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The impact of digital governance on tourism development

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ABSTRACT

This paper examines the impact of digital governance on inbound tourism using the panel dataset from 151 countries from 2000 to 2019. Fixed-effects and System Generalised Method of Moments estimations show that the internet shutdown capacity and practice decrease inbound tourism. Social media monitoring with strict rules also hinders inbound tourism. It is found that governance capacity and practical censorship implications negatively affect tourism activities. Several policy implications for the proper control of digital communications are also discussed.

1. Introduction

The digital economy is rising with the increasing use of the Internet and information communication technology (Lythreatis et al., 2021). Despite the persistence of the digital divide, there is also a trend of information globalisation, which significantly affects digital institutions (Sohag et al., 2021). Governments have exerted various degrees of internet censorship and surveillance, which have become an essential digital governance issue that affects the tourism industry (Hadjielias et al., 2022). Today's tourists quickly access information about visiting the destination country, motivated by pull factors such as the beach and sun, nature, shopping, and events (Liu and Nijkamp, 2019). Even though tourists usually stay for a limited period, they can also be concerned about the censorship of several digital platforms in the destination country. For instance, Google and WhatsApp are blocked in China, which may lead to inconvenience for tourists accustomed to using such media to search for information transfer (Kalbaska et al., 2017).

Institutional quality measurement in the tourism literature lacks a vital dimension that captures the quality of digital institutions dramatically shaped by information globalisation (Sohag et al., 2021). The internet and social media have become essential means for people to exchange information and communicate with each other, thanks to the advances in information technology. These changes are expected to lead to irresistible institutional framework changes. In a new virtual world created by digital technology, rules are also required to shape participants' online behaviours for cybersecurity (Madenga, 2021). The digital governance system is then proposed in various countries. It is supposed to work as efficiently as a legal system that protects a free and open environment for normal social activities while preventing shady practices. According to institutional economics theories, people in a society interact as if playing rounds in repeated games (Engle-Warnick and Slonim, 2004), from which specific rules, named institutions, will evolve naturally. At this point, researchers should capture the changing nature of 'contemporary institutions' by investigating how digital institutions influence a country's tourism development, particularly its international tourism demand (tourist arrivals). In addition, previous studies have

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examined how institutional framework affects inbound tourism, most of which usually employ a traditional index of institutional quality and investigates its impact on tourism flows (Ghalia et al., 2019; Gozgor et al., 2019, 2022; Groizard et al., 2022; Saha and Yap, 2014; Saha et al., 2017).

As Fig. 1 shows, the governance system starts with the algorithm for monitoring. If improper behaviours are detected, censorship will be activated automatically. Filtering is the initial stage of censorship, followed by shutting down if it does not work. From this perspective, digital governance may directly reduce the perceived network safety risks of inbound tourists, which benefits the development of inbound tourism (Ghalia et al., 2019; Groizard et al., 2022).

In general, given the prevalence of the digital economy, the effect of digital governance on inbound tourism is still unclear. On the one hand, economically wise and efficient digital administration would allow online information sharing to benefit the economy. Also, it represents the capability of the government to control the potential network security risks. However, on the other hand, too-restricted digital control would jeopardise the freedom of speech and deteriorate information asymmetry, which deters economic development. This economic effect of digital governance would be particularly significant for the tourism industry as the attractiveness of tourist destinations largely depends on information spreading and experience sharing amongst visitors and potential visitors (Giglio et al., 2019; Liu et al., 2019; Pencarelli, 2020; Sotiriadis, 2017; Xiang et al., 2017).

Given these backdrops, this paper aims to test the impact of digital governance on inbound tourism. Specifically, we examine whether the current digital governance serves its institutional purpose: to set the ground for routine online communications and interactions. As one of the first attempts to test digital governance's effect on tourist arrivals, we suggest empirical results have important implications for the destination country's competitiveness in the global tourism market (Fernández et al., 2022). First, we capture the critical change in the new institution, the emergence of digital governance, and investigate its efficiency in promoting/prohibiting inbound tourism, contributing to the literature on the inquisitional effect. Second, we recognise the dark side of sharing information online and on social media. At the same time, most studies focus on the bright side, such as reducing information asymmetry to attract more tourists and improve service management (Giglio et al., 2019; Liu et al., 2019; Sotiriadis, 2017; Xiang et al., 2017). Our paper provides a more mature and comprehensive view. Our study is designed to examine whether digital governance protects the bright side while prohibiting the tourism industry's dark side, advancing our understanding of the role of digital communication in tourism. Third, we further decompose digital governance into digital governance practice and capacity. As the literature suggests, institutional capacity is gradually adjusting to learning from more institutional practices (Friedland, 2018; Micelotta et al., 2017). In other words, digital governance capacity reflects all the prior digital governance practices.

The rest of the paper is organised as follows. Section 2 reviews the different dimensions of the previous literature. Section 3 explains the data and the method. Section 4 provides the empirical findings, robustness checks, and potential implications. Section 5 concludes the paper.

2. Literature review

2.1. Institutional quality and tourism

The institutional quality would indirectly and directly affect the tourism industry's development (Cajaiba-Santana et al., 2020). On the one hand, the institutional advancement would lead to rising national wealth, which would then create more tourism demand; on the other hand, a better institutional framework would provide a more stable environment and a better-organised surrounding with fewer risks (Paramati and Roc, 2019), which tourists would perceive as a safer and more friendly place to visit. For instance, Balli et al. (2016) revealed that institutional factors accounted for 8% of bilateral tourism flows in OECD countries and middle-income to low-income countries from 1994 to 2010. Demir and Gozgor (2019) argued that freedom of the press increased transparency and reduced information asymmetry, improving efficiency and enhancing the image. Gozgor et al. (2019) also indicated that the quality of formal institutions significantly influenced inbound tourism. Mushtaq et al. (2021) reported that the institutional quality index positively relates to international tourism demand.

Overall, the impact of institutional quality, measured by digital governance, on the tourism industry has not been thoroughly explored. First, institutional quality's direct and indirect effects on inbound tourism have not been distinguished. Second, as mentioned before, a proper index must capture institutions' changing essence. The current institution quality measurement has missed a significant

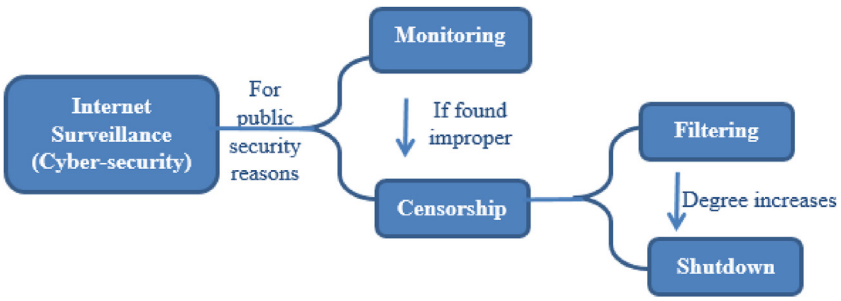

Fig. 1. Digital governance: The government control of digital communications.

institution dimension in the modern digital era, which transforms human lives intensively and extensively. It significantly restructures the way people exchange information and communicate with each other. The game rules (institutions) in human interactions will inevitably change to fit the new digital era as the prior technological advancements did.

2.2. The role of digital communications in tourism

In today's digital era, the physical distances between people are shortened mainly in the virtual world. People can meet and talk within internet coverage, sharing their opinions, lives, and stories. Social media like Facebook and Twitter can spread words much faster and reach a broader base of receivers than the traditional way, and thus have a more profound impact on consumer behaviours as well as on product producers and service providers (Aleti et al., 2019; Baek et al., 2017; Boerman et al., 2017). Most tourists can be concerned about their freedom of speech, expressing dissatisfaction about businesses or travel experiences. Several studies focus on how social media affects inbound tourism in tourism-related research. For example, Liu et al. (2019) show that travel experiences posted on social media may trigger viewers' destination visit intention. Giglio et al. (2019) show that social media user behaviours can identify the attractiveness of various tourism sites. While most studies have highlighted the positive role of social media for inbound tourism, Dolan et al. (2019) indicate that social media can also negatively influence tourism demand by enabling enhanced facilities for consumer complaints. Luo and Zhai (2017) revealed how social media aroused negative emotions and led to the boycott of a tourism destination, although refuted later by Tolkach (2018).

The current research seldom relates user-generated content on social media with the actual outcomes of tourist visits. Therefore, the present study mainly investigates how user-generated digital social media, taking various forms, affect consumers' perceptions and behavioural intentions, pushing tourism providers to enhance their facilities and management. Most tourism studies centre on the bright side of social media in the tourism industry while ignoring its dark side, except Dolan et al. (2019) and Luo and Zhai (2017). Furthermore, echoing our prior discussions, digital and social media play an essential role in people's daily routines living in the modern world with fast-growing technology. This irresistible changing environment is expected to lead to captivating changes in the institutional framework. Still, there is a lack of sufficient research in this direction.

2.3. The digital institutions and hypotheses development

Digital and social media serve as a double-bladed sword, with its bright side facilitating information sharing in the tourism industry. Its dark sides, such as fake news, cyberbullying, online witch hunts, addictive use, privacy abuse, and trolling, must be constrained (Baccarella et al., 2018; Jansson, 2018). The digital era calls for an institutional-level design to make a trade-off between the two edges of the sword, taking advantage of the bright side while constraining the dark side. In other words, the government is expected to make moves to monitor the activities in a new digital world, named a governance system, which is supposed to work as efficiently as a legal system has always been protecting the free and open environment for normal social activities while preventing shady practices. Therefore, governments worldwide can exert varying degrees of control over the internet and social media through surveillance, censorship, and even the shutdown of internet connections. The number of countries that try to control their citizens' online activities has increased (Madenga, 2021).

Surveillance. Political activists rely heavily on social media and the internet to communicate massively and mobilise people to participate in demonstrations. At the same time, governments can use surveillance to monitor and intervene in their actions. Individual online activities leave a digital footprint that can be tracked. Governments may collect and analyse citizens' digital prints for profiling purposes, often justified by using public security. With the help of internet surveillance, the state can identify individuals for purposes other than security reasons, such as harassing or punishing political dissidents (Brown and Korff, 2014).

Censorship. Governments can prohibit or restrict the communications of certain content on the internet. The degree of censorship ranges from content filtering to the extreme of a complete internet and mobile communication shutdown. Content filtering restricts access to certain websites or internet information containing specific keywords (Deibert, 2009). Censorship can be implemented explicitly through legislation or concealed using software applications.

Shutdown. In times of political unrest, governments may shut down part or the whole of internet communication to deprive political opponents or protestors of critical communication tools. The shutdown often includes the mobile network. In addition, in some countries, the internet may be shut down before and during sensitive events such as public gatherings, elections, or political rallies to limit the organisers' mobilisation ability (Wagner, 2018).

The internet and its digital media have become critical communication infrastructures for today's societies. Like traditional media, such as newspapers and broadcasting, digital media have become a "contested political space." The state has extensively governed this public sphere of media and communications, which involves a different degree of control and restrictions in surveillance, censorship, and shutdown of communications (Wagner, 2018).

Suppose the digital governance system is functioning correctly. If the government performs digital governance to some level beyond equilibrium, it will prohibit an economy's healthy development. It is expected to protect freedom of communication and information sharing on social media to the extent that the economic benefits and develops. In this study, we explore whether the current governance system is functioning appropriately in the tourism sector, that is, to protect inbound tourism without too many restrictions. We employ various proxies, including monitoring, censorship, filtering, and shutdown indices, representing different digital governance stages with multiple degrees of severity, as Fig. 1 shows.

Furthermore, we distinguish 'capacity' from 'practice.' Institutional capacity builds upon institutional practice (Friedland, 2018; Micelotta et al., 2017). Therefore, 'capacity' is a self-adjusting and learning outcome of fundamental rules or attempts at the institutional

level. As a result, the following main hypotheses help us testify to whether the digital governance system functions appropriately at an institutional level in the tourism sector.

Hypothesis 1. The practice of digital governance, in the form of monitoring, censorship, filtering, and shutdown, negatively affects inbound tourism.

Hypothesis 2. The capacity of digital governance negatively affects inbound tourism.

3. Data and method

3.1. Digital governance indicators

This paper considers nine different digital governance indicators, and the related data are obtained from Mechkova et al. (2021) and Pemstein et al. (2022). The digital governance indicators are measured based on objective data provided by the V-Dem project of the University of Gothenburg. Note that all these indicators are defined as the index from 1 to 10. All available indicators are used to measure digital governance, and they are as follows.

i) *Internet filtering capacity:* This indicator measures whether the government has the technical capability to filter or block certain websites. The minimum value is a lack of ability to block any website. The maximum value is the total capacity to do so. So, let us assume that the value of the index increased from 4 to 5, meaning there is more internet filtering capacity. Then, we expect a negative impact of this index on tourist arrivals as more internet filtering capacity decreases tourist arrivals.
ii) *Internet filtering in practice:* This indicator measures the government's internet filtering. The minimum value is the regular removal of political content against its political stance. The maximum value is that the government never filters political content on domestic websites. Note that this index is reversed-coded: the lower this index value, the more excellent internet filtering. So, let us assume that the value of the index decreased from 5 to 4, meaning there is more internet filtering. Then, we expect a positive impact of this index on tourist arrivals as more internet filtering reduces tourist arrivals.
iii) *Internet shutdown capacity:* This indicator measures how the government can shut down internet connections. The minimum value is that the government has no shutdown capacity. The maximum value is that it can shut down almost all internet connections. Therefore, we expect a negative impact of this index on tourist arrivals.
iv) *Internet shutdown in practice:* This indicator measures the government's regular internet connection shutdown. A lower index value often indicates shutdown practice; the minimum value is often used to shut down the internet. The maximum value is (almost) never doing this. Note that this index is also reversed-coded: the lower this index value, the more often the government shuts down the internet. Therefore, we expect a positive impact of this index on tourist arrivals.
v) *Social media shutdown in practice:* This indicator measures how the government shuts down social media. The minimum value is often used to shut down social media; the maximum value is the (almost) never do this. This index is reversed-coded: the lower this index value, the more often the government shuts down social media. Therefore, we expect a positive impact of this index on tourist arrivals.
vi) *Social media alternatives:* This indicator measures the extent to which the public has access to alternative social media platforms outside the control of the government. The minimum value indicates that the government controls all social media platforms. The maximum value is that practically no one contains social media. This index is reversed-coded: the lower this index value, the more significant the government's control over social media platforms. Therefore, we expect a positive impact of this index on tourist arrivals.
vii) *Social media monitoring:* This indicator measures social media monitoring. The minimum value is that the government monitors nearly all political content on social media. The maximum value is that the government (almost) never monitors political content. This index is reversed-coded: the lower this index value, the greater the government monitors social media platforms. Therefore, we expect a positive impact of this index on tourist arrivals.
viii) *Social media censorship in practice:* This indicator measures the degree of government censorship on politically sensitive content, such as filtering or deleting political content. The minimum value is that the government blocks all politically sensitive content. The maximum value is no censorship of any political content on social media. This index is also reversed-coded: the lower this index value, the greater the government censors' social media practice. Therefore, we expect a positive impact of this index on tourist arrivals.
ix) *Cybersecurity capacity:* This indicator measures the government's cybersecurity capacity. The minimum value is that the government does not have any ability to defend against cyber-attacks. The maximum value is that it has all the resources required to counter sophisticated cybersecurity threats. Therefore, we expect a negative impact of this index on tourist arrivals.

All the practice indices are reverse coded, and all the capacity indices are typically coded in ascending order.

3.2. Data of control variables

This paper uses panel data from 151 countries from 2000 to 2019. The starting year of the empirical analyses is due to the data availability, and we consider the annual frequency data. We also split the dataset into the Upper-middle-income and High-Income economies (83 countries) and the Low-income and Lower-middle-income economies (68 countries). Appendix Table I lists the

countries in the dataset. The dependent variable is the number of international tourist arrivals in the natural logarithmic form. The related data are obtained from the World Bank (2023).

We also consider controls in the panel data estimations. For this purpose, we capture the income effect by gross domestic product (GDP) per capita (constant $ prices) and the price effect by exchange rates ($1 to domestic currency). In addition, we include trade openness to capture international trade networks (imports plus exports relative to GDP in $ nominal prices). The data on these variables were extracted from the World Bank (2023). They are defined in the natural logarithmic form, except that trade openness is a ratio. Finally, we also include institutional quality as an additional control variable. For this purpose, we use the democracy index in the Polity5 dataset (index from 1 to 10), introduced by Marshall and Gurr (2020).

In the system GMM estimations, we also include heritages in the country (levels) and population density in the natural logarithmic form (i.e., the number of people per square kilometre of land area) to provide the suitability of the instruments. In addition, we also include the land area (square kilometres) in the natural logarithmic form. The population density and the land area series are obtained from the World Bank (2023), and heritage data are obtained from the Educational, Scientific and Cultural Organization of the United Nations (UNESCO) (2023). Table 1 defines variables in detail with their source reports and reports the descriptive statistics.

Table 2 presents the correlations between tourist arrivals and the nine digital governance indicators. Table 2 shows the positive correlations between tourist arrivals and all digital governance indicators. There are mixed correlations among the digital governance indicators. It is essential to note the multicollinearity problem between variables.

3.3. Models and estimation procedures

Following the main hypotheses and previous papers (e.g., Ghalia et al., 2019; Gozgor et al., 2019), we estimate the following empirical models for tourism demand:

$$lnITA_{i,t} = \alpha_0 + \alpha_1 ISMGI_{i,t} + \alpha_2 X_{i,t} + \mu_i + \vartheta_t + \varepsilon_{1i,t} \quad (1)$$

$$lnITA_{i,t} = \gamma_0 + \gamma_1 lnITA_{i,t-1} + \gamma_2 lSMGI_{i,t} + \gamma_3 X_{i,t} + \mu_i + \vartheta_t + \varepsilon_{2i,t} \quad (2)$$

Eq. (1) and Eq. (2), i indicates countries and t capture years. $lnITA_{i,t}$ represents the number of international tourist arrivals in the natural logarithm form. $lnITA_{i,t-1}$ is the lagged dependent variable to capture the persistence of tourist arrivals, implying that tourists who visit a country can revisit the same country. $ISMGI_{i,t}$ captures nine digital governance indicators previously explained in the data section. $X_{i,t}$ indicates the controls. μ_i represents the country's fixed effects, ϑ_t indicates the time fixed-effects, and $\varepsilon_{i,t}$ denotes error terms.

We estimate the empirical model in Eq. (1) with the panel data model with fixed effects estimations. Besides, we estimate the empirical model in Eq. (2) with the system generalised method of moments (GMM) estimations (Arellano and Bover, 1995; Blundell and

Table 1
Descriptive statistics.

Indicator	Definition	Source	Mean	Std. Dev	Min.	Max.	Obs.
Number of Tourist Arrivals	Natural Log	World Bank (2023)	14.08	1.955	7.972	18.28	2786
Internet Filtering Capacity	Index from 1 to 10	Mechkova et al. (2021) and Pemstein et al. (2022)	5.260	2.878	1.000	10.00	3078
Internet Filtering in Practice	Index from 1 to 10	Mechkova et al. (2021) and Pemstein et al. (2022)	5.400	2.712	1.000	9.000	3078
Internet Shutdown Capacity	Index from 1 to 10	Mechkova et al. (2021) and Pemstein et al. (2022)	5.358	2.836	1.000	10.00	3078
Internet Shutdown in Practice	Index from 1 to 10	Mechkova et al. (2021) and Pemstein et al. (2022)	4.818	2.192	1.000	7.000	3078
Social Media Shutdown in Practice	Index from 1 to 10	Mechkova et al. (2021) and Pemstein et al. (2022)	4.901	2.146	1.000	7.000	3078
Social Media Alternatives	Index from 1 to 10	Mechkova et al. (2021) and Pemstein et al. (2022)	5.489	2.915	1.000	10.00	3078
Social Media Monitoring	Index from 1 to 10	Mechkova et al. (2021) and Pemstein et al. (2022)	5.576	2.864	1.000	10.00	3078
Social Media Censorship in Practice	Index from 1 to 10	Mechkova et al. (2021) and Pemstein et al. (2022)	5.412	2.731	1.000	9.001	3078
Cybersecurity Capacity	Index from 1 to 10	Mechkova et al. (2021) and Pemstein et al. (2022)	5.292	2.901	1.000	10.00	3078
Institutional Quality (Democracy)	Index from 1 to 10	Marshall and Gurr (2020)	3.785	6.282	−10.00	10.00	2880
Per Capita Gross Domestic Product	Natural Log	World Bank (2023)	8.237	1.578	4.717	11.68	3039
Exchange Rate ($1 = Domestic Currency)	Natural Log	World Bank (2023)	3.425	2.731	−3.112	22.62	2716
Trade Openness (Nominal)	Ratio	World Bank (2023)	0.887	0.554	0.001	4.426	2900
Heritages in the Country	Number	UNESCO (2022)	6.900	10.02	0.000	55.00	3078
Land Area (sq. km)	Natural Log	World Bank (2023)	11.83	2.122	5.703	16.58	3060
Population Density (People per sq. km of Land Area)	Natural Log	World Bank (2023)	4.149	1.431	0.433	8.976	3054

Table 2
Correlation matrix.

Indicator	1	2	3	4	5	6	7	8	9	10
1 Log Tourist Arrivals	1.000	–	–	–	–	–	–	–	–	–
2 Internet Filtering Capacity	0.324	1.000	–	–	–	–	–	–	–	–
3 Internet Filtering Practice	0.112	−0.506	1.000	–	–	–	–	–	–	–
4 Internet Shutdown Capacity	0.026	0.699	−0.499	1.000	–	–	–	–	–	–
5 Internet Shutdown Practice	0.213	−0.389	0.833	−0.435	1.000	–	–	–	–	–
6 Social Media Shutdown Practice	0.187	−0.418	0.852	−0.424	0.914	1.000	–	–	–	–
7 Social Media Alternatives	0.266	−0.378	0.764	−0.471	0.784	0.784	1.000	–	–	–
8 Social Media Monitoring	0.086	−0.536	0.855	−0.525	0.728	0.767	0.742	1.000	–	–
9 Social Media Censorship Practice	0.123	−0.468	0.893	−0.451	0.802	0.857	0.762	0.833	1.000	–
10 Cybersecurity Capacity	0.672	0.550	−0.016	0.276	0.122	0.065	0.072	−0.082	−0.002	1.000

Bond, 1998), which are suitable for handling potential endogeneity bias and reverse causality problems; i.e., tourist arrivals can affect digital governance indicators. The time-fixed effects are also included. We consider the two-stage variant since it is asymptotically more efficient. However, the two-stage standard errors tended to be heavily biased downwards (Blundell and Bond, 1998). Therefore, we address this issue and use the finite sample correction derived by Windmeijer (2005) for the two-stage covariance matrix. Thus, we can make robust two-stage estimates more efficient than single-stage ones in the system GMM estimations. We observe that the system GMM estimations are efficient in terms of diagnostics. At this stage, we check over-identifying restrictions by the Sargan test. We must also find the first-order autocorrelation and reject the second-order autocorrelation following the Arellano–Bond autocorrelation tests.

4. Empirical results

4.1. The panel data model with the fixed-effects

Table 3 reports the estimation results from the panel data model with fixed effects. Columns (1) to (4) report the findings for internet governance. Columns (5) to (8) provide the results for social media governance. Column (9) reports the findings for cybersecurity capacity. Finally, Column (10) considers all indicators together.

Table 3 shows that internet filtering capacity and filtering in practice (reversed-coded) are positively and negatively associated with inbound tourism. It indicates that internet filtering capacity and practice positively impact inbound tourism, but their effects are statistically insignificant. This evidence does not support Hypotheses 1 & 2; internet shutdown capacity and shutdown in practice (reversed-coded) are positively and negatively associated with inbound tourism. The related coefficients are statistically significant. Social media shutdown, monitoring, and censorship negatively affect inbound tourism. Since these indices are all reversed-coded, the results indicate that the higher the freedom (less control) on social media in practice, the better performance in inbound tourism, which supports hypothesis 1. Therefore, tourists tend to visit countries with less control over social media. However, only the coefficient of social media monitoring in practice is statistically significant, suggesting that monitoring control on social media is the most efficient compared to other practical measures.

Cybersecurity capacity also positively affects inbound tourism, but the coefficient is statistically insignificant. This evidence shows that hypothesis 2 is not supported. The reversed-coded social media alternative is positively associated with inbound tourism, indicating that if the government restricts access to alternative social media platforms, it will negatively impact inbound tourism as it interferes with the freedom zone of everyday internet users. When considering all indicators, the related indicators' significance is at least valid at the 5% level.

Digital governance improves inbound tourism, including filtering, censoring, and shutdown in capacity and practice. It shows that the current digital governance system employed by the government serves as an efficient digital-era institution, which is supposed to facilitate economic development. Nevertheless, consider that the government restricts access to alternative social media platforms. In that case, that is too far beyond the safe zone and harms the freedom of internet users in the real sense.

When information sharing on social media is prohibited, it exerts a less positive effect on inbound tourism than when information spreading on the internet is not permitted. Furthermore, generally speaking, the coefficients of social media indices are relatively larger than internet filtering indices and smaller than internet shutdown indices. In other words, when information sharing on social media is monitored or filtered, it exerts a more significant positive effect on inbound tourism than when information spreading on the internet is observed or filtered.

When we look at controls (exchange rate, per capita income, and trade openness) on inbound tourism, coefficients are statistically significant at the 1% level, meeting the theoretical expectations. All controls positively relate to inbound tourism, but the impact on institutional quality is insignificant. Richer countries attract more tourists, and the income effect is valid. International trade networks promote tourism. A higher exchange rate value means a weaker domestic currency makes the source country cheaper. Thus, there are higher tourist arrivals, and the price effect is also valid.

4.2. Robustness checks: system GMM estimations

We check the robustness of the findings by utilising system GMM estimations. Note that we run a panel OLS, fixed-effects, and first

Table 3
Fixed-effects estimations: All countries.

Indicator	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Per Capita GDP	0.758***	0.768***	0.747***	0.766***	0.771***	0.773***	0.752***	0.768***	0.764***	0.750***
	(0.021)	(0.018)	(0.019)	(0.018)	(0.018)	(0.018)	(0.019)	(0.018)	(0.021)	(0.022)
Exchange Rate	0.099***	0.101***	0.096***	0.101***	0.101***	0.101***	0.099***	0.101***	0.100***	0.094***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Trade Openness	0.276***	0.273***	0.267***	0.278***	0.275***	0.273***	0.258***	0.269***	0.269***	0.255***
	(0.052)	(0.052)	(0.052)	(0.052)	(0.052)	(0.053)	(0.052)	(0.052)	(0.053)	(0.053)
Institutional Quality	0.029	0.035	0.026	0.036	0.039	0.043	0.032	0.041	0.040	0.025
	(0.029)	(0.028)	(0.030)	(0.032)	(0.033)	(0.031)	(0.029)	(0.030)	(0.028)	(0.027)
Internet Filtering Capacity	−0.016	–	–	–	–	–	–	–	–	−0.027
	(0.011)									(0.016)
Internet Filtering in Practice	–	0.018	–	–	–	–	–	–	–	0.033
		(0.012)								(0.020)
Internet Shutdown Capacity	–	–	−0.048***	–	–	–	–	–	–	−0.050***
			(0.012)							(0.015)
Internet Shutdown in Practice	–	–	–	0.057***	–	–	–	–	–	0.079***
				(0.016)						(0.025)
Social Media Shutdown in Practice	–	–	–	–	0.020	–	–	–	–	0.050*
					(0.018)					(0.027)
Social Media Alternatives	–	–	–	–	–	0.001	–	–	–	0.038**
						(0.015)				(0.018)
Social Media Monitoring	–	–	–	–	–	–	0.027***	–	–	0.040**
							(0.009)			(0.016)
Social Media Censorship in Practice	–	–	–	–	–	–	–	0.018	–	0.001
								(0.011)		(0.019)
Cybersecurity Capacity	–	–	–	–	–	–	–	–	−0.010	−0.010
									(0.012)	(0.015)
Constant Term	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2305	2305	2305	2305	2305	2305	2305	2305	2305	2305
Countries	151	151	151	151	151	151	151	151	151	151
R-squared	0.460	0.461	0.463	0.465	0.460	0.459	0.462	0.461	0.460	0.466

Notes: The dependent variable is the natural log of tourist arrivals. The robust standard errors in (). ***p < 0.01, **p < 0.05, and * p < 0.10.

Table 4
System GMM estimations: All countries.

Indicator	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lagged Dependent Variable	0.894***	0.949***	0.933***	0.959***	0.960***	0.956***	0.925***	0.947***	0.912***	0.851***
	(0.014)	(0.008)	(0.011)	(0.010)	(0.009)	(0.007)	(0.010)	(0.008)	(0.014)	(0.027)
Per Capita GDP	0.027**	0.028***	0.026**	0.021*	0.021**	0.019**	0.042***	0.026***	0.018*	0.011
	(0.011)	(0.009)	(0.012)	(0.010)	(0.009)	(0.008)	(0.009)	(0.008)	(0.010)	(0.021)
Exchange Rate	0.013***	0.009***	0.013***	0.011***	0.013***	0.010***	0.015***	0.011***	0.001	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.005)
Trade Openness	0.104***	0.060***	0.095***	0.088***	0.078***	0.081***	0.067***	0.065***	0.120***	0.201***
	(0.020)	(0.015)	(0.020)	(0.016)	(0.016)	(0.015)	(0.018)	(0.016)	(0.022)	(0.041)
Institutional Quality	0.052	0.050	0.049	0.059	0.058	0.051	0.077	0.044	0.036	0.013
	(0.044)	(0.035)	(0.046)	(0.039)	(0.040)	(0.039)	(0.046)	(0.035)	(0.042)	(0.020)
Internet Filtering Capacity	−0.045***	–	–	–	–	–	–	–	–	−0.005
	(0.007)									(0.021)
Internet Filtering in Practice	–	0.019***	–	–	–	–	–	–	–	0.127***
		(0.006)								(0.034)
Internet Shutdown Capacity	–	–	−0.036***	–	–	–	–	–	–	−0.048**
			(0.005)							(0.024)
Internet Shutdown in Practice	–	–	–	0.026***	–	–	–	–	–	0.118***
				(0.008)						(0.042)
Social Media Shutdown in Practice	–	–	–	–	0.029***	–	–	–	–	0.110*
					(0.007)					(0.056)
Social Media Alternatives	–	–	–	–	–	0.012***	–	–	–	0.106***
						(0.004)				(0.024)
Social Media Monitoring	–	–	–	–	–	–	0.027***	–	–	0.055**
							(0.005)			(0.025)
Social Media Censorship in Practice	–	–	–	–	–	–	–	0.021***	–	0.040
								(0.006)		(0.041)
Cybersecurity Capacity	–	–	–	–	–	–	–	–	−0.055***	−0.053***
									(0.012)	(0.019)
Constant Term	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2150	2150	2150	2150	2150	2150	2150	2150	2150	2150
Countries	149	149	149	149	149	149	149	149	149	149
Sargan Test Probability	[0.877]	[0.770]	[0.827]	[0.788]	[0.795]	[0.782]	[0.820]	[0.723]	[0.794]	[0.222]
AR (1) Probability	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
AR (2) Probability	[0.176]	[0.228]	[0.220]	[0.236]	[0.224]	[0.222]	[0.202]	[0.218]	[0.224]	[0.291]

Notes: The dependent variable is natural log tourist arrivals. The constant term is included. The robust standard errors are in (), and probability values are in []. ***$p < 0.01$, **$p < 0.05$, and * $p < 0.1$.

Table 5
System GMM estimations: Upper-middle-income and high-income countries.

Indicator	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lagged Dependent Variable	0.920***	0.892***	0.932***	0.897***	0.909***	0.927***	0.907***	0.918***	0.865***	0.909***
	(0.005)	(0.005)	(0.006)	(0.007)	(0.006)	(0.005)	(0.007)	(0.006)	(0.009)	(0.016)
Per Capita GDP	0.004	0.066***	0.013***	0.063***	0.057***	0.023***	0.042***	0.030***	0.012	0.045***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)	(0.006)	(0.006)	(0.009)	(0.014)
Exchange Rate	0.016***	0.009	0.012**	0.008**	0.011**	0.011***	0.020***	0.011**	0.001	0.022**
	(0.004)	(0.006)	(0.005)	(0.004)	(0.005)	(0.003)	(0.004)	(0.005)	(0.004)	(0.009)
Trade Openness	0.034***	0.024**	0.041***	0.011	0.020***	0.031***	0.003	0.026***	0.047***	0.011
	(0.011)	(0.012)	(0.012)	(0.008)	(0.007)	(0.007)	(0.009)	(0.010)	(0.014)	(0.026)
Institutional Quality	0.009	0.014	0.016	0.017	0.018	0.016	0.018	0.017	0.013	0.012
	(0.012)	(0.014)	(0.015)	(0.013)	(0.012)	(0.013)	(0.016)	(0.017)	(0.014)	(0.016)
Internet Filtering Capacity	−0.027***	–	–	–	–	–	–	–	–	−0.003
	(0.002)									(0.011)
Internet Filtering in Practice	–	0.046***	–	–	–	–	–	–	–	0.008
		(0.003)								(0.017)
Internet Shutdown Capacity	–	–	−0.026***	–	–	–	–	–	–	−0.012**
			(0.003)							(0.006)
Internet Shutdown in Practice	–	–	–	0.065***	–	–	–	–	–	0.063**
				(0.004)						(0.030)
Social Media Shutdown in Practice	–	–	–	–	0.060***	–	–	–	–	0.256***
					(0.003)					(0.038)
Social Media Alternatives	–	–	–	–	–	0.008***	–	–	–	0.090***
						(0.001)				(0.010)
Social Media Monitoring	–	–	–	–	–	–	0.034***	–	–	0.069***
							(0.002)			(0.009)
Social Media Censorship in Practice	–	–	–	–	–	–	–	0.026***	–	0.108**
								(0.004)		(0.017)
Cybersecurity Capacity	–	–	–	–	–	–	–	–	−0.075***	−0.016
									(0.006)	(0.012)
Constant Term	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1192	1192	1192	1192	1192	1192	1192	1192	1192	1192
Countries	82	82	82	82	82	82	82	82	82	82
Sargan Test Probability	[0.320]	[0.234]	[0.291]	[0.427]	[0.468]	[0.220]	[0.248]	[0.266]	[0.406]	[0.142]
AR (1) Probability	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
AR (2) Probability	[0.466]	[0.669]	[0.493]	[0.882]	[0.562]	[0.451]	[0.502]	[0.498]	[0.531]	[0.715]

Notes: The dependent variable is natural log tourist arrivals. The constant term is included. The robust standard errors are in (), and probability values are in []. ***$p < 0.01$, **$p < 0.05$, and * $p < 0.10$.

Table 6
System GMM estimations: Low-income and low-middle-income countries.

Indicator	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lagged Dependent Variable	0.974***	0.941***	0.971***	0.978***	0.981***	0.979***	0.986***	0.979***	0.967***	0.992***
	(0.003)	(0.009)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.013)
Per Capita GDP	0.014***	0.015***	0.011***	0.014***	0.015***	0.013***	0.016***	0.013***	0.021***	0.009
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.011)
Exchange Rate	0.006***	0.004***	0.012***	0.005***	0.005***	0.008***	0.003***	0.006***	0.006***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Trade Openness	0.127***	0.098***	0.149***	0.118***	0.101***	0.132***	0.099***	0.117***	0.137***	0.040
	(0.012)	(0.013)	(0.015)	(0.011)	(0.011)	(0.010)	(0.012)	(0.012)	(0.013)	(0.042)
Institutional Quality	0.029	0.031	0.023	0.028	0.029	0.027	0.034	0.027	0.043	0.019
	(0.035)	(0.038)	(0.044)	(0.033)	(0.032)	(0.029)	(0.036)	(0.035)	(0.036)	(0.063)
Internet Filtering Capacity	−0.002**	–	–	–	–	–	–	–	–	−0.044***
	(0.001)									(0.007)
Internet Filtering in Practice	–	0.013***	–	–	–	–	–	–	–	0.091***
		(0.002)								(0.028)
Internet Shutdown Capacity	–	–	−0.017***	–	–	–	–	–	–	−0.075***
			(0.001)							(0.012)
Internet Shutdown in Practice	–	–	–	0.022*	–	–	–	–	–	0.082***
				(0.012)						(0.018)
Social Media Shutdown in Practice	–	–	–	–	0.011***	–	–	–	–	0.001
					(0.002)					(0.019)
Social Media Alternatives	–	–	–	–	–	0.008***	–	–	–	0.036*
						(0.001)				(0.020)
Social Media Monitoring	–	–	–	–	–	–	0.009***	–	–	0.065***
							(0.001)			(0.011)
Social Media Censorship in Practice	–	–	–	–	–	–	–	0.006	–	0.054***
								(0.012)		(0.018)
Cybersecurity Capacity	–	–	–	–	–	–	–	–	−0.017***	−0.053***
									(0.003)	(0.011)
Constant Term	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	958	958	958	958	958	958	958	958	958	958
Countries	67	67	67	67	67	67	67	67	67	67
Sargan Test Probability	[0.824]	[0.763]	[0.716]	[0.798]	[0.795]	[0.773]	[0.802]	[0.786]	[0.792]	[0.505]
AR (1) Probability	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
AR (2) Probability	[0.154]	[0.164]	[0.153]	[0.157]	[0.162]	[0.155]	[0.164]	[0.157]	[0.154]	[0.239]

Notes: The dependent variable is natural log tourist arrivals. The constant term is included. The robust standard errors are in (), and probability values are in []. ***$p < 0.01$, **$p < 0.05$, and * $p < 0.10$.

difference GMM model by including the lagged dependent variable for each model. The lagged dependent variable value in the first difference GMM is higher than the OLS and the fixed-effect models. Therefore, the system GMM is the better option in our case.

Tables 4–6 present the system GMM estimation results for i) All (149) countries, ii) 82 Upper-middle-income and High-income economies, and iii) 67 Low-income and Lower-middle-income economies, respectively. Two countries are dropped when the lagged dependent variable is included in the system GMM estimations. Again, Columns (1) to (4) report the results for internet governance. Columns (5) to (8) provide the findings for social media governance. Column (9) reports the results for cybersecurity capacity. Finally, Column (10) considers all indicators together.

The findings in Tables 4–6 demonstrate that the results from the panel data model with fixed effects are robust, with much more significant coefficients than the prior estimates from the panel data model with fixed effects. Tables 4 and 5 report the significance level of 1% for all indices examined. All the coefficients in Table 6 are statistically significant, except for social media censorship in practice. Table 5 reports greater coefficients of all indices than Table 6, except the index of social media alternatives. It is observed that inbound tourism in Upper-middle-income and High-income economies is more sensitive to digital governance than that in Low-income and Lower-middle-income economies.

Furthermore, estimation diagnostics are also satisfied. Specifically, the Sargan test results show no over-identifying restrictions issue. The AR(1) and AR(2) autocorrelation tests reveal the existence of first-order autocorrelation but not second-order autocorrelation. Besides, the lagged tourist arrivals are statistically significant at the 1% level; therefore, the persistence effect is valid in all countries. The exchange rate, institutional quality, per capita income, and trade openness increase the demand for inbound tourism. However, the coefficients are statistically insignificant in some cases. Overall, the income- and the price effects are also valid in the system GMM estimations, and international trade networks promote inbound tourism. These results are consistent with those estimates from the panel data model with fixed effects.

4.3. Discussion and practical implications

Our study has several important implications. First, real-world activities were tremendously restricted due to COVID-19 and its aftermath, which unprecedentedly promoted online commercial and social activities, such as live-streaming e-commerce and TikTok broadcasts (Williams et al., 2022). For instance, in February 2021, the '*Reddit Revolution*' against hedge funds on Wall Street again demonstrated that online activities could accumulate the online power of users to the extent that they could balance the traditional giants. However, most countries' legal systems currently apply to offline activities in the real world rather than online activities in the virtual world. Therefore, there is an urgent call for digital-era institutions to be reviewed and restructured to provide an open, accessible, and secure platform for the enormous online activities to be conducted appropriately and operated.

Secondly, The rapid digital transformation has exposed the inadequacy of existing legal frameworks primarily designed for the physical world. With its borderless and ubiquitous nature, the virtual realm demands a more nuanced approach to regulation. A robust and equitable framework for online activities is paramount to ensure fairness, accountability, and protection of user rights.

Thirdly, this comprehensive overhaul of digital-era institutions must encompass a multifaceted approach. It requires fostering transparency and accountability among online platforms, empowering individuals to manage their data and privacy, and promoting ethical practices safeguarding user safety. Additionally, cross-border collaboration necessitates addressing global challenges, such as online harms and spreading misinformation.

Finally, the COVID-19 pandemic has not only reshaped our interactions but also unveiled the immense potential of the digital realm. To harness this potential effectively, we must adapt our legal frameworks and institutional structures to the realities of the virtual world. This transformative endeavour will lay the foundation for a more equitable, inclusive, and just digital society.

Our paper provides valuable insights for policymakers to understand and evaluate the impact of current digital governance practices, such as monitoring, filtering, and shutting down. Additionally, cybersecurity is of paramount importance in the tourism industry. Attractive destinations and positive travel experiences significantly influence potential visitors' intentions and future travel decisions. In essence, tourism demand is susceptible to information dissemination and sharing. Consequently, the quality and accuracy of relevant tourism information are crucial for potential tourists.

5. Conclusion

This study considers nine measures of digital governance provided by Mechkova et al. (2021) and Pemstein et al. (2022). It uses a panel dataset from 151 countries from 2000 to 2019 to examine the impact of digital governance and inbound tourism. It is found that digital governance capacity generally exerts a significant and positive effect on inbound tourism, indicating that digital government based on reflection functions properly to support inbound tourism by encouraging beneficial information sharing and preventing shady practices. The results also reveal that the current digital governance protects information-sharing freedom while preventing the uncertainties caused by deceptive online practices. The results are robust to applying different econometric techniques.

Given that digital media is flourishing and encroaching on the traditional boundary of information exchange, cybersecurity is the prerequisite and foundation for building a digital environment free for qualified and valuable information to be spread and shared. Our analysis also helps tourism sector policymakers understand cybersecurity's essential role in inbound tourism and the importance of maintaining a secure virtual world, especially in the current digital era. This awareness is vital for the middle- and higher-income tourism sectors, where potential visitors are more susceptible to cybersecurity than the lower-income economies.

Our paper provides the first evidence of digital governance in inbound tourism by focusing on global heterogeneity in digital governance with panel data. However, our results are limited to the panel data at the country level. At this stage, future studies may

investigate the views regarding governance measures held by domestic and external users and how the different views might affect international and domestic tourism. Future studies can also focus on bilateral data to consider the situation in the home country. Another research agenda can distinguish between leisure and business travellers to analyse the effects of digital governance on tourism. Finally, future papers can also seek firm-level evidence.

Ethical approval and informed consent statements

This article does not contain any studies with human participants performed by the authors.

Missing data availability statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

CRediT authorship contribution statement

Giray Gozgor: Conceptualization, Methodology, Writing – original draft. **Chi Keung Lau:** Data curation, Formal analysis, Writing – original draft. **Zhibin Lin:** Investigation, Project administration, Writing – original draft. **Yan Zeng:** Conceptualization, Validation, Writing – original draft.

Declaration of competing interest

Given Prof. Zhibin Lin' role as an Associate Editor of this journal, he was not involved in the editorial review or the decision to publish this article and had no access to information regarding its review.

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Appendix

Table I
151 Countries in the Dataset.

83 UMI and High-Income Countries
Albania, Algeria, Argentina, Armenia, Australia, Azerbaijan, Bahrain, Barbados, Belarus, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Canada, Chile, China, Colombia, Costa Rica, Croatia, Cyprus, the Czech Republic, Denmark, Dominican Republic, Ecuador, Estonia, Gabon, Georgia, Greece, Guatemala, Guyana, Hong Kong SAR (China), Hungary, Iceland, Iran, Iraq, Israel, Jamaica, Japan, Jordan, Kazakhstan, Korea Republic, Kuwait, Latvia, Lebanon, Libya, Lithuania, Malaysia, Maldives, Malta, Mauritius, Mexico, Montenegro, Namibia, New Zealand, North Macedonia, Norway, Oman, Panama, Paraguay, Peru, Poland, Qatar, Romania, Russia, Saudi Arabia, Serbia, Seychelles, Singapore, Slovakia, Slovenia, South Africa, Sri Lanka, Suriname, Sweden, Switzerland, Thailand, Turkiye, Turkmenistan, the United Arab Emirates, the United Kingdom, the United States, Uruguay, and Venezuela.
68 Low-Income and LMI Countries
Angola, Bangladesh, Benin, Bhutan, Bolivia, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo DR, Congo Republic, Djibouti, Egypt, El Salvador, Eritrea, Eswatini, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Haiti, Honduras, India, Indonesia, Ivory Coast, Kenya, Kyrgyzstan, Laos, Lesotho, Madagascar, Malawi, Mali, Mauritania, Moldova, Mongolia, Morocco, Mozambique, Myanmar, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Papua New Guinea, the Philippines, Rwanda, Senegal, Sierra Leone, Solomon Islands, Sudan, Syria, Tajikistan, Tanzania, Timor-Leste, Togo, Tunisia, Uganda, Ukraine, Uzbekistan, Vanuatu, Vietnam, Zambia, and Zimbabwe.

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