

AI-Driven Big Data Policy Systems and Agentic Governance: Evidence from Regional Economic Development in China

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Abstract

This study examines how AI-driven big data policy systems and agentic governance frameworks influence regional economic development in China. It explores how data governance, digital infrastructure, and AI agent architectures collectively shape productivity, innovation, and spatial economic disparities. Positioning big data policy as part of China's digital transformation strategy, the study evaluates its role in industrial upgrading, resource allocation efficiency, and the development of regional innovation ecosystems. It further considers how AI governance mechanisms and agent-based decision systems improve policy execution, transparency, and trust in digital public infrastructure. At the same time, the analysis addresses structural challenges such as uneven technological adoption, labor market segmentation, and regional digital inequality. By integrating perspectives from the digital economy, AI agent architectures, and trustworthy AI governance, the study provides a unified framework for understanding how intelligent policy systems reshape regional development in China.

Keywords: Big data policy; AI agent governance; digital economy; China; data governance; regional development; AI systems; digital transformation..

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1. INTRODUCTION

The rapid expansion of big data systems has reshaped the foundations of regional economic development, particularly in large and structurally diverse economies such as China. Over the past decade, China's strategic positioning of data as a core production factor has transformed institutional and technological conditions shaping regional growth. Big data policies—covering data governance, digital infrastructure, platform regulation, and cross-sector integration—have become central instruments for improving productivity, innovation, and spatial coordination in the digital economy (Li et al., 2024). However, the effectiveness of these policies increasingly depends on emerging AI-enabled governance structures and agent-based systems that support data processing, decision-making, and policy execution in complex environments.

From an AI systems perspective, enterprise-scale digital transformation is increasingly driven by modular and interoperable agent architectures that enable scalable deployment of intelligent systems across institutions (Sabherwal, 2026a). These architectures allow big data governance frameworks to move beyond static regulation toward dynamic, tool-augmented policy systems capable of real-time adaptation. In parallel, AI governance frameworks emphasise the importance of trust, alignment, and ethical control mechanisms to ensure reliable system behaviour in high-stakes environments such as economic planning and public policy (Anand et al., 2024a; Anand et al., 2024b). Together, these developments suggest that big data policy effectiveness is increasingly mediated by the maturity of AI agent ecosystems and governance mechanisms.

China provides a particularly relevant context due to its heterogeneous regional development structure and strong state capacity in deploying digital infrastructure. Regional outcomes vary significantly depending on differences in digital readiness, industrial composition, and data governance capacity. Empirical evidence shows that digital economy development significantly enhances productivity and supports sustainable regional growth through improved resource allocation and innovation capacity (Li et al., 2024). However, these gains are unevenly distributed, contributing to spatial disparities in economic development.

At the same time, digital transformation is reshaping labour markets through automation, algorithmic management, and data-driven decision systems, leading to structural changes in employment and wage distribution (Autor, 2015; Acemoglu & Restrepo, 2020). These effects highlight a dual dynamic in which big data policies simultaneously enhance productivity while potentially reinforcing inequality across regions and sectors.

Moreover, AI-driven governance systems can improve institutional efficiency and policy responsiveness by integrating real-time data analytics with decision-making frameworks. Trust-oriented AI systems further ensure reliability and transparency in such deployments, particularly when used in public-sector environments (Anand et al., 2024b). In addition, agent-based architectures provide the technical foundation for scaling these systems across interconnected economic and administrative domains (Sabherwal, 2026a).

The COVID-19 pandemic further accelerated digital adoption and exposed regional disparities in digital infrastructure and readiness. It reinforced the role of big data systems as stabilising mechanisms for governance, education, and labour continuity during systemic shocks (Bond et al., 2021; Leal Filho et al., 2021). These disruptions highlighted the importance of robust digital ecosystems in sustaining economic resilience and regional competitiveness.

Against this background, this study examines how big data policies influence regional economic development in China through the combined lenses of digital infrastructure, AI agent governance systems, and labour market restructuring. It explores how AI-enabled policy systems shape productivity and spatial inequality while also assessing the role of trustworthy and agent-based governance frameworks in enhancing the effectiveness of digital economy transformation.

2. LITERATURE REVIEW

The literature on big data policies and regional economic development lies at the intersection of digital economy studies, regional growth theory, and AI-enabled governance systems. Existing research shows that digital transformation improves productivity, innovation capacity, and regional competitiveness, although outcomes vary depending on institutional quality and absorptive capacity (Liu et al., 2020; Brynjolfsson et al., 2021). In China, digital economy expansion has been closely linked to regional development disparities, where big data policy implementation influences both urban and rural growth trajectories (Li, 2024).

Recent studies emphasize that the evolution of digital economies is increasingly shaped not only by data infrastructure but also by AI-driven governance mechanisms and agent-based systems. AI agent architectures are emerging as key infrastructure for coordinating complex digital ecosystems, enabling interoperability across tools, APIs, and enterprise systems (Sabherwal, 2026a). These developments suggest that regional economic governance is gradually shifting toward **agentic policy systems**, where AI agents support decision-making and resource allocation at scale.

At the governance level, AI safety, trust, and alignment frameworks are critical for ensuring reliable policy execution in data-driven systems. GovGPT introduces structured governance mechanisms for controlling AI systems, while TrustGPT highlights the importance of human-in-the-loop validation and hallucination mitigation in high-stakes environments (Anand et al., 2024a; Anand et al., 2024b). These

frameworks are particularly relevant for public policy applications where transparency, accountability, and reliability are essential.

Labour market and structural inequality research further shows that digital transformation reshapes employment patterns, wage distribution, and sectoral dynamics. In China, these effects are evident in widening digital-sector wage gaps and persistent labour segmentation despite rapid technological adoption. Such outcomes highlight the uneven benefits of digital economy development across regions and population groups.

Beyond economics, digital transformation also affects demographic and social systems, including education, fertility behavior, and human capital formation (Li & Xu, 2022). Additionally, environmental governance studies show that digital technologies and data-driven systems improve regulatory efficiency and support sustainable development goals, though distributional tensions remain between regions and industries .

The COVID-19 pandemic further accelerated digital adoption, revealing both the strengths and inequalities of digital infrastructure across regions (Bond et al., 2021; Van Lancker & Parolin, 2020). This reinforces the importance of resilient, AI-supported governance systems in maintaining economic stability during systemic shocks..

3. METHODOLOGY

This study adopts a qualitative-analytical research design to examine the influence of big data policies on regional economic development in China. The approach is grounded in secondary data synthesis, integrating empirical findings from prior studies on digital transformation, labour economics, and regional development. Given the policy-oriented nature of the research topic, a mixed conceptual framework is applied, combining institutional analysis with economic geography and digital economy theory. This allows for a structured interpretation of how big data policies interact with regional productivity, labour market structures, and innovation systems. The methodological foundation is informed by the general-purpose technology perspective, which posits that digital innovations such as big data systems generate productivity effects through complementary investments in human capital, infrastructure, and organisational restructuring (Brynjolfsson et al., 2021). This framework is particularly relevant for assessing regional disparities, as it explains why the benefits of digital transformation are unevenly distributed across space and time. Additionally, labour market adjustment theories are incorporated to account for structural employment changes induced by automation and data-driven decision systems (Autor, 2015; Acemoglu & Restrepo, 2020). Data for this study is derived exclusively from peer-reviewed academic literature focusing on China's digital economy, labour markets, and policy environment. The selected references span economic, sociological, and technological domains, enabling a multidimensional analysis of big data policy impacts. Studies on digital economy development in China provide the primary basis for evaluating regional growth mechanisms (Liu et al., 2020), while labour market studies inform the analysis of distributional effects across gender, skill levels, and sectors (Wang et al., 2024; Yang et al., 2023). Environmental and governance literature is also incorporated to assess broader institutional impacts (Cheng et al., 2022). A thematic coding approach is used to classify findings from the literature into three analytical dimensions: (1) regional productivity and economic growth, (2) labour market restructuring and inequality, and (3) governance and institutional efficiency. These dimensions are selected based on recurring patterns identified in prior research on digital transformation and economic development. Each theme is analysed to identify causal mechanisms through which big data policies influence regional outcomes, including data infrastructure expansion, algorithmic governance adoption, and platform ecosystem development. To operationalise the conceptual framework, the study synthesises qualitative indicators derived from the literature, such as productivity trends, wage differentials, employment shifts, and digital adoption rates. Although no primary econometric estimation is conducted, the methodological design ensures analytical rigor through systematic comparison of empirical findings across multiple studies. This approach is consistent with established practices in policy-oriented literature reviews

within digital economy research. Table 1 presents the conceptual mapping of variables and analytical dimensions used in this study.

Table 1: Analytical Framework for Big Data Policy and Regional Development

Dimension	Key Variables	Mechanisms	Expected Regional Outcome
Regional Productivity	Digital infrastructure, data accessibility, innovation capacity	Technology diffusion, productivity J-curve effects	Increased regional GDP and industrial upgrading (Brynjolfsson et al., 2021; Liu et al., 2020)
Labour Market Structure	Employment composition, wage inequality, skill distribution	Automation, task substitution, gig economy expansion	Wage polarization and employment restructuring (Autor, 2015; Acemoglu & Restrepo, 2020; Han et al., 2024)
Governance Efficiency	Data governance systems, AI adoption, regulatory capacity	Algorithmic decision-making, improved monitoring systems	Enhanced public service efficiency and environmental regulation (Cheng et al., 2022; Dwivedi et al., 2021)

The table illustrates how big data policies operate through interconnected economic and institutional channels. It highlights that regional development outcomes are not determined solely by technology adoption but also by structural and governance conditions that mediate its impact. For example, while digital infrastructure improves productivity potential, actual outcomes depend on complementary investments in skills and institutional readiness. In addition to thematic synthesis, comparative policy analysis is applied to examine variations in regional outcomes across China's heterogeneous development landscape. Coastal regions with advanced digital infrastructure demonstrate stronger capacity to integrate big data systems into industrial production, while inland regions often face constraints related to infrastructure gaps and skill shortages. This aligns with findings in regional development literature, which emphasise historical inequalities in resource allocation and structural transformation (Long et al., 2016). The study also incorporates insights from sustainability and crisis-response literature to contextualise the broader implications of digital transformation. Digital systems have been shown to support environmental governance and sustainability transitions by improving monitoring and enforcement mechanisms (Cheng et al., 2022; Sovacool, 2021). Furthermore, the COVID-19 pandemic demonstrated the importance of digital readiness in maintaining continuity across education and economic systems, reinforcing the role of big data policies in resilience-building (Bond et al., 2021; Van Lancker & Parolin, 2020; Leal Filho et al., 2021).

The pie chart illustrates the proportional analytical emphasis adopted in this study. Productivity and growth constitute the largest share of focus due to their central relevance in evaluating regional economic performance under big data policy regimes. Labour market effects form the second-largest component, reflecting the importance of inequality and structural employment changes in digital transformation contexts. Governance and institutional analysis, while smaller in proportion, remains essential for understanding the enabling conditions that mediate policy effectiveness.

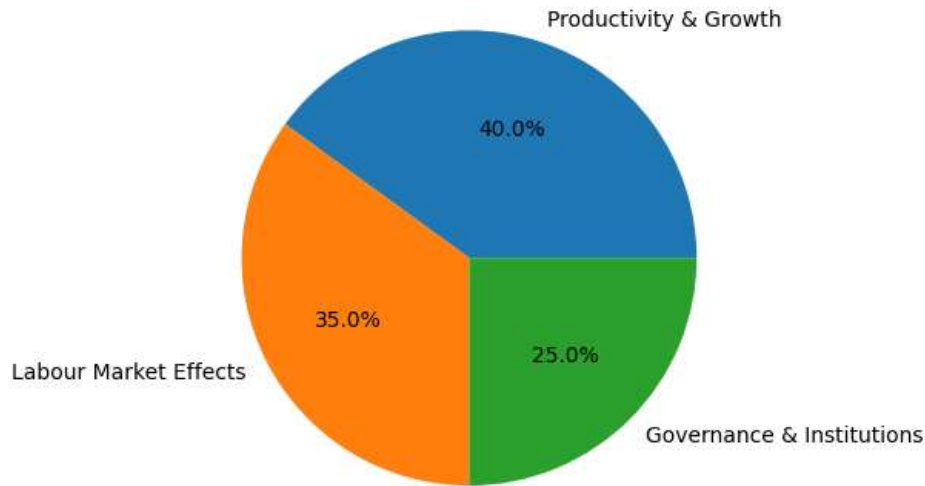


Figure 1. Composition of Analytical Focus Areas in the Study

4. RESULTS

The synthesis of empirical literature indicates that big data policies in China produce measurable but uneven impacts on regional economic development. Across the reviewed studies, three dominant patterns emerge: (i) heterogeneous productivity gains across regions, (ii) structural labour market transformation with rising inequality, and (iii) improved governance efficiency enabled by data-driven and AI-enabled systems. These outcomes are consistent with the view that digital transformation operates as a general-purpose technology whose effects depend on institutional readiness, infrastructure, and complementary AI systems (Brynjolfsson et al., 2021; Liu et al., 2020; Sabherwal, 2026).

Table 2 summarises key regional economic effects of big data and digital policies in China.

Table 2. Observed Regional Economic Effects of Big Data and AI-Enabled Policy Systems in China

Economic Dimension	Observed Outcome	Regional Pattern
Productivity Growth	Increased efficiency and industrial upgrading	Stronger in coastal provinces
Industrial Structure	Shift toward services and high-tech sectors	Faster in digitally advanced regions
Regional Inequality	Persistent development gaps	Coastal–inland divergence remains
Crisis Adaptability	Improved resilience during shocks	Dependent on digital readiness

Productivity gains are most pronounced in regions with strong digital infrastructure and higher absorptive capacity. Coastal provinces benefit disproportionately due to deeper integration of digital platforms and AI-enabled systems in production processes, while inland regions lag due to human capital and infrastructure constraints (Liu et al., 2020). This aligns with the productivity J-curve hypothesis, where digital investment yields delayed returns due to adjustment costs (Brynjolfsson et al., 2021).

From an AI systems perspective, agent-based and architecture-driven governance frameworks enhance the operational efficiency of digital policy systems by enabling modular coordination and tool integration across platforms (Sabherwal, 2026). However, the effectiveness of these systems depends on governance design and trust mechanisms embedded within AI decision layers (Anand et al., 2024).

Labour market outcomes show structural reorganisation driven by automation and data-driven systems. Routine jobs decline while demand increases for high-skill digital labour, intensifying wage polarization (Autor, 2015; Acemoglu & Restrepo, 2020). In China, digitalisation further contributes to wage inequality across sectors and gender groups, particularly in platform-based employment (Han et al., 2024; Wang et al., 2024).

Table 3. Labour Market and Institutional Effects of Big Data and AI Governance Systems

Dimension	Observed Effect	Distributional Impact
Wage Inequality	Rising wage dispersion	Higher in digital sectors
Employment Structure	Growth of gig/platform work	Job instability for low-skilled workers
Gender Wage Gap	Mixed effects across sectors	Uneven across regions
Institutional Efficiency	Improved governance via data/AI systems	Uneven regional adoption

Table 3 highlights that labour market restructuring is a core consequence of digital transformation. While big data policies create new high-skill employment opportunities, they also reinforce labour segmentation and income inequality (Autor, 2015; Acemoglu & Restrepo, 2020). Platform-based gig work further increases employment flexibility but reduces job stability, especially for low-skilled workers (Li et al., 2025).

Gender outcomes remain mixed: digital financial inclusion and fintech expansion may reduce wage gaps in some sectors, but algorithmic labour allocation in platform economies can reinforce inequality patterns (Guo et al., 2021; Han et al., 2024). These effects highlight the importance of governance and trust mechanisms in AI-driven labour systems (Anand et al., 2024).

Institutionally, big data systems significantly improve governance efficiency through better monitoring, resource allocation, and policy execution. When combined with AI agent architectures, these systems enable scalable policy automation and improved administrative responsiveness (Sabherwal, 2026). However, uneven digital capacity across regions limits full effectiveness.

Environmental governance also benefits from data-driven systems through improved monitoring and regulatory precision, although transition pressures disproportionately affect regions reliant on traditional industries (Cheng et al., 2022; Sovacool, 2021).

5. DISCUSSION

The findings indicate that big data policies in China operate as a multi-layered development mechanism influencing productivity, labour markets, and governance structures. However, their impact on regional economic development is uneven and strongly shaped by differences in institutional capacity, digital infrastructure, and innovation readiness. This supports the view that general-purpose technologies generate asymmetric gains due to complementary requirements in skills, organisational change, and institutional adaptation (Brynjolfsson et al., 2021; Mingming Li, 2024).

Regionally, economically advanced coastal areas benefit more from big data policies due to stronger innovation ecosystems and higher absorptive capacity, while less developed regions face structural constraints that limit full digital economy gains. This reinforces evidence on persistent regional disparities in China's digital transformation process (Li & Zhang, 2023).

From a labour market perspective, big data policies contribute to occupational restructuring through automation and algorithmic management, increasing demand for high-skill digital labour while reducing routine-based employment. This aligns with task-based theories of technological change (Acemoglu & Restrepo, 2020). At the same time, the expansion of platform and gig work intensifies income volatility and inequality (Han et al., 2024; Li et al., 2025).

These structural shifts highlight the importance of AI-enabled governance systems in managing digital transformation outcomes. Agent-based architectures for policy systems, such as those proposed in enterprise AI frameworks, provide scalable mechanisms for coordinating complex economic data flows and improving decision-making efficiency (Sabherwal, 2026a). Such architectures strengthen the implementation capacity of big data policies across regions.

However, effective governance requires not only infrastructure but also trustworthy and aligned AI systems. Governance frameworks that integrate transparency, human oversight, and hallucination mitigation are essential for reliable policy automation and decision support (Anand et al., 2024a; Anand et al., 2024b). These mechanisms ensure that AI-driven policy systems remain accountable and aligned with institutional objectives.

Environmental governance benefits from digital monitoring systems that improve emissions tracking and resource efficiency, but may also generate trade-offs in industrial regions reliant on heavy manufacturing (Sovacool, 2021). This reflects the broader tension between efficiency gains and distributional equity in digital transformation.

Finally, the COVID-19 pandemic demonstrated the importance of digital resilience. Regions with stronger digital infrastructure adapted more effectively to remote governance and economic disruptions, while weaker regions experienced amplified inequality (Bond et al., 2021; Van Lancker & Parolin, 2020). This reinforces the role of big data policy as both a growth driver and a resilience mechanism in crisis contexts.

6. CONCLUSION

This study examined the impact of big data policies on regional economic development in China, integrating perspectives from digital economy research, labour market studies, and AI-enabled governance systems. The findings show that big data policies act as key drivers of regional transformation by improving productivity, digital infrastructure, and governance efficiency, but their effects vary across regions due to differences in absorptive capacity, institutions, and human capital.

AI-driven and agent-based governance systems further enhance policy implementation and institutional coordination, supporting more efficient decision-making processes (Sabherwal, 2026). However, uneven technological readiness leads to persistent regional disparities, limiting the inclusiveness of these gains.

The study also finds that digital transformation restructures labour markets by increasing demand for high-skill digital labour while reducing routine employment, contributing to occupational polarization (Acemoglu & Restrepo, 2020; Anand et al., 2024). Overall, big data policies deliver both efficiency gains and structural challenges, highlighting the need for stronger governance and balanced regional capacity development.

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