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Does government AI readiness strengthen digital urban governance? International evidence from smart cities

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Abstract. Artificial intelligence readiness is increasingly important for public-sector digital transformation because it can shape transparency, citizen participation, service responsiveness and trust in urban governance. This study aims to examine whether national Government AI Readiness strengthens city-level digital urban governance and trust-related outcomes across an international sample of smart cities. The empirical analysis combines IMD Smart City Index data with the Government AI Readiness Index for 2020, 2021, 2023, 2024 and 2025, covering 641 city-year observations from 141 cities across 71 countries/economies, and applies two-way fixed effects models, country-clustered standard errors, lagged specifications, PCA-based robustness checks and component-level regressions. The results show that Government AI Readiness is positively and significantly associated with the Digital Urban Governance and Trust Index, with a coefficient

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of 0.0958, indicating that a 10-point increase in GAIRI corresponds to approximately a 0.96-point increase in the index. The lagged specification confirms this relationship, with a coefficient of 0.1156. PCA results show that the first principal component explains 72.66% of the variance, supporting the coherence of the constructed index. The moderation analysis indicates that internet speed and reliability have a strong positive effect. At the same time, the negative interaction coefficient (-0.0056 in the robustness model) suggests a diminishing-return effect rather than complementarity.

Keywords: government AI readiness, digital urban governance, smart cities, citizen participation, trust in authorities, public-sector digital transformation.

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1. INTRODUCTION

Artificial intelligence is becoming an increasingly important factor in the transformation of public administration, digital public services and citizen–government relations. In contemporary governance, digital transformation is no longer limited to the technical provision of online services but is increasingly associated with institutional responsiveness, transparency, accountability, civic engagement and trust. This shift is reflected in the World Bank’s GovTech approach, which identifies core government systems, digital public services, digital citizen engagement and enabling infrastructure as key dimensions of public-sector digital maturity. At the same time, the effective use of data and digital technologies depends not only on technological capacity but also on institutional safeguards, public trust and readiness to govern digital transformation responsibly (World Bank, 2021; Vasconcelos et al., 2025). In this context, Government AI Readiness can be viewed as part of a broader national institutional and technological environment that may shape how cities adopt, implement and benefit from digital governance practices.

The growing importance of trust in public institutions reinforces the relevance of this issue. Contemporary governments face increasing pressure to deliver services that are not only efficient and accessible but also transparent, inclusive and accountable. The OECD emphasises that citizens’ trust is closely linked to perceptions of government responsiveness, reliability, integrity, openness and fairness, which are also central dimensions of digital urban governance. Artificial intelligence may support better service design, faster administrative processes, data-driven decision-making and more personalised public services. However, its use in the public sector may also generate risks related to privacy, algorithmic bias, accountability, exclusion and the opacity of automated decision-making. Therefore, AI in government requires not only advanced technological infrastructure but also responsible governance frameworks, ethical safeguards and effective communication with citizens. This makes it important to examine whether countries that are better prepared for AI also demonstrate stronger city-level outcomes in transparency, participation and trust-related smart-city governance (OECD, 2024, 2025).

The international relevance of this research is further strengthened by current policy developments in Europe and beyond. The European Commission’s Digital Decade agenda defines digital public services, connectivity, digital skills, and digital transformation as strategic priorities for 2030, while the EU AI Act establishes a regulatory framework to foster trustworthy, human-centred artificial intelligence. These initiatives show that AI readiness is increasingly understood as a governance and institutional challenge rather than solely as a technological issue (European Commission, 2025, 2026; Vasa et al., 2023). Nevertheless, despite growing policy attention to AI, digital government and smart cities, empirical evidence

remains limited on whether national AI readiness is reflected in measurable city-level governance outcomes. This gap is especially important for smart cities, where digital technologies are expected to improve not only service delivery but also citizen participation, transparency and trust in authorities. Therefore, this study investigates whether Government AI Readiness strengthens digital urban governance across an international sample of smart cities.

The paper answers this question by merging city-level data from the IMD Smart City Index with the Government AI Readiness Index across 2020 - 2025 for 641 city- year observations spanning 141 cities from 71 countries/economies, estimating two-way fixed effects models with country-clustered standard errors as well as a battery of lagged specifications, PCA-based robustness checks and component-level regressions. The dependent variable is the Digital Urban Governance and Trust Index (DUGTI), compiled from twelve individual Smart City Index indicators measuring transparency, citizen engagement, digital public services and trust in institutions. This paper contributes to this literature by: (1) presenting a transparent and replicable composite metric of digital urban governance and citizen trust levels; (2) offering the first panel evidence at the international level connecting country AI readiness with quantifiable governance outcomes at the city-level; and (3) uncovering which components of governance are most associated with AI readiness, as well as the moderating importance of local digital connectivity. The rest of the paper is structured as follows: Section 2 provides a literature review, Section 3 details the data and methodology, Section 4 discusses the empirical results, and Section 5 concludes.

2. LITERATURE REVIEW

The literature on Government AI Readiness and digital urban governance combines research on AI in public administration, GovTech, smart-city governance, digital trust, transparency and citizen participation. AI readiness is not only a technological issue but also reflects institutional preparedness, ethical governance, leadership capacity and the ability of public organisations to transform data into public value. AI ecosystems are increasingly linked to knowledge-based growth, while GovTech is understood as a technological, institutional and human system shaping social progress and well-being (Abdullayev et al., 2026; Kuzior et al., 2026). Public-sector AI adoption also depends on expert knowledge, organisational readiness and managerial competences that allow innovation to be embedded in administrative processes (Ingaldi & Ulewicz, 2025; Zhidebekkyzy et al., 2026).

GovTech research shows that digital transformation can improve public administration, quality of life and economic governance, but its effects depend on institutional conditions and administrative capacity (Hossain et al., 2025; Lyeonov et al., 2026a; Lyeonov et al., 2026b; Vasylieva et al., 2026). In fragile, crisis-affected and developing contexts, digital tools may support transparency, secure public services and reconstruction, but they can also reproduce inequalities when digital access, accountability and governance safeguards are weak (Juhászová et al., 2026; Kafoe et al., 2026; Topazly et al., 2026).

Traditional public consultation often fails to capture the complex, multi-layered preferences of local communities, creating a clear need for experimental mixed-method approaches in participatory urban planning (Każmierczak & Palicki, 2021). Integrating AI into these frameworks allows for the real-time synthesis of both descriptive and normative spatial data, transforming citizens into active co-designers of resilient urban spaces. Smart-city studies provide the urban foundation for this research by showing that big data, AI and integrated digital systems support planning, predictive analytics, service optimisation and real-time urban management (Allam & Dhunny, 2019; Ullah et al., 2020). However, AI-enabled smart cities also create risks related to privacy, surveillance, exclusion and governance quality, while emerging digital environments such as the metaverse extend these challenges to environmental, economic and social sustainability (Allam et al., 2022; Yigitcanlar et al., 2020).

The governance dimension of smart cities is central because digital urban transformation concerns not only infrastructure, platforms and sensors but also public administration, citizen participation and accountability. It is crucial to avoid the social digital divide, which refers to the disparity in access to and use of technology. Citizen engagement in addressing local issues, such as urban revitalisation, requires transparency, community-centered motivation in shaping public spaces, and the effective design of information and tools. According to research outcomes, such factors affect local engagement and create a resilient living environment for all inhabitants (Bieda et al., 2026; Landa-Oregi et al., 2025). E-governance in smart cities depends on technological trends, institutional enablers, administrative capacity and citizen-centred mechanisms, while recent bibliometric evidence confirms the growing integration of digital transformation and urban governance research (Kuzior et al., 2023; Zhubanazarov et al., 2026). Smart-city development also requires sustainable financing and strategic resource mobilisation, whereas smart-city rankings do not always reflect the broader strength of the innovation ecosystem (Hedegaard et al., 2024; Kuzior et al., 2025). Residents' perceptions remain important because smart-city value depends on how citizens assess services, responsiveness and the city's image (Grębosz-Krawczyk & Zakrzewska-Bielawska, 2024). Citizens' perceptions of urban life are also revealed through their economic attitudes and choices, as scholars of urban economics have found that living conditions and local land-use policies affect spatial behaviour of large-city residents and housing prices (Palicki, 2017). For example, data from Warsaw suggests that noise pollution from aircraft near Warsaw's central airport resulted in an average price penalty of approximately 4% for homes inside the noise impact zone, and that this penalty increased following the official establishment of the Limited Use Area in 2011, reflecting that policy announcements themselves have quantifiable effects on real estate markets (Trojanek & Huderek-Glapska, 2018). Such revealed-preference data complements the survey data commonly used in smart city rankings: both survey and revealed preferences reflect citizen feedback on cities' actual performance, justifying the employment of perception-oriented metrics like the SCI as a proxy for government performance.

Trust, ethics and social legitimacy form another key part of the literature. Smart cities improve public management but also create tensions related to privacy, surveillance, security and social trust, while just and sustainable smart cities require citizens to act as active participants in digital systems rather than passive users (Eik et al., 2026; Ylipulli et al., 2025). AI-based urban technologies are particularly sensitive in areas such as automated traffic enforcement, policing, public safety, and crime prevention, where ethical design, accountability, and social justice are necessary to prevent biased or exclusionary outcomes (Aliyeva, 2026; Haley, 2025; Springs, 2024).

Trust also influences the adoption of digital technology by citizens, businesses, and public-sector users. Perceived security supports the acceptance of contactless services, while cybersecurity governance affects trust-based economic relations such as supplier credit decisions (Burkett & Recuero Virto, 2025; Li et al., 2026). In AI-enabled and citizen-facing environments, trust shapes behavioural intentions, crisis communication, personalised services and public value creation (Nguyen et al., 2026; Selaković, 2025; Sulkowski et al., 2025). These findings suggest that Government AI Readiness should be evaluated not only through technological preparedness but also through its contribution to trustworthy, rights-sensitive and citizen-oriented digital urban governance.

E-government adoption and administrative transformation depend on behavioural, organisational and managerial conditions. Behavioural approaches can stimulate e-government use by reducing cognitive barriers and improving user experience, while lean practices and process reengineering can strengthen transparency, responsiveness and citizen satisfaction in local government (Crăciun et al., 2025; Ghonim, 2026). Digital transformation also supports management control and organisational efficiency when data systems are integrated into decision-making, showing that AI readiness produces governance effects only when public organisations can convert digital tools into service improvements (El Massaoudi et al., 2025).

Transparency, accountability, and corruption-related outcomes are central to digital governance research. Digital budget transparency and financial management reforms can improve credibility and good governance, while digitalisation may reduce corruption risks through traceability, data availability and lower administrative discretion (Eriqat et al., 2025; Maisyarah, 2026; Ntuli et al., 2025). However, the relationship between digitalisation and integrity is not automatic, as corruption reduction depends on institutional design, enforcement capacity and safeguards against accountability erosion and rent-seeking (Pisker et al., 2026; Ugulava, 2026).

Local fiscal capacity and decentralised governance influence whether cities can benefit from digital and AI-related transformation. Local budgets, participatory budgeting and fiscal adaptation are important for accountability and resilience, especially under crisis conditions (Khodan & Burtnyak, 2025). Financial self-sufficiency, own-revenue growth and public expenditure priorities shape local autonomy, service provision and the resources available for digital transformation (Filipova et al., 2025; Mohapatra, 2026; Pupysheva et al., 2025). The size of this fiscal space directly depends on the stability and design of municipal revenue tools. Research on Polish municipalities suggests that legal changes to land-based revenues may leave cities worse off in terms of revenue stability in the long-term, forcing cuts to spending that disproportionately affect cities' abilities to provide high-quality public services and plan for their socio-economic development in the longer term (Trojanek et al., 2024). Additionally, local tax policy can be affected by strategic considerations between neighbouring municipalities - rather than setting tax rates based on the unique demands of their constituency, cities often follow their neighbours' tax decisions (Trojanek et al., 2021). These insights suggest that fiscal space for AI-enabled transformation will vary between cities and will not be entirely under cities' control, highlighting the importance of national-level determinants of municipal fiscal policy like those measured by Government AI Readiness.

The digital readiness literature shows that AI and ICT integration can deepen territorial and institutional inequalities when countries, regions and organisations differ in infrastructure, skills, innovation capacity and public-sector preparedness (Meidute-Kavaliauskiene et al., 2026). European evidence confirms substantial disparities in digital readiness, public-sector transformation, governance quality, service efficiency and socio-economic inclusion (Valaskova et al., 2025a; Valaskova et al., 2025b). Differences in digital and sustainable transformation across the pre- and post-pandemic periods further justify comparative international analysis of AI readiness and city-level governance outcomes (Paraschiv et al., 2024). These differences may also imply that national AI readiness could have different effects depending on digital connectivity on the local level, since national institutional capacity and city-level connectivity can be complementary sources of digital service provision. Hence, this study moderates the analysis.

Digital innovation ecosystems shape the conditions under which cities and institutions adopt new technologies. Digital Innovation Hubs support technological diffusion and capacity-building, while digital entrepreneurial ecosystems, digital culture and organisational readiness influence innovation outcomes and social sustainability (Gavkalova et al., 2024; Khatami et al., 2024; Suparna et al., 2025). Digital inclusion remains essential because the benefits of analytics, AI and digital services are unevenly distributed when citizens differ in access, capability and trust (Ruthvika & Hedau, 2025).

AI and digital tools are increasingly applied to specific urban and service management domains, but technical applications do not automatically yield better governance. AI-based waste classification, energy equity tools and smart feedback management can improve municipal systems and decision support (Kajda & Karwot, 2026; Kildei et al., 2025; Kirichok et al., 2025). Mobile social smart technologies and talent-related risks in smart-city companies further show that digital transformation depends on human capital, organisational competencies and participatory governance (Kostiushko et al., 2025; Titov & Kaukes, 2026).

The geopolitical and social dimensions of AI further show that Government AI Readiness is not only a technical or administrative variable. AI increasingly affects international competitiveness, technological

sovereignty and the strategic position of states, while public understanding of AI is shaped by education, expectations and perceptions of usefulness or risk (Neacșu et al., 2025; Pisiță & Zaharia, 2025). Smart mobility research also shows that AI is transforming urban transport, prediction, automation, and service personalisation, but these effects require governance frameworks that address safety, inclusiveness, accountability, and public acceptance (Nikitas et al., 2020).

Previous research confirms that AI, GovTech and smart-city development are interconnected, but the literature remains fragmented across technological, institutional, ethical, fiscal and citizen-experience perspectives. The common conclusion is that digital transformation creates public value only when supported by trustworthy institutions, transparent governance, digital inclusion and citizen-oriented service design. However, empirical evidence remains limited on whether national Government AI Readiness is systematically associated with measurable city-level digital governance and trust outcomes across countries, which defines the research gap addressed in this study.

This study aims to assess how national Government AI Readiness shapes city-level digital governance, citizen participation and trust-related outcomes across countries, thereby clarifying whether AI-related institutional capacity at the national level contributes to more transparent, participatory and trust-oriented smart-city governance.

3. METHODOLOGY

This study examines whether national readiness for artificial intelligence is associated with the development of digital governance and trust-related outcomes in smart cities. The empirical analysis combines city-level data from the IMD Smart City Index reports with country-level data from the Government AI Readiness Index. The Smart City data were collected from the IMD Smart City Index reports for 2020, 2021, 2023, 2024, 2025 and 2026, prepared by the International Institute for Management Development World Competitiveness Center, the Smart City Observatory, the Singapore University of Technology and Design and, in later editions, the World Smart Sustainable Cities Organisation (IMD WCC et al., 2020, 2021; IMD WCC & WEGO, 2023, 2024, 2025, 2026). The national AI readiness data were obtained from the Government AI Readiness Index dataset for 2020–2025 published by Oxford Insights (Oxford Insights, n.d.).

The unit of observation is a city-year. Since the Government AI Readiness Index is available at the country level, each city was matched to the country's AI readiness score. Therefore, GAIRI is not interpreted as a direct measure of AI implementation in a specific city. Instead, it is treated as a proxy for the national technological and institutional environment that may enable AI-supported digital transformation in urban governance. Because the Smart City and GAIRI datasets do not fully overlap in time, the main regression sample is restricted to years for which both city- and country-level data are available. The baseline specification uses 2020, 2021, 2023, 2024, and 2025, while the lagged specification excludes 2020 because the GAIRI data begin in 2020, so no one-year lag is available for that year.

The dependent variable is the Digital Urban Governance and Trust Index, constructed from twelve Smart City Index indicators that capture access to public information, anti-corruption perception, citizen participation, feedback mechanisms, responsiveness of online services, public Wi-Fi, internet speed and reliability, fiscal transparency, online voting, civic co-creation, digital administrative services and trust in authorities (Table 1). The index was calculated as the arithmetic mean of the selected components. Since all indicators are measured on a comparable 0–100 scale, the arithmetic mean yields a transparent, interpretable composite measure. As an additional robustness check, a PCA-based version of the index was also constructed from the same twelve standardised indicators. The first principal component was used as an

alternative dependent variable because it captures the dominant common dimension underlying the selected indicators.

Table 1

Construction of the digital urban governance and trust index

Dimension	Indicator included in the index
Access to public information	Information on local government decisions is easily accessible.
Anti-corruption perception	Corruption of city officials is not an issue of concern.
Citizen participation	Residents contribute to the decision-making of the local government.
Citizen feedback	Residents provide feedback on local government projects.
Responsiveness of digital services	Online reporting of city maintenance problems provides a speedy solution.
Public digital access	Free public Wi-Fi has improved access to city services.
Digital infrastructure	The current internet speed and reliability meet connectivity needs.
Fiscal transparency	Online public access to city finances has reduced corruption.
Digital democracy	Online voting has increased participation.
Civic co-creation	An online platform where residents can propose ideas has improved the city's life.
Digital administrative services	Processing identification documents online has reduced waiting times.
Trust in authorities	The availability of online information has increased trust in authorities.

Note: The index was calculated as the arithmetic mean of the selected indicators. A PCA-based version of the index was used as a robustness check.

The main explanatory variable is the Government AI Readiness Index. It reflects the extent to which national governments are prepared to use and govern artificial intelligence in public administration and broader public-sector transformation. The study also uses a lagged/previous available GAIRI value to test whether national AI readiness is associated with city-level digital governance outcomes with a lag. In addition, internet quality is introduced as a moderating variable, measured by the Smart City Index indicator “The current internet speed and reliability meet connectivity needs”. This variable captures the quality of local digital infrastructure and is used to test whether the relationship between AI readiness and digital urban governance depends on residents' connectivity conditions.

The empirical analysis tests the following hypotheses:

H1: Cities located in countries with higher Government AI Readiness demonstrate higher levels of digital urban governance and trust.

H2: National AI readiness is positively associated with subsequent city-level digital governance and trust outcomes when measured using a lagged specification.

H3: The relationship between AI readiness and smart-city governance is stronger in cities with better digital infrastructure, measured by internet speed and reliability.

The baseline empirical model is specified as follows:

$$Y_{ict} = \beta_1 GAIRI_{ct} + \mu_i + \lambda_t + \varepsilon_{ict}$$

where Y_{ict} denotes the Digital Urban Governance and Trust Index for city i , located in country c , in year t . $GAIRI_{ct}$ is the Government AI Readiness Index of country c in year t . Since GAIRI varies at the country-year level, it is not interpreted as a direct city-level measure of AI implementation. Instead, it captures the national technological, institutional and policy environment in which cities operate. μ_i represents city fixed effects, which control for time-invariant characteristics of cities, including geographical location, long-term institutional conditions, administrative traditions, urban structure and baseline level of development. λ_t

represents year fixed effects, which control for common shocks and global time trends affecting all cities in a given year. ε_{ict} is the error term.

The baseline analytical sample (Table A1, Appendix A) includes 641 city-year observations from 141 cities in 2020, 2021, 2023, 2024 and 2025. The year 2022 is excluded because the Smart City Index data are unavailable for that year, and 2026 is excluded from the main regression sample because the corresponding GAIRI data are unavailable. The lagged specification includes 516 city-year observations because the first available observation for each city/country cannot be assigned a lagged GAIRI value.

To test the delayed relationship between national AI readiness and city-level digital governance, the following lagged specification is estimated:

$$Y_{ict} = \beta_1 GAIRI_{ct-1} + \mu_i + \lambda_t + \varepsilon_{ict}$$

where $GAIRI_{ct-1}$ denotes the previous available value of the Government AI Readiness Index for country c. Because the Smart City panel is short and irregular, particularly due to the absence of 2022 Smart City data, this lagged model is interpreted as a robustness test of temporal ordering rather than as definitive causal evidence.

To test the moderating role of local digital infrastructure, the following interaction model is estimated:

$$Y_{ict} = \beta_1 GAIRI_{ct-1} + \beta_2 InternetQuality_{ict} + \beta_3 (GAIRI_{ct} \times InternetQuality_{ict}) + \mu_i + \lambda_t + \varepsilon_{ict}$$

where $InternetQuality_{ict}$ measures residents' assessment of whether internet speed and reliability meet connectivity needs in city i in year t. GAIRI and internet quality are mean-centred before constructing the interaction term. A positive and statistically significant interaction coefficient would indicate complementarity between national AI readiness and local digital infrastructure. A negative coefficient would instead suggest diminishing returns or a substitution effect.

The preferred estimation strategy is a two-way fixed-effects model with city- and year-fixed effects. This approach is appropriate because it controls for unobserved time-invariant differences between cities and common time-specific shocks. Standard errors are clustered at the country level because the main explanatory variable, GAIRI, varies at the country-year level rather than independently across individual cities. Clustering at the country level reduces the risk of overstating statistical significance when multiple cities within the same country share the same AI readiness score.

Several robustness checks are applied. First, the models are estimated using both current and lagged GAIRI. Second, standard errors are clustered at the country level to reflect the country-year structure of the main explanatory variable. Third, a PCA-based version of the Digital Urban Governance and Trust Index is used to verify that the results are not dependent on the index's simple-average construction. Fourth, interaction models are estimated to examine whether the relationship between national AI readiness and digital urban governance depends on local internet speed and reliability. Because internet speed and reliability are also included in the composite index, an additional robustness check recalculates the index after excluding this component. Fifth, component-level regressions are estimated for each index dimension to identify which aspects of digital urban governance are most closely associated with national AI readiness. Finally, Benjamini–Hochberg-adjusted p-values are calculated for the component-level analysis to account for multiple testing.

All calculations were conducted in RStudio using R version 4.4.0 (2024-04-24 ucrt), “Puppy Cup”. The main estimation procedures were implemented using the fixest package for two-way fixed effects models

with clustered standard errors. At the same time, data preparation and transformation were performed using the `dplyr`, `tidyr` and `readxl` packages. Principal component analysis was conducted using the base R `prcomp()` function, and graphical visualisations were prepared using the `ggplot2` package. Benjamini–Hochberg-adjusted p-values were calculated in R to account for multiple testing in the component-level analysis.

4. EMPIRICAL RESULTS AND DISCUSSION

4.1. Results

Figure 1 presents the average value of the Digital Urban Governance and Trust Index across the observed years. The figure is useful for identifying the general temporal pattern in city-level digital governance and trust-related outcomes. If the line shows an upward tendency, it suggests that digital governance, online public services, participation and trust-related indicators improved over the analysed period. If the changes are modest, the figure still confirms that the dependent variable varies over time, which justifies the use of panel models with year fixed effects. This descriptive evidence should be presented before the regression results because it helps readers understand the evolution of the main dependent variable before interpreting the econometric estimates.

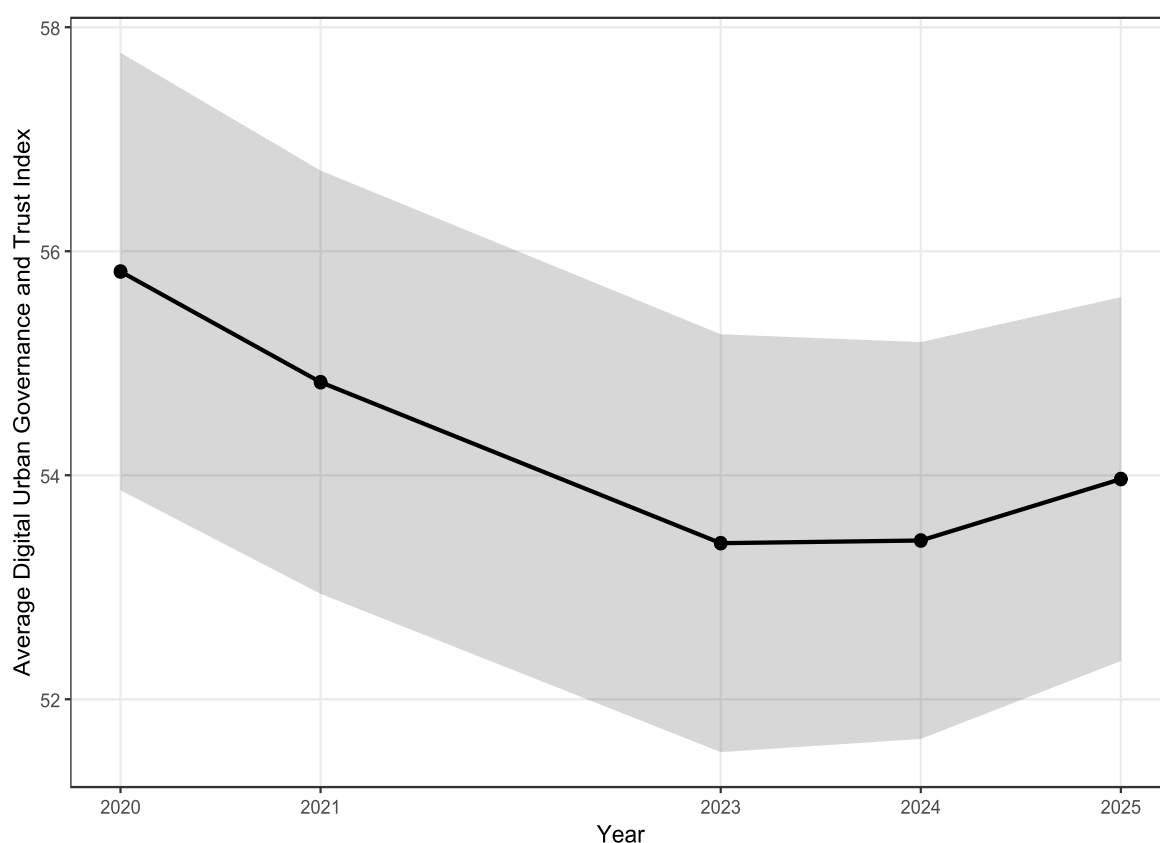


Figure 1. Average digital urban governance and trust index over time

Table 2 reports the results of the two-way fixed effects models examining the association between national Government AI Readiness and city-level smart-city outcomes. The first model uses the Digital Urban Governance and Trust Index as the dependent variable. In contrast, the second model uses the Smart Mobility Index as an alternative outcome to assess robustness. Both specifications include city and year

fixed effects, which means the estimates account for time-invariant differences across cities and common annual shocks affecting all cities in the sample.

Table 2

Two-way fixed effects estimates of the relationship between Government AI Readiness and smart-city outcomes

Variables	Model 1: Digital Urban Governance and Trust Index	Model 2: Smart Mobility Index
GAIRI	0.0958* (0.0387)	0.0344 (0.0438)
City fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Standard errors	Clustered by city	Clustered by city
Observations	641	641
R ²	0.97082	0.95865
Within R ²	0.02130	0.00208

Note: Clustered standard errors are reported in parentheses. Significance levels: * $p < 0.05$.

The results show a positive and statistically significant association between GAIRI and the Digital Urban Governance and Trust Index. The coefficient of GAIRI is 0.0958 and is significant at the 5% level. This means that, within the same city over time and after controlling for year-specific effects, a one-point increase in national Government AI Readiness is associated with approximately a 0.096-point increase in the Digital Urban Governance and Trust Index. In practical terms, a ten-point increase in GAIRI corresponds to about 0.96 points in the digital governance and trust index. Although the magnitude of the coefficient is moderate, the result supports the argument that national AI readiness may create a favourable institutional and technological environment for stronger digital urban governance, citizen participation and trust-related outcomes in smart cities.

By contrast, the coefficient of GAIRI in the Smart Mobility model is positive but statistically insignificant. This indicates that national AI readiness is not systematically associated with improvements in smart mobility outcomes, even after accounting for city- and year-fixed effects. This finding is conceptually important, as it suggests that Government AI Readiness is more closely related to governance-oriented and trust-related dimensions of smart-city development than to mobility-related urban services. Therefore, the results support the decision to focus the study on digital urban governance, participation, and trust rather than on the broader, more heterogeneous concept of smart-city development.

The high overall R² values in both models mainly reflect the inclusion of city-fixed effects, which capture persistent differences across cities. The within-R² values are more informative for interpreting GAIRI's explanatory power across cities over time. The within R² is 0.0213 in the Digital Urban Governance and Trust model and only 0.0021 in the Smart Mobility model. This confirms that changes in national AI readiness explain a small but meaningful share of within-city variation in governance and trust-related outcomes. At the same time, their explanatory power for smart mobility is very limited.

Table 3 presents the robustness check based on country-clustered standard errors. This specification is methodologically important because GAIRI is measured at the country-year level and then assigned to cities located in the corresponding country and year. Therefore, clustering standard errors at the country level provides a more conservative test of statistical significance than clustering only at the city level. The model includes both city and year fixed effects, allowing the analysis to control for unobserved time-invariant city characteristics and common year-specific shocks.

Table 3

Robustness check with country-clustered standard errors

Variables	Model 1: Digital Urban Governance and Trust Index	Model 2: Smart Mobility Index
GAIRI	0.0958* (0.0417)	0.0344 (0.0500)
City fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Standard errors	Clustered by country	Clustered by country
Observations	641	641
R ²	0.97082	0.95865
Within R ²	0.02130	0.00208

Note: Clustered standard errors are reported in parentheses. Significance level: * $p < 0.05$.

The results remain consistent with the baseline specification. GAIRI has a positive, statistically significant coefficient in the model, where the dependent variable is the Digital Urban Governance and Trust Index. The estimated coefficient is 0.0958 and remains significant at the 5% level after clustering standard errors by country. This means that a one-point increase in national Government AI Readiness is associated with approximately a 0.096-point increase in the city-level digital governance and trust index, holding constant city-specific characteristics and common annual effects. In substantive terms, a ten-point increase in GAIRI is associated with approximately a 0.96-point increase in the Digital Urban Governance and Trust Index.

By contrast, the coefficient of GAIRI in the Smart Mobility model is positive but statistically insignificant. This result confirms that the relationship between national AI readiness and smart-city development is not equally strong across all urban domains. National AI readiness appears to be more closely associated with governance-oriented outcomes, such as digital public services, transparency, citizen participation and trust in authorities, than with mobility-related outcomes. Thus, the country-clustered robustness check supports the main argument of the study: Government AI Readiness is conceptually and empirically more relevant for explaining digital urban governance and trust than for explaining smart mobility.

The high R² values in both models mainly reflect the inclusion of city-fixed effects, which capture persistent differences across cities. The within R² values are more informative for assessing the explanatory contribution of GAIRI to changes within cities over time. The within R² for the Digital Urban Governance and Trust model is 0.0213, compared with only 0.0021 for the Smart Mobility model. This further supports the interpretation that GAIRI explains a modest but meaningful part of within-city variation in governance and trust-related smart-city outcomes. At the same time, its explanatory power for smart mobility remains very limited.

Figure 2 illustrates the relationship between national Government AI Readiness and the Digital Urban Governance and Trust Index. The figure shows a positive association, indicating that cities located in countries with higher GAIRI scores tend to demonstrate stronger digital governance, citizen participation, transparency and trust-related outcomes. This visual pattern is consistent with the fixed-effects estimates reported in Tables 2 and 3, which show that GAIRI has a positive, statistically significant coefficient for the Digital Urban Governance and Trust Index. Therefore, Figure 2 provides descriptive support for the main empirical finding that national AI readiness is more closely associated with governance-oriented smart-city development than with broader smart-city performance.

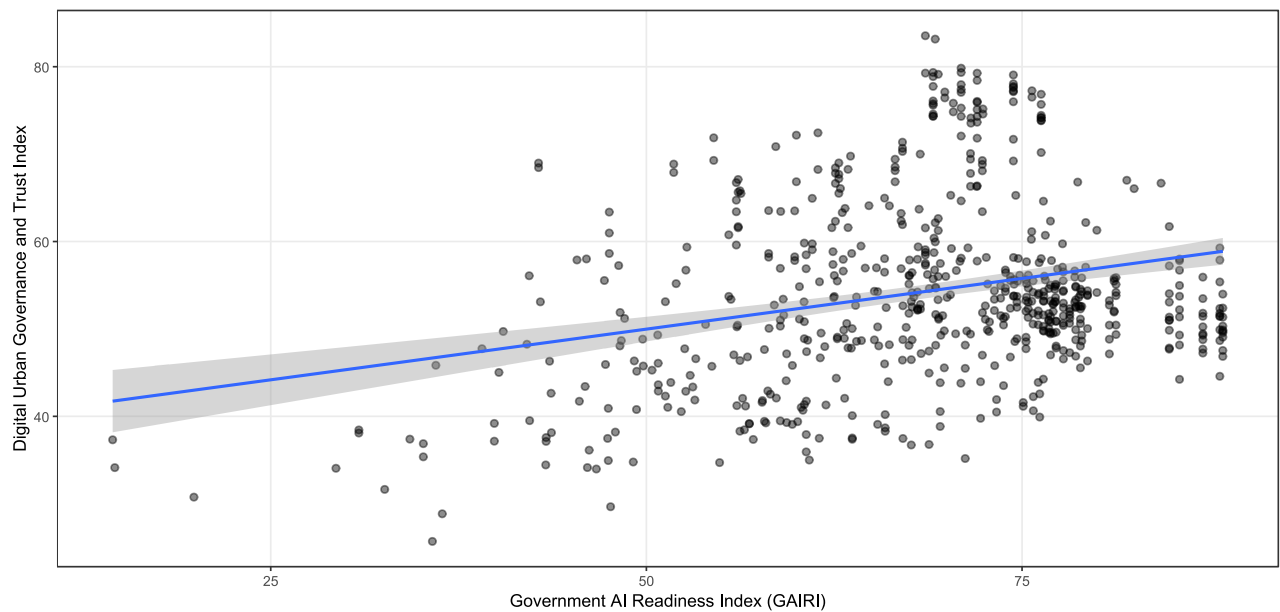


Figure 2. Relationship between GAIRI and digital governance

Table 4 presents the lagged specification, in which the previous available value of the national Government AI Readiness explains current smart-city outcomes. The number of observations decreases from 641 to 516 because the first observation for each city/country cannot be assigned a lagged GAIRI value. This specification is important because the effect of national AI readiness on urban governance is unlikely to be immediate. Instead, improvements in national digital capacity, institutional readiness, and AI-related public-sector infrastructure may take time to be reflected in city-level digital governance, participation, and trust-related outcomes.

Table 4

Lagged specification of the relationship between Government AI Readiness and smart-city outcomes

Variables	Model 3: Digital Urban Governance and Trust Index	Model 4: Smart Mobility Index
GAIRI lag	0.1156* (0.0455)	0.0869. (0.0482)
City fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Standard errors	Clustered by country	Clustered by country
Observations	516	516
R ²	0.97818	0.96457
Within R ²	0.03318	0.01246

Note: Clustered standard errors are reported in parentheses. Significance levels: * $p < 0.05$; . $p < 0.10$.

The results show that lagged GAIRI has a positive and statistically significant association with the Digital Urban Governance and Trust Index. The coefficient is 0.1156 and is significant at the 5% level. This means that a one-point increase in the previous available value of national Government AI Readiness is associated with an increase of approximately 0.116 points in the current Digital Urban Governance and Trust Index, after controlling for city fixed effects and year fixed effects. In practical terms, a 10-point increase in lagged GAIRI corresponds to about a 1.16-point increase in the governance and trust index. This result strengthens the study's main finding by suggesting that national AI readiness is associated with subsequent improvements in city-level digital governance, citizen participation, and trust-related outcomes.

The lagged coefficient for the Smart Mobility Index is also positive, but it is only marginally significant at the 10% level. This indicates that previous national AI readiness may have some delayed association with smart mobility outcomes, but the evidence is weaker than for digital governance and trust. The within R^2 is also higher for the Digital Urban Governance and Trust model than for the Smart Mobility model, at 0.0332 compared with 0.0125. This confirms that lagged GAIRI explains a larger share of within-city variation in governance- and trust-related outcomes than in mobility-related outcomes. Table 4 supports the argument that Government AI Readiness is more closely connected to the institutional and participatory dimensions of smart-city development than to the operational domain of urban mobility.

Table 5 reports the principal component analysis conducted for the twelve indicators used to construct the Digital Urban Governance and Trust Index. The first principal component explains 72.66% of the total variance, while the second component explains a further 10.74%. Together, the first two components account for 83.40% of the total variance. However, the dominant contribution of PC1 indicates that the selected variables have a strong common underlying structure and can be interpreted as measuring a shared latent dimension of digital urban governance, citizen participation, transparency and trust.

Table 5

Principal component analysis of the digital urban governance and trust indicators

Principal component	Standard deviation	Proportion of variance	Cumulative proportion
PC1	2.9529	0.7266	0.7266
PC2	1.1351	0.1074	0.8340
PC3	0.7446	0.0462	0.8802
PC4	0.6174	0.0318	0.9120
PC5	0.5076	0.0215	0.9335
PC6	0.4874	0.0198	0.9533
PC7	0.4289	0.0153	0.9686
PC8	0.3626	0.0110	0.9795
PC9	0.3141	0.0082	0.9878
PC10	0.2452	0.0050	0.9928
PC11	0.2178	0.0040	0.9967
PC12	0.1985	0.0033	1.0000

Note: PCA was conducted on the standardised indicators used to construct the Digital Urban Governance and Trust Index.

The high explanatory power of PC1 supports the use of a PCA-based alternative index as a robustness check. Since PC1 alone captures almost three-quarters of the total variation in the selected indicators, it provides a statistically grounded proxy for the common governance-and-trust component underlying the original simple-average index. This is important because it shows that the Digital Urban Governance and Trust Index is not merely an arbitrary aggregation of indicators but reflects a coherent empirical structure among the selected smart-city variables.

Table 6 presents the robustness results using the PCA-based version of the Digital Urban Governance and Trust Index. In Model 5, GAIRI is statistically significant at the 5% level. The estimated coefficient is -0.0271, with a country-clustered standard error of 0.0119. In Model 6, the lagged value of GAIRI is also statistically significant at the 5% level, with a coefficient of -0.0320 and a standard error of 0.0130. These results show that the relationship between national Government AI Readiness and the governance-and-trust dimension of smart-city development remains statistically significant when the dependent variable is constructed through PCA rather than as a simple average.

Table 6

Robustness check using the PCA-based digital urban governance and trust index

Variables	Model 5: PCA-based DUGTI	Model 6: PCA-based DUGTI, lagged GAIRI
GAIRI	-0.0271* (0.0119)	
GAIRI lag		-0.0320* (0.0130)
City fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Standard errors	Clustered by country	Clustered by country
Observations	641	516
Adjusted R ²	0.96195	0.96924
Within R ²	0.02136	0.03183

Note: Clustered standard errors are reported in parentheses. Significance level: * $p < 0.05$. The sign of a principal component is arbitrary; therefore, the direction of the coefficient should be interpreted together with the orientation of PC1 loadings.

The negative sign of the coefficients should be interpreted with caution because the sign of the first principal component is mathematically arbitrary. If PC1 is oriented in the opposite direction to the original Digital Urban Governance and Trust Index, the negative coefficients actually correspond to a positive association between Government AI Readiness and stronger digital governance outcomes. In other words, the statistical significance of GAIRI and lagged GAIRI confirms the robustness of the main result, while the sign depends on how the PCA score is oriented. For clearer substantive interpretation, the PCA-based index may be multiplied by -1 so that higher values correspond to stronger digital urban governance and trust. Under this reoriented version, the coefficients would be interpreted as positive associations of 0.0271 and 0.0320, respectively.

The PCA-based robustness check supports the baseline findings. The association between national AI readiness and digital urban governance remains statistically significant in both the contemporaneous and lagged specifications. Moreover, the lagged PCA model has a higher within-R² than the contemporaneous PCA model, 0.03183 versus 0.02136, consistent with the argument that the effects of national AI readiness on city-level governance and trust-related outcomes may emerge with a lag. Therefore, Table 6 strengthens the empirical conclusion that Government AI Readiness is linked to the institutional, participatory and trust-related dimensions of smart-city development.

Table 7 reports the moderation models testing whether the association between national Government AI Readiness and digital urban governance depends on the quality of city-level digital infrastructure, measured by internet speed and reliability. Models 7 and 8 use the baseline Digital Urban Governance and Trust Index and its reversed PCA-based version, respectively. Since internet speed and reliability are also components of the composite index, Models 9 and 10 provide an additional robustness check by recalculating the dependent variable after excluding this component. This verifies whether the moderation result is mechanically driven by the inclusion of the moderator in the dependent variable.

Table 7

Moderating role of internet speed and reliability in the relationship between Government AI readiness and digital urban governance

Variables	Model 7: DUGTI	Model 8: PCA-based DUGTI	Model 9: DUGTI excluding internet	Model 10: PCA-based DUGTI excluding internet
GAIRI, centred	0.0676. (0.0380)	0.0188. (0.0106)	0.0738. (0.0415)	0.0196. (0.0111)
Internet speed and reliability, centred	0.3383*** (0.0531)	0.1016*** (0.0147)	0.2781*** (0.0580)	0.0749*** (0.0153)
GAIRI × Internet speed and reliability	-0.0051* (0.0023)	-0.0015* (0.0007)	-0.0056* (0.0025)	-0.0015* (0.0007)
City fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Standard errors	Clustered by country	Clustered by country	Clustered by country	Clustered by country
Observations	641	641	641	641
Adjusted R ²	0.96988	0.97061	0.96583	0.96537
Within R ²	0.22185	0.24699	0.15421	0.15894

Note: Clustered standard errors are reported in parentheses. Significance levels: *** $p < 0.001$; * $p < 0.05$; . $p < 0.10$. GAIRI and internet speed and reliability were mean-centred before estimating the interaction models. In Models 8 and 10, the PCA-based indices were reversed so that higher values correspond to stronger digital urban governance and trust. Models 9 and 10 exclude the internet speed and reliability component from the dependent variable.

The results show that internet speed and reliability have a strong, positive and statistically significant association with digital urban governance in all specifications. In Model 7, a one-point increase in the internet speed and reliability indicator is associated with a 0.338-point increase in the Digital Urban Governance and Trust Index. After excluding internet speed and reliability from the dependent variable, the coefficient remains positive and highly significant in Model 9, although its magnitude decreases to 0.278. A similar pattern is observed for the PCA-based specifications: the coefficient is 0.1016 in Model 8 and 0.0749 in Model 10. These results confirm that local digital infrastructure is an important condition for stronger digital governance, online public services, participation and trust-related smart-city outcomes.

The coefficient of centred GAIRI is positive across all four models and marginally significant at the 10% level. This suggests that, when internet speed and reliability are at the sample mean, higher national AI readiness is weakly associated with stronger digital urban governance outcomes. More importantly, the interaction between GAIRI and internet speed and reliability is negative and statistically significant in all specifications, including the robustness models that exclude internet speed from the dependent variable. This confirms that the moderation result is not mechanically driven by the inclusion of internet quality in the composite index.

The negative interaction does not support the original expectation that national AI readiness would have a stronger effect in cities with better digital infrastructure. Instead, the evidence points to a diminishing-return pattern: the association between national AI readiness and digital urban governance becomes weaker as city-level internet speed and reliability increase. One possible interpretation is that cities with already strong digital infrastructure may have internalised many of the benefits associated with national AI readiness. In contrast, cities with weaker or average connectivity may benefit more from national-level institutional and technological readiness as an enabling environment for digital transformation. Therefore, Hypothesis H3 is not supported in its original complementarity form; the results instead suggest a substitution or diminishing-return effect between national AI readiness and city-level internet reliability.

Table 8 presents the bivariate correlations between GAIRI and the individual components of the Digital Urban Governance and Trust Index. The strongest positive association is observed for the perception that corruption among city officials is not a concern, with Pearson and Spearman correlations of 0.551 and 0.528, respectively. This suggests that countries with higher Government AI Readiness tend to have cities where respondents perceive fewer corruption problems in local government. Strong positive correlations are also found for feedback on local government projects, participation in decision-making, access to information about local government decisions, and online voting. These results indicate that the aggregate relationship between GAIRI and the Digital Urban Governance and Trust Index is mainly driven by transparency, anti-corruption perception, civic participation and digital democratic engagement.

Table 8

Correlations between GAIRI and the components of the digital urban governance and trust index

Component	Pearson r	Pearson p-value	Adjusted Pearson p- value	Spearman rho	Spearman p-value	Adjusted Spearman p- value
Local government information	0.364	<0.001	<0.001	0.258	<0.001	<0.001
Corruption is not a concern	0.551	<0.001	<0.001	0.528	<0.001	<0.001
Decision-making participation	0.414	<0.001	<0.001	0.312	<0.001	<0.001
Feedback on projects	0.424	<0.001	<0.001	0.321	<0.001	<0.001
Online reporting of problems	0.066	0.095	0.095	-0.070	0.076	0.091
Free public Wi-Fi	0.289	<0.001	<0.001	0.122	0.002	0.003
Internet speed and reliability	0.203	<0.001	<0.001	0.060	0.131	0.143
Online access to city finances	0.168	<0.001	<0.001	0.135	0.001	0.001
Online voting	0.305	<0.001	<0.001	0.253	<0.001	<0.001
Online platform for ideas	0.110	0.005	0.007	0.019	0.630	0.630
Online ID processing	-0.079	0.045	0.049	-0.266	<0.001	<0.001
Online information and trust	-0.106	0.007	0.009	-0.178	<0.001	<0.001

Note: The table reports Pearson and Spearman correlations between GAIRI and each component of the Digital Urban Governance and Trust Index. Adjusted p-values were calculated using the Benjamini–Hochberg correction—number of observations: 641. Values below 0.001 are reported as $p < 0.001$.

The results are weaker for more operational or service-oriented components. Online reporting of city maintenance problems is not statistically significant after adjustment, while internet speed and reliability are significant in the Pearson correlation but not in the Spearman correlation. This suggests that the relationship between GAIRI and digital infrastructure is less stable than the relationship with governance and participation indicators. Online access to city finances and free public Wi-Fi show positive, statistically significant correlations, but their magnitudes are moderate. The online platform for ideas is weakly significant in the Pearson test but not significant in the Spearman test, suggesting limited robustness.

Two components show negative correlations with GAIRI: online ID processing and the perceived effect of online information on trust in authorities. This finding should be interpreted cautiously, as these

are simple bivariate associations and do not control for city fixed effects, year effects or broader institutional differences. One possible explanation is that cities in countries with higher AI readiness may have higher citizen expectations for public-sector digitalisation, leading respondents to be more critical of administrative services and trust-related outcomes. Overall, Table 8 supports the central argument that national AI readiness is most closely related to transparency, participation and governance-oriented smart-city dimensions, rather than uniformly improving all digital service indicators.

Table 9 decomposes the aggregate Digital Urban Governance and Trust Index into its individual components and estimates the association between GAIRI and each component separately. The results show that national Government AI Readiness is most strongly and robustly associated with governance, transparency and participation-related indicators. The largest coefficient is observed for the perception that corruption among city officials is not a concern, where a one-point increase in GAIRI is associated with a 0.675-point increase in the component score. Strong and statistically significant associations are also found for residents' feedback on local government projects, participation in local decision-making, accessibility of information on local government decisions and online voting. These results remain significant after Benjamini–Hochberg adjustment, indicating they are not merely due to multiple testing.

Table 9
Component-level fixed effects estimates of the relationship between GAIRI and digital urban governance indicators

Component	GAIRI coefficient	Standard error	t-value	p-value	Adjusted p-value	Within R ²	Significance
Feedback on projects	0.425	0.084	5.032	<0.001	<0.001	0.185	***
Decision-making participation	0.435	0.095	4.558	<0.001	<0.001	0.176	***
Corruption is not a concern	0.675	0.165	4.097	<0.001	<0.001	0.310	***
Local government information	0.343	0.087	3.945	<0.001	<0.001	0.137	***
Online voting	0.321	0.099	3.245	0.002	0.004	0.094	**
Free public Wi-Fi	0.275	0.140	1.967	0.053	0.106	0.087	.
Internet speed and reliability	0.162	0.100	1.626	0.108	0.186	0.043	
Online access to city finances	0.194	0.132	1.474	0.145	0.217	0.029	
Online information and trust	-0.120	0.129	-0.931	0.355	0.442	0.010	
Online platform for ideas	0.122	0.135	0.906	0.368	0.442	0.012	
Online ID processing	-0.075	0.121	-0.618	0.538	0.587	0.007	
Online reporting of problems	0.075	0.150	0.504	0.616	0.616	0.005	

Note: The table reports two-way fixed-effects estimates for each component of the Digital Urban Governance and Trust Index. All models include city fixed effects and year fixed effects. Standard errors are clustered at the country level. Adjusted p-values were calculated using the Benjamini–Hochberg correction. Number of observations in each model: 641. Significance levels: *** $p < 0.001$; ** $p < 0.01$; . $p < 0.10$.

The component-level analysis clarifies the mechanism behind the positive aggregate relationship between GAIRI and the Digital Urban Governance and Trust Index. The effect is not evenly distributed across all digital services. Instead, it is concentrated in the institutional and participatory dimensions of smart-city governance, especially anti-corruption perceptions, public information, citizen feedback, and

democratic participation. By contrast, more operational or service-specific components, such as internet speed and reliability, online access to city finances, online ID processing, online reporting of maintenance problems, and platforms for proposing ideas, are not statistically significant in the fixed-effects models. Free public Wi-Fi shows only marginal significance in the unadjusted model and becomes insignificant after correction for multiple testing. Therefore, the results suggest that national AI readiness is more closely linked to cities' governance capacity than to all forms of digital service provision.

Table 9 strengthens the interpretation of the main findings. The positive association between GAIRI and digital urban governance is mainly driven by indicators of transparency, accountability, and citizen participation rather than by technical infrastructure alone. This supports the conceptual argument that Government AI Readiness should be understood as an enabling institutional environment for smart governance, rather than as a direct determinant of every smart-city technology or digital service.

Table 10 presents the component-level lagged fixed-effects estimates, allowing the analysis to identify which specific dimensions of digital urban governance respond to prior national Government AI Readiness. The results show that lagged GAIRI is most strongly associated with residents' participation in local decision-making. The coefficient is positive and statistically significant at the 0.1% level, and it remains significant after Benjamini–Hochberg adjustment. This suggests that higher prior national AI readiness is associated with stronger participatory outcomes at the city level, particularly in terms of citizens' involvement in local government decision-making processes.

Table 10

Component-level lagged fixed effects estimates of the relationship between GAIRI and digital urban governance indicators

Component	GAIRI lag coefficient	Standard error	t-value	p-value	Adjusted p-value	Within R ²	Significance
Decision-making participation	0.275	0.068	4.08	<0.001	0.001	0.070	***
Local government information	0.164	0.064	2.57	0.012	0.050	0.032	*
Corruption not a concern	0.188	0.073	2.57	0.013	0.050	0.032	*
Online platform for ideas	0.144	0.064	2.25	0.028	0.083	0.025	*
Online ID processing	0.111	0.060	1.84	0.070	0.165	0.018	.
Feedback on projects	0.113	0.064	1.76	0.083	0.165	0.017	.
Internet speed and reliability	0.075	0.056	1.33	0.188	0.312	0.009	
Online information and trust	0.073	0.057	1.27	0.208	0.312	0.003	
Online reporting of problems	0.068	0.066	1.03	0.307	0.410	0.006	
Online access to city finances	0.076	0.082	0.93	0.355	0.426	0.007	
Free public Wi-Fi	0.048	0.060	0.81	0.424	0.444	0.003	
Online voting	0.053	0.069	0.77	0.444	0.444	0.003	

Note: The table reports two-way fixed-effects estimates for each component of the Digital Urban Governance and Trust Index, using lagged GAIRI as the explanatory variable. All models include city fixed effects and year fixed effects. Standard errors are clustered at the country level. Adjusted p-values were calculated using the Benjamini–Hochberg correction. Number of observations in each model: 516. Significance levels based on unadjusted p-values: *** $p < 0.001$; * $p < 0.05$; . $p < 0.10$.

The lagged results also show positive, statistically significant associations between access to information on local government decisions and the perception that corruption among city officials is not a major concern. Both effects are significant at the 5% level, with adjusted p-values close to 0.05. This supports the argument that national AI readiness can contribute to city-level governance outcomes by fostering transparency, accountability, and institutional trust. The online platform for proposing ideas is also

positive and significant in the unadjusted test, although its adjusted p-value rises above the conventional 5% threshold. Therefore, this result should be interpreted as suggestive rather than fully robust after correction for multiple testing.

By contrast, several operational or service-oriented indicators do not show statistically significant lagged associations with GAIRI. These include internet speed and reliability, online reporting of city maintenance problems, online access to city finances, free public Wi-Fi and online voting. This indicates that previous national AI readiness is not uniformly translated into all types of smart-city services. Instead, its delayed association is more visible in institutional and participatory dimensions of urban governance than in infrastructure- or service-delivery indicators. Overall, Table 10 reinforces the main conclusion of the study: Government AI Readiness is most relevant for explaining digital governance, transparency and citizen participation in smart cities, rather than all smart-city components equally.

Figure 3 decomposes the aggregate relationship between GAIRI and digital urban governance into individual governance components. The figure shows that the strongest positive associations are concentrated in transparency, accountability, and participation-related dimensions, especially corruption not being a concern, residents' participation in local decision-making, feedback on local government projects, access to information about local government decisions, and online voting. At the same time, more operational or service-specific components show weaker or statistically insignificant relationships. This visual evidence complements Tables 9 and 10 by demonstrating that the aggregate effect of GAIRI is not evenly distributed across all digital services but is mainly driven by institutional and participatory aspects of smart-city governance.

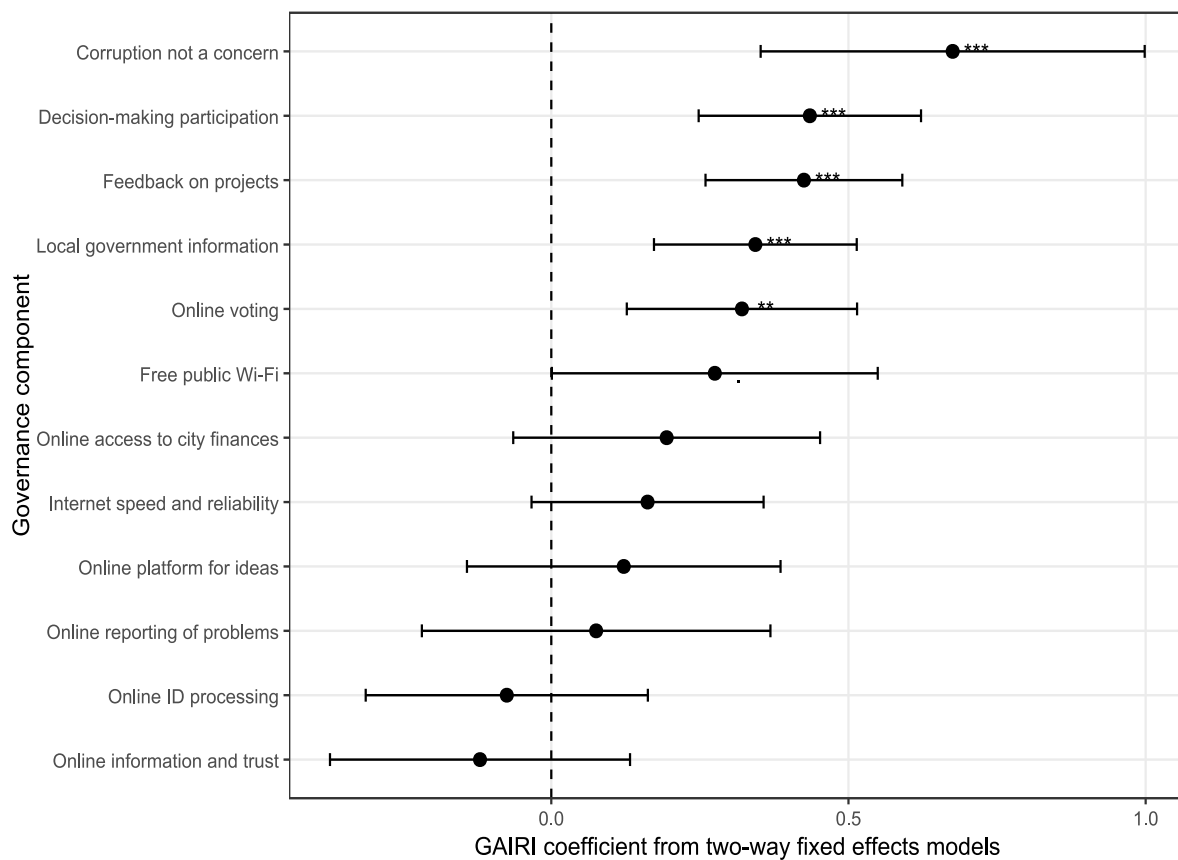


Figure 3. Relationship between GAIRI and individual governance components

4.2. Discussion

The findings confirm that national Government AI Readiness is positively associated with city-level digital urban governance and trust-related outcomes, supporting the argument that AI readiness should be understood as a broader institutional and technological enabling environment rather than a purely technical indicator. The baseline coefficient of GAIRI is positive and statistically significant for the Digital Urban Governance and Trust Index (0.0958). At the same time, the relationship remains robust after clustering standard errors at the country level and in the lagged specification (0.1156). This is consistent with the literature suggesting that AI readiness and GovTech capacity depend on institutional preparedness, organisational competences, ethical governance and the ability of public institutions to transform data and technologies into public value (Abdullayev et al., 2026; Kuzior et al., 2026; Zhidebekkyzy et al., 2026). The PCA results further support the conceptual coherence of the constructed index, as the first principal component explains 72.66% of the total variance, confirming that the selected indicators reflect a common governance-and-trust dimension. This corresponds to previous findings that e-government and GovTech development can improve public administration, quality of life and public-sector outcomes when embedded in effective institutional frameworks (Lyeonov et al., 2026a; Lyeonov et al., 2026b; Vasylieva et al., 2026).

The component-level results show that the positive association between GAIRI and digital urban governance is mainly driven by transparency, accountability and participation-related indicators rather than by all smart-city services equally. The strongest fixed-effects association is observed for the perception that corruption is not a concern (0.675), followed by participation in decision-making (0.435), feedback on local government projects (0.425), access to information on local government decisions (0.343) and online voting (0.321). This finding supports the literature claiming that smart-city governance is not limited to infrastructure, sensors, or platforms but is closely connected to citizen participation, accountability, public trust, and administrative responsiveness (Kuzior et al., 2023; Eik et al., 2026; Ylipulli et al., 2025). It also corresponds to studies showing that digital transparency and public-sector reforms can improve credibility and governance quality, but only when supported by institutional safeguards and accountability mechanisms (Maisyarah, 2026; Ntuli et al., 2025; Ugulava, 2026). The weaker or insignificant results for several operational indicators, such as online reporting, online ID processing and online access to city finances, suggest that national AI readiness does not automatically improve all types of digital public services. Instead, its effects appear more visible where digital tools are directly linked to transparency, participation and institutional trust.

The results also clarify that the relationship between Government AI Readiness and smart-city development is not uniform across urban domains. GAIRI is not significantly associated with the Smart Mobility Index in the baseline model (0.0344), while the lagged smart mobility coefficient is only marginally significant (0.0869), indicating that national AI readiness is more relevant for governance-oriented outcomes than for mobility-related services. This finding complements the smart mobility literature, which emphasises that AI can transform transport systems, prediction, automation and service personalisation, but also requires domain-specific governance frameworks and public acceptance (Nikitas et al., 2020). The moderation analysis provides an additional nuance: internet speed and reliability have a strong, direct, positive association with digital urban governance, but the interaction between GAIRI and internet reliability is negative and statistically significant, including in the robustness model that excludes internet from the dependent variable (-0.0056). This does not support the initial complementarity assumption and instead suggests a diminishing-return effect, where cities with weaker or average digital infrastructure may benefit more from national AI readiness than already digitally advanced cities. This result is consistent with the literature on uneven digital readiness, which shows that digital transformation depends on disparities in

infrastructure, skills, institutional preparedness and socio-economic inclusion (Meidute-Kavaliauskiene et al., 2026; Valaskova et al., 2025a; Valaskova et al., 2025b).

The study has several limitations that open directions for future research. First, the analysis is based on an unbalanced panel with a relatively short time period, which limits the ability to make strong causal claims and should be interpreted as evidence of association rather than definitive causality. Second, GAIRI is measured at the country level and assigned to cities, so it captures the national institutional and technological environment rather than direct city-level AI implementation. Third, the Smart City Index indicators are perception-based, which is valuable for studying trust and citizen experience but may also reflect differences in expectations across countries and cities. Fourth, the absence of Smart City data for 2022 creates an irregular panel structure, making the lagged specification a robustness test of temporal ordering rather than a fully causal dynamic model. Future research could extend the time period, include direct city-level indicators of AI adoption, compare different regions or income groups, apply causal identification strategies where possible, and examine how specific AI governance frameworks, data-protection regimes and digital inclusion policies shape the relationship between national AI readiness and smart-city governance outcomes.

5. CONCLUSION

This study aimed to clarify whether national Government AI Readiness contributes to stronger digital urban governance in smart cities, with particular attention to transparency, citizen participation, online public service responsiveness and trust in authorities. Rather than treating smart-city development as a purely technological phenomenon, the research examined whether AI-related institutional and technological readiness at the national level creates an enabling environment for more participatory, accountable and trust-oriented urban governance.

The empirical analysis combined city-level data from the IMD Smart City Index with country-level data from the Government AI Readiness Index. The final baseline sample included 641 city-year observations covering 141 cities across 71 countries/economies in 2020, 2021, 2023, 2024 and 2025. The main dependent variable was the Digital Urban Governance and Trust Index, constructed from twelve Smart City Index indicators. The study applied two-way fixed effects models with city- and year-fixed effects, country-clustered standard errors, lagged specifications, PCA-based robustness checks, interaction models, and component-level regressions with Benjamini–Hochberg-adjusted p-values.

The results show that Government AI Readiness is positively and statistically significantly associated with the Digital Urban Governance and Trust Index: the baseline coefficient is 0.0958, indicating that a 10-point increase in GAIRI corresponds to approximately a 0.96-point increase in digital governance and trust outcomes. By contrast, the coefficient for Smart Mobility is positive but statistically insignificant at 0.0344, confirming that national AI readiness is more closely related to governance-oriented smart-city outcomes than to mobility-related urban services. The lagged specification strengthens this conclusion, as the coefficient of lagged GAIRI rises to 0.1156 and remains significant at the 5% level. In contrast, the corresponding coefficient for Smart Mobility is only marginally significant at 0.0869. The PCA results confirm the internal coherence of the Digital Urban Governance and Trust Index, with the first principal component explaining 72.66% of the total variance and the first two components explaining 83.40%; the PCA-based regressions also remain statistically significant in both contemporaneous and lagged specifications. The moderation analysis shows that internet speed and reliability are strongly and positively associated with digital urban governance, with coefficients of 0.3383 in the baseline model and 0.2781 after excluding internet speed from the dependent variable. In contrast, the negative interaction coefficients of -0.0051 and -0.0056 indicate a diminishing-return effect rather than complementarity between national AI readiness and local internet reliability.

The findings have several policy implications. Governments should not treat AI readiness solely as a matter of technological investment, data infrastructure, or digital innovation capacity, but as part of a broader institutional framework supporting transparent, accountable, and participatory governance. National AI strategies should therefore be more closely linked to local digital governance agendas, including open access to public information, online feedback systems, participatory decision-making tools, anti-corruption transparency, and digital channels for citizen engagement. The results also suggest that cities with weaker or average digital infrastructure may benefit particularly from national AI readiness, indicating that national policies should support capacity-building and digital inclusion at the urban level rather than focusing solely on already advanced cities. At the same time, the strong positive role of internet speed and reliability confirms that local digital infrastructure remains a necessary condition for effective smart governance; therefore, investments in connectivity, interoperability, public-sector data systems and citizen-facing digital services should be combined with safeguards for transparency, accountability, privacy and trust.

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REFERENCES

- Abdullayev, K., Rakhimzhanova, K., Avetikyan, A., Zolkover, A., Danileviča, A., Povoroznyk, M., & Zhou, Y. (2026). AI ecosystem pillars and economic growth: Implications for knowledge economy architecture from AI vibrancy subindices. *Knowledge and Performance Management*, 10(1), 66–87. [https://doi.org/10.21511/kpm.10\(1\).2026.06](https://doi.org/10.21511/kpm.10(1).2026.06)
- Allam, Z., & Dhunny, Z. A. (2019). On big data, artificial intelligence and smart cities. *Cities*, 89, 80–91. <https://doi.org/10.1016/j.cities.2019.01.032>
- Allam, Z., Sharifi, A., Bibri, S. E., Jones, D. S., & Krogstie, J. (2022). The Metaverse as a Virtual Form of Smart Cities: Opportunities and Challenges for Environmental, Economic, and Social Sustainability in Urban Futures. *Smart Cities*, 5(3), 771–801. <https://doi.org/10.3390/smartcities5030040>
- Aliyeva, Z. (2026). Governmental Policy in Preventing Crime Against Health and Personal Safety: Bibliometric and Trend Analysis. *Health Economics and Management Review*, 7(1), 110–132. <https://doi.org/10.61093/hem.2026.1-06>
- Bieda, A., Kazak, J. K., & van Hoof, J. (2026). Who benefits from urban revitalisation? Between property value and quality of life. *Indoor and Built Environment*, 35(6), 763–767. <https://doi.org/10.1177/1420326X261452015>
- Burkett, M. G., & Recuero Virto, N. (2025). Exploring the Role of Innovation and Perceived Security in Contactless Technology Adoption: Evidence from Contactless Travel Services. *Journal of Tourism and Services*, 16(31), 220–244. <https://doi.org/10.29036/e68ww460>
- Crăciun, M.A., Dudian, M., and Lazăr, D.A. (2025). Nudging digital transformation: behavioral economics approaches to e-government adoption in the European Union with implications for Romania. *Administratie si Management Public*, 44, 60–74. <https://doi.org/10.24818/amp/2025.44-04>
- Eik, M., Prokopenko, O., Titov, E., Koldovskiy, A., Omelyanenko, V., Danileviča, A., & Demikhov, O. (2026). Ethics, Transparency, and Social Trust in Smart Cities: Balancing Privacy and Surveillance. *Business Ethics and Leadership*, 10(1), 295–322. [https://doi.org/10.61093/bel.10\(1\).295-322.2026](https://doi.org/10.61093/bel.10(1).295-322.2026)
- El Massaoudi, E. M., El Hammoui, A., Seghyar, N., & El Ouali, A. (2025). Digital transformation and improvement of management control: Empirical study in financial institutions. *Investment Management and Financial Innovations*, 22(3), 455–469. [https://doi.org/10.21511/imfi.22\(3\).2025.34](https://doi.org/10.21511/imfi.22(3).2025.34)
- Eriqat, I. O. A., Khatib, S. F. A., Abbas, A. F., & Fayad, A. A. S. (2025). Does digital payments reduce the risk of money laundering? The role of financial sector development. *Journal of Business Economics and Management*, 26(4), 860–879. <https://doi.org/10.3846/jbem.2025.24402>

- European Commission. (2025). *2025 State of the Digital Decade package*. <https://digital-strategy.ec.europa.eu/en/policies/2025-state-digital-decade-package>
- European Commission. (2026). *Europe's Digital Decade*. <https://digital-strategy.ec.europa.eu/en/policies/europes-digital-decade>
- Filipova, M., Djakona, A., & Haram, V. (2025). Determinants of Government Expenditures in the Baltic States. *Financial Markets, Institutions and Risks*, 9(2), 66-89. [https://doi.org/10.61093/fmir.9\(2\).66-89.2025](https://doi.org/10.61093/fmir.9(2).66-89.2025)
- Gavkalova, N., Gładysz, B., Quadri, W., Sassanelli, C., Asplund, F., Ramli, M. R., Detzner, P., Deville, J., Dragić, M., Van Erp, T., Georgescu, A., Price, L., Robertson, G., & Terzi, S. (2024). Digital Innovation Hubs and portfolio of their services across European economies. *Oeconomia Copernicana*, 15(1), 59-94. <https://doi.org/10.24136/oc.2757>
- Ghonim, A. (2026). Do lean practices and business process reengineering improve transparency, responsiveness, and citizen satisfaction? Evidence from Cairo and Giza local government units in Egypt. *Problems and Perspectives in Management*, 24(1), 305-317. doi: 10.21511/ppm.24(1).2026.21
- Grębosz-Krawczyk, M., and Zakrzewska-Bielawska, A. (2024). How to manage a smart city brand image, taking into account residents' perspective? *Administrative Management Public*, 43, 138-157. <https://doi.org/10.24818/amp/2024.43-08>
- Haley, P. (2025). Artificial Intelligence and Ethical Dimensions of Automated Traffic Enforcement: Implications for Public Health, Healthcare Equity, and Social Justice. *Health Economics and Management Review*, 6(2), 32-49. <https://doi.org/10.61093/hem.2025.2-03>
- Hedegaard, M., Kuzior, A., Tverezovska, O., Hrytsenko, Kolomiets, S. (2024). Smart City Projects Financing. *SocioEconomic Challenges*, 8(1), 286-309. [https://doi.org/10.61093/sec.8\(1\).286-309.2024](https://doi.org/10.61093/sec.8(1).286-309.2024)
- Hossain, MB., Rahman, MU., Čater, T., Vasa, L. (2025). Determinants of SMEs' strategic entrepreneurial innovative digitalization: examining the mediation role of human capital. *European Journal of Innovation Management*, 28(7), 2733-2760. <https://doi.org/10.1108/EJIM-02-2024-0176>
- Ingaldi, M., & Ulewicz, R. (2025). The role of ai in digital leadership – new competencies of leaders. *Polish Journal of Management Studies*, 31(2), 106-122. <https://doi.org/10.17512/pjms.2025.31.2.07>
- International Institute for Management Development World Competitiveness Center (IMD WCC), Smart City Observatory, & Singapore University of Technology and Design (SUTD). (2020). *Smart City Index 2020: A tool for action, an instrument for better lives for all citizens*. IMD World Competitiveness Center. <https://www.imd.org/smart-city-observatory>
- International Institute for Management Development World Competitiveness Center (IMD WCC), Smart City Observatory, & Singapore University of Technology and Design (SUTD). (2021). *Smart City Index 2021: A tool for action, an instrument for better lives for all citizens*. IMD World Competitiveness Center. https://imd.widen.net/s/9xzlz28bd/smart_city_ranking_2021
- International Institute for Management Development (IMD) World Competitiveness Center (IMD WCC), & World Smart Sustainable Cities Organisation (WEGO) (2023). *IMD Smart City Index Report 2023*. IMD World Competitiveness Center. <https://we-gov.org/portfolio/wego-imd-smart-cities-index-2023/>
- International Institute for Management Development (IMD) World Competitiveness Center (IMD WCC), & World Smart Sustainable Cities Organisation (WEGO) (2024). *IMD Smart City Index Report 2024*. IMD World Competitiveness Center. https://www.coit.es/sites/default/files/imd_-smartcityindex-2024-full-report.pdf
- International Institute for Management Development (IMD) World Competitiveness Center (IMD WCC) (2025). *IMD Smart City Index Report 2025*. IMD World Competitiveness Center. <https://ent.news/2025/4/1529.pdf>
- International Institute for Management Development (IMD) World Competitiveness Center (IMD WCC) (2026). *IMD Smart City Index Report 2026*. IMD World Competitiveness Center. <https://imd.widen.net/view/pdf/697v9hkavp/SmartCityIndex-2026.pdf?t.download=true&u=dnnfeq>
- Juhászová, Z., Brychko, A., Mosin, O., Povoroznyk, M., & Zakharkina, L. (2026). The role of GovTech in building an ethical, transparent, equitable, digital, and secure state during wartime and post-war reconstruction: Bibliometric insights from international experience. *Business Ethics and Leadership*, 10(2), 1-31. [https://doi.org/10.61093/bel.10\(2\).1-31.2026](https://doi.org/10.61093/bel.10(2).1-31.2026)

- Kafoe, A. S., Foh, B. M., & Kafoe, M. A. (2026). Beyond Panacea: Digital Governance, AI, and the Political Economy of Public Benefit in African Development. *Public Governance, Regulation and Law*, 2(2), 1–20. [https://doi.org/10.61093/pgrl.2\(2\).1-20.2026](https://doi.org/10.61093/pgrl.2(2).1-20.2026)
- Kajda, K., & Karwot, J. (2026). AI-Driven Waste Classification and Smart Management in Poland's Industry 4.0 Framework: CNN-Based Solutions for Sustainable Municipal Systems. *Green Transition and Sustainable Development*, 2(1), 65–87. [https://doi.org/10.61093/gtsd.2\(1\).65-87.2026](https://doi.org/10.61093/gtsd.2(1).65-87.2026)
- Kaźmierczak, B., & Palicki, S. (2021). How to combine descriptive and normative approaches in participatory urban planning: An experimental mixed-method implemented in the downtown district of Poznań, Poland. *Miscellanea Geographica*, 25(2), 72–84. <https://doi.org/10.2478/mgrsd-2020-0057>
- Khatami, F., Ferraris, A., Palmucci, D. N., & Dabić, M. (2024). Impact Analysis of the Digital Entrepreneurial Ecosystem to Improve the Tourism Industry and Social Sustainability. *Journal of Tourism and Services*, 15(29), 176–205. <https://doi.org/10.29036/jots.v15i29.831>
- Khodan, M., & Burtnyak, I. (2025). Local budgets in Ukraine during wartime: Challenges, adaptation strategies, and the role of participatory budgeting. *Public and Municipal Finance*, 14(4), 77–93. [https://doi.org/10.21511/pmf.14\(4\).2025.06](https://doi.org/10.21511/pmf.14(4).2025.06)
- Kildei, A., Tumpach, M., & Shafranov, K. (2025). Artificial Intelligence for Smart Customer Feedback Management: Improving Content Analysis Approaches. *Knowledge Economy and Lifelong Learning*, 1(1), 48–65. [https://doi.org/10.61093/kell.1\(1\).48-65.2025](https://doi.org/10.61093/kell.1(1).48-65.2025)
- Kirichok, O., Orlovska, Y., Zhanseitova, G., Oriekhova, A., Babaiev, D., Havrylenko, O., & Vasylieva, T. (2025). Bridging digital innovation and energy justice: The role of artificial intelligence in advancing energy equity. *Environmental Economics*, 16(4), 166–181. [https://doi.org/10.21511/ee.16\(4\).2025.11](https://doi.org/10.21511/ee.16(4).2025.11)
- Kostiushko, I., Juhászová, S., & Dyvynska, Yu. (2025). Mobile Social Smart Technologies to Optimise Customer Support Services. *Knowledge Economy and Lifelong Learning*, 1(1), 66–82. [https://doi.org/10.61093/kell.1\(1\).66-82.2025](https://doi.org/10.61093/kell.1(1).66-82.2025)
- Kuzior, A., Hrytsenko, L., Trojanek, M., & Oláh, J. (2026). GovTech as a “technological - institutional – human” system: Non-linear effects on social progress and human well-being. *Human Technology*, 22(1), 198–218. <https://doi.org/10.14254/1795-6889.2026.22-1.10>
- Kuzior, A., Marhasova, V., Zozulakova, V., Kočnerova, M., Koibichuk, V., Ryabushka, L., & Vasylieva, T. (2025). Smart city rankings and startup ecosystems: An empirical analysis of inverse correlation across 77 smart cities. *Problems and Perspectives in Management*, 23(2), 409–422. [https://doi.org/10.21511/ppm.23\(2\).2025.29](https://doi.org/10.21511/ppm.23(2).2025.29)
- Kuzior, A., Pakhnenko, O., Tiutiunyk, I., & Lyeonov, S. (2023). E-Governance in Smart Cities: Global Trends and Key Enablers. *Smart Cities*, 6(4), 1663–1689. <https://doi.org/10.3390/smartcities6040078>
- Landa-Oregi, I., Gonzalez-Ochoantesana, I., & Anaya-Rodriguez, M. (2025). Understanding the engagement of citizens in the regeneration of urban spaces through human-centered design: a systematic literature review. *Cities* 2025; 168: 106414. <https://doi.org/10.1016/j.cities.2025.106414>
- Li, D., Yan, H., & Ma, S. (2026). Trust in the digital age: how cybersecurity governance willingness shapes trade credit – evidence from supplier credit decisions. *Journal of Business Economics and Management*, 27(2), 323–343. <https://doi.org/10.3846/jbem.2026.25751>
- Lyeonov, S., Hrytsenko, L., Macko, A., & Oláh, J. (2026a). E-government development and business transactional expenditure: Cross-country evidence on interest rate spread distortions, logistics performance, and services trade restrictiveness. *Economics and Sociology*, 19(1), 195–223. doi:10.14254/2071- 789X.2026/19-1/10
- Lyeonov, S., Hrytsenko, L., Zamek, D., & Remsei, S. (2026b). E-government development, armed conflict, and government revenue: A cross-country panel analysis. *Journal of International Studies*, 19(1), 160–184. doi:10.14254/2071- 8330.2026/19-1/9
- Maisyarah, R. (2026). Digital budget transparency and perceived budget credibility: Technocratic and normative mechanisms in Indonesian local governments. *Public and Municipal Finance*, 15(1), 43–57. doi: 10.21511/pmf.15(1).2026.04
- Meidute-Kavaliauskiene, I., Davidaviciene, V., Iurasova, O., & Jakubavicius, A. (2026). AI-driven digital transformation and ICT integration: Implications for uneven economic development pathways in

- Europe. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, 21(1), 41-93. <https://doi.org/10.24136/eq.4175>
- Mohapatra, B. P. (2026). Own Revenue Growth of Rural Local Governments and Socio-Economic Challenges. *SocioEconomic Challenges*, 10(1), 105-119. [https://doi.org/10.61093/sec.10\(1\).105-119.2026](https://doi.org/10.61093/sec.10(1).105-119.2026)
- Neacșu, M. C., Eregep, E. Y., & Diaconescu, M. (2025). Artificial intelligence as a geopolitical tool. *Amfiteatru Economic*, 27(68), 253–268. <https://doi.org/10.24818/EA/2025/68/253>
- Nguyen, H. P., Le, P. U., & Le, X. T. (2026). From AI disclosure to purchase intention: The mediating role of trust and the moderating effect of collectivistic orientation in Vietnam. *Innovative Marketing*, 22(1), 274–284. [https://doi.org/10.21511/im.22\(1\).2026.20](https://doi.org/10.21511/im.22(1).2026.20)
- Nikitas, A., Michalakopoulou, K., Njoya, E. T., & Karampatzakis, D. (2020). Artificial Intelligence, Transport and the Smart City: Definitions and Dimensions of a New Mobility Era. *Sustainability*, 12(7), 2789. <https://doi.org/10.3390/su12072789>
- Ntuli, F., Ntshangase, B. A., & Msosa, S. K. (2025). Innovative Financial Management Reforms: A Catalyst of Good Governance in the South African Public Sector. *Financial Markets, Institutions and Risks*, 9(4), 16-29. [https://doi.org/10.61093/fmir.9\(4\).16-29.2025](https://doi.org/10.61093/fmir.9(4).16-29.2025)
- OECD. (2024). *OECD survey on drivers of trust in public institutions – 2024 results: Building trust in a complex policy environment*. OECD Publishing. <https://doi.org/10.1787/9a20554b-en>
- OECD. (2025). *Governing with artificial intelligence: The state of play and way forward in core government functions*. OECD Publishing. <https://doi.org/10.1787/795de142-en>
- Oxford Insights. (n.d.). *Government AI Readiness Index 2020-2025 (Index data)*. <https://oxfordinsights.com>
- Palicki, S. (2017). Housing resources and needs in light of modern urban transformations: The case of Poznan. *Real Estate Management and Valuation*, 25(2), 72–78. <https://doi.org/10.1515/remav-2017-0014>
- Paraschiv, D. M., Muhammad, A., Petrariu, I. R., Gheorghe, M., Diaconescu, R. I., & Istudor, M. (2024). Shaping Europe's digital and sustainable future: Analysis of the Digital Economy and Society Index in the pre- and post-pandemic period. *Amfiteatru Economic*, 26(Special Issue No. 18), 1012–1030. <https://doi.org/10.24818/EA/2024/S18/1012>
- Pisică, A. I., & Zaharia, R. M. (2025). What Artificial Intelligence Means to Us – Students' Insights. *European Journal of Interdisciplinary Studies*, 17(1), 142–152. <https://doi.org/10.24818/ejis.2025.09>
- Pisker, B., Radman-Funarić, M., & Cosic, D. (2026). Digitalization and corruption: Global intersection matrix. *Montenegrin Journal of Economics*, 22(1), 7–14. <https://doi.org/10.14254/1800-5845/2026.22-1.1>
- Pupysheva, T., Zhetpisbayeva, M., Koshebayeva, G., Magrupova, Z., Togaibayeva, L., & Biryukov, V. (2025). Financial self-sufficiency of rural budgets as the basis of local self-government. *Montenegrin Journal of Economics*, 21(1), 137–156. <https://doi.org/10.14254/1800-5845/2025.21-1.11>
- Ruthvika, J., & Hedau, A. (2025). Digital Inclusion and Economic Equity: Evaluating the Role of Business Analytics in Overcoming Socioeconomic Challenges. *SocioEconomic Challenges*, 9(4), 150-164. [https://doi.org/10.61093/sec.9\(4\).150-164.2025](https://doi.org/10.61093/sec.9(4).150-164.2025)
- Selaković, M. (2025). Government Crisis Communications and Business Crisis Response during 2024 Dubai Floods. *European Journal of Interdisciplinary Studies*, 17(2), 23–32. <https://doi.org/10.24818/ejis.2025.11>
- Springs, D. (2024). Smart city planning focused on the US cities in need of policing innovations and public health safety technologies and strategies. *Health Economics and Management Review*, 5(1), 117-128. <https://doi.org/10.61093/hem.2024.1-09>
- Sulkowski, Ł., Wójcik-Chodorowska, J., Jarosz, K., & Jung-Konstanty, S. (2025). Public value management, deinstitutionalization, and personalized social services in local communities. *Journal of International Studies*, 18(2), 50-74. doi:10.14254/2071-8330.2025/18-2/3
- Suparna, G., Riana, I. G., Surya, I. B. K., Rihayana, I. G., & Yudhistira, P. G. A. (2025). From digital culture to digital innovation: the serial mediating roles of digital capability and organizational readiness. *Polish Journal of Management Studies*, 32(2), 219–236. <https://doi.org/10.17512/pjms.2025.32.2.14>
- Titov, E., & Kaukes, A. (2026). Assessment of Talent-Related Risks in Smart City Companies. *Knowledge Economy and Lifelong Learning*, 2(2), 64-88. [https://doi.org/10.61093/kell.2\(2\).64-88.2026](https://doi.org/10.61093/kell.2(2).64-88.2026)

- Topazly, R., Stadniichuk, R., Liubokhynets, L., Shuprudko, M., Zhosan, H., & Plietnov, M. (2026). Institutional Trust and Governance Effectiveness as Mediators in Transforming Digital Maturity into Post-War Infrastructure Recovery. *Business Ethics and Leadership*, 10(1), 188-206. [https://doi.org/10.61093/bel.10\(1\).188-206.2026](https://doi.org/10.61093/bel.10(1).188-206.2026)
- Trojanek, M., Kisiala, W., & Trojanek, R. (2021). Do local governments follow their neighbours' tax strategies? Tax mimicking amongst Polish municipalities. *Land Use Policy*, 108, 105576. <https://doi.org/10.1016/j.landusepol.2021.105576>
- Trojanek, R., Gluszek, M., & Trojanek, M. (2024). Public land leases, reforms and (in)stability of municipal revenues in Poland – The case of Poznan city. *Cities*, 148, 104877. <https://doi.org/10.1016/j.cities.2024.104877>
- Trojanek, R., & Huderek-Glapska, S. (2018). Measuring the noise cost of aviation – The association between the Limited Use Area around Warsaw Chopin Airport and property values. *Journal of Air Transport Management*, 67, 103–114. <https://doi.org/10.1016/j.jairtraman.2017.12.002>
- Ugulava G. (2026). Two Faces of Decline in Public Governance: Accountability Erosion and Rent-Seeking. *Public Governance, Regulation and Law*, 2(1), 20-32. [https://doi.org/10.61093/pgrl.2\(1\).20-32.2026](https://doi.org/10.61093/pgrl.2(1).20-32.2026)
- Ullah, Z., Al-Turjman, F., Mostarda, L., & Gagliardi, R. (2020). Applications of Artificial Intelligence and Machine learning in smart cities. *Computer Communications*, 154, 313–323. <https://doi.org/10.1016/j.comcom.2020.02.069>
- Valaskova, K., Juracka, D., Nagy, M., & Chaudhuri, S. (2025a). Digital readiness across the European Union: A multidimensional empirical assessment of structural determinants, intra-regional disparities, and strategic implications in the era of Industry 5.0. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, 20(3), 1035-1086. <https://doi.org/10.24136/eq.3886>
- Valaskova, K., Nagy, M., Figura, M., & Rousek, P. (2025b). Res publica digitalis: The uneven digital transformation of the European public sector and the impact of policy disparities on governance, service efficiency, and socioeconomic inclusion. *Oeconomia Copernicana*, 16(3), 1177-1260. <https://doi.org/10.24136/oc.3866>
- Vasa, L., Kireyeva, A.A., Nurbatsin, A., Kredina, A. (2023). Analysis of the Impact of ICT on Economic Growth: Empirical Data from 16 Regions of Kazakhstan. *Acta Polytechnica Hungarica*, 20(3), 29-44. <https://doi.org/10.12700/APH.20.3.2023.3.3>
- Vasconcelos, J. R., Dener, C., Nii-Aponsah, H., Blanco, C. V., Immonen, A. J., Nordlund, P., Siregar, F., & Song, Y. (2025). *GovTech maturity index 2025: Tracking public sector digital transformation worldwide* (Prosperity Insight Series). World Bank Group. <http://documents.worldbank.org/curated/en/099121725193511608>
- Vasylieva, T., Krawczyk, D., Rącka, I., & Fenyves, V. (2026). Digital government and quality of life: Unpacking the human-centred mechanisms of e-government development. *Human Technology*, 22(1), 178–197. <https://doi.org/10.14254/1795-6889.2026.22-1.9>
- World Bank. (2021). *World development report 2021: Data for better lives*. World Bank. <https://doi.org/10.1596/978-1-4648-1600-0>
- Yigitcanlar, T., Desouza, K. C., Butler, L., & Roozkhosh, F. (2020). Contributions and Risks of Artificial Intelligence (AI) in Building Smarter Cities: Insights from a Systematic Review of the Literature. *Energies*, 13(6), 1473. <https://doi.org/10.3390/en13061473>
- Ylipulli, J., Hämäläinen, J., & Palo, E. (2025). Radical digital agency as a foundation for just and sustainable smart cities. *Human Technology*, 21(1), 6–34. <https://doi.org/10.14254/1795-6889.2025.21-1.1>
- Zhidebekkyzy, A., Sansyrbayeva, K., Ashirbekova, L., & Imreh-Tóth, M. (2026). AI-driven public administration: Expert insights on adoption and implementation. *Economics and Sociology*, 19(1), 172-194. doi:10.14254/2071- 789X.2026/19-1/9
- Zhubanazarov, S., González, R. C. L., Ulakov, S., Dulat, M., & Zhakupova, B. (2026). Digital transformation and urban governance: A bibliometric analysis of public administration research. *Problems and Perspectives in Management*, 24(2), 362–380. [https://doi.org/10.21511/ppm.24\(2\).2026.25](https://doi.org/10.21511/ppm.24(2).2026.25)

Appendix A

Table A1

Analytical sample and city coverage

Sample characteristic		Value
Number of city-year observations		641
Number of cities		141
Number of countries/economies		71
Number of observed years		5
Years included in the baseline sample		2020, 2021, 2023, 2024, 2025
Country/economy	Number of cities	Cities included in the sample
Algeria	1	Algiers
Argentina	1	Buenos Aires
Australia	4	Brisbane; Canberra; Melbourne; Sydney
Austria	1	Vienna
Belgium	1	Brussels
Brazil	3	Brasília; Rio De Janeiro; São Paulo
Bulgaria	1	Sofia
Canada	4	Montreal; Ottawa; Toronto; Vancouver
Chile	1	Santiago
China	10	Beijing; Chengdu; Chongqing; Guangzhou; Hangzhou; Nanjing; Shanghai; Shenzhen; Tianjin; Zhuhai
Colombia	2	Bogotá; Medellín
Costa Rica	1	San Jose
Croatia	1	Zagreb
Cyprus	1	Nicosia
Czechia	1	Prague
Denmark	1	Copenhagen
Egypt	1	Cairo
Estonia	1	Tallinn
Finland	1	Helsinki
France	5	Bordeaux; Lille; Lyon; Marseille; Paris
Germany	6	Berlin; Dusseldorf; Hamburg; Hanover; Kiel; Munich
Ghana	1	Accra
Greece	1	Athens
Guatemala	1	Guatemala City
Hong Kong	1	Hong Kong
Hungary	1	Budapest
Iceland	1	Reykjavik
India	4	Bengaluru; Delhi; Hyderabad; Mumbai
Indonesia	3	Jakarta; Makassar; Medan
Ireland	1	Dublin
Israel	1	Tel Aviv
Italy	3	Bologna; Milan; Rome
Japan	2	Osaka; Tokyo
Jordan	1	Amman
Kenya	1	Nairobi
Korea South	2	Busan; Seoul
Latvia	1	Riga
Lebanon	1	Beirut
Lithuania	1	Vilnius
Luxembourg	1	Luxembourg

Malaysia	1	Kuala Lumpur
Mexico	1	Mexico City
Morocco	1	Rabat
Netherlands	3	Amsterdam; Rotterdam; The Hague
New Zealand	2	Auckland; Wellington
Nigeria	2	Abuja; Lagos
Norway	1	Oslo
Oman	1	Muscat
Pakistan	1	Islamabad
Peru	1	Lima
Philippines	1	Manila
Poland	2	Krakow; Warsaw
Portugal	1	Lisbon
Qatar	1	Doha
Romania	1	Bucharest
Saudi Arabia	4	Jeddah; Mecca; Medina; Riyadh
Singapore	1	Singapore
Slovakia	1	Bratislava
Slovenia	1	Ljubljana
South Africa	1	Cape Town
Spain	4	Barcelona; Bilbao; Madrid; Zaragoza
Sweden	2	Gothenburg; Stockholm
Switzerland	3	Geneva; Lausanne; Zurich
Taiwan	1	Taipei City
Thailand	1	Bangkok
Tunisia	1	Tunis
Turkey	2	Ankara; Istanbul
UAE	2	Abu Dhabi; Dubai
UK	8	Belfast; Birmingham; Cardiff; Glasgow; Leeds; London; Manchester; Newcastle
USA	10	Boston; Chicago; Denver; Los Angeles; New York; Philadelphia; Phoenix; San Francisco; Seattle; Washington D.C.
Vietnam	2	Hanoi; Ho Chi Minh City
Yemen	1	Sana'a

Note: The table reports the final baseline analytical sample used in the two-way fixed effects models. The sample includes city-year observations for which the Digital Urban Governance and Trust Index, GAIRI, city identifier, country/economy identifier and year are available. The year 2022 is not included because Smart City Index data are unavailable for that year.