Routledge
Taylor & Francis Group

Journal of Contemporary Asia

ISSN: 0047-2336 (Print) 1752-7554 (Online) Journal homepage: www.tandfonline.com/journals/rjoc20

Making the China Data Valley – The National Integrated Big Data Centre System and Local Governance

Kevin Ziyu Liu

To cite this article: Kevin Ziyu Liu (2025) Making the China Data Valley – The National Integrated Big Data Centre System and Local Governance, Journal of Contemporary Asia, 55:2, 203-225, DOI: 10.1080/00472336.2024.2311808

To link to this article: https://doi.org/10.1080/00472336.2024.2311808

JOURNAL OF CONTEMPORARY ASIA
2025, VOL. 55, NO. 2, 203–225
https://doi.org/10.1080/00472336.2024.2311808

Making the China Data Valley – The National Integrated Big Data Centre System and Local Governance

Kevin Ziyu Liu

Department of Communication Studies, University of Minnesota Twin Cities, Minneapolis, USA

ABSTRACT

As a core part of the New Infrastructure Project, China officially launched the National Integrated Big Data Centre System (NIBDCS) in 2022. As part of the "West Computes Data for East" initiative, the NBDCS is a national digital governing infrastructure that includes eight National Data Hubs hosted by ten National Data Centre Clusters. This article examines the Guizhou Hub – one of the earliest established National Data Hubs and where China's first National Big Data Pilot Zone is located. The research takes an infrastructural perspective and reveals how contingent alignments, including the central state's initiatives, local government's role, and corporations like Apple and Alibaba, have come to negotiate, collaborate, and compromise in sustainable arrangements, and eventually bring about Guizhou Hub. The research shows that the grand strategies envisioned and supported by the central state are not enough; localising technological infrastructures requires key local leaders with business and political networks, and mechanisms of state–commercial complexes where intimate partnerships among governmental entities, state-owned enterprises, and private corporations are established, and mutual interests are achieved. This process is conditioned by a "frame of locality" and requires scholarly attention to a local perspective of infrastructural developments.

KEY WORDS

China; data centre; infrastructure; National Integrated Big Data Centre System; new infrastructure; political economy

On February 17, 2022, four administrations of China's central state – National Development and Reform Commission (NDRC), Cyberspace Administration of China (CAC), Ministry of Industry and Information Technology (MIIT), and National Energy Administration (NEA) – co-ratified the implementation plan for China's National Integrated Big Data Centre System (NIBDCS), officially launching the "West Computes Data for East" (东数西算, or WCDE) project (*Xinhua*, February 17, 2022). With the construction of eight data hubs and ten data centre clusters across the country, the WCDE project will host data processing, storage, and computing capacities and will function as a core engine of China's New Infrastructure Project. Data, as the central state has announced, is now being positioned as the "fundamental and strategic resource, and a key element of productivity" for the nation's endeavour to achieve socialist modernity; and a network of mega-data centres and data centre clusters appears necessary as the

CONTACT Kevin Ziyu Liu liux2275@umn.edua Department of Communication Studies, University of Minnesota Twin Cities, 225 Ford Hall, 224 Church St., Minneapolis, MN 55455, USA.

backbone that empowers the nation's governing capacity, industrial digitisation, data-based public services, and smart city developments (NDRC et al. 2020). As Figure 1 shows, under the WCDE initiative, a web of data centre hubs will connect the economically more developed coastal regions to the inland provinces and provide infrastructural support for the nation's digital governing needs.

Data hubs are not isolated clusters: they are by design nodes of a network of mega-data centres that carry out storage, transportation, and computation capacities. The Guizhou Hub, for example, not only functions as a digital infrastructure for local governance, but also as a key interconnecting node of the Guangdong–Hong Kong–Macao–Guizhou–Chengdu and Chongqing Data Passageway, providing data processing support to the Yangtze Delta Region and the Greater Bay Area, according to Jiao, the Chief Engineer and Chief of Staff of the Big Data Development Administration of Guizhou Province (quoted in *Guangming Daily*, February 28, 2022). Data hubs thus bear multifaceted and multilevel functionality: they (i) are nodes of a national integrated system for China's digital modernisation; (ii) connect neighbouring regions of different levels of economic development; and (iii) support local digitisation which, in turn, is an integral part of the national pursuit of digitisation. Therefore, any one of these national data hubs is situated in a complex network of national strategy, regional development, and local particularities. Indeed, a data hub does not emerge from the void, nor simply by top design; rather, it emerges from a complex network of global/local forces and political-economic arrangements, which, in turn, shape how the data hub emerges and localises, making it what Parks and Starosielski (2015, 4) call a "situated sociotechnical system."

Given the political, economic, and technological significance of China's digital infrastructure, and the potential impact China's NIBDCS might have, it is critical to look at how the system came into existence and how it is implemented and "actualised" in different regions (see below). In other words, it is necessary to explore how different data hubs and data centre clusters emerge from the interwoven networks of global, national, and local forces. Adopting political economy of media and infrastructural approaches, this

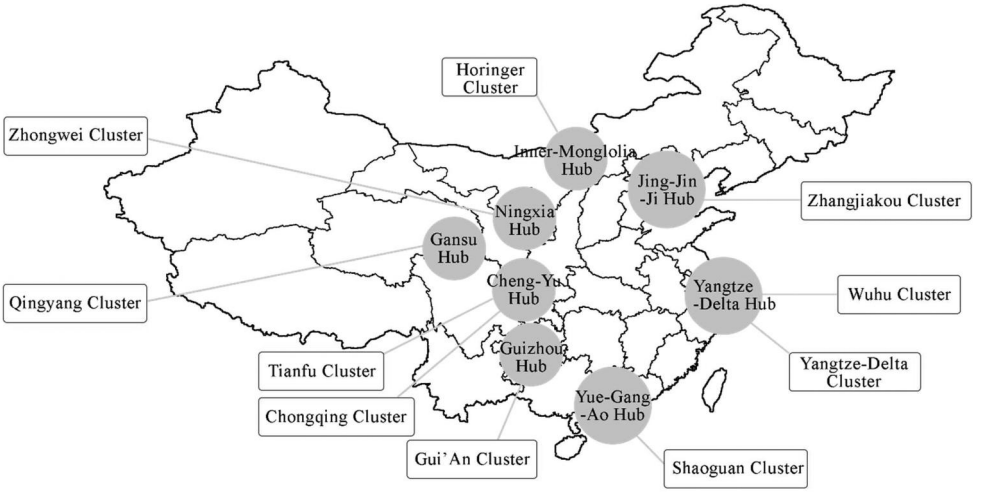

Figure 1. Distribution of data centre clusters and national data hubs
Note: This is an illustration of the distribution of the data hubs and data centre clusters adapted from a source map approved by the Ministry of Natural Resources for public usage, with a Map Review (Inspection) Number: GS (2023) 2767. The map is not an illustration of the actual territory of China. For the most up-to-date map of the People's Republic of China's territory, see http://bzdt.ch.mnr.gov.cn/index.html.
Source: Adapted from an illustration from NDRC's official website (NDRC 2022).

research provides a nuanced case study of the emergence of the Guizhou Hub, one of the earliest established data hubs of NIBDCS. Guizhou Hub also hosts China's first National Big Data Pilot Zone – Gui'An Big Data New District. The district also hosts Huawei's world's largest data centre, Apple's iCloud China data centre, and cloud facilities of major high-tech enterprises like Tencent and China's Big Three Internet Service Providers (ISPs) – China Telecom, China Unicom, and China Mobile. Yet there has been little scholarly attention to this region and its data infrastructure. This research suggests that a case study of the historical, political, and economic conditions of the emergence of a key national data infrastructure region like Guizhou Hub would reveal critical dynamics of how a centrally designed strategy is realised and sustained, thus producing stable results locally. Put differently, it explores how large-scale plans must be embraced into the particular local conditions and the "frame of locality" to be sustainable and self-reproductive.

This article asks several questions. How are cutting-edge data technologies localised in regions that were historically poor, under-developed, and have never had a digital industry? How is a major cluster of the central-designed national data system *actualised* in Guizhou province? How do different political and economic forces come to shape local development? How do they negotiate and collaborate? By charting the political economy of the emergence of Guizhou as a data hub, this research examines the process through which data technologies are established, stabilised, and therefore, actualised locally. By looking at how various forces – from the central to local government, from state-owned enterprises (SOEs) to the private sector, and from global corporations to domestic and local businesses – are involved, this article reveals an established pattern of governance that is becoming increasingly visible in contemporary China. That is, the central state exerts its governing power by providing guidelines and outlines of development, but it is powerful local leaders (appointed by the central state) with political and business networks who champion these developmental objectives. Throughout this process, corporations that have the technological capabilities are brought into "commercial-state complexes" where their commercial interests and the political goals of regional developments are simultaneously satisfied. This research details how these mechanisms are worked out through complex interactions between the public and private sectors, and how private agents are harnessed through incentives and pressures to support digitisation initiatives.

The case study presented here not only illustrates the birth of one of China's eight national data hubs, but also shows how national strategies are envisaged and supported from the top and how this was insufficient, being dependent on particular local dynamics to turn contingent alignments of political, economic, and cultural forces into something sustainable, therefore realising political objectives with local commercial compatibility. In a sense, this research delineates the processes of what Latour (1993, 10–11) would have called "translation." Through translation, the grand vision of the central state is localised and institutionalised as the actual reality of a region, and the various contingent forces are worked into stable assemblages that could sustain a certain type of local development. In this process, private corporations incur "sunk costs" in regional developments as they work closely with local governments, hence are under pressure to make a project work and to acquire financial gain from the investments. This article argues that understanding the magnitude of these dynamics sheds light on why corporations would invest in the government-initiated plans in the first place, and the complex but also contingent relationships between private corporations and public entities.

This research is part of an ongoing project that focuses on the broader issue of digital infrastructure development, digital governance, and data centre development in

contemporary China. It is not claimed that the findings presented here are representative of all that is happening in China's current efforts in the digital sphere, as it will take further research to produce comparative studies across different regions. Nevertheless, this study suggests that the mechanisms observed from the case of Guizhou Hub bring valuable insights to the scholarly discussion of the digitisation initiatives that China has been pursuing in the last decade, and it sheds light on the understanding of how these strategies could be realised in China on a regional and local level in a sustainable manner.

Studying the China Data Valley: Theory and Methods

As data and cloud computing technologies become major topics of global governance, China has become a critical player. However, as Jiang and Fu (2018, 388) argue, data technology developments in China "have received significantly less attention in the discussion and debate of this burgeoning field." Indeed, while there has been a proliferating scholarship on data technology, cloud, and data centres such as Mosco (2014), Hogan (2015), and Reading and Notley (2015), almost no scholarly research has examined the particularities of China's recent NIBDCS initiative. Scholars have also paid attention to data centres of renowned international corporations, such as Google by Gilmore and Troutman (2020) and Mayer (2019), Facebook by Brodie (2021), and Microsoft by Pasek (2019). However, limited attention has been paid to similar issues in China, especially how data centre developments are articulated to the national strategy. This study fills this scholarly gap and aims to show not only the physical presence of technological objects such as the construction of a data centre – though this is certainly a critical part of the analysis – but also the institutionalisation of a network of political and economic arrangements that stabilises and sustains the emergence of these tangible presences of data technology. This case study of Guizhou Hub speaks to the non-stable and contingent process through which digital technologies localise as an *infrastructure* that eventually will become ubiquitous and "disappear into the woodwork of urban life" (Mosco 2019, 16).

Star and Ruhleder (1996, 114) have argued that the establishment of technological infrastructure requires that "the tension between local and global is resolved"; that is, only when technologies become "invisible" and imprinted into diverse local organisational transformations, and a fundamental part of everyday life have they become infrastructural. Similarly, Starosielski (2015, 19) conceptualised infrastructure with two strategies: (i) "strategy of insulation" describes spatial reconfigurations that claim "an autonomous place" of a technology and isolate it from its surroundings; and (ii) "strategy of interconnection" stabilises technologies by "transduc[ing]" energy from one system to another, achieving "equilibrium … (or at least attempted)" across different local forces. For example, the construction of data centres has occupied farmland, but also absorbed the surplus labour from local villages when they suddenly had no land to farm. These conceptual frameworks describe how technologies disappear into the bits and pieces of local, everyday banality – described here with the more general term "actualisation." When global and local tensions are resolved, natural and artificial environments are reorganised to compromise and accept the novel technology, and when various political, economic, and cultural elements that were stirred by the new technology achieve a new equilibrium with the establishment of new networks and relationships, this is when the novel technology becomes infrastructural and is actualised locally.

Of course, the actualisation of infrastructures involves complicated and sometimes long processes, and this article does not capture all these dynamics. It primarily addresses the emergence phase of the data infrastructure on a regional level, focusing on relatively

large-scale operations that involve the localisation of global and domestic technology giants, SOEs, and their interaction with the political arrangements and objectives of government – in this case, mostly the provincial government. Further research is needed to examine how the emergence of data infrastructure is further naturalised through local discourse and cultural production, and how smaller-scale political, economic, and sociocultural operations – such as lower-level governments and smaller local enterprises – contribute to the process of "infrastructurising" data technologies.

In addition to an infrastructure perspective, by presenting how state power and private corporations interact, this article engages with discussions of post-socialist governance in contemporary China. Specifically, it follows Ong's (2006) understanding of the post-Mao China in a dual relation: (i) neo-liberalism as an exception, where market-driven transformations and policies are introduced into a socialist state as exceptions; and (ii) exceptions to neo-liberalism, where certain social sectors are excluded from neo-liberal operations by state intervention. As such, China showcases a neo-liberalism with Chinese characteristics. That is, socialism still occupies China's central political ideology, but it became "socialism from afar" – instead of "dismantling the socialist apparatus," Chinese reformers managed to transform China gradually "by creating a space for people to exercise a multitude of private choices, but always within the political limits set by the socialist state" (Ong and Zhang 2008, 2–3). This framework allows a conceptualisation of the state–market relationship in post-socialist China as situational. Put differently, the political power of the state might not always present itself in a "big brother" manner, instead, it might function at a relative distance by setting the limits and herding other operations in a general direction.

This article also relates Ong's framework with Mann's (1984, 189) conceptualisation of the infrastructural power of a state, which refers to "the capacity of the state to actually penetrate civil society, and to implement logistically political decisions throughout the realm," and it determines "how far bureaucracy can reach to exert control and regulate social relations" (Soifer 2008, 234). While the Chinese state exerts its power by setting the boundaries of a limited "freedom," Mann's concept asks through what dynamic or instrument this power at a distance infiltrates the space within the boundaries. Or what is the "infrastructure" through which the institutional and bureaucratic power of the state is exercised so that "socialism from afar" is sustained? This article employs the term "state–commercial complex" to describe the situation where the state and private actors successfully work together in a way that fulfils the political and commercial objectives of both parties, thus achieving the actualisation of an infrastructural power of the state. It argues that state–commercial complexes have become normalised in productive state–market relationships as a governing infrastructure that facilitates state power's penetration of society at a distance.

A state–commercial complex is an assemblage of networked relationships by which political, commercial, global, local, institutional, and individual interests are achieved through negotiation and compromise. When this assemblage works out, a system of interlocking power relations is observed, whereby the central and/or local governments achieve certain political or economic objectives by supporting, incubating, and utilising corporations that have developed technologies capable of fulfilling these governments' needs. State–market symbiosis is a similar concept conceptualised to describe a situation where "Internet companies help the state to maintain social order and stability in exchange for markets and profits" (Jiang and Fu 2018, 385). However, this definition has a strong implication of a strictly two-way exchange – the corporations stabilise the society (assuming that stabilising the society is the primary objective of this relationship), and the state gives markets and profits to corporations in return (which assumes that profits could be

easily exchanged for political actions). These two assumptions are not always true. This definition also ignores the fact that different levels of government might not operate in a frictionless manner, and these operations are much more nuanced than a generalised idea of the Chinese state or the Chinese Communist Party's (CCP) authority. Quite differently, the notion of the state–commercial complex follows Ong and Zhang's (2008) assemblage approach and views state–market relationships as different scales of assemblages that articulate or disarticulate with each other. Precisely because the state–market relationship is highly contingent and often precarious, neither political pressure nor economic interests guarantee a successful collaboration. Rather, to what extent a political objective could be achieved and to what extent the commercial interests could be fulfilled is a constantly negotiated, fluid, and situational process. The emergence of a large-scale project like NIBDCS or Guizhou Hub involves the functioning of multiple state–commercial complexes at different levels and scales.

Once state–commercial complexes are actualised, a state–market relationship can be highly productive. Cases that illustrate certain characteristics of successful state-commercial complexes could be found from China's contemporary history of economic reform and high technology development, such as the emergence of Tencent and its commercial surveillance infrastructure (Liu 2019). The case study in this article more comprehensively demonstrates such a scenario. However, this does not mean that state–market relationships will always be win–win situations. Rather, productive state–commercial complexes are highly contingent and context-specific, thus requiring close examination to illustrate both local particularities and broader historical contexts that condition their emergence. This also means that these assemblages are not always stable or successful in producing a designated outcome. A state–commercial complex is not achieved when negotiations and interactions fail. An example is Ant Finance – a technology company established by Alibaba Group that operates Alipay, one of China's largest online payment platforms. Alipay was initially supported by the state as a pilot product for online payment, and it became a great success and in 2022 held more than a 50% share of the third-party mobile payment market (iResearch 2022). However, while providing banking services like personal loans, Ant Finance avoids the regulations for financial institutions because it is established as a technology company. The company has a 2–3% capital ratio whereas the ratio for most financial institutions is 12–15% (*Forbes*, November 23, 2020).[1] When Ant Finance decided to launch on both the Shanghai and Hongkong Stock Exchanges, the Chinese authorities suspended its Initial Public Offering. In this case, Ant Finance's economic interest went beyond not only the international financial regulation norms, but also the state authority's tolerance of high-tech firms and their loose adherence to rules. So, the state nurtured the success of Alipay as a pilot project, but this collaboration resulted in conflicts as the company's economic interest posed potential harm to the financial market. Therefore, it is critical to recognise that as state–market dynamics emerge and transform, neither political nor commercial forces are determining in the first instance; either could be, depending on the particularities of each case.

Lastly, regarding methodology and empirical data, this research utilises many policy documents collected from publicly available databases, including political documents from various ministries of central and local governments. As well, media reports in both English and Chinese are used, and some of these are from the archives of local official media organisations. Most importantly, this research is part of a larger project that has included fieldwork and archival research. The research also refers to the empirical material collected from interviews conducted by the author.

The rest of this article is in two main sections. The first section provides a detailed discussion of the policy foundation of Guizhou Hub's emergence and unearths how particular political, economic, and personnel arrangements were made to ensure the success of the project. These contexts define the political boundary of Guizhou's development. The second section focuses on how state–commercial complexes are actualised with the cases of Apple's iCloud data centre and Alibaba's close collaboration with the provincial government. The article reveals the formation of a state–corporate network through which collaborations, negotiations, and compromises are made in contingent ways. These processes are intermingled with local, national, and global forces; they uncover the actualisation of Guizhou Hub as a data infrastructure and reveal new dynamics of the infrastructural power of the Chinese state.

The Emergence of Guizhou Hub

Before becoming a critical component of the NIBDCS, Guizhou was never known for digital technology. The province has been a main target of "Western Development," meaning that *development* – from backwardness to modernity, as the term is framed in popular discourse in reform-China – has been the major task assigned by the central state to Guizhou authorities. As described by Cao – a middle-aged local villager of what is now the Gui'An Big Data New District – in the past, ploughing the soil by ox was about the limit of technology in agriculture, and everything else used manual labour in her younger age (Interview, February 2021). Indeed, the hardship that Cao endured reflects the general situation of the province's past. As one of the most mountainous regions in the world, Guizhou had been the poorest province in China for decades and its GDP per capita remained the lowest until 2015. Before the eight-year campaign of poverty alleviation by the central state had allegedly eliminated extreme poverty in China by the end of 2020 (State Council 2021), Guizhou had about 2.8 million residents living below the poverty line by 2017, with a daily income of less than US$0.95 (Li 2018). Over 4 million of its 35 million residents lived on less than US$1.90 a day, and fewer than 45% used the internet in 2016 (*The Economist*, May 31, 2018). For decades until the data development initiative, the province's economic structure heavily relied upon traditional industries (such as phosphorus mining) and agriculture (including tobacco and alcohol production), and the service industry accounted for only about 10% of Guizhou's GDP (see Table 1).

Table 1. The GDP component of Guizhou Province, 2012–2020 (selected)

	2020	2019	2018	2017	2016	2015	2014	2013	2012
GDP	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Primary industry growth rate	14.2	13.6	14.0	14.9	15.7	15.6	13.8	12.3	13.0
Secondary industry growth rate	35.1	35.6	35.9	36.5	39.7	39.6	41.7	40.6	39.2
Tertiary industry growth rate	50.7	50.8	50.1	48.5	44.6	44.8	44.5	47.1	47.8
Agriculture, forestry, animal husbandry, and fishery	15.0	14.4	14.8	15.7	16.5	16.2	14.2	12.7	13.0
industry	26.1	26.6	27.1	28.1	31.6	31.7	34.0	33.4	32.5
Construction	9.0	9.0	8.8	8.5	8.1	7.9	7.7	7.3	6.7
Wholesale & retail trade	7.8	7.6	7.7	7.6	6.2	6.4	6.7	7.2	7.5
Transport, storage, and post	4.0	4.2	4.3	4.2	8.4	8.7	8.9	9.5	10.0
Hotel & catering services	2.1	2.5	2.5	2.5	3.4	3.4	3.5	3.6	3.9
Financial intermediation	6.1	6.3	6.5	6.4	5.9	5.8	5.3	5.5	5.3
Real estate	4.6	3.8	3.7	3.6	2.1	2.2	2.4	2.5	2.6

Source: Data collected by the author from the Bureau of Statistics of the Guizhou Government. An electronic version of the original data is available at http://hgk.guizhou.gov.cn/publish/tj/2022/zk/indexch.htm (2017–2020) and http://hgk.guizhou.gov.cn/publish/tj/2017/zk/indexch.htm (2012–2016).

However, all of this is changing. From 2015, local and national mainstream media started to report Guizhou's rise in data technology by portraying the province as the "China Data Valley," like Silicon Valley in the USA. With state planning and support, and through the development of data technologies, a previously poor and backward region became something more significant – an indispensable part of China's digital modernity which is still in the making. Such a future aspiration was vividly on display in a 2017 sponsored advertisement that the Guizhou government had with CNN, claiming that with big data, Guizhou will become a city like "Beijing or Shanghai, filled with modern buildings and high-tech firms" (Guizhou Government n.d.). In this section it is argued that Guizhou's rise as a national data hub is a continuation of China's national strategy of developing the "backward" region to modernity that precedes the current data technology development. However, this strategy was insufficient without key political figures and their political and commercial networks – localising the national strategy.

Guizhou's rise needs to be positioned within the broader context of China's uneven regional development and the cautious and gradual manner of change from the time Deng Xiaoping's economic reforms were first implemented in coastal regions, then in the interior areas (see Huan 1986). Whereas coastal regions have undergone four decades of reform, China's inland regions have lagged. To address the problem of increasing regional uneven development, in 1999, Jiang Zemin proposed the "Western Development" strategy (西部大开发), which has become the principal developmental guideline. As the poorest province, Guizhou had naturally been a target of Western Development. In 2022, "State Council's Advice on Supporting Guizhou's Endeavour of Charging New Paths in Western Development in the New Era" was released.[2] It claims to "support Guizhou's endeavour of Western Development in the new era," embracing the two-decade-long strategy of Western Development and articulating it with Xi Jinping's rhetoric of "new era" (State Council 2022).[3] Guizhou's emergence as the China Data Valley has been from the beginning an integral part of Western Development. The undergirding objective of the establishment of the data hub is still to develop the region from backward (落后) to modern (现代), with this goal defining the nature of the local data technology and infrastructure development.

In January 2012, the State Council (2012a) released the guiding principle for Guizhou's development, emphasising the priority of developing a modern transportation system, industry, and tourism. The guideline explicitly states that "Guizhou's primary contradiction is poverty and backwardness, its principal mission is to accelerate the development," mainly by "standing firm with a scientific way of development and transforming ways of economic development." At this time, digital technology had not been a priority for Guizhou's leadership, but the document urged it to develop Guizhou's economy in new ways under Western Development. As a general guideline, the document positioned Guizhou as an "important energy base for the nation, base of energy fine processing, and light industry base," and urges Guizhou to engage in "further railroad construction, enlarge highway construction, … [and] strengthen the construction of energy transportation." For information technology, it required to promote "telecommunication network, radio and television network, internet development, and increase the popularisation of telephone, internet, and urban internet fibre optic" (State Council 2012a). Further, the 2012 "Western Development 'Twelfth Five-Year-Plan'" established the Gui'An New District as an economic pilot zone (NDRC 2012). However, these guidelines mostly depict a province that is lacking in basic modern infrastructure such as railroads and highways, and a relatively unsatisfactory implementation of basic telecommunication technologies. None of these directives specified an emphasis on digital technology. Therefore, it was the provincial leadership's task to establish a plan for transforming Guizhou's developmental path.

Earlier, in 2011, under the advocacy of Guizhou's provincial Party Secretary, Li Zhanshu – identified by Gore (2017, 54–56) as a key political ally of Xi and who later became the Chairman of the Standing Committee of the National People's Congress – and the Governor, Zhao Kezhi, the concept of Gui'An New District had been proposed (Government of Gui'An New District 2022). A "General Plan for Guizhou Gui'An New District" was released by the State Council in 2012, detailing a 1,795 square kilometre region between two cities – Guiyang and An Shun – with a registered population of 730,000 spreading across 20 counties. The area mainly consisted of undeveloped woodland, rural villages, and small sections from previously urban areas of Guiyang and An Shun. According to the plan, the new district is set up to: (i) "explore new paths for the underdeveloped region to catch up"; and (ii) "promote a harmonious development of the urban and rural … to promote sustainable development … and increase the level of openness (开放水平)." The plan hoped to explore key developments in "finance, convention, logistics, high-end real estate, information service, scientific service, business service, outsourcing service, and cultural invitation" (State Council 2012b, 6). While there is a directional hint towards the service industry including information technologies in the document, there is no explicit plan to establish a data centre cluster.

Simultaneously with the establishment of Gui'An District, Guizhou's leadership underwent a series of changes critical for Guizhou's turn to the digital. As Xi Jinping officially came to power in late 2012, Li Zhanshu departed Guizhou and became Xi's Chief of Staff and a member of the Politburo Standing Committee, making him one of the seven most powerful people in China. Chen Min'Er, the Vice Governor of Zhejiang Province (where the headquarters of Alibaba Group is located), was appointed Vice Party Secretary of Guizhou in February 2012, then the Governor of Guizhou in 2013, and Party Secretary of Guizhou in 2015. In 2017, Chen became the Party Secretary of Chongqing – one of China's four centrally administered municipalities – and a member of the Central Politburo. In 2013, Chen Gang, who is now Party Secretary of Qinghai Province and a member of the Central Politburo, moved from the head of Chaoyang District in Beijing (where Zhongguancun, also known as the Silicon Valley of China, is located) and became the Party Secretary of Guiyang and a member of the Party Standing Committee of Guizhou from mid-2013 to 2017.

These political figures shared some characteristics. For example, they were members of the top leadership of coastal and developed regions, and they came to Guizhou after the central state tasked Guizhou with finding new development models. And, after leaving their posts in Guizhou, they were all promoted to higher positions, and all became members of the Politburo, which indicates their high rank as members of the top leadership.

The CCP has a history of appointing promising officials to manage relatively poor and under-developed regions to demonstrate their administrative ability and achievement before they are raised to higher leadership. For Guizhou, these then-rising political stars all turned out to be critical in the province's strategy to become the China Data Valley: From late 2011 to mid-2012, Li Zhanshu proposed and set the foundations of Gui'An New District as a pilot zone for local development. The central state then appointed Chen Min'Er and Chen Gang to Guizhou as the Party Secretary of the Province and its capital city, respectively, to solve Guizhou's development problems. Chen Min'Er, in Zhejiang Province, had established a close relationship with Alibaba, and this relationship was brought to Guizhou (see below). Chen Gang not only brought his Beijing connections, but also his experience of managing a high-tech pilot zone like Zhongguancun. It was after these personnel changes were settled that Guizhou's digital industry developed and began its dramatic transformation into a major data hub. Two informants told of a

popular saying from local public institutions: "Big Data, Big Secretary" (大数据, 大书记), illustrating the importance of these key political figures in the drastic transformation of the local economy (Interviews, Guiyang, February 28, 2021).

In January 2013, the central state released "A Guide to the Construction and Arrangement of Data Centres," requiring strategic planning and specifying environmental requirements for different scales of data centres across the country (MIIT et al. 2013). The Guizhou province leadership grasped this as an opportunity and re-positioned Gui'An New District as a pilot zone for data technology. In 2013, Gui'An successfully brought in the so-called Big Three ISPs. From October to December, China Telecom, China Mobile, and China Unicom each signed an agreement with the Guizhou government to construct their cloud and data centres at Gui'An and pledged 4 billion, 2 billion, and 6 billion yuan investments, respectively. At the launch ceremonies, Governor Chen and Party Secretary Zhao made speeches, demonstrating their endorsements (*Guizhou Daily*, July 3, 2013; *Guizhou Daily*, December 17, 2013). In addition to these SOEs, Guizhou also worked with private corporations. For example, Taiwan's Foxconn signed a strategic collaboration agreement with the provincial government, promising the construction of its new-generation manufacturing plant, data centre, sports park, and residential compounds in Gui'An (Jin 2013).

In 2014, Gui'An was approved by the State Council (2014) as a national-level new district, making it China's eighth national new district that receives direct finance and administrative support from the State Council, and legitimising its position as a pilot zone of national importance. As a result, over 35 national commissions, departments, and ministries released supportive policies for Guizhou's development. As a national new district, Gui'An was also granted flexibility in financial and tax policy, land regulation policy, investment and industrial policy, and received human resource subsidies (People's Government of Guizhou Province 2014a).

Gui'An's district government provided favourable terms for businesses. For example, corporations that met the local requirements were promised a 15% deduction of Corporate Income Tax, with entities that contributed the most Corporate Income Tax, Value Added Tax, and Business Tax within three years offered a full return of these taxes. In addition, high-level executives and core technical personnel enjoyed a full return of Individual Income Tax for five years; construction-related fees were waived for industrial and high-tech projects that finished within three years, and up to 12 million yuan would be awarded to locally registered corporations listed on the stock market (Gui'An New District Government 2014). The district government also received strong support from higher-level administration. For example, from 2013 to 2020, Gui'An's local government was to keep all fiscal income to re-invest in local development, and all land transaction revenue was to be returned to the local government (General Office of the People's Government of Guizhou Province 2014).

In 2014, a detailed developmental plan for big data development in Guizhou from 2014 to 2020 was released by the provincial government (People's Government of Guizhou Province 2014a). With this industrial planning and the successful collaboration with the Big Three and Foxconn, on March 11, 2014, Governor Chen and the Party Secretary of Guiyang, Chen Gang, with a few other provincial leaders hosted "Guizhou-Beijing Big Data Industrial Development Promotional Conference" in Beijing. The venue of the conference was in Zhongguancun – known as the "Silicon Valley of China," where Chen Gang had served as the head of the district government. The conference presented Guizhou's supportive policies, endorsements from the central state, and successful projects. Over 41 mainstream media outlets, including party media such as *People's Daily*,

Xinhua, and CCTV (China Central Television), participated in and reported on the conference. In an eye-catching way, Guizhou's leadership introduced Gui'An to the industry (*Guiyang Daily*, February 21, 2014).

After the Beijing conference, Governor Chen formed and headed the Leading Group of Big Data Industrial Development, with almost 50 members who were heads of different government departments in Guizhou (*Guizhou Daily*, June 5, 2014). An Office of the Leading Group was also established to execute decisions made by the leading group; this office later became the founding group of the Big Data Bureau of Guizhou Province (Wu and Lu 2019, 71). Anchoring Guizhou's development to big data, local government essentially created a market from the ground up, and provided various political and financial support to targeted businesses to gradually transform a politics-directed industry into a market-oriented industry.

With these changes, the province entered the fast track of digital development. In November 2014, the provincial government released a three-year plan for promoting the construction of information infrastructure, pledging to generate over 33 billion yuan investment in the following three years (People's Government of Guizhou Province 2014b). In February 2015, the MIIT issued an official document, endorsing Guizhou's achievement in digital technology development and announcing the establishment of the "Guiyang-Gui'An Big Data Industrial Aggregation Development Model District," making Guizhou the first to receive such approval (*Guizhou Daily*, February 14, 2015). Two days later, Premier Li Keqiang arrived in Guiyang to survey the local development of the big data industry, praising Guizhou's achievements (State Council 2015a). In May 2015, Guizhou opened the first of what would be annual China International Big Data Expos, that would bring high-tech companies and their executives to present their cutting-edge data technologies. At the 2015 Expo, executives from companies such as Alibaba, Tencent, and Foxconn appeared, with keynote speeches from high-tech entrepreneurs Jack Ma from Alibaba and Pony Ma from Tencent. One month later, President Xi visited Guizhou and toured the Guizhou Big Data Exhibition Centre and China Telecom's cloud computing centre, further endorsing Guizhou's developmental strategy (*Xinhua*, June 17, 2015). In 2016, Premier Li attended the Big Data Expo in Guiyang and made a keynote speech, further advocating the integration of "traditional" industry with data technology, signalling Guizhou's position in piloting data technology integration for both business and government transformation.

With approvals from key central state departments, the president and premier, few would dare question Guizhou's promising future as a key data hub. In 2015, Tencent signed an agreement with the local government and began construction of its bomb-shelter-like data centre built inside two mountain caves, designed to store 300,000 servers, with a security level able to protect occupants from a nuclear attack (Tencent 2018). In 2016, Huawei decided to build its world's largest data centre in Gui'An (InfoQ 2016). In 2017, Apple began work with local government to build an iCloud China data centre (*Shanghai Daily*, July 12, 2017). With top-level political endorsement and the presence of major corporations, local media and public discourse became saturated by the terms "big data" and "cloud."

Indeed, Guizhou has witnessed a significant increase in digital industry. For example, Figure 2 shows a steep increase in the number of newly registered big data enterprises in Guizhou from 2012 to 2018. A government report shows that during the 13th Five Year Plan period (2016–2020), Guizhou achieved an increase in income from software and information technology services, electronic manufacturing, and telecommunication services by 19.3%, 19.6%, and 6.8%, respectively. During this period, 23,128 local enterprises integrated cloud technology into their daily operations (Information Office of Guizhou

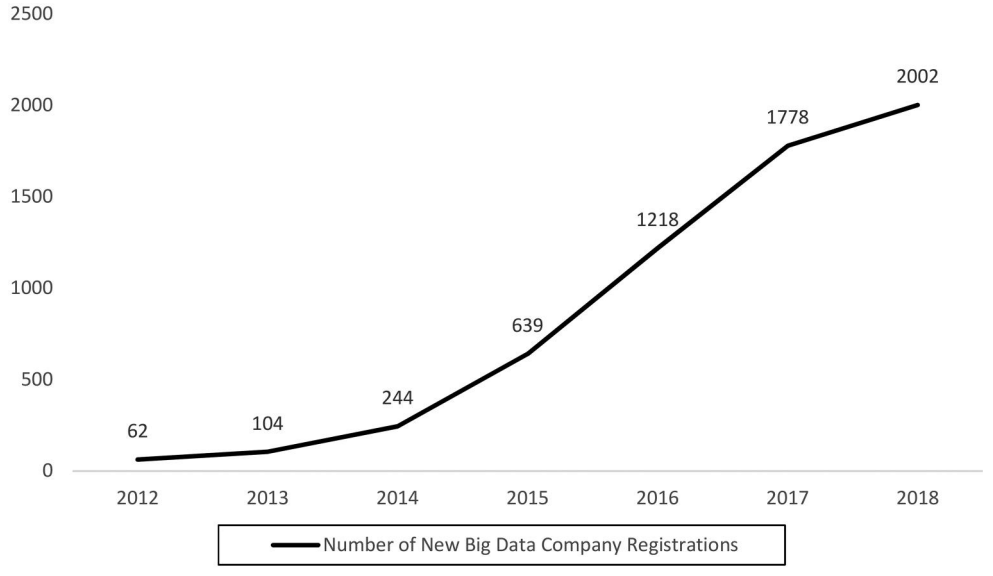

Figure 2. The number of newly registered big data companies in Guizhou, 2012–2018
Source: Data extracted from Wu and Lu (2019, 82).

Province 2022). As a result, in 2020, Guizhou was ranked fourth in China on the progress of opening and sharing of public information by the Office of the Central Cyberspace Affairs Commission (Information Office of Guizhou Province 2022). Meanwhile, a report by Tsinghua University's Centre on Data and Governance (2020) ranked Guizhou seventh among all provinces and the capital city Guiyang the third among all capital cities in the development of digital government.

With a growing new local digital industry, the relationships between central/local government, market, and the commercial sectors display some hybrid and interdependent characteristics. A local official document has declared that the general principle of digital development is to "let the government lead, let the enterprises do" (政府引导, 企业主体), emphasising the government's role of "making overall arrangements … [and] optimising [related industrial and ancillary] policies … [to] let the enterprises to be the agent of innovation and development" (People's Government of Guizhou Province 2014a). In other words, the central state sets the general direction of the development, tasks local government with developing action plans to achieve the objectives, with key political figures fostering political and commercial support. Large-scale political and financial resources are directed into establishing a testing ground based on the needs of corporations. Thus, a new industry is created, and the local government would nurture the market until it is self-sustaining. The main tasks of the local government during this process are to: (i) create favourable business environments and policies; (ii) bring in successful businesses to create the industry and demonstrate the feasibility of the government's plan; (iii) grant higher-level political and financial support by demonstrating the success; and, (iv) bring in more SOEs or private corporations to further saturate the initially state-planned industry with market forces. This development is a continuation of a longer struggle for modernisation and development, and it is important to see the contingencies brought in by key political figures and their interaction with commercial forces.

Localising Data Technologies: State–Commercial Complexes

The emergence of Guizhou as one of the eight national data hubs of China is a result of the realisation of multiple national strategies such as Western Development and the WCDE. As the previous section demonstrated, the central and local government's supportive policies, as well as the decisions made by key political figures and their networks, all played critical roles in Guizhou's efforts to become a data centre cluster. While political support and endorsements are critical in creating and sustaining a favourable business and industrial environment, the government does not possess the cutting-edge technologies of big data or cloud computing. To bring in these technologies, the local government needs to work with enterprises that own these technologies to build the data facilities so that a digital technology market and industry can be created. Additionally, these data facilities would also become the digital infrastructure on which the government builds its digital governing apparatus. This process, however, involves multiple players and interests: ISPs, large international and domestic corporations, and small-scale local technology firms among others.

This section of the article explores these state–business interactions and argues that, instead of assuming the direct and smooth localisation of data technologies, localisation is actualised through interactions of different interests, actors, and political or/and economic forces. These interactions are fluid, situational, and contingent, but when they work together, they display certain tendencies under their particular historical contexts. This section adds nuances to the story told above about the emergence of Guizhou as a data centre cluster by discussing particular cases where state–commercial complexes were established.

Localising the iCloud

Though China has been Apple's largest market for years, the iCloud China data centre was in the USA before 2017. Consequently, the digital signal needs to travel through undersea cables back and forth between servers in North Carolina and Apple devices in China, making iCloud China services relatively slow. In 2017, Apple announced a collaboration with a local partner, Guizhou-Cloud Big Data (GCBD), to construct an iCloud data centre in China. In doing so, as Lisa Jackson, Apple's then Vice President of Environment, Policy and Social Initiatives claimed, China would see an improvement in its iCloud experience with "faster and more stable access to the data service" (*Shanghai Daily*, July 12, 2017). The local partner GCBD is located in Gui'An New District. Being just a few kilometres from the data centres of the Big Three – Tencent, Huawei, and Apple's iCloud data centre – means that part of the central area of Gui'An is one of the most important symbols of the region's success in becoming a key data hub.

On the surface, it might seem that improving its service would be sufficient reason for Apple to make the move to Gui'An, however, the localisation of iCloud is a much more complicated event that involves global governing trends, China's national strategy, as well as nuanced interactions between Apple and the local government of Guizhou. This case displays the working of a state–commercial complex that functions on the edges of political reasonings and economic rationality. In this complex, political factors are crucial, but it is the emergence of Guizhou Hub as an assemblage that articulates national strategy, corporate interests, and local development needs that, as will be shown, constitute the main backdrop of Apple's case. Understanding how the case demonstrates a complex negotiation that eventually localised iCloud reveals critical aspects of how state–

commercial complexes are achieved at a local level and how such a dynamic is instrumental to the establishment of the infrastructural power of the Chinese state.

To detail this case, this research first suggests that the localisation of the iCloud data centre is conditioned by a global trend where governments, both authoritarian and democratic, emphasise data sovereignty – the idea that data collected within particular nations are subject to the laws and regulations of that nation, as storing and processing particular data might be critical to national security (Taylor 2020, 4). A related concern is known as Trans-Border Data Flows (TBDF), which refers to data flows across national borders that threaten personal privacy. European nations began to legislate for TBDF regulations from 1980 (Unver and Kim 2016). After the Edward Snowden revelations of the United States National Security Agency's (NSA) operations of unlawfully collecting personal data from millions of customers from major telecommunication providers across the USA and internationally (see *The Guardian*, June 6, 2013), concerns about data security have increased. The European Union (EU), for example, created the EU–US Privacy Shield Agreement to regulate how EU citizens' data could be exported to the USA (Unver and Kim 2016, 9). In 2018, the EU enacted "the toughest privacy and security law in the world to strictly regulate how personal data might be transferred to non-EU nations" (GDPR 2022). Other nations, such as Russia and India, have also introduced data sovereignty legislations in the past decade to regulate personal data storage and outboard transfer (see HRW 2020; Parliament of India 2019; Ministry of Electronics and Information Technology 2022, 16–17).

Likewise, China has also been creating legislation to regulate the storage and transfer of personal and public data. In 2011, the People's Bank of China implemented a strict regulation, requiring that "personal financial information must be stored, processed, and analysed within the national border" (People's Bank of China 2011). The NSA scandal in 2013, however, was pivotal in the Chinese state's decision to accelerate legislation for data security in all realms, ranging from population and health data, topographical information, and traffic data, to more general cloud services (Liu 2020, 89). The State Council (2015b) officially defined data as a "national strategic resource" in 2015 and in 2016, the People's Congress passed the Cybersecurity Law, the first comprehensive national-level law on cybersecurity and internet governance. The Cybersecurity Law came into effect in July 2017, with supporting policies and standards released by relevant state departments subsequently (State Council 2015b). Article 37 of the law enlarges the previous 2011 financial information restriction to all personal information, stating that:

> Personal information and important data collected and generated from the operations by the operators of key information infrastructures within the national border of the People's Republic of China should be stored within the national border. For the needs of the outbound transfer due to business, the operation should undergo security evaluation according to the method formulated by the Cyberspace Administration of China and other departments of the State Council (*Xinhua*, November 7, 2016).

As a result, Apple had to make a compromise and set up its iCloud data centre within Chinese territory to comply with the Cybersecurity Law. Shortly after the law came into effect, Apple announced that it would open its first data centre in Guizhou province, a $1 billion investment. Apple admits that the move was to "improve the speed and reliability of … products and services while also complying with the newly passed regulations" (Mozur, Wakabayashi, and Wingfield 2017). A more nuanced account of Apple's move would consider the broader global context of data national sovereignty as well as Apple's own need to provide better services.

This more nuanced assessment would also consider Apple's decision to home its data centre in Guizhou in a context of both key political figures' efforts and the Gui'An District's general conditions. A year before the implementation of the Cybersecurity Law, a draft of the law was released to obtain public opinion. At the same time, the Leading Group of big data development in Guizhou was working on a target list of investors. The Leading Group shortly realised that the draft of the Cybersecurity Law indicated a signal that all international corporations that had a data business in China would need a local partner. To grasp this opportunity, the provincial government assembled an "Apple negotiation squad" to persuade Apple to build its data centre in Gui'An New District (Wu and Lu 2019, 73). The leader of the team, Qing Rupei, was Vice Governor of Guizhou province at the time, and other members included Ma Ningyu, the then Director of the Office of Big Data Development – established from the previous Office of the Leading Group – and Feng Lei, the General Manager of AIPO Cloud Technology, a GCBD subsidiary that became Apple's local partner. From mid-2016, negotiations continued for almost two years, and in December 2017, the iCloud Strategic Co-operation Framework Agreement was signed between Apple and the Guizhou provincial government.

This strategic framework was an outcome of governmental support, favourable terms, and a supportive business environment. At the press conference that announced the signing of this strategic framework, the head of the Big Data Bureau of Guizhou Province stated that GCBD would be Apple's exclusive partner for iCloud operations in China, and that iCloud would be operated by GCBD with technical support from Apple; both local government officials and Apple executives also emphasised Gui'An's potential as China's first big data pilot zone (Guan 2017). At the time, Gui'An was already the largest data centre cluster in South China. In 2023, a top leader of GCBD stated that the iCloud branch of GCBD operates in a very autonomous way, because decisions made by Apple do not go through the local team and Apple manages all the data directly (Interview, May 2023). In this instance, GCBD is more of a local maintenance team for Apple than a real managing entity of iCloud. This information substantiates an earlier announcement made by Apple that no "backdoors," to bypass the encryption of the system to access data without normal authentication, would be created (cited in Mozur, Wakabayashi, and Wingfield 2017). Hence it could be reasonably inferred that though the location of iCloud China servers moved to Guizhou, Apple managed to maintain a high level of autonomy, while the local partner GCBD and Gui'An district obtained fame as the exclusive local host.[4]

The construction of the data centre took time. After choosing the site in 2017, the data centre was designed to be constructed in two stages, designed to utilise about 1.6 square kilometres. In 2019, stage one involving land expropriation and resettlement was completed, and stage two was still under construction in 2022 (Office of Investment Invitation of Gui'An New District 2019). To comply with the Cybersecurity Law, GCBD rented servers from China Telecom (with the signing of an "Infrastructure Agreement" between the two parties) and launched iCloud China's local data centre operation in 2018. This means that before stage one of Apple's data centre was completed in 2020, iCloud China had already been operating on servers rented from the Big Three. This was to comply with the 2017 Cybersecurity Law. Then, COVID-19 delayed stage two construction, so GCBD had to rent data servers from China Telecom again in 2021 to fulfil iCloud China's expanding storage needs.

In addition, not only were the Big Three's data centres all located within walking distance of Apple's iCloud data centre, but they also had newly constructed data centres ready to rent out when Apple was under pressure to localise the iCloud data quickly in

2018. Therefore, with the active support from the local government, Apple had a feasible plan to resolve its data localisation needs in a location that promised a favourable future business environment. With governmental support and ready-to-rent servers from the Big Three, Guizhou's "Apple negotiation squad" was "the only candidate who went to the negotiation with a ready executive plan" (Wu and Lu 2019, 76). In other words, Apple's interactions with local SOEs were conditioned by a multifaceted and continuously changing complex of real-world challenges. Though there were political factors, Apple's choice was also an economically rational and practical decision.

GCBD: More Than iCloud

Apple's investment was celebrated by Guizhou's government as an example of its successful pursuit of one of the best big names in digital technologies and digital consumer products to have in an industrial pilot zone. With Apple, Huawei, Tencent, Foxconn, and the Big Three, Gui'An New District became a critical data centre aggregation. However, from a closer look at Apple's local partner, GCBD, it can be seen that Apple's localisation involves another state–commercial complex that is not directly related to Apple's own services but undergirds GCBD's operation. Put simply, GCBD was not only Apple's local partner, but a critical infrastructure of the provincial government's digital governance strategy. Specifically, GCBD runs the core cloud platform that supports the provincial government's digital administrative system. In other words, as GCBD established its technological capability to operate iCloud China, the provincial government of Guizhou also tasked GCBD with operating the database and cloud platform for the entire digital governance system of the province. Hence GCBD is also the core of Guizhou Province's comprehensive digital governance platform.

In addition to the factors discussed above, it took more than a favourable commercial environment and local political support for Apple to make an investment decision. After all, cloud service requires a considerable level of technological capability. In fact, GCBD as an SOE 100% invested by the provincial government, was created with technological support from major SOEs and private high-tech corporations in China, which not only made it possible for GCBD to emerge as an important local cloud service provider, but also ensured its technological capability to allow the company to take over the operations of iCloud China. The political significance of GCBD as the carrier of the provincial digital governance platform – 云上贵州, or Guizhou Over the Cloud – means it cannot fail. With such political centrality, GCBD assembled a team of experts from top high-tech firms, and it is these high-tech firms that guarantee GCBD's technological capability, and it is these firms that Apple was indirectly working with to ensure the successful localisation of iCloud China. These factors mean GCBD is a critical assemblage of political, commercial, and technological interests.

The provincial government established GCBD in 2014 with a registered capital of 335 million yuan to integrate all of Guizhou's administrative systems on one cloud platform (GCBD 2020). In its early phase, it utilised strong corporate support. A long list of major high-tech partners is given on its website, including Alibaba, Huawei, Tencent, Baidu, the Big Three ISPs, Apple, Dell, ZTE, and more. Among these, Alibaba is the most critical. The case of Alibaba's collaboration with GCBD shows how domestic high-tech giants work with a local government in a mutually constitutive way that ensures corporate interests while fulfilling the local government's digitisation needs. As part of the broader national efforts at digital governance under the New Infrastructure initiative, this case also sheds light on how these national initiatives are realised locally.

In April 2014, a month after making a keynote speech at the big data promotional conference hosted by Guizhou's Governor Chen in Beijing, Alibaba's Jack Ma visited Guiyang. Ma and Chen already knew each other as the latter was previously head of Zhejiang Province where Alibaba's headquarters is located. In signing the "Cloud Computing and Big Data Strategic Cooperation Framework Agreement" with the Alibaba Group, Chen contracted the latter to lead the development of Guizhou government's administrative cloud platform, and promised a deep collaboration in data technologies (*Xinhua*, April 18, 2014). Shortly afterwards, Ali Cloud, Alibaba's cloud computing branch, sent a group of over 100 engineers to Guizhou. The team was led by Hu Xiaoming, the President of Ali Cloud, and it worked on-site for three months to establish the basic structure for GCBD's cloud framework. In November 2014, Ali Cloud completed the development, delivering GCBD as China's first provincial administrative data and cloud platform (*National Business Daily*, May 26, 2017).

GCBD was programmed using Ali Cloud's "Apsara System," an original large-scale cloud computing system developed by Alibaba for commercial cloud services (Meng 2016, 58). GCBD has five basic functional sectors: (i) a basic resource platform that provides computing, storing, and networking capacities; (ii) a service platform that provides these services to outside clients; (iii) an application platform that provides API (Application Programming Interface), filing, and testing tools to connect with outside applications; (iv) a security platform that provides a data security service to the other platforms; and (v) an operation and maintenance platform (Meng 2016, 60). GCBD is designed to host digital administration for all levels of government in Guizhou – from provincial to municipal and district/county levels. Together, these functional sectors serve two major functions: (i) to collect, wash, organise, categorise, and compute public data from all administrative levels and publish the processed data for administrative use; and (ii) to interact with other platforms – via APIs – that can be connected to GCBD to provide governmental data access to the public and social institutions (Meng 2016, 67). In general, GCBD is designed as a comprehensive cloud platform for all the Guizhou government's digital working and data processing needs both for administrative governance and public access.

Establishing this complicated system in just a few months, Alibaba built GCBD for free (Wu and Lu 2019, 71). However, as a public-traded private corporation, Alibaba did not build the system as an act of charity. With the Framework Agreement with Guizhou's provincial government, Alibaba was tasked by the Guizhou government not only with developing GCBD's cloud platform, but also for crafting a developmental plan to explore digital industry opportunities in Guizhou. In other words, Alibaba has become a key partner in the Guizhou government's broader development and poverty-alleviation plans with e-commerce.

With close collaborations like this, Alibaba has been expanding its dominance in e-commerce and online shopping by moving into rural areas where neither online shopping nor shipping logistics had previously been available. What is important is that Alibaba not only obtained permission to do business in rural Guizhou, but it also enjoyed support from the local government as the latter would often invest and construct required local infrastructures upon which Alibaba's business relies. For example, as the owner of Taobao, China's most successful e-commerce platform, Alibaba gained access to rural villages to set up its Taobao Station. In 2014, Alibaba launched its "Thousands of Counties and Tens of Thousands of Villages" (千县万村) project, planning to invest 10 billion yuan in three to five years and establish 1,000 county-level operation centres and 100,000 village service centres across rural China, to "cover one-third of counties in China and one-sixth of rural China in general" (Chen 2014).

At the same time, Guizhou's provincial government utilised Alibaba to bring business opportunities and experience in establishing offline e-commerce infrastructures to previously under-developed and rural areas, developing local economies. In 2015, the provincial government of Guizhou signed the "Strategic Collaborative Agreement for Rural E-Commerce Establishment" with Alibaba, tasking the latter to establish rural e-commerce platforms and supply chains, rural e-commerce service projects, logistical systems, training projects, and so on (*Guizhou Daily*, August 21, 2015). Subsequently, Rural Taobao Operation Centres were established across the province. For example, in the administrative region of Tongren City alone, 54 village Taobao Stations were established in 2015, covering a population of 100,000 (Administration of Tongren High and New Technology District 2015). Similar operations can be found across the province and agreements were made at lower city and county levels. As a result, local government secured economic growth, while Alibaba trained skilled labour for local e-commerce development and Alibaba enlarged its business.

Additionally, Alibaba's "free" service to set up GCBD granted it access to a massive amount of data from which it could capitalise. During a media interview, Zhou, an expert from the Department of Strategic Development at Alibaba, explained that Ali Cloud has implemented data analysis equipment within the data server of GCBD to perform data selection, filtering, and analysis services for Guizhou's government. During this process, the provincial government opens the raw administrative data to Alibaba, and these data are collected and processed by GCBD (cited in Li 2015). Such an arrangement has become a model of state–commercial collaboration. Alibaba is not the only corporation to benefit from this arrangement. Granting original administrative data access to technology corporations has become what is called "airborne technology": technology giants making their services available to local governments that need "free" digital technologies in exchange for the corporations' access to data produced by the system.

In fact, Alipay – along with WeChat owned by Tencent – has become an integrated part of the digital public service of Guizhou province. Through its city services portal, citizens could access their electronic IDs, insurance, COVID-19 testing services, and pay bills for utilities such as water and electricity. Because most, if not all, of these infrastructural services are operated by SOEs and/or directly by government departments, the data sharing between these social media products and the local government's database is evident. On the top of Alipay's Guiyang City Service page, the title "Mobile Portal of Guizhou Province Administrative Services" signals official endorsement.

In conclusion, while Alibaba did not charge for developing the GCBD cloud platform, as a private corporation, it did not *lose* in any sense. Instead, its *gain* has been phenomenal: with co-operative agreements with the provincial and lower-level governments, Alibaba has massively expanded the reach of e-commerce to thousands of rural villages. Contracted to establish digital platforms for public services, Alibaba has accessed a large volume of data flowing into its public service portal, which directly brings more users and data to Alipay. Additionally, these arrangements have enabled Alibaba to access an enormous amount of public and administrative data as the city services are connected to local authorities' departmental databases. The digitisation of these public services also generates new data from traditionally either non-digital transactions or secured administrative operations. All these data could potentially generate profit for Alibaba.

As has been suggested, neither did Guizhou's local governments lose. They have used corporate power to build their own digital infrastructure and governing platforms free of

charge. As the governments did not own the necessary technology, they had to work with both major SOEs and technology giants that have already developed or had the capability of developing these kinds of digital technologies for the governments. Nevertheless, it is important to note that as the private sector becomes increasingly engaged in rural areas, there exists a risk of market over-dependency, resulting in monopoly.

Conclusion

This article has dealt with two questions: how has data technology been actualised in Guizhou? And, how did Guizhou emerge as a critical national data hub and data centre cluster as part of China's grand strategy of digital governance and digital modernisation? Several pivotal political-economic operations have been identified. Support from the central government, with Guizhou following the broader national strategy of developing West China into a modern economy. The related appointment of officials who have both strong political ties and wide personal connections, has meant that Guizhou province has enjoyed both political and financial support from the central state. With their political and economic significance endorsed by the central state, major SOEs and private technology giants have been attracted to Guizhou. This both demonstrates goodwill in supporting the state's digital strategy and permits the expansion of their businesses. Key projects are outlined by the provincial government, and substantial local political and financial support follows. The localisation of the technology giants like iCloud, the Big Three, Tencent, Huawei, and Alibaba, and their deep engagement with the provincial government establishes the fundamental industrial framework.

This framework, on the one hand, fulfils the government's technological needs, and on the other, promises corporations access to a large amount of data and vast un-digitised rural regions – both of which could be turned into profits. GCBD served as an example of how a product of related state–commercial complexes could satisfy these needs. In a way, these emerging state–commercial complexes are instrumental in achieving a local equilibrium – what Starosielski (2015, 19) calls a "strategy of interconnection," as discussed earlier. These complexes balance forces from different infrastructural systems as well as contradictions between "state planning" and "free market." As such, the state–commercial complexes, on the one hand, determine situations of neo-liberalism as exception and bring in market resources for local development – such as Alibaba's expansion into rural regions; on the other hand, the complexes identify exceptions to neo-liberalism and use strong governmental intervention to incubate a new market through governmental funding. As a governing instrument, the state–commercial complex framework provides an observation window to understand the actualisation of infrastructural power of contemporary China.

In this sense, there is no way, for example, to isolate Apple's iCloud from the local conditions of Guizhou; after all, the iCloud China project in Gui'An has become an integrated part of the region's status as a national data hub. Nevertheless, it is critical to recognise that these processes are neither purely political nor just economic, but both – in some circumstances the economic factors are the determining factor, and in others, the political design dominates. In other words, there are always contingencies in the making of state–commercial complexes, and it is critical to understand these local operations within the broader historical and political-economic contexts. Acknowledging the necessity to further interrogate issues such as data privacy, data mining, and labour, this article proposes that a historical and local approach allows a comprehensive understanding of a grand project like the NIBDCS, or China's New Infrastructure initiative in general.

While the dynamics described in this article direct our attention to the local contexts of Guizhou Province, these operations mainly function to establish a general structure of how the objectives of developing Guizhou through digitisation might be achieved. The success stories of productive state–market relationships that facilitate state–commercial complexes are not the whole story. There have also been failures in Guizhou. For example, the provincial government's partnership with Qualcomm to manufacture server chips – a 38.5-billion-yuan joint venture – went bankrupt in 2019 (*The Economic Observer*, April 27, 2019). Furthermore, it takes more than large-scale political arrangements and technology giants to *localise* data technology and institutionalise it as an essential part of everyday life. Central state's strategy, local government's policy designs, and major collaborations among SOEs, corporations, and the provincial government cannot guarantee that the data technologies will be localised. For this to occur, these technologies must become part of the story that the place tells about itself, and it must become an integrated part of the local networks of power that would defend the continuation and existence of these technologies. Further research is needed to explore the localisation of data technologies by local businesses and the socio-cultural constructions of ordinary people's lives.

Notes

1. Capital ratio is the amount of an institution's capital in relation to the amount of money that it has lent to people and organisations. This means that Ant Finance is extremely highly leveraged and that it has a lot more debt than equity, signifying an insufficient capitalisation.
2. This document is often referred to as "the number two document" (二号文件) in local official discourse (it is the second political order of the year signed by the State Council). Multiple informants commented that referring to it in this way gives the document a sense of political significance. It signals that Guizhou's development ranks high among the central state's overall concerns.
3. "New era" is rhetoric derived from Xi Jinping doctrine. "New era" distinguishes Xi's administration from his predecessors; the phrase is now widely used in political and official documents.
4. It is important to recognise that there was a change in the privacy terms for iCloud China as Apple started to work with GCBD. This opened the possibility for Apple and GCBD to access users' data and potentially share these with local authorities in line with the applicable law. The new clause in the privacy terms states: "You understand and agree that Apple and GCBD will have access to all data that you store on this service, including the right to share, exchange and disclose all user data, including Content, to and between each other under applicable law" (Apple 2021). In recent years, the Chinese government has initiated a series of legislation related to data protection. The "Personal Information Protection Law" was passed in 2021, requiring personal information collection to be "minimised" and prohibiting unlawful data collection. This signals a legislative attention to data privacy, but the actual effects have not been evaluated. There is a need for more scholarly attention to data privacy. However, having such a clause change does not determine whether local authorities will access private data. For example, Apple provided iCloud user data to the Chinese government in nine cases after requests, but during this same period in the USA – where there was no similar change to privacy terms – Apple turned over iCloud content to authorities in 10,781 cases (Nicas, Zhong, and Wakabavashi 2021). A discussion of surveillance and censorship is beyond the scope of this article, but the above information indicates the complexity of this issue that merits investigation elsewhere.

Disclosure Statement

No potential conflict of interest was reported by the author.

ORCID

Kevin Ziyu Liu http://orcid.org/0000-0003-3309-3517

References

Administration of Tongren High and New Technology District. 2015, July 29. "阿里巴巴集团农村淘宝同仁运营服务中心项目" [Alibaba Group's Rural Taobao Operation Centre Tongren Project]. Accessed December 30, 2023, http://trgxq.trs.gov.cn/zsyz/qyfc/201611/t20161129_23445045.html.

Apple. 2021. "iCloud Operated by GCBD Terms and Conditions." Apple.com, Accessed March 30, 2023, https://www.apple.com/legal/internet-services/icloud/en/gcbd-terms.html.

Brodie, P. 2021. "Hosting Cultures: Placing the Global Data Centre 'Industry'." *Canadian Journal of Communication* 46 (2): 151–176.

Centre on Data and Governance. 2020. 2020 数字政府发展指数报告 [2020 Digital Government Development Index Report]. Beijing: Tsinghua University. https://www.dps.tsinghua.edu.cn/__local/1/6D/AC/34CFA8E7F589B12DD81FE77ACB9_968502EA_66D561.pdf.

Chen, J. 2014. "阿里启动千县万村计划" [Alibaba Launches "Qianxian Wancun" Project]. *People*, October 15. Accessed December 7, 2023, http://scitech.people.com.cn/n/2014/1015/c1057-25834741.html.

GCBD. 2020. "公司简介" [Introduction of the Company]. *Guizhou-Cloud Big Data*. Accessed December 30, 2023, https://www.gzdata.com.cn/c424/index.html.

GDPR. 2022. "What is GDPR, the EU's New Data Protection Law?" GDPR.EU website. Accessed December 30, 2023, https://gdpr.eu/what-is-gdpr/.

General Office of the People's Government of Guizhou Province. 2014. 省人民政府办公厅关于支持贵安新区发展若干政策措施的意见 *[General Office of the Guizhou Provincial Government's Advice on Policies to Support the Development of Gui'An New District]*. Place: General Office of the People's Government of Guizhou Province, 2014 (35).

Gilmore, J., and B. Troutman. 2020. "Articulating Infrastructure to Water: Agriculture and Google's South Carolina Data Centre." *International Journal of Cultural Studies* 23 (6): 916–931.

Gore, L. 2017. "Li Zhanshu: A Key Player in Xi Jinping's Second Term." *East Asian Policy* 9 (3): 50–57.

Government of Gui'An New District. 2022. "成立过程" [Process of Establishment]. 2022. http://www.gaxq.gov.cn/galy/lsyg/202203/t20220309_72891206.html.

Guan, R. 2017. "贵州举行苹果公司 iCloud 战略合作框架 '协议' 发布会" [The Press Conference of the Signing of iCloud Strategic Co-operation Framework Agreement between Apple and the People's Government of Guizhou Province]. The State Council Information Office of the People's Republic of China. Accessed March 30, 2023, http://www.scio.gov.cn/xwfbh/gssxwfbh/xwfbh/guizhou/Document/1558278/1558278.htm.

Gui'An New District Government. 2014. "贵安新区招商引资优惠政策" [Preferential Policies for Business Investment in Gui'An New District]. Accessed December 30, 2023, http://www.gaxq.gov.cn/xwdt/gagg/201812/t20181217_1982496.html.

Guizhou Government. n.d. *CNN* (sponsored Ad). Accessed January 5, 2024, https://sponsorcontent.cnn.com/edition/2018/guizhou/china-big-data-valley/

Hogan, M. 2015. "Data Flows and Water Woes: The Utah Data Centre." *Big Data & Society* 2 (2): 1–12.

HRW. 2020. "Russia: Growing Internet Isolation, Control, Censorship." Human Rights Watch, June 18. Accessed December 7, 2023, https://www.hrw.org/news/2020/06/18/russia-growing-internet-isolation-control-censorship.

Huan, G. 1986. "China's Open Door Policy, 1978–1984." *Journal of International Affairs* 39 (2): 1–18.

InfoQ. 2021. "探访华为云全球最大数据中心, 背后藏着这些 '黑科技'" [Visiting the Largest Data Center of Huawei Cloud, the Hidden "Dark Technology"]. *Cloud Yun+* 11: 10–13. Accessed December 18, 2023, https://res-static.hc-cdn.cn/cloudbu-site/china/zh-cn/cloudplus/eleventh/CLOUD_eleventhphase.pdf.

Information Office of Guizhou Province. 2022. "国家大数据(贵州)综合试验区建设情况新闻发布会" [Development Process of the National Big Data (Guizhou) Comprehensive Pilot]. Press Release, January 6. Accessed December 30, 2023, http://dsj.guizhou.gov.cn/jdhy/xwfbh/202201/t20220106_72252938.html.

iResearch. 2022. 2022 年中国第三方支付行业研究报告 [2022 Chinese Third-party Mobile Payments Market Report]. iResearch. Accessed December 30, 2023, https://www.iresearch.com.cn/Detail/report?id=4104&isfree=0.

Jiang, M., and K. Fu. 2018. "Chinese Social Media and Big Data: Big Data, Big Brother, Big Profit?" *Policy and Internet* 10 (4): 372–392.

Jin, A. 2013. “贵安新区富士康(贵州)第四代绿色产业园开工” [Foxconn (Guizhou) Launches the Fourth-generation Green Industrial Park at Gui’An New District]. Gov.cn. Accessed November 26, 2023, http://www.gov.cn/gzdt/2013-10/22/content_2511986.htm.
Latour, B. 1993. *We Have Never Been Modern*. Cambridge, MA: Harvard University Press.
Li, G. 2015. “阿里腾讯京东抢滩: 贵阳大数据 ‘祛魅’” [Alibaba, Tencent, and JD Seize the Opportunity: “Demystify” Guiyang’s Big Data]. *The 21st Century Economy*. Accessed December 30, 2023, https://m.21jingji.com/article/20150620/9f6440b6865a5ea28f1fae445f7ed526.html.
Li, J. 2018. “Go Big or Go Home: Guizhou Bets on ‘Big Data.’” *Sixth Tone*. Accessed December 30, 2023, https://www.sixthtone.com/news/1002616/go-big-or-go-home-guizhou-bets-on-big-data.
Liu, J. 2020. “China’s Data Localization.” *Chinese Journal of Communication* 13 (1): 84–103.
Liu, K. 2019. “Commercial–State Empire: A Political Economy Perspective on Social Surveillance in Contemporary China.” *The Political Economy of Communication* 7 (1): 3–29.
Mann, M. 1984. “The Autonomous Power of the State: Its Origins, Mechanisms and Results.” *European Journal of Sociology* 25 (2): 185–213.
Mayer, V. 2019. “The Second Coming: Google and Internet Infrastructure.” *Culture Machine* 18. Accessed December 30, 2023, https://culturemachine.net/vol-18-the-nature-of-data-centers/the-second-coming/.
Meng, Q. 2016. 云上贵州 *[Guizhou over the Cloud]*. Beijing: Tsinghua University Press.
MIIT, NDRC, MLR, PSMC, and NEB. 2013. 关于数据中心建设布局的指导意见 [A Guide to the Construction and Arraignment of Data Centres]. Ministry of Industry and Information Technology of the People’s Republic of China, 2013 (13). Accessed March 19, 2023, https://www.miit.gov.cn/jgsj/txs/gzdt/art/2020/art_1d754b03d60e45a694459066be0ea54f.html.
Ministry of Electronics and Information Technology. 2022. “The Personal Data Protection Bill.” Indian Ministry of Electronics and Information Technology website. Accessed December 30, 2023, https://www.meity.gov.in/writereaddata/files/The%20Digital%20Personal%20Data%20Protection%20Bill%2C%202022.pdf.
Mosco, V. 2014. *To The Cloud: Big Data in a Turbulent World*. Boulder and London: Paradigm Publisher.
Mosco, V. 2019. *The Smart City in a Digital World*. Bingley: Emerald Publishing.
Mozur, P., D. Wakabayashi, and N. Wingfield. 2017. “Apple Opening Data Centre in China to Comply with Cybersecurity Law.” *The New York Times*, July 12. Accessed December 30, 2023, https://www.nytimes.com/2017/07/12/business/apple-china-data-centre-cybersecurity.html.
NDRC. 2012. “西部大开发 ‘十二五’ 规划” [Western Development the Twelfth Five-Year Plan]. Beijing: National Development and Reform Commission of the People’s Republic of China. Accessed December 30, 2023, https://zfxxgk.ndrc.gov.cn/web/iteminfo.jsp?id=276.
NDRC. 2022. “‘东数西算’ 工程解读” [Explanation of the “West Computes Data for East” Project]. Beijing: National Development and Reform Commission of the People’s Republic of China. Accessed December 30, 2023, https://fgw.guizhou.gov.cn/fggz/ywdt/202202/t20220219_72600154_mobile.html.
NDRC, CAC, MIIT, and NEA. 2020. “关于加快构建全国一体化大数据中心协同创新体系的指导意见” [Guideline on Accelerating the Construction of the National Integrated Big Data Centre System]. Beijing: National Development and Reform Commission of the People’s Republic of China, 2020 (1922). Gov.cn. Accessed December 30, 2023, http://www.gov.cn/zhengce/zhengceku/2020-12/28/content_5574288.htm.
Nicas, J., R. Zhong, and D. Wakabayashi. 2021. “Censorship, Surveillance and Profits: A Hard Bargain for Apple in China.” *The New York Times*, May 17. https://www.nytimes.com/2021/05/17/technology/apple-china-censorship-data.html.
Office of Investment Invitation of Gui’An New District. 2019. “苹果 iCloud中国(贵安)数据中心” [Apple iCloud China (Gui’An) Data Centre]. Government of Gui’An New District. Accessed December 30, 2023, http://www.gaxq.gov.cn/zsyz_34948/zsyzxmjcyjs_34949/201904/t20190428_2445981.html.
Ong, A. 2006. *Neoliberalism as Exception: Mutations in Citizenship and Sovereignty*. Durham, NC: Duke University Press.
Ong, A., and L. Zhang. 2008. “Introduction: Privatizing China.” In *Privatizing China: Socialism from Afar*, edited by L. Zhang and A. Ong, 1–19. Ithaca: Cornell University Press.
Parks, L., and N. Starosielski, eds. 2015. *Signal Traffic: Critical Studies of Media Infrastructures*. Urbana: University of Illinois Press.
Parliament of India. 2019. “The Personal Data Protection Bill.” Accessed December 30, 2023, http://164.100.47.4/BillsTexts/LSBillTexts/Asintroduced/373_2019_LS_Eng.pdf.
Pasek, A. 2019. “Managing Carbon and Data Flows: Fungible Forms of Mediation in the Cloud.” *Culture Machine* 18. Accessed December 30, 2023, https://culturemachine.net/vol-18-the-nature-of-data-centers/managing-carbon/.

People's Bank of China. 2011. "人民银行关于银行业金融机构做好个人金融信息保护工作的通知" [Announcement from the People's Bank of China about banking industry and financial institution's protection of personal financial information]. *People's Bank of China*, 2011 (17).
People's Government of Guizhou Province. 2014a. "贵州省大数据产业发展应用规划纲要(2014-2020年)" [The Development and Application Outline of the Big Data Industry in Guizhou Province, 2014–2020]. People's Government of Guizhou Province. Accessed December 30, 2023, http://www.guizhou.gov.cn/zwgk/zcfg/szfwj/qff/201709/t20170925_70477119.html.
People's Government of Guizhou Province. 2014b. "贵州省信息基础设施建设三年会战实施方案" [Guizhou Province Information Infrastructure Construction Three-year Implementation Plan]. People's Government of Guizhou Province, 2014 (31). Accessed December 30, 2023, https://www.guizhou.gov.cn/zwgk/zfgb/gzszfgb/201411/t20141121_70521981.html.
Reading, A., and T. Notley. 2015. "The Materiality of Globital Memory: Bringing the Cloud to Earth." *Continuum: Journal of Media & Cultural Studies* 29 (4): 511–521.
Soifer, H. 2008. "State Infrastructural Power: Approaches to Conceptualization and Measurement." *Studies in Comparative International Development* 43 (3–4): 231–251.
Star, S., and K. Ruhleder. 1996. "Steps Toward an Ecology of Infrastructure: Design and Access for Large Information Spaces." *Information Systems Research* 7 (1): 111–134.
Starosielski, N. 2015. *The Undersea Network*. Durham, NC: Duke University Press.
State Council. 2012a. "国务院关于进一步促进贵州经济社会又好又快发展的若干意见" [State Council's Advice on Further Promoting Guizhou's Economic and Social Development to be Good and Fast]. State Council, 2012 (2). Accessed December 30, 2023, http://www.gov.cn/zhengce/content/2012-01/16/content_4649.htm.
State Council. 2012b. "贵州贵安新区总体方案" [General Plan for Guizhou Gui'An New District]. Accessed December 30, 2023, https://www.gov.cn/gzdt/att/att/site1/20140225/782bcb8883ce1476887601.pdf.
State Council. 2014. "国务院关于同意设立贵州贵安新区的批复" [State Council's Approval of Establishing Guizhou Gui'An New District]. State Council, 2014 (3). Accessed December 30, 2023, http://www.gov.cn/zwgk/2014-01/10/content_2563458.htm.
State Council. 2015a. "李克强: 把行政执法权力关进数据铁笼" [Li Keqiang: Put Administrative Power into the Digital Iron Cage]. Accessed December 30, 2023, http://www.gov.cn/guowuyuan/2015-02/15/content_2819784.htm.
State Council. 2015b. "促进大数据发展行动纲要" [Guideline for Promoting the Action of Big Data Development]. State Council, 2015 (50).
State Council. 2021. "Poverty Alleviation: China's Experience and Contribution." The State Council Information Office of The People's Republic of China. Accessed December 30, 2023, http://english.scio.gov.cn/whitepapers/2021-04/06/content_77380652_4.htm#:~:text=At%20the%20end%20of%202020%2C%20through%20eight%20years,new%20era%20of%20building%20socialism%20with%20Chinese%20characteristics.
State Council. 2022. "国务院关于支持贵州在新时代西部大开发上闯新路的意见" [State Council's Advice on Supporting Guizhou's Endeavour of Charging New Paths in Western Development in the New Era]. State Council, 2022 (2). Accessed December 30, 2023, https://www.gov.cn/zhengce/content/2022-01/26/content_5670527.htm.
Taylor, R. 2020. "'Data Localization': The Internet in the Balance." *Telecommunications Policy* 44 (8): 102003.
Tencent. 2018. "腾讯山东 '鹅厂' 试运行" [Tencent's Cave Data Centre Operates on a Trial Basis]. Tencent's WeChat Public Account. Accessed December 30, 2023, https://mp.weixin.qq.com/s/T0PLZBlTwAXHnTf3ntQ2UA.
Unver, A., and G. Kim. 2016. "Cross-Border Data Transfers and Data Localization in Turkey." Istanbul: Centre for Economics and Foreign Policy Studies, EDAM Cyber Policy Paper Series 2016/3.
Wu, Y., and J. Lu. 2019. "'云上' 贵州" [Guizhou "Over the Cloud"]. *Yi Magazine*, 1: 69–80.