of artificial intelligence in the marketing activities of cultural institutions brings several positive effects. The use of AI tools such as personalized recommendations, chatbots, and visitor behavior analysis has contributed to increased interest in what institutions have to offer, improved overall customer satisfaction, and an enriched visitor experience. Studies also show that AI technologies, especially chatbots, are an effective way to reach younger generations and build a relevant and interactive relationship with them. These findings highlight the importance and potential of artificial intelligence as a tool for innovating marketing communication in the cultural sphere.

4 Case study – East Slovak Gallery

In the context of a case study, we conducted a detailed examination of the East Slovak Gallery's overall profile. We scrutinized various sections according to annual reports to obtain a more thorough understanding of the institution's present financial, economic, and social circumstances.

The East Slovak Gallery is located at Hlavná 110/27 in Košice, ID No. 31297820. It is a contributory organization that was established on April 1, 2009, and its founder is the Košice Self-Governing Region. In terms of size, we classify it as a small business, with 25-49 employees. The gallery is a specialized legal entity whose mission, in accordance with Act No. 115/1998 Coll. on museums and galleries and on the protection of objects of museum and gallery value, as amended, is to carry out collecting, scientific research, and cultural and educational activities.

4.1 Financial Analysis

The financial analysis of the East Slovak Gallery is founded on a comprehensive examination of its annual reports spanning the past five years. This specific duration was intentionally selected, as it signifies a time of considerable transformations within the cultural sector, especially concerning the increasing necessity for digitization and the modernization of communication and marketing strategies. Recent years have witnessed notable technological advancements alongside heightened expectations for adaptability from cultural institutions, a situation further intensified by the COVID-19 pandemic. Consequently, the analyzed timeframe enables us to discern the ongoing trends in the gallery's financial transactions, investment focuses, and operational patterns, all of which directly influence its capacity to respond to the evolving requirements of its audience and the challenges posed by the digital landscape.

The gallery's own revenues (e.g., from admission fees or space rentals) are relatively low—in 2024, they amounted to €71,127, which represents only a small share of the total budget. However, their gradual increase may indicate growing public interest or an expansion of services offered.

Grant and project funding shows some volatility. The significant increase in 2023 and 2024 is likely related to the implementation of specific projects supported by external institutions (e.g., the Arts Support Fund, the Ministry of Culture of the Slovak Republic).

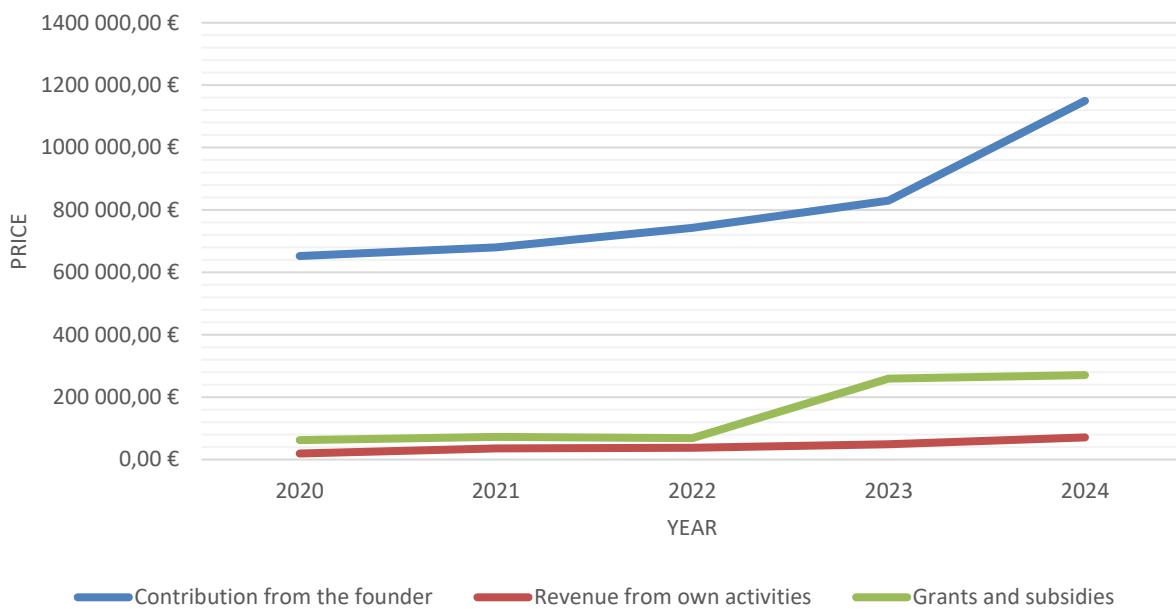


Figure 3 Revenue development 2020–2024

Source: own processing, annual reports

Figure 3 shows a significant increase in the contribution from the founder, which rose by more than 75% between 2020 (€652,425) and 2024 (€1,149,828). This trend points to stable and growing financial support from the Košice Self-Governing Region.

Overall, the gallery's operating costs are rising – in 2020, they amounted to €957,051, while in 2024 they reached €1,288,934. The main expenditure items are personnel costs and operating costs, with personnel costs rising particularly between 2021 and 2023. Operating costs remain high and stable, which may be a consequence of energy prices, building management, or technical support for exhibitions. Despite rising costs, the gallery has managed to maintain a balanced budget, mainly thanks to increasing subsidies and the ability to obtain project funding (Figure 4).

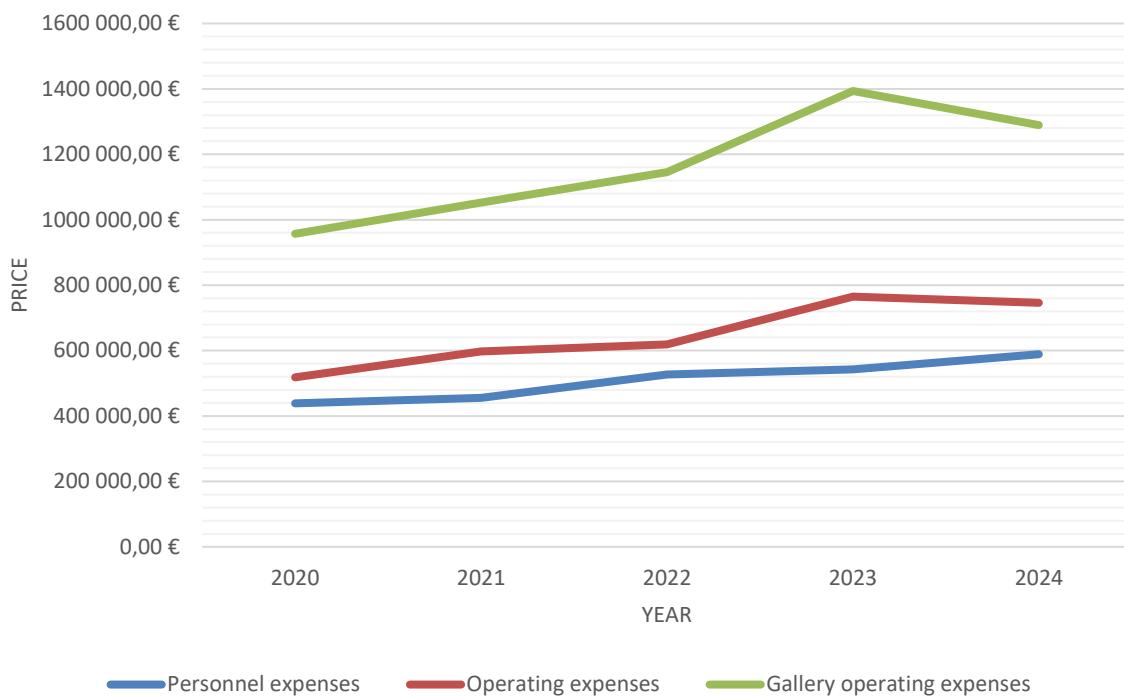


Figure 4 Development of expenses 2020–2024

Source: own processing, annual reports

For a more comprehensive assessment of the financial management of the East Slovak Gallery, we calculated several financial indicators. Although the gallery is a contributory organization and does not generate profit as a business entity, these indicators help to evaluate the efficiency of resource utilization, the level of indebtedness, and the degree of self-financing.

Table 2 Profitability indicator values

	Current AP (2024)	Previous AP (2023)	Index 2024/2023	Difference
ROE	0,419409934	0,614015942	0,683060332	-32%
ROA	0,009153454	0,007193395	1,272480451	27%
ROI	0,00925566	0,00724509	1,277508009	28%
ROS	0,212346058	0,163675457	1,29736041	30%
Degree of self-financing	0,021824601	0,011715323	1,862910772	86%
Level of indebtedness	0,978175399	0,988284677	0,989770885	-1%

Source: own processing

The **ROE (return on equity)** indicator reached an exceptionally high value (0.61) in 2023, which points to the high efficiency of equity utilization. In 2024, it declined, although it remains relatively high. For every €1 of equity, it generated €0.419 of net profit. This development may be the result of rising costs or increased equity.

ROA (Return on Assets) rose slightly in 2024 (by 27%), signaling an improvement in the efficiency of all assets. For every €1 of the gallery's assets, there was a net profit of €0.0092 in 2024. Although ROA is low, this is common for organizations of this type. The slight increase indicates an improvement in the efficiency of total asset utilization.

The growth in **ROI (return on investment)** indicates a higher return on resources invested in the gallery's operations in 2024 compared to 2023, which may be related to better use of subsidies, grants, or rationalization of expenses. For every €1 invested in the gallery, almost 1 cent was “returned” as surplus. In this context, it is not a return in the sense of profit, but rather the benefit and value gained in relation to the total costs. A higher ROI in 2024 signals a more efficient use of the budget.

The increasing **ROS (Return on Sales)** indicates that the gallery will be able to generate a higher operating surplus from each euro of revenue in 2024, which is a good indicator of financial health and efficiency. For every €1 of revenue, the gallery “generated” a surplus of €0.21.

In terms of **self-financing**, in 2024 the gallery will finance its total VK liabilities at a level of 2.18%, representing an 86% year-on-year increase. Although the figures are low, year-on-year growth is almost double. This means that the gallery is increasing its degree of independence, e.g. through better PR, visitor numbers, rentals, or sales of publications.

The gallery has a high **level of debt**. In 2024, it stood at 0.98. In the context of a contributory organization, this is not a problem, but compared to last year, we can see that dependence on external financing is slightly decreasing, which is a positive trend.

In summary, the financial assessment indicates that the East Slovak Gallery has upheld a consistent and effective approach to financial management, progressively enhancing its ability to respond to changes within the sector and future developmental requirements.

4.2 Website and App

One of the main platforms through which the gallery presents itself is its website www.vsg.sk. In 2024, it recorded almost 82,000 unique visits, which is an increase of 37% compared to the previous year 2023, when visits stood at 60,051. The challenge the gallery faces with its website is to protect it from potential attacks and to resolve unexpected errors and problems.

Visitor data is based on the annual reports of the East Slovak Gallery for the last eight years. The gallery does not analyze visitor data, so the available statistical data published in these reports was used as the main source. Looking at Figure 5, the visitor curve shows an upward trend over the last eight years. A huge increase in visits can be seen between 2019 and 2020, which rose by approximately 1450.27%. The main reason for this increase is the fact that in 2019, the gallery launched a new version of its website as we know it today. Another factor that contributed to this was the onset of the pandemic, when online traffic increased overall. In 2021-2022, when measures began to be gradually relaxed and the offline world began to function again, we can see a decline in website traffic. However, since then, website traffic has continued to grow by approximately 20,000 visits per year.

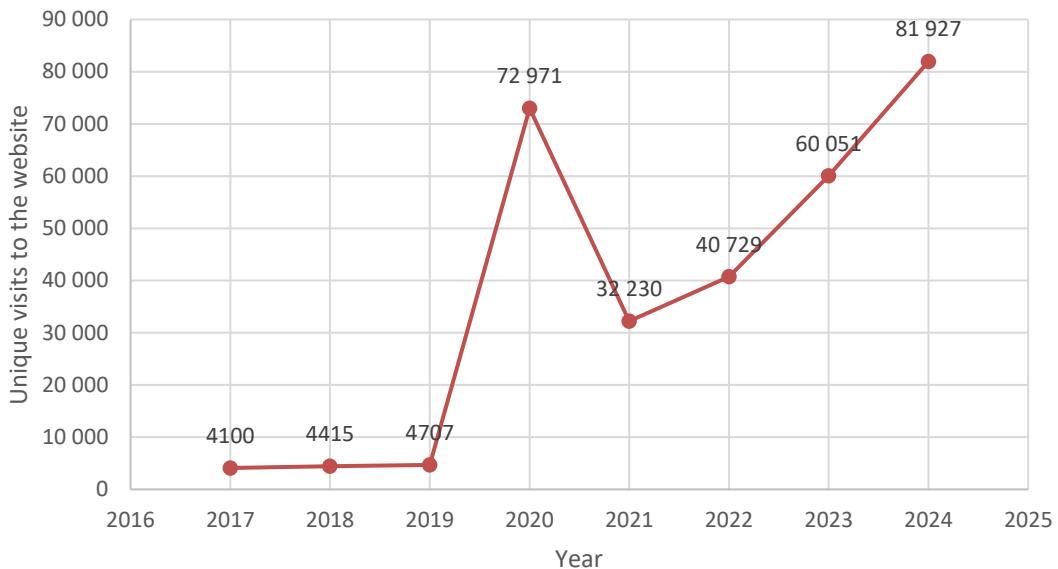


Figure 5 Website visits 2017-2024

Source: own processing

The East Slovak Gallery in Košice has also seen a significant increase in the number of users of its mobile app in recent years. This app, which serves as a modern tool for mediating works of art and exhibitions, has become a key element in the gallery's digital transformation. Between 2020 and 2024, the number of app users increased by approximately 318%. The most significant increase was recorded in 2023, which may be the result of successful marketing campaigns and the expansion of the gallery's digital services. The decline in 2024 indicates the need to analyze and adapt strategies to maintain and further grow the user base.

The data indicates that the gallery's digital platforms are undergoing sustained growth over the long term, which underscores the necessity for ongoing investment in online channels and highlights the imperative to enhance digital strategies to maintain user engagement.

In conclusion, the East Slovak Gallery has not yet significantly incorporated AI tools into its digital framework; nevertheless, the summary provided in *Figure 2* indicates that technologies like ChatGPT, DALL-E 2, Midjourney, Jasper.ai, Peppertype.ai, or Copy.ai could substantially improve both the website and the mobile application. The integration of these tools—be it for interactive communication, automated content generation, or visual creation—presents a chance for the gallery to enhance user engagement and update its digital offerings.

5 Conclusion

The findings outlined in this article substantiate that digital marketing, especially when augmented by artificial intelligence, greatly improves the capacity of cultural institutions to communicate effectively and engage a variety of audiences.

A comparative analysis of existing literature reveals consistent results: AI-enhanced solutions—such as tailored content delivery, chatbots, IoT-based systems, and interactive devices—result in increased visitor satisfaction, enhanced relevance of the information provided, and a stronger intention to return to cultural venues. These results are in agreement with prior research that underscores the significance of personalization, interactivity, and data-driven communication in modern marketing contexts. Nevertheless, this paper also points out

variations among studies, particularly concerning the level of technological maturity, visitor expectations, and the readiness of institutions for digital transformation.

These variations indicate that the implementation of AI necessitates not only technological investments but also organizational changes, staff training, and strategic alignment. The results obtained in this study contribute to the wider academic conversation by integrating dispersed knowledge and suggesting a conceptual framework that mirrors the current landscape of digital marketing evolution in cultural institutions. The findings illustrate that AI possesses considerable potential to enhance visitor experiences, facilitate effective management of interactions, and bolster the competitive standing of cultural institutions.

Concurrently, certain limitations must be recognized. Numerous studies are context-dependent, frequently experimental, and mainly exploratory. The long-term impacts of AI on visitor behavior, ethical issues concerning data privacy, and the financial and operational hurdles linked to AI implementation remain inadequately explored.

The case study of the East Slovak Gallery introduces a practical aspect to this framework. The financial assessment reveals a stable and progressively enhancing financial management system, bolstered by increasing contributions from the founder and the successful acquisition of project-based funding. The analysis of digital platforms indicates a sustained rise in website traffic and mobile application usage, signifying a growing interest in the gallery's online presence. Nevertheless, the evaluation also indicates that the gallery has yet to meaningfully integrate AI technologies. Given the opportunities highlighted in the generative AI overview—such as tools like ChatGPT, DALL-E 2, Midjourney, Jasper.ai, Peppertype.ai, or Copy.ai—there exists considerable untapped potential for improving user engagement, personalization, and automated content generation across the gallery's digital interfaces.

In summary, the results imply that while cultural institutions are increasingly acknowledging the significance of digital communication, the incorporation of AI constitutes the next vital phase in their strategic development. Future studies should concentrate on longitudinal assessments of AI adoption, comparisons among various types of cultural institutions, and a more profound exploration of ethical, organizational, and educational ramifications. As digital technologies continue to progress, cultural organizations must embrace innovative tools and strategies to enhance their mission, broaden accessibility, and maintain relevance in a transforming digital environment.

Acknowledgements

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Digital Public Administration on Local Level: Case of Online Application Services in Primary Schools from the Banska Bystrica Region

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Abstract

This paper examines organizational adoption of a school-level digital public service: the availability of an online application submission e-service among primary schools in the Banská Bystrica Self-Governing Region (Slovakia). Building on the Technology–Organization–Environment (TOE) framework, we operationalize adoption using an observed indicator derived from a structured audit of schools' publicly available web presence and link it to school and municipal context variables. Unlike prior studies that rely predominantly on perception-based surveys or national-level diffusion indicators, our dataset captures a concrete, observable service feature at organizational granularity. The results show that the language of instruction is the strongest correlate of adoption: Hungarian-language schools are substantially less likely to provide an online application service than Slovak-language schools, even when accounting for school size and local socio-economic conditions. We interpret language as a salient environmental factor that shapes the fit, accessibility, and perceived risk of standardized digital services in linguistically heterogeneous settings. The findings contribute to the economics of digital transformation by highlighting how socio-linguistic frictions can constrain efficiency gains from e-services and potentially widen access gaps. Implications for policy include language-aware service design, multilingual communication standards, and targeted support for schools in minority-language environments.

Keywords: Digital transformation; e-government; primary schools; online application; Technology–Organization–Environment (TOE); language of instruction; minority language

JEL Classification: H75; O33; I21

1 Introduction

Digital transformation has become a central driver of productivity, service quality, and coordination efficiency across both private and public sectors. In public administration, digitalization is often discussed through the lens of national portals, interoperability architectures, and country-level diffusion of e-government (e.g., Zhao, Shen and Collier, 2014). Yet the economic relevance of digital transformation is equally visible in “everyday” frontline services delivered close to citizens, where changes in administrative processes can directly affect transaction costs, information frictions, and service access. Primary schools represent a particularly important setting: they interact with virtually all households with children, operate under budget and capacity constraints, and deliver administratively intensive services that influence parents’ coordination costs and trust in public institutions. From an economic standpoint, shifting from paper-based and

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in-person procedures to electronic services can reduce administrative burden and lower coordination costs for families, municipalities, and schools, potentially improving allocative efficiency by enabling timelier and more accurate matching between demand (applicants) and capacity (school places) (Ebrahim and Irani, 2005).

Despite this relevance, evidence on digital service provision at the level of individual schools remains limited. A large share of prior research examines technology adoption either at the level of (i) individual acceptance—typically relying on survey-based intention and usage constructs grounded in models such as TAM and related acceptance frameworks in education (Granić and Marangunić, 2019)—or (ii) macro diffusion, where adoption is approximated by national indicators and country-level explanatory variables, including cultural dimensions (Zhao, Shen and Collier, 2014; Lee, Trimi and Kim, 2013). These approaches yield important insights but are less informative about organizational adoption decisions in frontline public organizations, which may be shaped by capacity constraints, governance arrangements, and local context in ways that are difficult to infer from national indices or individual-level attitudes alone. Moreover, the e-government literature emphasizes that implementation outcomes depend not only on technology availability but also on organizational and environmental barriers, including institutional and governance factors (Ebrahim and Irani, 2005).

To address this gap, this paper studies the adoption of a specific electronic service in education: whether a primary school offers an online application submission service. Using a cross-sectional dataset of 263 primary schools in the Banská Bystrica Self-Governing Region (Slovakia), the paper investigates which factors are associated with the presence of this service based on micro-level, observational evidence rather than perception surveys. The analysis is guided by the Technology–Organization–Environment (TOE) framework, which is widely used to explain organizational adoption through (i) technological conditions, (ii) organizational characteristics, and (iii) environmental context (Tornatzky and Fleischer, 1990; Baker, 2012). TOE is especially suitable here because the outcome is an organizational-level adoption decision rather than individual behavioral intention.

A distinctive contribution of this study is its emphasis on language of instruction as a key environmental factor. While language is sometimes treated as a background cultural attribute in technology diffusion research (Lee, Trimi and Kim, 2013), it can also be conceptualized as a concrete environmental friction affecting information accessibility, content availability, stakeholder expectations, and the perceived “fit” of standardized digital services with local needs. Recent evidence in the e-government domain shows that linguistic differences can meaningfully shape adoption behavior by increasing perceived uncertainty and the risk of misunderstanding, thereby reducing uptake (Xu et al., 2025). In parallel, work on language equality in the digital age highlights how language barriers can limit access to digital services and contribute to uneven benefits from digital transformation (European Parliament, 2017). Building on these insights, this paper integrates language into a TOE-consistent explanation of e-service provision at the school level.

Two widely used frameworks are acknowledged but not applied as the primary theoretical lens. First, the Unified Theory of Acceptance and Use of Technology (UTAUT) is designed to explain individual acceptance and usage through constructs such as performance expectancy and effort expectancy (Venkatesh et al., 2003). Given that this study focuses on organizational adoption and

relies on non-survey data, UTAUT is not the best fit for the empirical design. Second, the DigCompOrg (2015) framework provides a comprehensive view of digitally competent educational organizations (Kampylis, Punie and Devine, 2015). However, DigCompOrg is broader than the single-service adoption outcome examined here and would require multidimensional organizational assessment data not available in the present dataset. These frameworks remain valuable reference points for future work that combines organizational adoption with user acceptance and richer measures of school digital capacity.

The goal of the paper is therefore twofold: (1) to provide micro-level evidence on determinants of organizational provision of an online application service in primary schools, and (2) to demonstrate how an environmental factor—language of instruction—can be integrated into a TOE-based explanation of digital service adoption in a regional education context (Tornatzky and Fleischer, 1990; Baker, 2012). Importantly, the study intentionally does not use WCAG accessibility statements and GDPR mentions as explanatory variables. In the audited web environment, these elements were frequently standardized or automatically included as part of common web solutions, resulting in limited meaningful variation across schools and a weak conceptual link to the adoption decision of the online application service itself.

The remainder of the paper is structured as follows. The next section reviews relevant literature and develops a TOE-based conceptual framing with an emphasis on language as an environmental determinant. The following sections describe the dataset, operationalization of variables, and empirical strategy, then present results and discuss implications for digital transformation of frontline public services in education. The paper concludes with key findings, limitations, and directions for further research.

2 Theoretical framing

This section develops the theoretical and empirical core of the paper. The outcome of interest is whether a primary school provides an online application service (HasOnlineApplication), interpreted as a concrete manifestation of digital transformation in a frontline public service (school admissions).

2.1 Why electronic services of primary schools matter in economics and digital transformation

From an economic perspective, school admissions are a recurring, high-volume administrative interaction in which transaction costs (time, travel, information frictions) accrue to households, while administrative processing costs accrue to public organizations. Because admissions are often parents' first "life situation" encounter with public administration, the availability of a digital channel can be interpreted as a micro-level indicator of state capacity and service productivity. In the Slovak context, the service is relevant even in digitally connected regions: despite high internet coverage, many schools still rely on paper-based applications, which motivates studying which organizations supply a digital channel and why.

Why TOE is used, and why UTAUT and DigCompOrg are acknowledged but not applied
This study adopts the Technology–Organization–Environment (TOE) framework as an organizational adoption lens. TOE posits that the adoption of an innovation is shaped by the technological context, organizational context, and environmental context, and it has been widely

applied across adoption settings. The TOE framing is also consistent with recent public-sector adoption research (e.g., e-participation adoption in local governments), where the three contexts structure hypothesized determinants of adoption.

By contrast, UTAUT focuses on individual users' acceptance and usage behavior (and is known to outperform several earlier acceptance models in its original tests). Because the dependent variable here is organizational provision of a digital service (not individual intention/usage), UTAUT is not the primary theoretical fit; nonetheless, it is relevant background theory and is therefore referenced.

Similarly, the DigCompOrg framework (2015) is acknowledged as an education-sector framework for conceptualizing digital capacity at the organizational level (e.g., leadership, infrastructure, teaching/learning practices). It is not applied directly in the present empirical model because the dataset does not contain the full set of DigCompOrg constructs; instead, the study uses feasible proxies (e.g., digital coordinator, digital hardware, and strategic salience of “digital”) derived from administrative and website-audit data.

Emphasis on the “Environment” context: language as a key determinant

A distinctive contribution of this paper is to treat language environment as a potentially binding constraint in digital public service provision and adoption. Economic research on e-government adoption shows that language-related frictions can reduce adoption by increasing uncertainty about completing online processes successfully (e.g., dialect-induced barriers in e-government use). This aligns with broader arguments that language equality and multilingualism matter for access to digital services in the EU context.

Economically, this implies underutilized public digital capital as government build platforms, but without language support the adoption ceiling stays low, so average cost reductions and processing time gains are not fully realized. On microlevel, higher operating costs are increased from more calls, more assisted digital sessions, more case handling after failed submissions. From individual perspective Xu, Bi, Wu & Zhu (2025) explain low e-government adoption through mismatch between local dialect and the official language used in government interactions. The online channel becomes more uncertain than the offline channel, because online completion depends heavily on text comprehension and self-navigation. This uncertainty functions like an informational transaction cost that pushes users to substitute back to offline channels even when online would otherwise save time.

In the school setting, language can influence both the supply side (schools' incentives and capacity to publish and maintain a service) and the demand side (parents' ability to interpret instructions and complete forms). This paper operationalizes language environment at the school level via the language of instruction and empirically tests whether Slovak-language vs Hungarian-language instruction is associated with differences in the probability of providing the online admissions service.

2.2 Data, variables, and hypotheses operationalized in TOE

The dependent variable is a binary indicator:

- HasOnlineApplication = 1 if the school provides an online application service (or an online application form mechanism) on its website; 0 otherwise.

Table 1: Dependent variable

HasOnlineApplication	Frequency		Percent
	0	1	
0	123		46.77
1		140	53.23
Total		263	100.00

The independent variables are organized by TOE context. Table provides a structured overview and the expected relationship to the dependent variable.

Table 2: Independent variables used in the empirical model and expected relationship to online application provision

TOE CONTEXT	VARIABLE (DATASET NAME)	LEVEL / TYPE	EXPECT ED DIRECTI ON	ECONOMIC / ORGANIZATIO NAL RATIONALE
TECHNOLOGY	Digital education hardware (DigiEduHW)	School / binary	+	Greater available ICT assets reduce marginal cost of deploying/maintaining digital services.
TECHNOLOGY	Digital coordinator (SchoolDigiCoor)	School / binary	+	Dedicated capacity can support implementation online initiatives.
ORGANIZATION	Strategic in digital (TimesKeyWordDigitalInStrategy)	School / count	+	Formal strategy that explicitly emphasizes digitalization is a proxy for leadership attention and prioritization.
ORGANIZATION	School size (Pupils)	School / continuou s	+	Larger schools face higher transaction volumes; digitalization can yield larger returns to scale in administrative processes.
ORGANIZATION	Organizational maturity	School / continuou s	+/-	Older institutions may have more routines

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	(YearsOfEducationPro vision)		(potentially resistant) but also more administrative capacity; sign is ambiguous.
ENVIRONMENT	Language of instruction (Language)	School / categorica l	Language environment can create digital access frictions and/or different institutional incentives, affecting service provision.
ENVIRONMENT	Broadband coverage (InternetCoverage100 MB/s (%))	Municipal ity / continuou s	Better digital infrastructure lowers access barriers and increases expected usefulness of an online channel.
ENVIRONMENT	Human capital (HigherEducationPopul ation (%))	Municipal ity / continuou s	Higher digital skills and administrative literacy can increase uptake and pressure to provide online services.
ENVIRONMENT	Municipality size (Inhabitants)	Municipal ity / continuou s	Larger municipalities may have more digital demand and stronger institutional capacity

Exclusion of WCAG and GDPR variables

Although the dataset contains WCAGStatement and MentionsOfGDPR, these variables are excluded from the analysis because they were often embedded automatically as part of a standardized web-service template and therefore provide limited meaningful cross-school variation for explaining online admissions service provision.

Table 3: Pearson pairwise correlations

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	schooldigicor	digieduhw	hasonlineapplication	timeskeyworddigitalistrategy	competitioninarea	yearsofeducationprovision	inhabitants	pupils	svklanguage	hunlanguage	svkhunlanguage	hunlanguage	svklanguage	highereducationpopulation	internetcoverage100mb
internetcoverage100mb	1.00	0.34	0.17	0.15	0.08	0.14	0.16	0.09	-	-	-	-	-	-	0.11
highereducationpopulation		0.34	1.00	0.42	0.40	0.10	0.21	0.55	0.13	0.48	0.03	0.11	0.02	0.16	
svklanguage			0.17	0.42	1.00	0.92	0.31	0.21	0.21	0.12	0.19	0.22	0.30	0.02	0.16
hunlanguage				0.15	0.40	0.92	1.00	0.08	0.20	0.19	0.17	0.16	0.21	0.30	0.06
svkhunlanguage					0.08	0.10	0.31	0.08	1.00	0.04	0.08	0.10	0.08	0.05	0.03
pupils						0.14	0.21	0.21	0.20	0.04	1.00	0.48	0.06	0.44	0.21
inhabitants							0.16	0.55	0.21	0.19	0.08	0.48	1.00	0.23	0.98
yearsofeducationprovision								0.09	0.13	0.12	0.17	0.10	0.06	0.23	-
competitioninarea									0.13	0.48	0.19	0.16	0.08	0.29	1.00
timeskeyworddigitalistrategy										0.11	0.03	0.22	0.21	0.05	0.04
hasonlineapplication											0.10	0.11	0.30	0.30	0.03
digieduhw												0.19	0.02	0.02	0.06
schooldigicor													0.11	0.16	0.16

Table reports pairwise Pearson correlations among the main explanatory variables and the dependent variable (HasOnlineApplication). The correlation structure is useful for two purposes: a) describing associations that motivate the multivariate models, and (b) diagnosing potential multicollinearity that can inflate standard errors and destabilize coefficient estimates.

A key diagnostic result is the extremely high correlation between municipal population (Inhabitants) and the local competition measure (CompetitionInArea), with $r = 0.9748$. This indicates that these variables capture almost the same underlying dimension (larger municipalities tend to have more schools/greater competition). Including both simultaneously in a regression is likely to generate unstable coefficients and large standard errors, even if the underlying concept is relevant.

The language dummies exhibit very strong negative correlations. In particular, svklanguage and hunlanguage show $r = -0.9231$, consistent with near-complementary coding. This is expected.

Correlations with HasOnlineApplication highlight which variables are most strongly associated with adoption at the bivariate level:

- School size (Pupils) shows a moderate positive correlation with adoption ($r = 0.3065$), suggesting that larger schools are more likely to offer the online application e-service.
- Language of instruction (svklanguage) is also moderately positively correlated with adoption ($r = 0.2997$), consistent with the regression results that Slovak-language schools are more likely to publish the e-service than Hungarian-language schools.
- The presence of a digital coordinator (SchoolDigiCoor) correlates positively with adoption ($r = 0.1840$), indicating a potential technological/organizational capability channel, although this association may overlap with school size and language context in multivariate models.

The correlation structure supports the main empirical narrative: language of instruction and school scale show the clearest association with e-service availability, while infrastructure and socio-demographic context appear less informative in this regional setting.

2.2 Empirical research

Given the binary outcome, the baseline specification is a logistic regression.

The empirical results indicate that the environmental language context is a particularly strong predictor of whether a school provides an online admissions service. In the baseline logistic model, schools with Slovak language of instruction have substantially higher odds of providing an online application service than schools with other instruction languages (notably Hungarian), with an odds ratio reported around 4.86 (95% CI: 2.39–9.85; $p < 0.001$).

Organizational capacity proxies are also positively associated with adoption. The presence of a digital coordinator is associated with notably higher odds of offering an online application service. In addition, a larger school size is associated with higher adoption (e.g., an increase of 100 pupils linked with a sizable increase in the likelihood/odds of provision in the reported estimates). Finally, higher strategic emphasis on “digital” (measured by keyword counts in strategy documents) is associated with higher odds of service provision.

(1) Technological context: In the technological context model, we estimate a logistic regression with the availability of an online application e-service as the dependent variable. The model is statistically significant overall ($p = 0.0067$). The presence of a digital coordinator is strongly associated with adoption: schools with a digital coordinator exhibit markedly higher odds of providing the online application service. In contrast, the indicator capturing digital education hardware is not statistically significant ($p = 0.492$). This suggests that technological infrastructure alone is not sufficient to explain e-service availability; rather, the existence of a dedicated coordination role—reflecting the capability to implement, maintain, and communicate digital services—appears more consequential for adoption.

Table 4: Technological context logistic regression

hasonlineapplication	Odds ratio	Std. err.	z	P> z	[95% conf. interval]
digieduhw	1.551931	.9929311	0.69	0.492	.4428643 5.438439
schooldigicoor	3.900019	1.865296	2.85	0.004	1.527408 9.958143

cons	.6551874	.4127443	-0.67	0.502	.1906073	2.25212
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(2) Organizational context: This model estimates the probability that a school provides an online application submission e-service (HasOnlineApplication) as a function of (i) school size (Pupils), (ii) organizational maturity proxied by the years of education provision (YearsOfEducationProvision), and (iii) the salience of “digital” in the school’s strategic document (TimesKeyWordDigitalInStrategy, a keyword-count measure).

The model is statistically significant overall ($p < 0.001$), suggesting that these variables capture a non-trivial part of cross-school variation in e-service availability.

School size (Pupils). The coefficient is positive and highly significant ($p < 0.001$). Interpreted as odds ratios, each additional pupil is associated with a 0.34% increase in the odds of offering the online application service. Although the per-pupil effect is small, it compounds with scale: larger schools are meaningfully more likely to provide e-service, consistent with scale economies in administration and stronger demand-side pressure to streamline intake processes.

Years of education provision. This proxy for institutional maturity is not statistically significant. The point estimate suggests a weak positive association, but the confidence interval includes 1, indicating insufficient evidence that “older” schools are more likely to offer the service once size and strategy salience are accounted for.

Digital keyword count in strategy. The count-based strategy indicator is positive and statistically significant ($p = 0.045$). Each additional occurrence of the digital-related keyword in the strategic document is associated with approximately a 6.9% increase in the odds of e-service availability. This result supports the interpretation that formal strategic emphasis on digitalization correlates with concrete service adoption—though the measure remains a proxy.

Table 5: Organizational context logistic regression

hasonlineapplication	Odds ratio	Std. err.	z	P> z	[95% conf. interval]
pupils	1.003438	.0008349	4.13	0.000	1.001803 1.005076
yearsofeducationprovision	1.008885	.005715	1.56	0.118	.9977456 1.020148
timeskeyworddigitalinstrategy	1.068962	.0356002	2.00	0.045	1.001416 1.141065
cons	.3492298	.1084654	-3.39	0.001	.1899946 .6419208

(3) Environmental context: This model estimates the likelihood that a primary school provides an online application submission e-service (HasOnlineApplication) as a function of three environmental/context variables: the language of instruction (svklanguage), the local share of tertiary-educated population (HigherEducationPopulation), and broadband coverage (InternetCoverage100MB/s). Odds ratios (OR) are reported.

The model is statistically significant overall with a pseudo R^2 of 0.0698, indicating that the included environmental factors explain a meaningful—though not exhaustive—portion of cross-school variation in e-service availability.

The strongest result concerns Language of instruction (svklanguage) (OR=4.86; p<0.001). Schools with Slovak as the language of instruction have approximately 4.9 times higher odds of offering the online application e-service than schools with Hungarian (or non-Slovak) instruction, holding the other contextual variables constant. The confidence interval is well above 1, suggesting a large and precisely estimated association. Interpreted in TOE terms, language appears to be a central environmental factor that shapes the accessibility, perceived risk, and institutional “fit” of standardized digital services in linguistically heterogeneous settings.

Higher-education population share is not statistically significant (p = 0.515). The point estimate is slightly below 1, but the confidence interval spans 1, implying no reliable evidence that the local concentration of tertiary-educated residents is associated with whether schools publish this specific e-service, once language and broadband coverage are controlled for.

InternetCoverage100MB/s is also not statistically significant (p = 0.316). While better connectivity could theoretically enable service provision, the non-significant estimate suggests that within this regional sample, variation in broadband coverage does not differentiate adopters from non-adopters. A plausible interpretation is that broadband availability is not the binding constraint for publishing the service, or that coverage is sufficiently high/clustered that it lacks explanatory power in this context.

In this environmental context specification, the language of instruction emerges as the dominant correlate of online application e-service availability: Slovak-language schools are substantially more likely to provide the service than non-Slovak (primarily Hungarian-language) schools. By contrast, local educational composition and broadband coverage do not show statistically detectable associations. This pattern suggests that, for this specific school e-service, adoption is less constrained by general digital infrastructure and more influenced by socio-linguistic conditions that affect service accessibility and institutional alignment. The result supports a TOE-based interpretation in which language operates as a key environmental friction that can shape the realized benefits of digital transformation and potentially contribute to unequal access to digital public services across language communities.

Table 6: Environmental context logistic regression

hasonlineapplication	Odds ratio	Std. err.	z	P> z	[95% conf. interval]
svklanguage	4.855441	1.753425	4.38	0.000	2.392423 9.854157
highereducationpopulation	.983396	.0252626	-0.65	0.515	.9351079 1.034178
internetcoverage100mbs	1.011612	.0116444	1.00	0.316	.9890449 1.034694
cons	.1751438	.1504494	-2.03	0.043	.0325243 .943151

Analysis of full technology-organizational-environmental framework

This specification estimates a logistic regression for online application e-service availability (HasOnlineApplication) including all previously discussed predictors: technological readiness proxies (DigiEduHW, SchoolDigiCoor), organizational proxies (Pupils, YearsOfEducationProvision, TimesKeyWordDigitalInStrategy), and environmental context

(svklanguage, HigherEducationPopulation, InternetCoverage100MB/s). Odds ratios (OR) are reported.

The model is statistically significant overall ($p < 0.001$) with the highest pseudo R^2 among reported models, indicating improved explanatory power when multiple TOE dimensions are considered jointly.

Language of instruction (svklanguage) remains large and statistically significant (OR = 3.51; $p = 0.001$). Even after controlling for technology, school size, strategic emphasis, and municipal conditions, Slovak-language schools have 3.5 times higher odds of offering the online application service than non-Slovak (primarily Hungarian-language) schools.

School size (Pupils) is also positive and highly significant ($p < 0.001$). The per-pupil effect is small but cumulative, consistent with scale effects: larger schools face higher administrative load and have stronger incentives (and possibly more capacity) to publish an online application channel.

In the full model, Digital coordinator (SchoolDigiCoor) is no longer statistically significant ($p = 0.128$). The point estimate remains > 1 , but precision drops and the confidence interval crosses 1. This suggests that the coordinator effect observed in the technology-only model may overlap with other factors—especially school size and language composition—or that the coordinator variable is correlated with these factors (collinearity/overlap in explained variance).

Digital hardware (DigiEduHW) not significant ($p = 0.989$). This reinforces the earlier conclusion that hardware availability alone does not explain whether the e-service is published.

Strategic “digital” keyword count (TimesKeyWordDigitalInStrategy) no longer significant ($p = 0.217$). The effect that was significant in the organization-focused model appears to be absorbed once language and other controls enter, implying the keyword measure may partly proxy broader contextual differences (including language) or correlate with school size/organizational practices.

Higher education share & broadband coverage. Both are not significant ($p = 0.417$ and $p = 0.557$, respectively), consistent with the environmental-only model: within this region, these contextual variables do not differentiate adopters from non-adopters of this specific e-service.

When technology, organization, and environmental context are modeled jointly, language of instruction remains the most robust and substantively large predictor of whether a school provides an online application e-service, and school size is the second consistently significant correlate. Other variables (digital coordinator, strategy keyword count) lose statistical significance once these controls are included, suggesting their explanatory power in simpler models may reflect shared variance with language and/or school scale rather than independent effects.

Table 7: Full technology-organizational-environmental context logistic regression

hasonlineapplication	Odds ratio	Std. err.	z	P> z	[95% conf. interval]
digieduhw	.9907643	.6943301	-0.01	0.989	.2508686 3.912862
schooldigicoor	2.15381	1.084933	1.52	0.128	.8024792 5.780706
pupils	1.002938	.0008404	3.50	0.000	1.001292 1.004586

yearsofeducationprovision	1.005735	.0061242	0.94	0.348	.9938033	1.01781
timeskeyworddigitalinstrategy	1.040671	.0336392	1.23	0.217	.9767848	1.108736
svklanguage	3.508361	1.367112	3.22	0.001	1.634611	7.529985
highereducationpopulation	.977285	.0276485	-0.81	0.417	.9245699	1.033006
internetcoverage100mbps	1.007209	.0123265	0.59	0.557	.9833368	1.03166
cons	.1323977	.1374174	-1.95	0.051	.0173144	1.012405

3 Conclusion

In this specification, school size and strategic salience of digitalization are significant correlates of online application e-service availability, whereas institutional age/maturity (years of education provision) is not. Substantively, the results suggest that adoption is more closely related to (i) scale—which may increase administrative burden and incentives to digitize—and (ii) organizational prioritization, as reflected in strategic documents, than to the mere longevity of the institution. The model remains associative rather than causal; nonetheless, it indicates that observable organizational factors beyond basic technological inputs help explain why some schools provide an online application service while others do not.

Much of the TOE-based e-government / e-participation literature relies on perception-based survey constructs (e.g., perceived benefits, top management support, public pressure, public readiness) measured via multi-item Likert scales, often at the level of local governments or citizens. By contrast, this study uses a school-level, audit-based dataset focused on observed service provision on websites, complemented by administrative and municipal context indicators. This shift from perceptions to observed organizational outputs reduces common-method bias, but it also implies that some standard TOE constructs (e.g., perceived benefits) are proxied indirectly rather than measured directly.

The literature also tends to treat “environment” primarily as infrastructure, regulation, or external pressure; this paper extends the environmental lens by focusing on language as a salient factor, consistent with emerging evidence that linguistic frictions can materially affect e-government uptake and welfare.

This paper examined the organizational adoption of a school-level e-service—the availability of an online application submission service—in primary schools in the Banská Bystrica Self-Governing Region (Slovakia). Using a cross-sectional dataset that combines school and municipal characteristics with a structured review of schools’ publicly available web presence, the analysis indicates that the language of instruction (Slovak vs. Hungarian) is the most salient predictor of whether a school offers the online application service. Interpreted through the Technology–Organization–Environment (TOE) framework, language functions as a crucial environmental factor shaping the “fit” between a standardized digital public service and the local socio-linguistic context.

This finding is consistent with a growing stream of evidence that language frictions materially affect digital public-service adoption. For example, recent evidence on e-government uptake shows that language barriers (dialect differences) increase uncertainty and perceived failure risk in online administrative interactions, reducing adoption (Xu et al., 2025). Likewise, policy-oriented research on language equality argues that language barriers constrain citizens’ and organizations’ ability to

benefit from digital public services and the Digital Single Market (European Parliament, 2017). While several e-government studies emphasize technical architecture, interoperability, and organizational barriers (Ebrahim & Irani, 2005), our results highlight that—at least in a linguistically heterogeneous region—environmental language context can dominate more conventional organizational or infrastructure correlates.

Compared to prior TOE-based adoption studies, our contribution is also methodological and empirical. Much of the TOE adoption literature in public-sector digitalization relies on survey-based perceptions of managers and officials and typically models adoption intentions or perceived readiness (e.g., Ninčević Pašalić & Ćukušić, 2024). In contrast, our dependent variable is an observed service feature (online application availability) at the organizational level, derived from direct web-based auditing, and paired with administrative/context indicators. Similarly, cultural explanations of technology diffusion often operate at the country level (Zhao et al., 2014) or use adoption in private markets (Lee et al., 2013), whereas our evidence isolates a concrete, low-level public service in a single region, enabling a sharper view of within-country heterogeneity.

From an economics and digital-transformation perspective, the results reinforce that school e-services are not merely “IT features” but transaction-cost and productivity instruments: online application submission potentially reduces coordination costs for households and administrative burden for schools and municipalities. However, if language context constrains adoption, digital transformation may inadvertently reproduce or deepen local inequalities in access to public services. A key implication is that language-aware service design and deployment—including multilingual interfaces, content governance, and user support—should be treated as a first-order design parameter rather than a peripheral “communication” issue.

Advantages of this study include: (i) a clearly defined, observable adoption outcome (service availability), (ii) organizational-level granularity, and (iii) a TOE - consistent interpretation that connects measurable environmental factors to adoption outcomes. Limitations should be noted. First, the dataset is cross-sectional and confined to one region, limiting causal inference and external validity. Second, the audit captures publicly visible service availability rather than actual usage intensity or service quality. Third, some potentially relevant organizational factors (e.g., leadership attitudes, IT budgets, vendor contracts) are not directly observed. Finally, two compliance-related indicators (WCAG statement and GDPR mention) were deliberately excluded because they were largely standardized/automated and therefore exhibited insufficient meaningful variation to explain adoption in this setting.

Future research could extend this approach by (i) adding panel data (before/after service rollouts), (ii) measuring actual uptake (applications submitted online) and user outcomes, and (iii) integrating qualitative evidence on institutional constraints and vendor-driven standardization. While this paper did not apply UTAUT (Venkatesh et al., 2003) or DigCompOrg (Kampylis et al., 2015), both frameworks remain relevant for complementary work: UTAUT for individual-level acceptance and usage behavior (parents, school staff), and DigCompOrg for diagnosing organizational capacity for digitally supported schooling. A combined, multi-level design (TOE + DigCompOrg + user-acceptance models) could provide a fuller account of how organizational readiness and socio-linguistic context translate into actual service adoption and welfare gains.

4 Limitations

This study aims to identify and interpret factors associated with whether a primary school publicly provides an online application submission e-service. While the empirical design is suitable for detecting robust associations in a real-world setting, several limitations follow directly from the research goal and data-generating process and should be addressed in subsequent work.

Proxy measurement

A core implication of the TOE perspective is that organizational readiness such as leadership commitment, internal IT capacity, process maturity, and resource availability should matter for adoption. In this study, however, organizational determinants are captured primarily through observable proxies derived from administrative/context variables and schools' publicly visible online traces. Such proxies may reflect only a subset of the intended constructs and may be confounded by factors unrelated to adoption (e.g., communication style, marketing effort, or outsourcing practices). This can attenuate true organizational effects and, in turn, make environmental factors (such as language) appear comparatively stronger.

Seasonality

Online application submission may be seasonal: some schools publish the service only during enrollment windows, and outside this period it may be hidden, archived, or replaced by downloadable forms. Audits conducted outside the key application period can therefore generate systematic "false negatives," meaning a school might have an operational service but not display it at the time of measurement. This limitation is directly tied to the study's goal because it affects whether the dependent variable captures true availability when needed.

Statistical power and robustness with multiple covariates

Although the dataset covers a substantial number of schools, the effective sample size for some variables and model specifications may be reduced by the limited variation of certain indicators.

Omitted variables and endogeneity in the adoption process

Some adoption-relevant factors are not directly observed, including municipal governance arrangements, internal process, rural and urban effect and the role of the founding body in enforcing standardized solutions. These unobserved features may correlate with both language context and adoption, potentially biasing estimates.

Implication for future research

A central result of this paper is that language of instruction emerges as a key environmental correlate of adoption. Future work should therefore conceptualize language not merely as a demographic descriptor but as an environmental friction that influences service accessibility, and the transaction costs of digital interaction—consistent with language equality and e-government adoption arguments. Extending the design to incorporate UTAUT at the user level (parents and school staff) would allow researchers to test whether language affects adoption via perceived usefulness, effort expectancy, and trust-related mechanisms, thereby linking organizational adoption to citizen/stakeholder acceptance and actual use.

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