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Article

Digital-Algorithmic Urban Governmentality: 'Borders Through Cities' and 'Cities Through Borders'

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Abstract

This paper argues that the significant transformations, occurring in contemporary (Korean) cities can be understood through the lens of governmentality. In particular, digital-algorithmic technologies, when combined with governmentality, have transformed the role of the apparatuses of security and discipline. These changes are exemplified by two phenomena emerging in contemporary urban areas—mechanisms that detect and control individual abnormal factors while maintaining overall circulation—which have become core operational principles of cities these days. First, contemporary cities have become both key areas and apparatuses of internalized borders that extend national borders into domestic territories. As such, cities function as sites that sustain the flow of 'necessary' migrants while 'screening out' those deemed 'unnecessary,' relying on their physical and administrative infrastructures (what I refer to as *borders through cities*). Second, in many cities across Korea and the broader society, this border logic has been adopted as a mode of urban governing. Rather than simply restricting the movement of people and things, cities are evolving into sites of governance that encourage flows while controlling individual irregularity (what I refer to as *cities through borders*).

Keywords

(Digital-algorithmic) Governmentality, Urban areas, Internalized borders, Borders through cities, Cities through borders

Introduction

Since the onset of large-scale urbanization, cities have served both as the driving force behind modern society and as the most representative sites of its dynamism. This remains true today, as cities continue to undergo significant transformations in response to profound challenges confronting many nations. This paper aims to understand these transformations by focusing on the convergence of urban spaces and borders in contemporary cities.

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As scholars across various disciplines, including political and social geography, sociology, political and legal anthropology, security studies, geopolitics, and European studies, have noted (e.g., Amoore, 2024; Bialasiewicz, 2012; Burrell & Schweyher, 2021; Casas-Cortes et al., 2016; Coleman & Stuesse, 2016; Seliger, 1999; Varsanyi et al., 2012), borders today are no longer confined solely to the outermost edges of nation-states. Instead, they have expanded and become mobile, operating both within and beyond national territories. In many countries, the importance of borders functioning within national territories—so-called internalized borders (e.g. Gorman, 2017)—has grown significantly. Cities play a crucial role in this internalization, serving as key sites where border mechanisms operate. In other words, borders function through cities, which I refer to as "*borders through cities*."

At the same time, cities do not merely serve as sites where borders are enforced; they increasingly operate according to the general principles of governing borders. That is, while cities facilitate the free circulation of various elements that constitute urban life (like regular immigrants in border), they also develop mechanisms to detect and regulate those elements that may potentially disrupt these broader flows (like irregular migrants in border). This newly emerging mode of urban governance, in which cities integrate border-like functions into their operational logic, is what I term "*cities through borders*."

Furthermore, within these twin processes—borders through cities and cities through borders—an increasingly prominent trend is emerging: beyond merely managing overall flows, urban governance is shifting toward predictive control, based on highly developed technologies. This involves identifying and preemptively eliminating elements deemed potential threats to the continuity of urban flows. Digital and algorithmic technologies, particularly big data and machine learning, play a central role in this mode of governance.

This paper argues that understanding the evolution of contemporary cities—shaped by the convergence of urban spaces and borders—requires an engagement with Michel Foucault's concept of governmentality. In particular, discussions of governmentality highlight how the interplay of discipline and security mechanisms, alongside the development of liberalism, operates to regulate the broader environment so that flows circulate smoothly while individual cases are managed to achieve 'normalization.' This mode of power is particularly useful for explaining the transformations occurring in cities today. Moreover, because governmentality inherently accounts for materiality, it offers a suitable framework for incorporating the rise of digital and algorithmic technologies.

Accordingly, this paper first examines the core theoretical foundations of governmentality by focusing on Foucault's *Security, Territory, Population* and *The Birth of Biopolitics*, especially their discussions on the regulation of overall flows and the management of exceptional cases through discipline and security mechanisms. This theoretical review establishes the background for analyzing how governmentality operates in contemporary urban contexts. The paper then explores two specific forms of urban–border convergence as empirical illustrations of these processes. First, it examines *borders through cities*, in which cities function as key sites of internalized borders. This section reviews recent literature on cases from North America and Europe and briefly analyzes South Korea's immigration information platform as an example of an urban-internalized border nexus in Korea. Second, it discusses *cities through borders*, where border mechanisms become embedded in the very operational logic of cities. By reviewing recent studies on this phenomenon across multiple global cities and analyzing cases such as Seoul and Rio de Janeiro, this section aims to enhance our understanding of urban governance in Korean cities. Finally, this paper concludes by arguing that the radical transformations of contemporary cities necessitate more dynamic interdisciplinary collaboration across the social sciences and related fields.

Governmentality: From Discipline and the Apparatuses of Security to Digital Governmentality

This chapter explores Foucault's concept of governmentality as a theoretical foundation for understanding the convergence of urban spaces and borders, focusing on discipline, security apparatuses, and the principles of liberalism that undergird them. While governmentality encompasses various ideas in Foucault's works, this chapter draws mainly on two seminal works on governmentality—Security, Territory, Population and The Birth of Biopolitics.

In his 1976–77 lectures (later collected in *Security, Territory, Population*), Foucault contrasts premodern sovereign power—marked by physical punishment, confiscation, and prohibition—with modern power, which targets entire populations in a less overtly coercive manner. Central to his argument is the concept of circulation: while earlier crisis responses (e.g., to food shortages or epidemics) relied on punitive measures, power exercise since the modern era promotes freer circulation by facilitating international trade, employing controlled vaccination strategies, and designing urban spaces to enable smooth movement (Foucault, 2007: Chapters 1–3; see also Aradau & Blanke, 2010). In this sense, he notes that modern power "has a constant tendency to expand; it is centrifugal. New elements are constantly being integrated: production, psychology, behavior, the ways of doing things of producers, buyers, consumers, importers, and exporters, and the world market" (Foucault, 2007, p. 45), and he argues that "resituating the town in a space of circulation" (Foucault, 2007, p. 13) was essential to this mode of power.

Foucault distinguishes this system from laissez-faire, which implies disordered circulation, by emphasizing that free circulation is maintained through the continuous management of the milieu for keeping security, such as stable food supplies, epidemic control, and making safe cities. This management creates and regulates the conditions under which various elements (food, pathogens, supplies, knowledge, etc.) circulate smoothly. He describes this process as "the right disposition of things arranged so as to lead to a suitable end" (Foucault, 2007, pp. 96, 98), collectively referring to it as the apparatuses of security (Foucault, 2007, Chapters 1–4).

Yet governmentality is not solely about (the apparatuses of) security; it also includes discipline. As discussed in *Discipline and Punish* (and in earlier works such as *Madness and Civilization* and *The Birth of the Clinic*), discipline "is essentially centripetal" and "it isolates a space … concentrates, focuses, and encloses … The first action of discipline is … to circumscribe a space in which its power …" (Foucault, 2007, pp. 44-45). That is, discipline confines and monitors 'abnormal' elements. Foucault explains, "discipline regulates everything. Discipline allows nothing to escape … [it] normarlizes … [and] analyzes and breaks down … individuals, places, time, movements, actions, and operations … [thus] discipline establishes optimal sequences or co-ordinations …" (Foucault, 2007, pp. 45, 56-57). For instance, during an epidemic (as exemplified by COVID-19; see Park 2020), isolating the infected and enforcing specific behaviors illustrates how disciplinary power transforms 'abnormal' cases into 'normal' ones.

Thus, for Foucault the apparatuses of security and discipline jointly constitute governmentality. On one hand, governmentality allows natural circulation of various phenomena—flows that statistically follow a normal "curve" (Foucault, 2007, pp. 62-63)—while on the other, it captures deviations and enacts normalization to "reduce … deviant normalities … to bring them in line with this normal, general curve" (Foucault, 2007, p. 62). In sum, governmentality is a modern mode of power and problem-solving[1] wherein security apparatuses ensure smooth circulation and discipline functions to manage disruptive elements individually.

Moreover, after establishing security apparatuses and discipline—and conceptualizing governmentality through their interrelation—Foucault later situates governmentality within the expansion of liberalism in the modern West (and worldwide), as detailed in *The Birth of*

Biopolitics and *Society Must Be Defended*. Liberalism, he argues, is not simply an ideology that unconditionally expands freedom; rather, it is founded on security apparatuses that guarantee continuous free circulation. Yet to maintain this circulation along a normalized curve, measures and disciplinary regulations based on "natural … [and] spontaneous mechanisms" must be imposed (Foucault, 2008, p. 3), a process that paradoxically expands control, suppression, and management procedures (Foucault, 2008, p. 67). Consequently, as Foucault explains, freedom does not exist naturally (nor is it merely "the command of freedom" as some suggest (Foucault, 2008, p. 63)); instead, freedom is produced by governmentality, which continuously regulates, organizes, and adjusts power to sustain both freedom and security (Foucault, 2008, p. 66).

Recent social scientists—from science and technology studies, geography, anthropology, to political science—have expanded upon Foucault's discussion. They show that advances in digital and algorithmic technologies have greatly enhanced the capacity to manage the conditions that enable free circulation (via the apparatuses of security) and to detect and isolate irregular cases (via discipline). In other words, whereas until recently regulatory techniques for "taking charge of the behavior of individuals day by day and in its fine detail" (Foucault, 2008, p. 67) and for "determine[ing] the precise extent to which and up to what point … individual interests … constitute a danger for the interest of all" (Foucault, 2008, p. 65) have been applied only broadly, they are now executed with much greater precision through modern technologies such as biometric data, big data, algorithms, and artificial intelligence. Additionally, technologies like biometric tracking and real-time cloud-based data systems support highly specific management systems for criminals, immigrants, and ordinary citizens (Amoore, 2006, 2024). Contemporary practices even extend governmentality to use detailed personal information and AI to analyze backgrounds, lifestyles, and content consumption, thereby predicting future social flows (Leszczynski, 2016; Lyon, 2014), a process referred to as "digital governmentality" (see Dijstelbloem & Broeders, 2015; Leese et al., 2022). More concrete examples of digital governmentality—especially with a focus on urban areas—will be discussed later.

'Borders Through Cities'

Internalized and Administrative 'Borders Through Cities'

Borders exemplify one of the key principles of governmentality discussed in Chapter 2—namely, the way of power exercises which sustains overall flows while screening individual abnormal cases. This chapter shifts its focus to the significance of cities within the concept of internalized borders—borders that extend inward from the territorial periphery. Specifically, it reviews two strands in the literature on contemporary urban change. First, cities serve as crucial sites for internalized border operations because they function as living spaces for many immigrants and concentrate administrative and social infrastructures. Second, cities have emerged as significant actors in border management alongside the nation-state.

Traditionally, borders were regarded as the outermost limits of a territorial state. However, recent studies by geographers, anthropologists, border scholars, sociologists, and other social scientists have challenged this idea by demonstrating that borders now extend both inside and outside the territory (e.g., ubiquitous borders; Balibar, 1998; Mezzadra & Neilson, 2012). These researchers have particularly focused on changes within Europe. One phenomenon drawing considerable attention is the transformation of nation-state borders—and the emergence of border externalization—stemming from the advent of the European Union and the migration of so-called 'unwanted' migrants (such as refugees and asylum seekers) from North Africa and West

Asia into Europe. Through the Maastricht Treaty of 1991, the EU abolished established borders between its member states and secured free movement for its citizens within the Union. At the same time, this change has led to the fortification of the EU's external perimeter. To achieve this, the EU has begun to establish facilities, practices, and institutional arrangements outside its territory that preemptively block, control, and manage unwanted migrants. In and across the EU, Frontex[2] is responsible for this task; under its leadership, police forces, military units, and other EU initiatives are jointly deployed to regions such as the Mediterranean, North Africa, Turkey, the Azores, and even sub-Saharan countries to restrict movement before migrants reach EU territory. Researchers refer to these activities as border externalization (or externalized border) (for example, see Bialasiewicz, 2012; Casas-Cortes et al., 2016; Geiger & Pecoud, 2010).

Borders, when externalized, imply the existence of internalized borders—an aspect that is even more central to this paper. Today, many countries, particularly wealthy ones, host large, diverse immigrant populations for socio-economic reasons such as the pursuit of job opportunities and better living conditions (in other words, for example, labor shortage). This group includes both legally admitted migrant workers and undocumented immigrants. Once undocumented immigrants enter a country, expelling them is often difficult because they frequently play significant roles in the national economy and society, and humanitarian regulations and pressures—from international conventions, domestic laws, civil society, academia, religious groups, and opposition parties—further complicating forced removal. Consequently, countries must develop ways to 'read,' (Scott, 1998) manage, regulate, and control these immigrants within their territories. Thus, as discussed in Chapter 2 on governmentality, the focus is not on blocking overall migration flows but on identifying and managing potentially problematic elements (i.e., irregular immigrants) within those flows.

A prime example of such management is the administrative differentiation between (so-called) 'appropriate' and 'inappropriate' immigrants. Numerous scholars, particularly in anthropology, have focused on this administrative dimension. One key mechanism is the issuance of identification documents—passports, visas, driver's licenses, and similar forms of verification—what Noiriel (1996) refers to as "cards and codes." These documents, issued only to appropriate immigrants, serve as a direct means for the state to verify immigrant identities. For example, as demonstrated in Burrell and Schweyher's (2021) study of the Swedish *personnummer*, the assignment of an identification number has significant consequences. Their study shows that even Polish immigrants—despite being EU citizens—are identified as a distinct population and become subject to various forms of surveillance and subtle everyday restrictions based on whether they possess this number. As Burrell and Schweyher aptly point out, the *personnummer* functions as a crucial administrative mechanism that distinguishes diverse immigrant groups and confines their behaviors to specific social-spatial domains.

In addition, research on refugees and asylum seekers—such as Cabot's (2012) study—demonstrates that administrative identification documents (e.g., the 'Pink card' containing a person's name and basic details) serve as a key device governing access to housing, food, healthcare, and even freedom of movement in Greece. Beyond these documents, scholars have examined broader administrative measures that function as internalized borders. For instance, Vetters (2019), using a legal anthropological approach, analyzed the administrative guidelines of Berlin's foreign registration offices. According to Vetters, these guidelines are not merely informal subordinate rules; rather, they form an essential legal and administrative framework that governs how immigrant checkpoints and related enforcement measures are implemented at the street level (Lipsky, 1980). Moreover, the diverse and contingent state–immigrant interactions at this level feed back into these guidelines and eventually shape higher-level laws, functioning as a dynamic internalized border that regulates immigrants and influences the overall legal framework

of the state and the European Union.

Procedures that 'read' immigrants' information—thereby incorporating immigrants into the state's administrative network—operate not only through identification documents and numbering systems (which, via surveillance, allow 'wanted' immigrants to be accepted while rejecting or confining 'unwanted' ones) but also through a broader system spanning both the public and private sectors. This system comprises various administrative and social infrastructures that, at different times and locations, identify, manage, and control immigrants. Many researchers—especially sociologists and anthropologists—have explored these dimensions (Fabini, 2017; Tervonen and Enache 2017, Tervonen et al., 2018). For example, Yuval-Davis et al. (2018) showed that the social infrastructure essential to urban life, when combined with administrative devices, functions as a core element of borders. Analyzing the 2014 UK Immigration Act and earlier laws on immigrants and asylum seekers, they found that this legislation not only enables the government to crack down on the social activities of irregular migrants but also designates various institutions and sites—such as banks, driving license authorities, hospitals, private organizations, public agencies, restaurants, shops, factories, city libraries, and video rental shops—as venues where immigrants' statuses are verified, thereby determining the scope of their social activities.

For instance, in the UK, by penalizing employers who hire immigrants lacking a regular legal status (as defined in relation to visas and passports), the state renders the entire social sphere "hostile" (Yuval-Davis et al., 2018, p. 233) to such immigrants. Consequently, employers, bank and hospital staff, and document officers are compelled to demand identity documents and paperwork to verify immigrant status. Similarly, in Berlin, cases have been documented where immigrants registering for library memberships must provide not only proof of residence but also the expiration date of their visas, and kindergarten enrollment procedures sometimes require parents to submit copies of their passports and visa documents (Lebuhn, 2013). Combined, these practices create a system that categorizes and 'screens out' various immigrants throughout the territory.

Although these studies have primarily focused on identity documents, administrative paperwork, and the institutions that verify them, these cases are consistently set against the backdrop of major urban areas such as Malmö, Athens, Berlin, and London. In other words, internalized borders today operate *through cities*. Two key factors explain this. First, internalized borders function by verifying identity documents and processing paperwork at everyday administrative and social venues—thereby distinguishing immigrants with legal status from those without and isolating the latter either spatially or by relegating them to socially marginal areas (e.g., the informal economy). These procedures work most effectively in cities, where administrative resources and personnel are densely concentrated. Second, cities are inherently centers of economic and social opportunity (e.g., jobs, factories, restaurants, schools, hospitals) and serve as transportation hubs where many immigrants settle or remain during the early phases of migration (Meeus et al., 2019; Wessendorf, 2022). Consequently, cities become critical sites for internalized border operations, and effective immigrant management depends on establishing an "efficient" internalized border system. For these reasons, I argue that today's borders depend on cities.

Furthermore, discussions about borders in everyday social domains are linked to another research stream. Since the emergence of the European Union, Europe's governance structures have been dynamically reconfigured, prompting scholars from political science, sociology, and geography to investigate governance arrangements that extend beyond the nation-state—a phenomenon known as Multilevel Governance (MLG) (Caponio & Jones-Correa, 2018; Flamant, 2020; Lacroix & Spencer, 2022; Panizzon & van Riemsdijk, 2019; van Riemsdijk et al., 2021).

In the context of internalized borders and immigration management, these researchers emphasize the role of cities. Municipal governments sometimes implement internalized border policies that diverge from or even contradict central government directives. For example, several European cities have independently accepted refugees and asylum seekers (contrary to central policies) (Caponio, 2021; Lacroix & Spencer, 2022), forming alliances that enhance their influence and establish autonomous forms of immigration governance—that is, internalized borders.

In summary, today's borders have expanded into various locations, and internalized borders—those that maintain overall flows while capturing individual deviations—are becoming increasingly important. Cities, with their dense administrative and social infrastructures, concentrated immigrant populations, and inherent influence, occupy a central role in this process and facilitate governance arrangements that transcend the nation-state. This paper refers to these changes as '*Borders through Cities*.' In the next chapter, the discussion will examine how contemporary cities operate—both regarding immigrants and more broadly—by maintaining overall flows while managing individual cases.

The Case of 'Borders Through Cities': South Korea's Administrative Border System and the 'Foreigners Information Platform'

In this section, I examine Korea's internalized border system as a case of *borders through cities*, focusing on the Integrated Administrative Information Platform for Foreigners. As discussed earlier, immigrant governance in Korea—through digital administrative practices and the spatial milieu provided by cities—is robust, reflecting a long-standing state-driven tradition of dense administrative development that applies equally to foreigners (Park, 2024).

Within this framework, the most essential elements are the Foreigner Registration Numbers and Cards (FRN/C) (Figure 1). Originally designed to read the entire Korean population, this system is applied similarly to new foreign entrants. The Resident Registration Number, which includes details such as date of birth and region, enables each individual to be identified administratively and digitally, thereby linking citizens to the state. Likewise, the FRN/C contains similar data (e.g., date of birth, country of origin, and visa details) and is automatically computerized and disseminated by administrative agencies. As Park (2024) notes, the existence of these numbers—and their internal logic (for example, if the first digit of the final seven digits is 5, 6, 7, or 8, then the holder is classified as a foreigner)—ensures that foreigners are distinguished from Korean citizens both numerically and administratively. Through this system, all immigrants are automatically read and thus become bordered, forming the core of Korea's internalized border system.

However, within the context of this paper, what is even more significant is the internalized border through the cities that is based on this system. Although the FRN/C itself functions as an administrative border, it merely represents a distinction within the state's dataset. For this to translate into a border that immigrants (and Korean citizens) actually experience in everyday life, it is essential that this information circulates through the diverse infrastructures of the city and should be required by those various urban functions/infrastructures. For example, if a FRN were maintained solely in its initial state, it would fail to capture the movement of the foreign population, and the actual task of identifying the individual immigrant would fail. Hence, a process to capture the movement of foreign populations is required, and at its core are the basic administrative institutions—such as district offices, county offices, and neighborhood offices—that cover the entire territory with a focus on urban areas. Just as Korean citizens are required to report address changes when they move, foreign populations are similarly obligated to report relocations. This reporting serves as an important basis for the state's administrative recognition and subsequent surveillance of foreign populations within the natinal territory. These

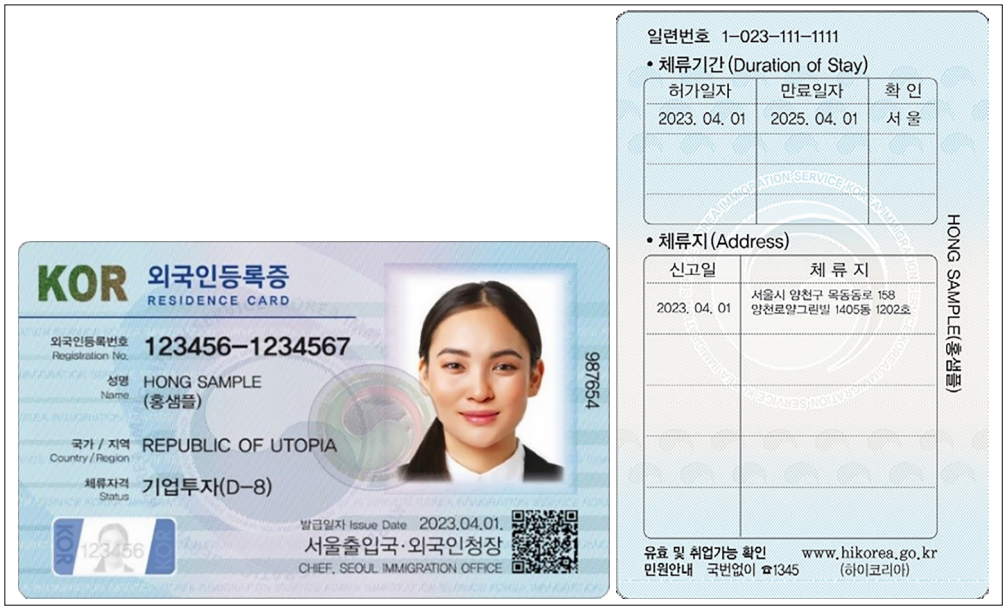

Figure 1. Foreigner registration card (left: front side, right: back side)
Source: Korea immigration service, ministry of justice

administrative institutions are predominantly located in urban areas (or, in rural areas, in the urban centers of those regions) and form a core component of urban infrastructure (Park, 2024).

Beyond the internalized borders maintained by administrative institutions and foreign registration numbers, a critical aspect of 'borders through cities' is the operation of border mechanisms in everyday urban settings. As noted earlier, these practices are especially evident in key urban facilities—companies, schools, and hospitals—that play central roles in daily life by distinguishing between Korean citizens and foreigners. For example, many urban factories, restaurants, and businesses employing foreign workers (in coordination with state agencies) act as *de facto* border management bodies by handling information on visa types, durations, work roles, employment insurance status, and registration numbers/cards. Regional offices of the Ministry of Employment collaborate with employers through administrative practices—issuing official documents, conducting inspections, enforcing crackdowns, and imposing fines—to uphold these internalized borders.

Similarly, schools play a comparable role. Given that most universities are located in urban areas, they have become critical infrastructures for managing international students. Universities continuously monitor whether these students remain within the 'normal' framework—using attendance checks via in-class roll calls and digital applications like KakaoTalk—to prevent them from becoming irregular migrants. Incidents such as the forced deportation of international students at Hanshin University in 2023 and the exclusion of irregular migrant children from remote classes during COVID-19 demonstrate that educational institutions actively 'remove' irregular students to maintain an overall 'normal' flow—a task traditionally seen as the responsibility of public officials.

Moreover, maybe more importantly, border practices occur in even the most prosaic aspects of daily life. Foreigner registration numbers and cards are indispensable—or, in their absence, trigger cumbersome processes—for activities such as activating mobile phones, signing real

estate contracts, opening bank accounts, accessing public services, and verifying one's identity online. Since these services are essential for contemporary social life, difficulties in accessing them can lead to significant hardships, such as unstable housing or unpaid wages. In this context, various urban functions—banks, real estate agencies, mobile phone outlets, libraries, gyms, sports facilities, supermarkets, and online identity verification venues—serve as crucial infrastructures that distinguish between ordinary citizens and migrants, further 'screening out' irregular immigrants.

In addition, similar processes occur in many social and legal domains within urban areas. Everyday interactions with public institutions—concerning taxation, health insurance, crime reporting, vehicle registration, legal disputes, and other administrative notifications—also serve to identify irregular immigrants. This function is embedded in urban infrastructures such as tax agencies, insurance companies, police stations, and local police offices.

Recently, Korea's separate systems, which have been controlled by different state bureaus and private companies, are consolidated into a single integrated platform centered on the Ministry of Justice. This platform connects the various public and private agencies discussed earlier, sharing in real time the information they collect about foreigners (see Figure 2). It encompasses institutions ranging from airports, immigration offices, police stations, courts, and prosecutors' offices to schools, tax authorities, the Ministry of Employment, the National Health Insurance Corporation, banks, and mobile and Internet service providers (Choi et al., 2021). A dedicated big data unit within the Ministry of Justice analyzes this vast dataset for "public interest" purposes and for "policy formulation" (Choi et al., 2021, p. 11). Because these agencies are typically located in urban areas, the platform serves as a prime example of how border functions operate through urban infrastructures in Korea. Planned in 2021 and now in operation, its current level of maturity remains unclear. Moreover, since the government collects and shares extensive administrative data and personal information on foreigners, details about the platform are not

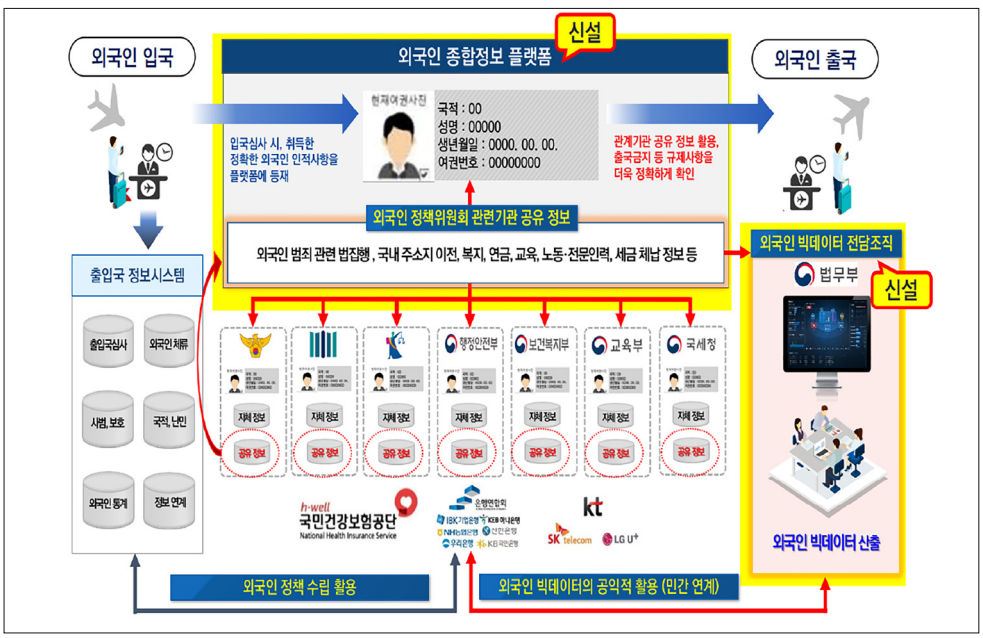

Figure 2. Plan for the foreigners information platform

actively disclosed, which can make research challenging. However, as Park (2023) notes, this platform appears likely to become a de facto internalized border in Korea and play a significant role in urban immigrant governance, warranting further study.

'Cities Through Borders'

Digital-Algorithmic Governmentality and the 'Speculative Futures'

Digital governmentality increasingly relies on digital technology and algorithms—a trend that originally emerged in border operations and now extends to managing various urban elements such as crime, traffic, infrastructure, and mobility. I refer to this phenomenon as "cities through borders." This section first examines how digital governmentality functions predictively as a border mechanism, then reviews recent studies on its role in governing urban components.

While governance has long been discussed across social sciences, Katzenbach and Ulbricht (2019) note that "algorithmic governance"—the integration of digital technologies (data and algorithms) with governance—was first conceptualized by Muller-Birn et al. (2013). Unlike traditional governance, which relied on interactions among transnational, local, and private actors, contemporary governance increasingly hinges on data-driven algorithms (see also Coletta and Kitchin, 2017).

As illustrated in Foucault's work on governmentality, digital governmentality uses algorithms to identify, classify, and manage various social issues—ranging from human movement (including irregular migrants) and the arrangement of things to pathogens, urban safety, and data (Kitchin, 2014; Roche, 2014, 2016). As Lawrence Lessig famously stated, "code is law" (Lessig, 1999). A key aspect is that today's systems rely on individually tagged, comprehensive records—especially data gathered via smartphones and platforms—resulting in far more detailed datasets than past statistical approaches (Dammann et al., 2022).

This unprecedentedly large and detailed data set, along with its derived outcomes, constitutes one of the most critical and unique features of digital governmentality (especially when compared to earlier, non-digital forms). Relying on real-time monitoring technology, these big data sets are continuously expanded, with the information being categorized and surveilled in a finely tuned manner (Bennet, 2017; Graham, 2005; Neyland & Mollers, 2017). Ultimately, the analysis of this data wields powerful predictive force by calculating the probability of certain events—particularly negative ones—occurring (Aradau, 2016; Lyon, 2014). This mechanism not only organizes the individual abnormal cases but also anticipates their occurrence, thereby playing a crucial role in ensuring that the overall flow of certain events is maintained and that governmentality can operate more effectively (Shelton et al., 2015). This is why digital governmentality is so crucial in contemporary governing systems.

As discussed above, one of the earliest applications of digital governmentality was in the realm of borders—especially in the context of security. Rather than merely blocking people and objects, borders perform a complex function: they admit authorized or 'wanted' migrants while filtering out or confining those deemed 'unwanted,' thereby marginalizing them. In the context of globalization (i.e., liberalism), borders continuously investigate, categorize, and manage various types of migrants—including both documented and undocumented economic migrants, family migrants, refugees, and asylum seekers—to ensure overall flow while controlling disruptive elements. To achieve this with increasing precision, digital governmentality relies on technological capabilities such as big data on immigration records, cloud-based systems, digitized passports and identity documents, biometric data collection and sharing, the datafication of

everyday life, and analysis via artificial intelligence and machine learning.

These operational principles, originally applied to borders, have gradually expanded to govern entire cities (Ploger, 2008). Contemporary urban environments, founded on liberal principles for economic, political, and social reasons, cannot function by simply blocking the flows of people, objects, or data—except in exceptional cases like COVID-19 or wartime. Instead, urban space is predicated on the free movement generated by these flows and the economic, social, and cultural forces they create. To preserve these interactions, cities must continuously identify and either normalize or eliminate any "abnormal" elements that might disrupt smooth flow (Burrell, 2016). In this respect, I argue that today's cities adhere to the operational principles of borders, which I refer to as 'cities through borders.'

Numerous researchers have examined concrete cases of digital governmentality in urban settings. One prominent example is the management of urban crime and security through the identification and removal of criminals. Major cities worldwide have deployed extensive high-definition CCTV networks; contrary to the assumption that such systems are confined to authoritarian regimes, cities like London, Atlanta, Singapore, Chicago, Sydney, Berlin, Vienna, Washington, D.C., and Seoul all maintain comprehensive coverage (Park, 2020). These networks form a core material infrastructure of digital governmentality, playing a crucial role in crime prediction and prevention by monitoring and analyzing behaviors in real time. For instance, if a person is seen walking along a deserted street at night and is then rapidly approached by another individual who forcibly seizes something, a pre-trained AI system can use facial recognition to analyze the ages, races, and genders of those involved and assign a probability that the act constitutes a robbery.

Furthermore, beyond real-time analyses, systems that integrate variables such as location, time, age, race, gender, and even an individual's history (via facial recognition) have been studied as mechanisms for predicting potential crimes or abnormal situations—what Leszczynski (2016) called "speculative futures" (or "politics of prediction" (Aradau & Blanke, 2017), see also Mandalapu et al., 2023; McClendon & Meghanathan, 2015; Shah et al., 2021). This predictive mechanism applies not only to robbery but also to crimes like vehicle theft, (sexual) violence, burglary, vandalism, harassment, and homicide, as well as to non-criminal disruptions affecting urban security, such as protests, crowding at concerts or festivals, sudden crowd formations, and urban disasters. By pre-training artificial intelligence and refining its algorithms, these systems can identify and eliminate 'abnormal' behaviors and situations. In doing so, a range of urban crime and security devices work together to realize digital governmentality that maintains a 'normal' state—or overall secure flow—within cities (Katzenbach & Ulbricht, 2019).

Transportation and the movement of goods form another key domain of contemporary urban governing, one that relies on digital technologies to regulate flows and eliminate disruptions within Foucauldian liberalistic cities. These circulatory systems are critical for urban functioning: traditional flows (automobile traffic, public transit, pedestrian, bicycle, and personal mobility, as well as goods, parcel, and food deliveries) coexist with emerging modes (such as autonomous vehicles, trains, subways, drones, and air taxis) that are poised to become core components of urban mobility (Abduljabbar et al., 2019; Bharadiya, 2023; Wheeler and Steenbeek, 2021; Zantalis et al., 2019). Digital governmentality in transportation and logistics management involves manipulating road and pedestrian signals, employing variable lane systems, and monitoring traffic accidents, real-time public transport locations, dispatch intervals, passenger loads, congestion levels, and incidents near transit hubs—primarily through CCTV. Moreover, much like in crime prevention, machine learning and AI inference techniques are employed to predict future outcomes based on real-time data. For example, in the event of a large-scale concert or sports game, prediction systems simulate post-event crowd movement by considering factors

such as the venue's proximity to public transit, the layout of surrounding buildings and walkways, crowd size, weather conditions, and the configuration of pedestrian signals. These forecasts can then guide people in specific directions (Foucault, 2007) and, through various interventions (e.g., adjusting event management or deploying additional public transport), minimize congestion and stabilize overall urban traffic flow.

The examples from crime prevention and transportation management illustrate prominent cases of digital governmentality. Similar surveillance, data collection, simulation, prediction, and data-driven problem-solving practices are also evident in many other urban domains—from housing and environmental policy to urban development and infrastructure. As Foucault discussed in his analysis of urban hygiene and epidemic management, contemporary scholars have also examined COVID-19 and related public health measures—particularly urban surveillance technologies and digital governmentality (Kitchin, 2020; Park, 2020). Additionally, while issues related to crime and transportation are managed on immediate, day-to-day time scales, digital governmentality is increasingly applied to longer-term urban policy challenges, simultaneously managing overall flows and individual problems within urban systems (Barns et al., 2017; Dammann et al., 2022; Gabrys, 2014; Talamo et al., 2016).

Finally, although this paper does not primarily focus on the broader principles of urban governing, it is worth noting that digital governmentality—as one aspect of what Foucault termed the 'conduct of conduct'—is closely linked to the internalization of governing practices by individuals. Research has shown that platform services (e.g., Google Maps, Uber, Deliveroo, and various news services) increasingly induce certain behaviors among citizens and collect their data for urban governance purposes (for example, Dammann et al., 2022; Fields et al., 2020; Tornberg & Uitermark, 2020).

The Case of 'Cities Through Borders' in Rio de Janeiro and Seoul

In this section, I examine two cases as examples of 'cities through borders.' One is the Centro de Operações Rio (COR) in Rio de Janeiro, Brazil, and the other is a developing case in Seoul—the predictive policing system by the Electronics and Telecommunications Research Institute (ETRI). Although COR is a leading example of digital and algorithmic urban governmentality, it remains relatively unknown in Korea. COR is Latin America's first comprehensive urban management system, developed in response to the dynamic challenges in Rio de Janeiro following a massive landslide in April 2010 that necessitated integrated disaster management and emergency response (COR website; Luque-Ayala & Marvin, 2016). Developed in collaboration with IBM (New York Times, 2012), COR employs over 800 cameras to capture real-time footage across the city and utilizes a geographically referenced urban map that continuously provides data on weather patterns, public transportation, patrol statuses, and other urban functions (Luque-Ayala & Marvin, 2016).

As Luque-Ayala and Marvin (2016) correctly note—and as analyzed in this paper—COR faithfully follows Foucault's approach to urban issues in terms of circulation. It addresses urban challenges by using safety apparatuses as a foundational principle and applying disciplinary methods at the individual level, while also managing the materiality of urban infrastructures (e.g., water, sewage, roads, energy, waste, and recycling systems) to explain Rio de Janeiro's governance (see also Otter, 2007). In this way, COR aims for "the continuation of what has become normal" throughout the city (Gordon et al., 2014, p. 10, from Luque-Ayala & Marvin, 2016). By integrating diverse urban flows, COR coordinates governance relationships among multiple government scales (local and state) and private actors (such as transportation and power providers). Moreover, the system incorporates media and journalism—not only as a promotional channel for COR but also as a way to encourage citizens to have information about urban events

and to voluntarily report real-time data that happens in urban spaces (e.g., on roads, traffic, and disasters) via social media. This creates a public-participatory system that includes citizens as constituents of an 'urban calculation apparatus' (Gabrys, 2014).

All these diverse data sources are collected by COR and, using pre-set algorithms, are employed to predict the likelihood of specific negative events, thereby informing critical urban decision-making. In short, COR functions as a core digital–algorithmic urban apparatus that identifies and forecasts abnormal events—such as disasters or exceptional situations—and ultimately works to eliminate these abnormalities from urban space (COR website; Luque-Ayala & Marvin, 2016).

For example, based on a forecast predicting several hours of continuous rain in 2014, COR issued an emergency alert for Rio de Janeiro. In addition, by using topographic and ecological data on landslide-prone areas continuously accumulated since the heavy rains and landslides of 2010, COR activated evacuation procedures and flood response scenarios. This comprehensive system simultaneously and continuously coordinates numerous elements: meetings among public institutions, private companies, local communities, and citizen groups; dissemination of codes of conduct; distribution of information via TV, radio, social media, and SMS; real-time adjustments to traffic (e.g., removal of fallen trees, accident handling, and road repairs); and ongoing monitoring and recovery of disaster areas (Luque-Ayala & Marvin, 2016). Although such an integrated system may appear similar to traditional urban disaster-response measures, it is not surprising—as Foucault argued—that safety apparatuses and disciplinary techniques centered on circulation are key features of modern power. Crucially, when digital–algorithmic technology is combined with governmentality, the vast amount of real-time data collected enables significant predictive capacity, which in turn can potentially transform urban governance (e.g., the allocation of personnel, materials, and resources).

Another prominent domain where predictive capacity is transforming urban governance is predictive policing. Although still under development, Seoul—a city with an extensive CCTV network—has committed to introducing an AI-based crime prediction system.[3] The Electronics and Telecommunications Research Institute (ETRI) announced in 2020 that it was developing a system that combines high-definition CCTV, artificial intelligence, and historical crime data to predict criminal incidents across urban locations (ETRI press release). In July 2024, ETRI unveiled a prototype, called Dejaview, with commercialization planned for 2025 (KBS, 2024). In connection with this initiative, the Seoul Metropolitan Government has announced plans to upgrade the city's entire CCTV network to an AI-based system by 2026 (Seoul Metropolitan Government, 2023).

As the media describe this system as a realization of the movie '*Minority Report*' (e.g., Chosun Ilbo, 2024; DongA Science, 2024) given its predictive nature, the system automatically analyzes real-time CCTV footage from specific spatial and temporal contexts and determines the probability that these situations will escalate into criminal incidents. If the computed probability exceeds a pre-set threshold, the system alerts the control center and triggers audible alarms in the affected area, aiming to prevent crime or enable early intervention. For instance, if a CCTV camera captures a person walking in a dark alley and someone rapidly approaches from behind, accompanied by distress sounds, the system would assess the situation as having a high likelihood of being criminal (see Figure 3). Although it might be challenging to differentiate precisely among crime types, such a scenario could indicate theft, robbery, or sexual violence—especially if empirical data suggest a higher likelihood when the victim is female and the chaser is male. Similarly, if someone is observed collapsing on the street while another person approaches and appears to search their body, the system can make a comparable inference.

This predictive policing system in Seoul is based on an extensive crime dataset accumulated prior to its introduction. In collaboration with the Seocho-gu, ETRI analyzed a dataset of 32,656

Figure 3. Predictive crime analysis and alert system developed by the ETRI
Source: ETRI Webzine.

incidents captured by CCTV in Seocho-gu since 2018 and developed a Predictive Crime Map—one of the foundational datasets for the new AI system (AI Times, 2024). In addition, various simulated video scenarios have been created to train the AI to recognize crime situations, and materials addressing issues such as setting appropriate alert thresholds (likely requiring input from police and crime experts) have been gathered to ensure the system's technical and operational functionality. Once operational, every detected crime incident serves as additional training data, enabling the system to continuously refine its predictive accuracy. Finally, while the system's primary goal is to predict and prevent crime, crime—when viewed from the perspectives of circulation and governmentality—is a constitutive element of urban life; thus, the system can also be applied to other elements, such as disasters including early-stage fires triggered by electrical sparks, sudden collapses, or structural failures caused by extreme weather. Consequently, all abnormal situations captured in real time by CCTV can be detected and ultimately removed through this system.

It is important to note that the use of predictive urban management technologies does not guarantee a future of utopian, error-free cities. Systems like Dejaview and other predictive policing technologies are inherently probabilistic, carrying the risk of erroneous judgments and mispredictions. If a disaster or incident is mistakenly predicted not to occur, significant loss of life and material damage may result; conversely, if a non-criminal situation is wrongly classified as criminal, this can lead to infringements on citizens' rights and privacy, unnecessary alarms, and wasteful deployment of police resources. In one reported experiment, ETRI's system demonstrated an accuracy of approximately 83% (KBS, 2024), meaning it misclassified roughly 17% of cases—a figure that is far from negligible, as it implies that 17 out of every 100 predicted incidents are erroneous. Such technical instability raises important, fundamental questions regarding AI-based urban governance, although these expansive academic and ethical issues extend beyond the scope of this paper.

Conclusion

This paper has reviewed studies emphasizing the distinctive changes in urban areas by centering on Foucault's discussion of circulation and his concept of governmentality—defined as the

interplay of safety apparatuses and disciplinary mechanisms. In doing so, the paper has addressed what I term "borders through cities" and "cities through borders." Foucault demonstrated that, unlike pre-modern methods that blocked problematic elements, modern power resolves issues by allowing free circulation while correcting disruptions—a mode he termed "governmentality," closely linked to the emergence of liberalism.

This mode of governmentality is evident in how borders manage immigrant flows. In a context where nations must accept immigrants for economic, social, and other reasons, borders serve to capture and manage potentially problematic individuals (i.e., irregular migrants) without obstructing overall movement. As the spatial reach of borders expands, cities—due to their dense administrative and material infrastructures and the concentration of immigrant populations—become crucial sites for these internalized border functions. In this paper, I refer to this phenomenon as 'borders through cities,' examining the Korean case through instruments such as foreigner registration numbers/cards, everyday border practices, and a comprehensive foreigner management platform. Moreover, the same governing logic extends beyond borders. Contemporary cities not only strive to preserve free flows of people, infrastructure, and goods but also work to swiftly eliminate disruptions—be they accidents, disasters, or other anomalies—a broader mode I term 'cities through borders.'

Cities, home to vast populations, are key to understanding modern society. In this regard, understanding the ongoing digital-algorithmic transformation occurring in cities is a crucial research priority for the near future. This task is particularly urgent given that these changes are closely intertwined with and even reliant on rapidly evolving technologies. One effective approach to addressing this challenge is to prioritize highly interdisciplinary academic inquiry. For example. Governance studies, border and migration studies, science and technology studies (STS), security studies, geography, sociology, urban studies, political science, algorithm and artificial intelligence studies, and (urban) environmental studies are all essential to grasping the complexity of contemporary cities and their transformations. Therefore, cities—and the conflation of cities and borders—constitute an important site for interdisciplinary dialogue.

Lastly, discussions on the conflation of borders and cities and the operation of digital-algorithmic governmentality must not overlook potential policy and ethical concerns. While the concept of governmentality—particularly discipline mechanism that 'removes' irregular people and things from the 'normality'—offers a valuable lens for understanding the 'borders-cities' nexus, it also directly relates to the exclusion of specific marginalized populations in urban spaces. Existing studies have already demonstrated the potential exclusion of certain racial and migrant groups due to biases embedded in the politics of code and algorithmic governance (Ash et al., 2018; Leszczynski & Elwood, 2022; Ruha, 2019). More broadly, discrimination against particular sociocultural groups or even individuals (beyond ethnic and racial groups) can be allowed and legitimized by the purported usefulness and 'effectiveness' of highly developed digital-algorithmic apparatuses of security and discipline. Thus, policymakers, practitioners, and researchers must recognize and address these issues as seriously as they consider the technical understanding of these technologies and their impact on urban areas.

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Conflicting Interests

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Notes

1. However, more correctly, what Foucault emphasizes was not 'solving' various problems but 'optimization' of them (Klauser, Paasche, and Soderstrom 2014).
2. The official name of this agency is the European Border and Coast Guard Agency.
3. In addition to Seoul, many Chinese cities have extensive predictive policing systems, which have evolved from the country's dense traditional administrative structures. Some European countries, such as Denmark and the Netherlands, also operate such systems, while certain states or police departments in the U.S. already implement or plan to implement them. For example, a predictive policing system in Chicago is currently under developed (University of Chicago, Department of Medicine, 2022).

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