



# Taxing Data-Driven Value Creation: A Value-Chain Analysis of China's Digital Economy Taxation

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**Abstract.** The emergence of data as a core factor of production has exposed fundamental institutional misalignments in traditional tax systems. While existing research often emphasizes platform-based digital taxes, it tends to overlook stage-specific value creation mechanisms across the data lifecycle and their interaction with tax architectures such as China's VAT-centric system. This paper develops a data value chain decomposition framework, integrated with institutional misfit theory, to analyze tax challenges across five lifecycle stages: collection, storage, processing, transmission, and application. We identify key contradictions between each stage's value logic and prevailing tax categories (value-added tax (VAT), corporate income tax (CIT), and personal income tax (PIT)). Because generic digital tax reforms do not adequately address these stage-specific distortions, we propose a VAT-first reform pathway that refines withholding mechanisms for cross-border data services and phases in a mark-to-market data-asset tax (DAT) under CIT, offering a pragmatic option for developing economies alongside the OECD's Two-Pillar Solution.

**Keywords:** data value chain; digital economy; tax system optimization; international tax rules; digital services tax

## 1 Introduction

The digital economy is reshaping the global economic landscape. Data, as a novel factor of production, creates value across its lifecycle, from collection and storage to processing, analysis, and application, forming a complex and multi-dimensional data value chain. However, the intangibility, replicability, and cross-border mobility of data create systemic challenges for traditional tax systems. Jurisdictional misalignment can intensify tax base erosion and profit shifting (BEPS) risks <sup>[1]</sup>. As shown in the figure 1, this study deconstructs tax governance challenges at each stage of the data value chain, assesses the adaptability of China's major tax categories, and discusses reform pathways by drawing on international experience and domestic realities. The goal is to provide a coherent analytical framework and practicable policy recommendations for optimizing China's tax system.

## 2 Theoretical Framework

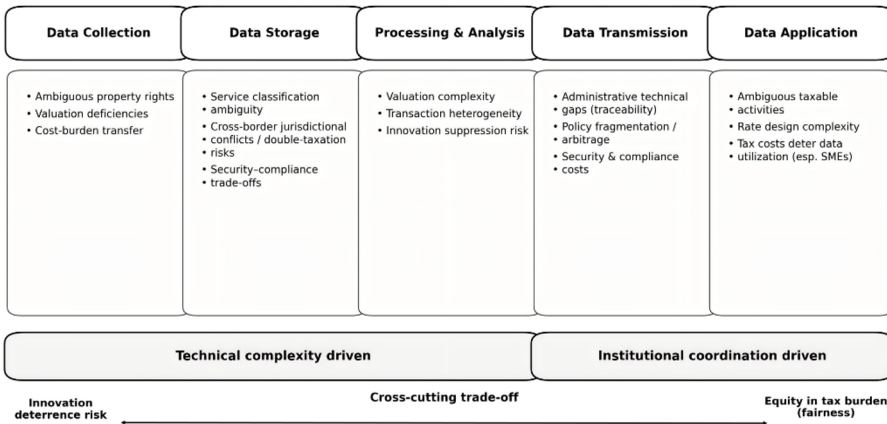
### 2.1 The Data Value Chain Framework

The data value chain describes a system of value-added activities across the data lifecycle. It goes beyond a purely linear sequence and encompasses multi-actor collaboration networks. Building on global value chain theory<sup>[2]</sup>, value creation can be viewed in three dimensions: technological capability enhancement, economic value creation, and social value optimization, forming an integrated virtual-physical ecosystem<sup>[3]</sup>.

### 2.2 Institutional Misfit Theory

As data becomes a key production factor, traditional tax base boundaries are increasingly strained. The virtual and replicable nature of data flows can create disconnects in tax base definition, tax administration, and jurisdictional allocation<sup>[1]</sup>. A core challenge is the separation between where value is created and where profits are attributed, which can aggravate BEPS risks. Tax policy therefore needs to move beyond taxing outcomes and instead engage with the value creation process. In addition, tax design must interact with data governance requirements (e.g., privacy and security), evolving from passive collection to active governance.

**End-to-End View: Stage-Specific Challenges Along the Data Value Chain**



**Fig. 1.** Stage-Specific Challenges Along the Data Value Chain.

## 3 Tax Issues Across the Data Value Chain Stages

As seen in the figure 2, tax elements vary across each stage of the data value chain.

### 3.1 Data Collection Stage

The initial stage involves aggregating multi-source data. The core tax issue is the feasibility of a data resource tax. While theoretically justified by the non-excludability of data <sup>[4]</sup>, implementation faces barriers including ambiguous property rights (unclear legal frameworks complicate taxable-entity identification), valuation deficiencies (context-dependent data value renders traditional resource valuation methods inadequate), and cost-burden transfer (compliance costs and tax liabilities may stifle data circulation, especially for small and medium-sized enterprises (SMEs)).

### 3.2 Data Storage Stage

Taxing data storage services (e.g., cloud storage) within existing tax categories (e.g., VAT) is challenging due to service classification ambiguity (diverse storage forms such as cloud and on-premise lead to inconsistent categorization), cross-border jurisdictional conflicts (geographical dispersion of data triggers tax sovereignty disputes and double-taxation risks), and security-compliance trade-offs (encryption and privacy requirements increase verification complexity).

### 3.3 Data Processing and Analysis Stage

This core value-creation phase focuses on designing a data-asset tax (DAT). Key challenges include valuation complexity (data asset value depends on quality, timeliness, and context, requiring dynamic pricing models), transaction heterogeneity (defining taxable activities for diverse transactions such as direct sales or API calls), and innovation suppression risk (tax costs may deter research and development (R&D) investments in data technologies) <sup>[1]</sup>.

### 3.4 Data Transmission Stage

The cross-border nature of data transmission poses significant challenges, including administrative technical gaps (intangibility and mobility complicate transaction tracing for tax authorities), policy fragmentation (divergent national tax policies may incentivize tax arbitrage), and security-compliance costs (balancing data sovereignty with administrative efficiency is complex).

### 3.5 Data Application Stage

Taxing the terminal value-realization stage (e.g., via a data usage tax) must balance efficiency and equity. Key barriers include ambiguous taxable activities (diverse application scenarios such as targeted advertising and AI training hinder unified scope definitions), rate design complexity (rates must reflect data sensitivity, commercial value, and taxpayer capacity), and innovation suppression risks (tax costs may deter data utilization, particularly for SMEs).

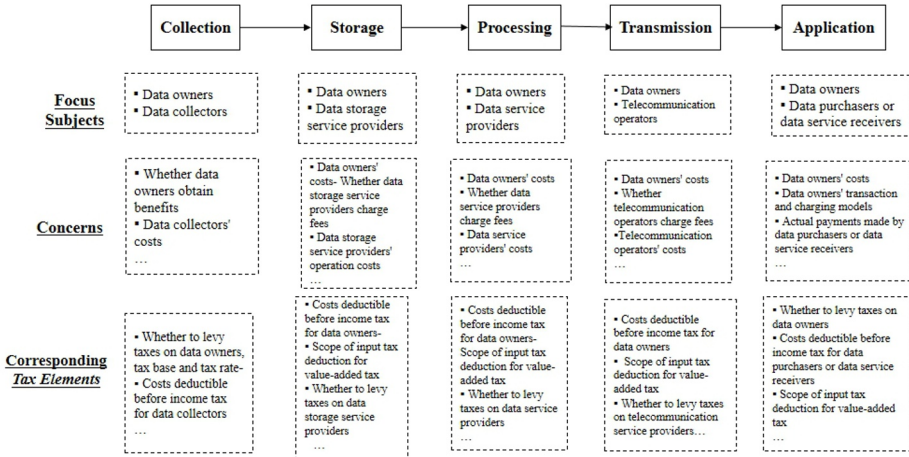


Fig. 2. Tax Management Framework Based on the Data Value Chain.

## 4 Analysis of the Adaptability of Existing Tax Categories

### 4.1 Value-Added Tax (VAT)

VAT faces three core challenges in the digital economy: ambiguous taxable-entity definition (cross-border transactions weaken traditional physical-presence criteria, suggesting a 'substantial presence' test based on user scale or data flows); indeterminacy of taxable objects (integrated digital services, such as cloud fees covering both storage and processing, complicate value segmentation; the EU's One-Stop Shop (OSS) offers a useful administrative reference); and limited tax scope (VAT often captures only superficial transactions and may miss high-value-added activities such as data processing, implying the need to extend coverage across the data value chain).

### 4.2 Corporate Income Tax (CIT)

CIT requires adaptation in several areas. Key directions include expanding taxable scope to better reflect value creation from data assets (e.g., user databases and algorithms) as taxable intangibles; refining tax incentives through super-deductions for data-related R&D expenditures (e.g., data cleaning and algorithm optimization) and accelerated depreciation for data infrastructure; and redefining permanent establishment (PE) beyond physical presence by adopting the OECD's Significant Economic Presence principle that incorporates user participation and data-driven value creation.

### 4.3 Personal Income Tax (PIT)

PIT reforms should focus on three areas: Broadening taxable income: Explicitly classify and tax emerging incomes from the digital economy (e.g., live-streaming revenue,

data transaction royalties); Adjusting tax rates: Consider a progressive rate structure to balance incentives for technical talent with equity concerns regarding data monopolies; and Enhancing tax administration: Leverage technology (e.g., blockchain, APIs integrated with platforms) for real-time tracking, pre-filled returns, and smart contract audits to improve compliance.

## 5 International Experiences and China's Tax System Design

### 5.1 International References and Evolving Rules

Regional exploration: the EU digital tax initiative. The EU's proposed Digital Services Tax (DST) sought to tax revenues generated by large digital firms in market jurisdictions, addressing the misalignment between user location and value creation<sup>[5]</sup>. In practice, it faced challenges such as tax base ambiguity, potential trade frictions, and interactions with emerging global rules, illustrating the difficulty of unilateral or regional approaches.

Global rule construction: the OECD Two-Pillar Solution. The OECD's Two-Pillar framework is a prominent ongoing effort to address digital economy taxation challenges<sup>[1, 6]</sup>.

Pillar 1 (Profit Reallocation): Allocates a portion of large multinational enterprises (MNEs)' residual profits to market jurisdictions where users are located, using a formulaic approach ("Amount A").

Pillar 2 (Global Minimum Tax): Pillar 2 establishes a 15% global minimum corporate tax rate, reducing incentives to shift profits to low-tax jurisdictions. Implementation can be complex, including coordination with domestic law and consistent application across countries. Japan's decision to shelve a unilateral DST proposal while aligning more closely with the OECD process highlights the importance of international coordination<sup>[7]</sup>.

### 5.2 A VAT-First Reform Pathway for China

Strategic rationale: China's fiscal reliance on VAT (accounting for about 38% of total tax revenue) offers a first-mover advantage in taxing data flows. This pathway consists of two complementary pillars:

#### **Pillar 1. Refined VAT Withholding for Cross-Border Data Services**

Mechanism. Foreign service providers would register via a simplified One-Stop Shop (OSS) portal, with VAT withheld at 6% on B2C data services. Taxable services should be defined based on their core activity (e.g., data processing or analytics) to reduce legal ambiguity and limit scope creep.

Implementation. Build on China's existing e-commerce VAT withholding arrangements and extend them to relevant data services. This leverages existing administrative infrastructure while promoting tax neutrality between domestic and foreign providers.

#### **Pillar 2. Phased Introduction of a Data-Asset Tax under CIT**

Phase 1. Establish a data-asset registration and disclosure mechanism, requiring enterprises to report material data assets (e.g., user databases and algorithms) in their financial statements where applicable. Introduce targeted incentives such as accelerated depreciation or enhanced deductions for data infrastructure investment.

Phase 2. Introduce a mark-to-market data-asset tax (DAT) under CIT, taxing unrealized gains on eligible data assets at a reduced rate (e.g., 10%) to encourage circulation while capturing value creation. This should be paired with strengthened transfer pricing documentation for cross-border data-related transactions.

**Administrative synergy.** The Four-Flow Integration principle, which monitors capital flow, data flow, invoice flow, and contract flow in a coordinated manner to help authorities trace data transactions and services across the lifecycle, improving auditability and enforcement. China's rollout of fully digital invoicing provides an institutional foundation for this approach.

### 5.3 Strategic Considerations for China's Implementation

China's tax system optimization should be guided by several principles: redefining value concepts by incorporating data's unique value-creation patterns into tax governance; stabilizing market expectations by balancing policy flexibility with stability to reduce compliance costs and encourage investment; applying transaction-triggered taxation along the data value chain, supported by the 'Four-Flow Integration' principle for accurate tracking; strengthening synergy between administration and tax design by leveraging technologies such as big data, AI, and blockchain to improve verification and enforcement; and maintaining domestic-international coordination by safeguarding national interests while participating in international rule-making and ensuring compatibility with frameworks such as the OECD's Two-Pillar Solution.

Specific pathways include short-term adjustments (fine-tuning tax rate structures for digital businesses, enhancing R&D tax incentives, and strengthening cross-border tax administration mechanisms) and long-term ecological adaptation (establishing a coherent data taxation system based on clarified property rights and dynamic valuation, promoting deep tax informatization, and strengthening international tax cooperation).

## 6 Conclusion and Future Research

This paper examines institutional misfit in China's tax system along the data value chain and argues that stage-specific adjustments are needed to better align tax bases and enforcement with data-driven value creation. A VAT-first pathway can serve as a pragmatic developing-economy option by strengthening consumption-based taxation while preserving innovation incentives. The feasibility of a data-asset tax ultimately depends on clearer property rights and more mature registration and valuation infrastructures.

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