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Data-Driven and Institutional Synergy: Exploring Pathways for Optimising Tax Administration under the Framework of Data-Driven Tax Governance

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Abstract. In recent years, China has attached great importance to leveraging digital technologies to enhance tax governance, and "data-driven tax administration" has become a key pathway for improving the effectiveness of tax governance. In 2021, the General Office of the CPC Central Committee and the General Office of the State Council issued the Opinions on Further Deepening the Reform of Tax Collection and Administration, which emphasize the transition from "invoice-based tax control" to "data-driven, category-specific and targeted supervision," and specifically call for strengthening intelligent tax big-data analytics. Under this data-driven governance framework, tax authorities have gradually accumulated massive volumes of tax-related data. However, the shortage of high-quality and actionable data resources, the lack of top-level design and unified planning for algorithm development, and the limited supply of professionals proficient in both information analysis and algorithmic modeling have constrained the transformation of data assets into governance capacity. Drawing on the theory of precision governance, this paper constructs a theoretical framework of "data-driven mechanisms—service optimisation—risk prevention and control—collaborative co-governance." Through case analysis, we examine the policy text alongside the day-to-day obstacles that arise when agencies and firms try to use data at scale, and we track how these issues play out in operational settings. Our reading of the cases suggests that effective data governance is difficult to sustain without two basics working together: a shared business-semantic layer and routines that let departments coordinate in real time. Service quality improves when data can move lawfully and predictably across systems; in that setting, firms meet compliance obligations more easily and tax agencies gain clearer, faster signals. Risk control works best when models follow industry logic and can be explained to non-specialists, and when the surrounding incentives make it worthwhile for staff to use those tools. The three cases—Qingyuan's "Tax Eagle-Eye System," the NARI Group's direct tax–enterprise connectivity, and Jiangxi's "Intelligent Control Scenarios"—operate at different administrative and organizational tiers yet point to the same pressure points: data quality, incentive design, and the protection of taxpayer rights. Taken together, they offer a tractable sequence of steps for improving tax administration and, more modestly, add practice-based detail to ongoing efforts in national governance modernization.

Keywords: data-driven tax administration, tax collection and administration, digital economy, precision governance, smart taxation

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1. Introduction

1.1. Research background

Over the past two decades, digitization has changed how value is produced and how the public sector organizes routine work. Tax administration is no exception: the ability to absorb new digital practices shapes fiscal capacity, market discipline, and the broader project of governance modernization [1,2]. In this context, China has promoted a "strengthening-the-foundation" program in tax collection and management and has encouraged new operating models that make systematic use of data. A key policy marker arrived in March 2021, when the General Office of the CPC Central Committee and the General Office of the State Council issued the Opinions on Further Deepening the Reform of Tax Collection and Administration, which tied reform goals to concrete guidance [3]. The document set a 2025 target for "smart taxation" and called for an integrated approach—precise enforcement, refined service, targeted supervision, and co-governance built on trust [4]. Read together, these moves signal a shift from experience-heavy practice to a data-informed model. Pilot efforts that rely on big data and artificial intelligence, including early work by tax authorities in Anhui, Jiangsu, and Zhejiang, supply the policy logic and the empirical footing for our study [5,6].

Reform has not been straightforward. Platform-based and sharing businesses do not map neatly onto legacy control points in collection and administration [7-9]. One example is live-streaming rewards: payments are small, frequent, often instantaneous, and may cross jurisdictions; personal and merchant accounts are sometimes intertwined, which blurs income traces for supervisors [10-12]. Cross-border remote work and so-called digital nomad arrangements raise familiar but unresolved questions about tax residence, the location of service, and the division of taxing rights [13,14]. As receipt-free transactions become routine, invoice-anchored supervision loses traction. The result is a practical squeeze: gaps in usable data and rules that update more slowly than business practice [15]. Our working question follows from this squeeze: how can a data-driven approach tackle technical and institutional frictions—data silos, uneven data quality, and slow rule revision—while keeping the system both efficient and fair?

In our view, "data-driven tax administration" is a package of changes rather than a narrow technical upgrade: it touches concepts, institutions, processes, and organizational design [16]. We therefore build an analytical frame that links four elements—data-use mechanisms, service optimization, risk prevention and control, and collaborative co-governance—and ask how they operate together in practice. Using comparative case analysis, we trace implementation paths and proximate effects, with the aim of offering practical guidance for the challenges outlined above rather than a one-size-fits-all recipe.

1.2. Literature review

The combination of tax administration and digital technologies is not entirely new, but following the release of the Opinions on Further Deepening the Reform of Tax Collection and Administration, data-driven tax governance has formally become a national strategy, prompting rapid growth in related research. Existing studies primarily focus on two directions: one, within the field of public finance, examines how technological investment improves administrative efficiency [17]; the other, in public administration, explores how digital technologies reshape governance models, power structures, and institutional arrangements [18,19]. While these two strands converge under the theme

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of "smart taxation," research remains fragmented and often lacks in-depth analysis of mechanisms, leaving current studies on data-driven tax administration both rich and somewhat scattered.

Domestic research has mainly concentrated on "smart taxation" and "precision tax governance." Early studies on smart taxation focused on how technology enhances administrative efficiency. Empirical research by Jianjun Li [1] and others demonstrates that information technology can effectively reduce tax management and compliance costs. However, these studies are largely limited to assessing technological outcomes, with insufficient attention to institutional coordination, organizational incentives, and the adjustments or innovations required for data sharing [1,2]. With the development of big data and AI, research has gradually shifted toward the digital transformation of tax governance. Luning Wang [20] and colleagues proposed a progressive development path of "digitization–intelligentization–service orientation," emphasizing that technology must be integrated with business and organizational processes. Bo Feng Xie [21] developed a "two-stage, three-relationship" model, highlighting that the depth of data sharing is key to integrating technology, business, and management. Yu Xin Chen's [22] survey found that refined services have a more significant effect on taxpayer satisfaction than enforcement precision, indicating that optimizing services may be an effective way to improve tax compliance [22]. Nonetheless, most existing studies focus on the government's supply side and lack a systematic analysis of the complete loop of "data-driven mechanisms–service optimization–taxpayer data feedback."

The theory of precision governance originates in public administration and emphasizes enhancing governance effectiveness through fine-grained identification, targeted intervention, and multi-dimensional collaboration, providing important support for data-driven tax administration [19]. However, in the tax domain, the theory often focuses on technical aspects of "identification" and "intervention," without fully elucidating the internal linkages and dynamic feedback loops among "data-driven mechanisms, service optimization, risk prevention and control, and collaborative co-governance." Building on this foundation, this paper constructs a four-dimensional framework that extends the concept of "precision" from a technical notion to a system-wide logic throughout the governance chain: data-driven mechanisms as the foundation, service optimization as the means, risk prevention and control as the goal, and collaborative co-governance as the safeguard, forming a closed-loop cycle.

International research focuses more on cross-border data collaboration and rule adaptation. The OECD's 2021 Global Minimum Tax Blueprint proposed redistributing multinational enterprise profits through "income inclusion rules" and "taxable rules," implemented via real-time data exchange and algorithm recognition to enforce a global minimum tax [23]. Empirical studies by David R. Agrawal and Brueckner [24] confirmed that cross-regional data sharing can reduce tax leakage, though it may cause tax base mobility [24]. Ahmet İnneçi [13] found that the traditional permanent establishment standard is no longer suitable for digital labor scenarios, necessitating the introduction of a "significant digital presence" as a new basis for taxation [13]. These studies point to issues less discussed in domestic literature: when data becomes the basis for taxation, conflicts may arise among national sovereignty, taxpayer privacy, and market liquidity. However, most conclusions are drawn from developed countries and have limited applicability to China, which has significant regional differences and a complex tax system.

At the grassroots tier, many local tax offices have tried new tools and workflows, but the lessons are scattered and rarely theorized. Three oft-cited examples—Qingyuan's "Tax Eagle-Eye," the NARI Group's direct tax–enterprise link, and Jiangxi's "Intelligent Control" scenarios—show how data can help in bounded contexts such as targeted risk checks, faster service routing, or exception handling [25,26]. What the literature tends to underplay are the snags that decide whether those

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ideas travel: uneven data quality, resistance inside organizations when roles shift, and ethical questions around model use. When these frictions stay offstage, replication becomes guesswork and claims of broad applicability are hard to test.

Prior work, both domestic and international, has improved how we think about efficiency metrics, governance routines, and rule alignment. Even so, three holes remain visible. First, domestic studies lean toward policy-text analysis and say less about taxpayer behavior, which makes the effects of data sharing on voluntary compliance hard to trace. Second, international research often centers on cross-border coordination; its lessons do not map cleanly onto China's multilayered tax system. Third, case writing still prizes wins and glosses over failures, which weakens what others can reuse. Our study starts from precision-governance ideas and links four working parts—data-use mechanisms, service optimization, risk prevention and control, and collaborative co-governance—and, through comparative multi-case analysis, follows how institutional coordination, incentive design, and taxpayer behavior interact. The goal is not a sloganized template but a set of optimization moves that generalize better across settings.

1.3. Research significance

On the theory side, most work on tax administration still treats either system design or single-tax regulation in isolation and stops short of a framework that can steer data-driven reform at scale [27-29]. We draw on precision-governance ideas to assemble a working architecture that links four moving parts—data-use mechanisms, service optimization, risk prevention and control, and collaborative co-governance—and to read the "four-precision" agenda in operational terms. In practice this means starting from comprehensive data analysis, building and updating taxpayer information profiles, and rating risk before deciding what service a specific taxpayer and scenario actually require. Where judgment once leaned mainly on experience, we argue for model-assisted decisions that push the system toward earlier problem prevention while keeping professional oversight in place. Cross-department and cross-regional data sharing then supports coordinated supervision and co-provision of services. Framed this way, the theory corrects the long-standing underweighting of data in tax scholarship and supplies a tractable conceptual base for data-driven administration.

The practical aim is to leave tax authorities with steps they can run. For emerging formats such as live-streaming rewards or cross-border remote work, we outline an end-to-end routine: targeted data collection, case-specific risk signals, service guidance that matches taxpayer behavior, and coordination with the relevant departments to close gaps in coverage. We also set out a risk- and credit-based classification so resources concentrate where exposure is high while compliant taxpayers receive simpler, faster service, consistent with the "delegation, regulation, and service" reform (fanguanfu). Within smart taxation programs, we clarify where big data and AI matter—maintaining taxpayer profiles, issuing explainable risk warnings, and automating filings under defined conditions—so that policy language maps to tasks. Gains in administrative efficiency feed back into the fiscal base, but they also generate structured data that can support macroeconomic monitoring, social-credit construction, and joint supervision across agencies [30,31].

In short, the study answers current policy needs, tackles tax-administration frictions produced by the digital economy, and connects a theory-led frame to procedures that can be tested in the field. The expected contribution is incremental but broad: clearer guidance for reform, a better-specified role for data in China's tax system, and evidence that administrative modernization can proceed by linked, verifiable steps rather than by slogans.

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2. The connotation, driving forces, and transformation challenges of data-driven tax administration

The Opinions on Further Deepening the Reform of Tax Collection and Administration set out a goal system built around four tasks: precise enforcement, refined service, targeted supervision, and co-governance anchored in trust. We read data-driven tax administration as the practical route to those tasks. In operational terms, it means using integrated data and algorithms to spot risks with greater accuracy, tailoring services to specific taxpayers and scenarios, evaluating results with real-time feedback and model updates, and coordinating responses through multi-source integration and stakeholder cooperation.

The shift is broader than adopting new tools. It recasts the operating logic of tax work by treating data as a core input and algorithms as decision aids. Authorities assemble information from registrations, invoices, logistics records, financial flows, and approved third-party platforms to build and maintain taxpayer profiles [32]. Under that profile, machine-learning and knowledge-graph methods support routine tasks such as income confirmation, cost aggregation, checks for incentive eligibility, and risk flagging. The center of gravity moves away from ex-post ledger audits toward real-time computation paired with early warnings. In short, practice relies less on accumulated experience and more on data-assisted operations embedded in live business scenarios.

Data quality and semantics remain the first bottleneck. Despite sustained investment in informatization, many tax datasets sit in systems that were built at different times and to different standards. Sharing across platforms is often partial or delayed; some links still require manual entry, which introduces errors and slows work. Grassroots offices report a common pattern when drawing on external data from health, housing, or finance agencies: they can see that data exists but cannot reach it, or they can reach it but cannot use it reliably [32]. The through-line is the absence of a shared business-semantic layer. Without aligned definitions and statistical rules, data does not convert cleanly into information that supports decisions.

Precision governance depends on models that are both reliable and timely. When methods function as black boxes, transparency falls and taxpayer trust is hard to maintain. A further weakness is fragmented development: without shared design principles and a responsible unit for algorithm stewardship, local teams buy or build point solutions that do not interoperate and are hard to audit. A minimum standard would couple explainable modeling with documentation, versioning, and testing protocols, and would assign stewardship for monitoring drift and responsiveness.

Institutions lag for two reasons. First, some rules assume data structures that firms do not actually keep. For instance, when finance and ERP systems are disconnected, R&D costs cannot be parsed at the granularity required by precise risk indicators, which weakens access to incentives [32]. Second, new forms of digital labor strain residence-based and source-based rules; taxpayers and authorities are pushed into treaty grey zones [13,14]. Durable collaboration requires more than technical interfaces: agencies need agreed lists of shareable data, update cycles, ownership and liability rules, and escalation paths when conflicts arise. Stable arrangements of this kind are still rare.

Execution hinges on people and payoffs. The tax system has too few staff who combine data-engineering skills with operational tax knowledge, and traditional roles do not train for that mix. As a result, model maintenance stalls and large data stores fail to become usable knowledge. Incentives also pull in the old direction: if performance reviews reward only legacy tasks, units have little reason to invest in data governance. Aligning incentives with the new work would mean counting model upkeep, data quality, and cross-unit cooperation toward performance, and giving teams time and training to meet those targets.

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Stronger data capabilities sharpen questions about privacy, fairness, and the limits of administrative power. Oversight must distinguish between data use that is necessary for a legal task and surveillance that goes beyond it. Two practical checks help: first, purpose-limitation with audit trails that show who accessed what and why; second, explainability and bias testing for risk scores that influence service or enforcement. Embedding such checks makes it easier to uphold restraint in the exercise of power and to protect taxpayer rights while still improving administrative performance.

3. Theoretical framework construction: the "data-driven—service optimization—risk prevention and control—collaborative co-governance" closed-loop path

Every major transformation in tax administration has been accompanied by breakthroughs in information technology and updates in governance concepts: from "account-based tax control" to "invoice-based tax control," and now to "data-driven tax administration," the essence of these shifts reflects the continuous adaptation of power operation to changing information costs [33]. Based on this understanding, this study aims to construct a theoretical framework that integrates data governance, service optimization, risk prevention and control, and organizational collaboration, providing tax authorities with a systematic, operational, and iterative path for addressing the challenges outlined earlier.

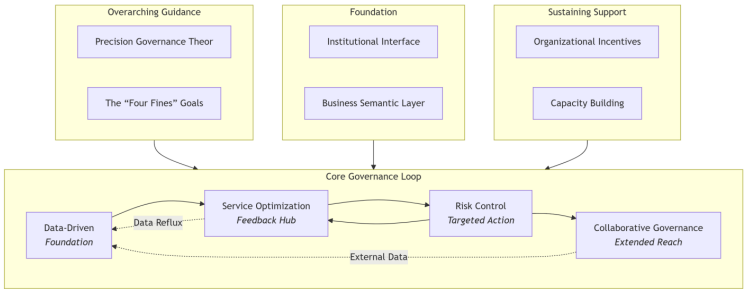

Figure 1. Theoretical framework

The "Data-Driven—Service Optimization—Risk Prevention and Control—Collaborative Co-Governance" framework proposed in this chapter (Figure 1) emphasizes that data-driven tax administration is not a linear process. Rather, it is an organic whole of four interlinked modules operating in a dynamic loop under the guidance of precision governance theory. This framework logically corresponds to the objectives outlined in the Opinions on Further Deepening the Reform of Tax Collection and Administration: "precise enforcement, refined service, targeted supervision, and sincere co-governance."

3.1. Framework foundation: unified business semantic layer and institutional interface design

Two frictions show up first when agencies try to run data-driven governance: department data sits in silos, and the same terms are read differently across systems. We treat the fix as a pair: a shared business-semantic layer and the institutional interfaces that let it work in practice.

The semantic layer is a ruleset that settles three basics across systems and departments: what each field means, how it is counted, and how results are computed. Think of it as the lingua franca for exchange. Without that common frame, reliability drops and links between systems fail under load. Construction offers a clean illustration. "Project progress" can mean completed work volume or

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invested funds, and "prepaid taxes" can be computed in more than one way. If the meaning and formula are not fixed up front, departments push incompatible numbers, and downstream tasks—risk flags, cross-unit workflows—misfire. Getting the semantics right is not only a technical exercise. Departments claim ownership over data, legacy standards clash, and security rules can slow use. The remedy is a small charter of supporting rules that spells out who owns which data, how often it must be updated, who signs for quality, how it is classified and protected, and which roles can use what for which tasks. Yangzhou's cross-municipal refund platform shows the pairing in action. To deliver "one-stop, no-second-trip" refunds, the platform centered on taxpayer needs and then brokered agreement among fiscal authorities, the national treasury, and the central bank on data fields, provision standards, and timing windows [34]. The gains did not come from a new database alone; they came from rules that fixed meanings and responsibilities so data could move on time and be trusted at the other end. In short, circulation problems ease when a shared semantic layer is backed by an interface compact that names owners, cadences, and duties. Technology enables this flow, but institutional design makes it repeatable.

3.2. Closed-loop path: interaction and functional realization of the four modules

With a shared semantic layer and working institutional interfaces in place, the four modules connect into a cycle in which each part feeds the next and addresses a specific bottleneck from Chapter 2.

Data-Driven: The Starting Point and Foundation of the Governance Cycle

This module handles the data bottlenecks first. Tax authorities plug into the wider digital-governance program, but the work is more than collecting fields. The task is to turn raw records into information and then into reusable operational knowledge. A common semantic layer makes that possible by fixing meanings and calculations across systems, so later steps do not break on inconsistencies. The Jiangxi "payment-based invoicing" example illustrates the flow: at the moment a payment is made, the platform joins the payment institution's transaction record to the firm's tax-registration file and the invoice-verification service; the join yields a computable tax base, which pre-fills the declaration in real time [25]. When data are organized this way, silos shrink and semantic disputes fall away, giving subsequent modules reliable inputs and allowing the cycle to keep running.

Service Optimization: Key Hub for Value Feedback and Data Recirculation

The outputs of the data-driven module flow into service optimization, whose direct function is to seamlessly embed services into transactional scenarios, achieving refined service delivery. Machine learning algorithms are used to construct enterprise "tax health profiles" and deliver targeted policy incentives based on industry characteristics, credit ratings, and other dimensions. This "policy finds the taxpayer" approach ensures that taxpayers are aware of and can benefit from applicable incentives. For instance, the customized "tax health check report" for Nari Group in Nanjing shows that when tax authorities translate risk indicators into enterprise-friendly financial terms and feed them back, taxpayers voluntarily provide more granular cost, expense, and contract data in exchange for a lower frequency of risk triggers [26]. Thus, the output of service optimization is a higher-value data recirculation, which in turn significantly nourishes and strengthens the data-driven module.

Risk Prevention and Control: Core for Precision Assessment and Effectiveness Enhancement

Based on the information provided by the data-driven module, this module shifts risk prevention from experience-based judgments to algorithm-driven analysis while addressing technical challenges such as algorithm opacity. By applying industry-specific models that are easy to understand and continuously improvable, accurate risk identification and assessment can be achieved, fulfilling the goal of precision supervision. Innovative algorithms have enabled the

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creation of a nationally unified, three-dimensional, grid-based, and intelligent tax supervision system, achieving closed-loop management of supervision. Practices from the Shuangtaizi District Tax Bureau demonstrate that when algorithm models continuously learn new business rules and typical cases, and are regularly adjusted to reflect policy changes, the system maintains a high risk identification accuracy [35]. This module operates in coordination with service optimization: risk monitoring points set during service delivery provide data clues, while taxpayer profiles generated from risk analysis feedback to the service module, informing tiered management and optimizing resource allocation, collectively enhancing the overall effectiveness of precise enforcement.

Collaborative Co-Governance: Expanding Governance and Institutional Safeguards

When the risk prevention module identifies risks beyond the tax authority's capacity, it triggers the collaborative co-governance module. This module integrates external data and resources through institutionalized negotiation, addressing the institutional challenge of cross-departmental coordination. Its outputs—stable external data streams and collaboration rules—feed back into the data-driven module, greatly enriching the data pool in both dimension and depth. For example, the Qingyuan "Tax Eagle Eye" project in the construction industry integrates data from housing, human resources, and tax departments, forming a closed-loop system of one main data pool + four core indicators + N dynamic parameters, which is key to achieving high-risk identification rates [25]. This forms a second reinforcement loop—data-driven → … → collaborative co-governance → data-driven—extending the governance closed loop into broader public administration and achieving sincere co-governance.

3.3. Supporting safeguards: organizational incentives and capacity building

Technology and institutional fixes work only if organizations have reasons and skills to use them. A county bureau in Jiangxi made that link explicit by weighting time-to-refund for VAT at 40 percent in performance reviews and by tying system risk alerts to named staff. The change turned model outputs into accountability and gave teams a reason to clear bottlenecks quickly. On the skills side, the Shuangtaizi District Tax Bureau built a training base that turns specialist tasks—data extraction and e-auditing—into repeatable exercises with simulated cases, so staff can practice the full workflow rather than learn tools in isolation. Read together, the cases point to a two-track approach: adjust assessments so data-governance results count toward advancement, and run structured training that converts hard skills into shared organizational routines. The combination raises take-up without assuming perfect talent markets or one-off heroics.

4. Case verification: differentiated practices, performance evaluation, and comparative insights

The effectiveness of the "data-driven tax administration" theoretical model must be validated against real-world scenarios and actual data. The Opinions on Further Deepening Tax Administration Reform, jointly issued by the General Office of the CPC Central Committee and the General Office of the State Council, explicitly set the reform direction as "precise enforcement, refined service, targeted supervision, and sincere co-governance." This chapter selects three representative cases—Qingyuan "Tax Eagle Eye" platform, Nari Group tax-enterprise direct connection system, and Jiangxi "Intelligent Control Scenarios" application—for in-depth analysis. These cases are used to systematically examine the implementation paths and applicability conditions of the data-driven → service optimization → risk prevention → collaborative co-governance theoretical framework under different environments. Collectively, they reflect the common challenges of tax administration in the

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context of the digital economy: incomplete dismantling of data silos, existing rules struggling to keep pace with emerging business models, and taxpayer cooperation mechanisms still in need of innovation.

We read each case along four lines of inquiry: whether data infrastructure creates momentum that persists through routine work; how service changes affect taxpayers' willingness to comply; whether risk systems identify problems precisely and trigger fast responses; and how stakeholder collaboration widens what tax agencies can realistically do. For every case, we record measured effects and note what still fails against the Chapter 2 bottlenecks, using those results to check how far the framework travels across settings.

The construction industry is hard to supervise: projects run long, money moves through layered accounts, and many payments lack formal invoices. Qingyuan's "Tax Eagle-Eye" links datasets from housing and urban-rural development (permits), human-resources (injury insurance), banks (transaction records), and the tax authority (prepayment declarations). A cross-department exchange then applies unified indicators to surface risks automatically, which cuts the lag created by fragmented information. Reported results include risk-flag accuracy above 90 percent, roughly halving frontline verification effort, and a 12.6 percent year-on-year rise in construction-sector receipts [25]. Two limits are visible: performance depends on settled, institutionalized sharing with external agencies and on timely updates; and the taxpayer side still needs more tailored service.

NARI runs cross-region businesses under multiple tax types and accounting rules. The firm embedded current tax provisions in its ERP and shared-service stack so operational, accounting, and declaration data convert automatically and update together. The integration reduces friction in cross-regional transactions and narrows policy-application differences across sites. In practice, the system flags additional pre-tax R&D deductions and shortens VAT refunds to about six working days; a "digital tax mirror" lets managers simulate tax effects before major moves, lowering compliance risk [26]. The model assumes a strong digital core and integrated tax-finance teams, which makes replication harder for smaller firms with fewer resources.

Misclassification of industry codes shifts taxpayers into the wrong VAT rates and incentives. Jiangxi's system trains an identification routine on declaration data, invoice records, and electricity-use patterns to flag likely misclassifications in real time. Publishing the decision criteria improves transparency and reduces "black-box" concerns; affected taxpayers see why a flag fired and what data supported it. In 2014, the program corrected codes for 2,014 firms, recovered 107 million yuan, and did so without triggering audits or disputes [25]. To keep that performance, the authority needs timely policy updates and coordinated feeds from multiple sources so the model tracks changes in both rules and behavior.

To summarize the commonalities and differences among the three practices, the following table compares them across scenario focus, data sources, challenges addressed, framework implementation, outcomes, and limitations:

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Table 1. Comparative analysis of the three cases

Analysis Dimension	Qingyuan "Tax Eagle Eye" System	Nari Group Tax-Enterprise Direct Connection System	Jiangxi "Intelligent Control Scenarios"
Core Scenario	Construction industry tax risk management	Full-process tax management for a group enterprise	VAT industry classification governance
Data Sources	Cross-departmental data (housing, HR, banking, tax)	Enterprise internal ERP and financial systems	Tax data + external features (e.g., electricity usage)
Challenges Addressed	Data silos, delayed administration, un-invoiced transactions	Data complexity, policy applicability deviations, high compliance costs	Policy arbitrage, algorithm reliability, taxpayer trust
Framework Modules Applied	Data-driven, risk prevention, collaborative co-governance	Data-driven, service optimization, risk prevention	Data-driven, risk prevention (with explainability)
Outcomes	Risk hit rate >90%; tax revenue ↑12.6% [25]	R&D deduction identification rate 98%; VAT refund ≤6 days [26]	Annual additional tax recovered: 107 million yuan; zero disputes [25]
Limitations	Reliant on external collaboration; limited personalized service	Dependent on enterprise digitalization; hard to scale for SMEs	Model requires continuous iteration; algorithm maintenance pressure

The comparison shows that "data-driven tax administration" does not have a one-size-fits-all model. Its success depends on whether the specific scenario and governance objectives are effectively matched: The Qingyuan case highlights that cross-departmental data standardization and institutional alignment are fundamental. The Nari Group example shows that enterprise-level data management capability is key for successful tax-enterprise collaboration. The Jiangxi case demonstrates that transparent and interpretable algorithms foster taxpayer cooperation. Together, these findings illustrate that digital transformation is not merely a technological upgrade, but a systematic process involving institutional redesign, adjustment of rights and responsibilities, and capacity building. Advancing this work requires a realistic approach closely aligned with actual governance needs.

5. Conclusion and outlook

Against the backdrop of the ongoing promotion of "data-driven tax administration", this study focuses on the optimization of the tax administration system. By systematically reviewing relevant policy documents, constructing a theoretical framework, and analyzing local practice cases, the research addresses a core question: When data becomes a key production factor, how can tax administration transform in a way that ensures stable fiscal revenue while safeguarding market vitality and taxpayers' legitimate rights? Through an in-depth analysis of representative cases—Qingyuan "Tax Eagle Eye" system, Nari Group's tax-enterprise direct connection system, and Jiangxi "Intelligent Control Scenarios" application—this study reaches the following conclusions: the value of data as a factor is not realized through a simple linear process. Instead, it requires coordinated efforts across multiple dimensions, including establishing unified business semantics, improving institutional alignment mechanisms, and optimizing organizational incentive structures, ultimately forming a spiral upward development path.

Firstly, the "data-driven—service optimization—risk prevention—collaborative co-governance" closed-loop framework provides a systematic solution to tax challenges in the digital economy. The

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effective operation of this framework relies not only on technological support but also on the synergistic functioning of three key elements: unified business semantics, scientifically designed institutional interfaces, and smoothly operating data compliance mechanisms. Practice shows that only by organically integrating data, technology, systems, and organizational structures can data be transformed into actionable tax governance capabilities, providing strong support for the implementation of "data-driven tax administration".

Secondly, "data-driven tax administration" is reshaping the relationship between tax authorities and taxpayers, shifting from traditional "one-way management" to a cooperative and mutually beneficial model. Previously, information asymmetry often created adversarial dynamics between tax authorities and enterprises. Today, tax authorities provide precise services such as "tax health reports" and "policy simulation tests", which encourage taxpayers to voluntarily provide accurate data in exchange for improved service experiences. This approach—promoting voluntary compliance through service optimization—has proven effective in enhancing tax compliance while fostering a positive feedback loop within the overall tax governance system.

Finally, organizational effectiveness is a decisive factor in sustaining "data-driven tax administration", with the core being the establishment of effective incentive mechanisms, rather than simply conducting technical training. The Jiangxi tax authorities' practice demonstrates that maintaining high risk identification accuracy depends on linking system-generated risk warnings directly to individual performance evaluations, thereby translating data governance outcomes into measurable performance indicators [25]. This experience is highly instructive: what may appear as a shortage of skilled personnel is, in essence, a misalignment between incentive mechanisms and technological development. Only by incorporating the results of data governance into performance evaluation can tax authorities avoid a disconnect between technology and practice, fully mobilizing the innovative capacity of grassroots tax offices.

Based on the above research conclusions, this study offers the following concrete recommendations for tax authorities to advance the reform of "data-driven tax administration":

First, prioritize the standardization of data and the construction of cross-departmental collaboration mechanisms. Establish a "centralized control at the headquarters—regional management at the provincial level" algorithm governance system. At the national level, the State Taxation Administration should set up a Smart Tax Center to coordinate tax data resources nationwide, focusing on developing foundational, general-purpose core algorithm models. Provincial tax authorities should establish regional algorithm centers to carry out scenario-specific algorithm development under the national framework, forming a two-tier structure that combines nationwide standardization with regional innovation. Additionally, a "negative list" system for data sharing can be explored, along with corresponding incentives, to clearly define the rights and responsibilities of each department in data sharing, systematically addressing the issue of data silos.

Second, explore the establishment of a "data rights" exchange mechanism to optimize incentives for taxpayer compliance while simultaneously strengthening taxpayer rights protection. This can be achieved by improving governance rules for tax-related data security, refining the institutional system for taxpayer data rights, and involving prosecutorial authorities to enhance remedies and safeguards. Such measures can advance the goals of tax data sharing while better protecting taxpayer rights, balancing the interests of tax authorities and taxpayers, and guiding taxpayers to transition from "passive compliance" to active compliance.

Third, reshape organizational capabilities with a focus on incentive innovation and talent development. Develop a tiered talent training system, specifically recruiting professionals in computer science, statistics, and related fields to build core teams skilled in data mining, risk

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modeling, and business analysis. While advancing the Golden Tax Phase IV initiative, deepen performance management reform in parallel. It is recommended to significantly increase the weight of indicators such as “data governance effectiveness,” “taxpayer satisfaction,” and “service response speed” in performance evaluations for grassroots tax offices. Additionally, risk warning outputs from algorithmic models should be directly embedded into individual performance accounts, forming a “data–indicator–personnel” closed-loop management system, which addresses the “last-mile” motivation problem for reform implementation.

Looking ahead, this study identifies two key development directions: Deepen the application of blockchain technology in tax administration. The Shenzhen blockchain electronic invoice pilot demonstrates that blockchain can ensure end-to-end traceability and immutability of invoices [36]. Its core value lies in establishing a trusted foundation for tax-enterprise collaborative governance: when tax authorities, taxpayers, and third-party platforms share the same immutable transaction records, data sharing evolves from administrative coordination to a technologically secured collaborative mechanism. Integrate environmental, social, and governance (ESG) factors into tax evaluation systems. Under China’s “dual carbon” targets, a company’s carbon emissions, social responsibility performance, and governance capability are becoming critical variables affecting tax policies [37]. Incorporating ESG data into tax administration systems can not only enhance the precision of green tax enforcement but also guide corporate green transformation through differentiated tax rates and other policy instruments, thereby expanding the role of taxation in promoting sustainable development.

Fundamentally, “data-driven tax administration” is more than a technological upgrade—it represents a profound management transformation, involving adjustments to power allocation, institutional norms, and governance philosophy. Tax authorities must seek a new balance between efficiency and fairness, technological oversight and power restraint, fiscal revenue and market vitality. Only by achieving this balanced development can data as a factor truly drive the modernization of the governance system, without creating new administrative challenges.

References

[1] Li Jianjun. Evaluation and Analysis of Tax Administration Efficiency: 1997–2007 [J]. Chinese Economic Issues, 2011(01): 52–60.
[2] Lü Bingyang, Fan Yong. Progress and Interprovincial Disparities in Tax Collection Efficiency Since the Tax-Sharing System Reform [J]. World Economy, 2006, (10): 69-77+96.
[3] Huang Shirui, Yuan Pinhuan. Tidal Wave Sweeps Through the Yangtze River Delta: Tax Administration Reform Sets Sail Once More [J]. China Taxation, 2021(06): 12–15.
[4] General Office of the Central Committee of the Communist Party of China, General Office of the State Council. Opinions on Further Deepening Tax Administration Reform [Z]. 2021-03.
[5] Wei Congcong. Research on Tax Administration Efficiency from the Perspective of 'Data-Driven Taxation’ [D]. Jilin University, 2023.
[6] Qiu Yang. Forging Loyalty, Embracing Innovation, Strengthening Coordination, and Mitigating Risks: Forging Ahead in the Dynamic Practice of Advancing Smart Taxation [J]. China Taxation, 2024, (02): 76-77.DOI: 10.19376/j.cnki.cn11-1178/f.2024.02.029.
[7] Chen Kai, Yang Yaping. Why Enterprise Digital Transformation Increases Tax Collection Difficulty: Evidence from Tax Avoidance Activities of Chinese Listed Companies [J]. Journal of Shanxi University of Finance and Economics, 2023, 45(12): 111-122.
[8] Dong Yang. Challenges and Responses to China's Tax System and Administration in the Context of the Digital Economy [D]. Yunnan University of Finance and Economics, 2022. DOI: 10.27455/d.cnki.gycmc.2022.000704.
[9] Zhang Youqian. Tax Reform: From Incremental to Systemic Integration [N]. Beijing Daily, 2021-04-19(011).
[10] H.Zhang.Research on the Construction of Tax Collection and Administration System for Natural Persons—Taking Live Streamers as the Research Object [J]. Open Journal of Social Sciences, 2018, 6, 89-95.

DOI: 10.54254/2754-1169/2025.BL30636

[11] Lulu Mei. Research on Tax Collection and Management Based on Network Platform Transaction [J]. Journal of Physics: Conference Series, 2020.2(1648): 022175.
[12] Xiong Yuting, Dong Mei. Analysis of Personal Income Tax Collection and Administration Issues in Online Live Streaming Rewards [J]. Journal of Hubei Second Normal University, 2022(2): 68-73.
[13] Ahmet İnneçi, Dijital Çağın Bir Vergi Sorunu: Dijital Göçebelerin Vergilendirilmesi [J]. Sayıştay Dergisi, 2023, 34(129): 235-257
[14] R. de la Feria, G. Maffini.(2021). The Impact of Digitalization on Personal Income Taxes [J]. British Tax Review, 2, 154-168, Available at SSRN: https: //ssrn.com/abstract=3835095.
[15] Li Changping. “Cloud Tax Easy” Simplifies Tax Filing and Payment [J]. China Taxation, 2023(08): 44-46.
[16] Jiang Xuewu. Upholding Principles While Innovating, Focusing on “Synthesis” to Advance Tax Administration Reform with Tangible Results [J]. China Taxation, 2021(06): 18-21.
[17] Fan Yong, Du Han. Tax Big Data: Theory, Application, and Limitations [J]. Taxation Research, 2021(09): 57-62.
[18] Wang Weiyu, Xin Hao. Theoretical Foundations and Future Trends of Tax Governance Innovation Driven by Big Data [J]. Taxation and Economy, 2021(05): 34-41.
[19] Yuan Jiao, Cheng Wenqian, Wang Chengzhan. Modernizing China's Tax Governance: Establishing a New Dual-Wing Governance Framework of Rule of Law and Digital Governance [J]. Taxation Research, 2023(10): 60-68.
[20] Wang Luning, Chen Zhong. Theoretical Supply and Practical Pathways for Smart Taxation Development [J]. International Taxation, 2023(10): 65-67.
[21] Xie Bofeng. Several Theoretical Issues in Smart Taxation Development: Reflections on Deepening Tax Collection and Management Reform [J]. Taxation Research, 2021(09): 50-56.
[22] Chen Yuxin. Research on Optimizing China's Tax Administration under Data-Driven Taxation [D]. Shanxi University of Finance and Economics, 2023. DOI: 10.27283/d.cnki.gsxcc.2023.001152.
[23] OECD (2021), Tax Challenges Arising from Digitalisation of the Economy – Global Anti-Base Erosion Model Rules (Pillar Two): Inclusive Framework on BEPS [M].OECD Publishing, Paris, 2021. DOI: 10.1787/782bac33-en.
[24] Agrawal D R, Brueckner J K. Taxes and Telework: The Impacts of State Income Taxes in a Work-from-Home Economy [J]. SSRN Electronic Journal, 2021.No. 9975
[25] Yining Tang, Wanjun Li et al. Research on Tax Collection and Administration Efficiency in the Context of “Governing Taxation by Numbers” [J]. Academic Journal of Science and Technology, 2023, 02(11): 233-236
[26] Hu Shunjing. NARI Group Co., Ltd. Enhances Quality and Creates Value Through Data-Driven Tax Management [J]. State-Owned Enterprise Management, 2024, (01): 68-69.
[27] Diogo Nicolau Pítsica. Teoría Aplicada de la Tributación Óptima [M]. Universidad de Santiago de Compostela, 2021.http: //hdl.handle.net/10366/148970
[28] J. Mirrlees. An Exploration in the Theory of Optimum Income Taxation [J]. Review of Economic Studies, 1971, 38(2), 175–208.
[29] P. Diamond, J. Mirrlees. Optimal Taxation and Public Production I: Production Efficiency, II: Tax Rules [J]. Journal of Public Economics, 1971.8-27
[30] Liu Ming. Mining and Application of Tax Big Data [J]. Tax Collection and Payment, 2023, (08): 23-25.
[31] Zheng Ting. Further Deepening Tax Administration Reform: Delivering Taxpayer Services with Dedication, Commitment, and Effort [J]. China Taxation, 2021(06): 24-27.
[32] Wang Weinan. Research on Optimizing Individual Income Tax Administration in Heilongjiang Province Under the Context of “Data-Driven Taxation” [D]. Harbin University of Commerce, 2023.
[33] Wang Lingkai. Research on Optimizing the Development Path of “Smart Taxation” Based on Holistic Governance Theory: A Case Study of Liuzhou Municipal Taxation Bureau [D]. Guangxi University, 2022.
[34] Zhang Xiaoyi. Research on Issues and Countermeasures for Digital Transformation of Grassroots Tax Services: A Case Study of District G Tax Bureau [D]. Shandong University. 2024.
[35] Rong Yanbo. Research on Tax Risk Management in Tax Bureaus Under the Context of “Data-Driven Taxation” [J]. Township Enterprise Herald, 2024, (23): 42-44.
[36] Research Team on “Utilizing Blockchain to Promote Modernization of Tax Administration, ” Zhang Guojun, Li Wei, et al. Blockchain-Based Innovation in “Internet Plus Taxation”: A Case Study of Shenzhen Municipal Tax Bureau's Practices [J]. Taxation Research, 2019, (01): 68-73.
[37] Liang Gong.Study on Tax Governance of Data Assets in the Context of Digital Economy [J]. International Journal of Management Science Research, 2023, 06(06): 26-30.