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MODEL INNOVATION IN SUBNATIONAL TRANSNATIONAL COOPERATION: A STUDY OF AGRICULTURAL TECHNOLOGY COOPERATION BETWEEN XINJIANG AND TASHKENT UNDER THE "2+X" FRAMEWORK

Umarov Abduvahob Tursunovich[1], CaoGang[2]

[1]*Doctor of Sciences in Economics, Professor "Dean of the Faculty" of Economics of the National University of Uzbekistan named after Mirzo Ulugbek*

[2]*Independent researcher at the department of "Regional Economics and management" faculty of Economics of the National University of Uzbekistan named after Mirzo Ulugbek*

ABSTRACT

This study introduces the "2+X" analytical framework to overcome the structural gap between macro-level strategies and micro-level implementation in China–Central Asia regional cooperation. By positioning Xinjiang and Tashkent as dual cores and incorporating third-party actors with comparative advantages, the framework advances cooperation from bilateral arrangements toward open, network-based multilateral governance.

Based on the "Structure Mechanism Outcome" model and empirical evidence from agricultural technology cooperation, the findings demonstrate that "X" actors reduce information asymmetry, enhance institutional resilience, and promote the upgrading of regional integrated value chains. The research deepens understanding of subnational cooperation under the Belt and Road Initiative and provides a practical pathway for policy design and regional development.

KEYWORDS: *"2+X" Model; Subnational Cooperation; Regional Economic Integration; Xinjiang-Tashkent; Third-party Synergy*

1. INTRODUCTION

With the in-depth advancement of the "Belt and Road Initiative" (BRI), the status of Central Asia as a strategic hub has become increasingly prominent. However, in sharp contrast to this robust practice, scholarly analysis of China-Central Asia regional cooperation suffers from a significant "scale imbalance." Existing research largely adheres to the "state-centric" paradigm, focusing on macro-level strategies and geopolitics while reducing subnational actors such as Xinjiang and Tashkent to passive implementers of national policies. This neglect of their agency and potential for institutional innovation in transnational interactions has resulted in a critical theoretical gap regarding the micro-dynamic mechanisms that drive regional integration.

Against this backdrop, the interaction between China's Xinjiang and Tashkent, the capital of Uzbekistan, provides an ideal case for examining subnational cooperation. The two regions are highly complementary in terms of resource endowment, industrial structure, and development needs: Xinjiang serves as China's "Western Gate," possessing advantages in logistics, industry, and policy experimentation; meanwhile, Tashkent is the economic and demographic center of Central Asia, currently in a critical period of transition. This complementarity renders their direct local-level linkage a core growth pole for deepening China-Uzbekistan bilateral relations.

Nevertheless, pragmatic cooperation still faces structural constraints such as homogeneity of actors, fragmented financing channels, and poor alignment between technology and markets, exposing the inherent limitations of traditional bilateral frameworks. To break through these bottlenecks, this study innovatively proposes the "2+X" meso-level analytical framework. The core of this model lies in the "dual cores" (2) formed by Xinjiang and Tashkent, upon which third-party entities (X) with comparative advantages in capital, technology, or markets are dynamically introduced. This drives a shift in the cooperation paradigm from closed, linear bilateral relations toward open, networked multilateral governance.

Based on this, this paper aims to construct a "Structure-Mechanism-Outcome" (SMO) analytical framework and use Xinjiang-Tashkent agricultural technology cooperation as an empirical case to explore three core questions: First, what is the basis of structural complementarity between Xinjiang and Tashkent as "dual cores"? Second, what is the theoretical logic of "X" entity embedding and the specific mechanisms through which they exert

influence? Third, what is the theoretical superiority of the "2+X" model compared to traditional bilateralism, and what implications does it hold for broader BRI cooperation? This research not only strives to provide a new analytical tool for subnational regionalism theory but also aims to offer a practical path for the high-quality development of the Belt and Road Initiative.

2. LITERATURE REVIEW

To establish the theoretical foundation for the "2+X" subnational transnational cooperation model, this paper systematically reviews relevant research across three dimensions: paradigm shift, spatial economic foundations, and functional complementarity. By integrating key theoretical elements, this section clarifies the academic rationale and innovative contributions of the proposed analytical framework.

2.1 Shifts in Theoretical Paradigms: From State-Centrism to Subnational Agency

Traditional theories of regional economic integration take the nation-state as the basic unit, focusing on macro-institutional benefits such as customs unions and common markets (Balassa, 2013; Viner, 2014). The rise of the New Regionalism approach prompted a significant paradigm shift, emphasizing that regionalization is a socially constructed process involving multiple actors, where subnational governments and urban networks play crucial roles in multi-level governance (Hettne & Söderbaum, 2000; Hooghe & Marks, 2001). This shift has spawned research agendas such as "paradiplomacy" and "city diplomacy" (Cornago, 2010; Kuznetsov, 2014), affirming the agency of subnational actors like Xinjiang and Tashkent in proactively constructing transnational networks by leveraging their locational and policy flexibility.

However, while the importance of subnational actors is recognized theoretically, empirical research on China–Central Asia cooperation remains overly focused on national strategic alignment and geopolitical competition (Li, 2022; Zhang, 2025). There is a lack of systematic analysis regarding the micro-dynamics and institutional innovations of local-level cooperation, leading to a notable "scale imbalance" between academic research and rich practical experience.

2.2 Spatial Economic Foundations: Growth Pole Theory and Core Node Functions

Growth Pole Theory (Perroux, 1950) posits that economic growth first emerges in spatial nodes with innovative capabilities, radiating to the periphery through polarization and diffusion effects. In the context of global networking, core cities become key regional hubs by virtue of their infrastructure, capital, and talent agglomeration (Scott, 2001). From this perspective, the interaction between Tashkent, as Uzbekistan's political and economic center, and Xinjiang, as China's gateway-style growth pole for westward opening, is essentially a strategic alignment of regional growth poles.

This "dual-core" structure composed of heterogeneous growth poles provides the spatial economic foundation for the cross-regional optimal allocation of resource factors, serving as the prerequisite for the "2+X" model. Yet, existing studies mostly focus on the internal evolution of individual growth poles; research remains underdeveloped regarding how two heterogeneous growth poles form synergy through institutionalized collaboration to jointly attract and integrate external resources.

2.3 Sources of Institutional Innovation: The Logic of Functional Complementarity in Third-Party Synergy

The concept of "third-party synergy" originates from international development cooperation, centering on integrating the comparative advantages of different actors to enhance project efficiency and sustainability (OECD/IsDB, 2025). This concept emphasizes functional complementarity and resource sharing, providing new ideas for solving complex challenges.

The theoretical innovation of this paper lies in creatively migrating and downscaling the logic of "third-party synergy" from macro-level international development assistance to subnational economic and trade cooperation scenarios. Here, "X" is defined as a third-party entity possessing core advantages in specific functions (such as finance, technology, or markets). This migration offers an insightful solution for breaking through resource and capacity bottlenecks in local-level cooperation. Nevertheless, current literature lacks in-depth discussion on how third-party actors specifically embed themselves into locally-led cooperation networks, their interactive governance mechanisms, and performance evaluations.

In summary, while existing theories provide important insights into subnational agency, core city cooperation potential, and the value of functional complementarity, these theoretical elements remain fragmented. They fail to effectively integrate the structural advantages of "growth pole dual-cores" with the institutional innovation of

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"third-party functional synergy" into a meso-level theoretical framework capable of systematically explaining the micro-dynamics of subnational cooperation. To this end, the "Structure-Mechanism-Outcome" (SMO) integrated analytical framework constructed in this paper aims to systematically synthesize these scattered theoretical threads, providing a new theoretical tool for analyzing Xinjiang-Tashkent cooperation and broader subnational regional cooperation.

3. RESEARCH METHODOLOGY

This study selects the "Xinjiang-Uzbekistan Water-Saving Irrigation Technology Cooperation Project," launched in 2020, as its empirical focus. Led jointly by the Xinjiang Department of Agriculture and Rural Affairs and the Tashkent Regional Government, the project aims to address local water scarcity through the introduction of high-efficiency drip irrigation technology.

The case selection is based on three criteria: Empirical Verifiability (project details are documented in authoritative reports such as those from the World Bank); Operational Integrity (covering the entire lifecycle from technology introduction and localization to large-scale promotion); and Significance of Third-party Participation (explicit involvement of the World Bank and CGIAR), which perfectly aligns with the core characteristics of the "2+X" model. Methodologically, this section employs multi-source triangulation, conducting cross-analysis of policy documents, evaluation reports, and academic literature to ensure the reliability of research findings.

4. ANALYSIS AND RESULT

This study analyzes agricultural technology cooperation between Xinjiang and Tashkent based on the "2+X" model. The "dual cores" — Xinjiang as a supply and transit hub and Tashkent as an institutional interface center — form the primary structural basis of the collaboration, while "X" actors effectively allocate resources and technologies, enhancing project potential and ensuring stability.

The findings indicate that the "2+X" model facilitates functional integration and institutional cohesion in subnational transnational cooperation, enabling the transition from simple resource exchange to the modernization of regionally integrated value chains and establishing new methodological pathways for achieving strategic objectives.

The strategic introduction of "X" is the linchpin for breaking through the bottlenecks of bilateral cooperation. Based on their core value contributions, these entities can be categorized into three ideal types. Their functional typologies and the specific bottlenecks they address are summarized in Table 1.

Table 1:
Functional Classification and Empowerment Dimensions of "X" Entities[1]

Ideal Type	Core Functions	Bottlenecks Addressed	Empowerment Dimension
Financial/Capital X (e.g., AIIB, Commercial Banks)	Providing structured financing, credit guarantees, and risk-sharing mechanisms.	Fragmented financing channels; high cross-border investment risks.	Capital Augmentation: Enhancing financial sustainability and project leverage.
Technical/Knowledge X (e.g., Research Institutes, Standards Bodies)	Offering R&D support, technical certification, and standardized protocols.	Technical barriers; information asymmetry; lack of localized R&D.	Cognitive Upgrading: Bridging the "knowledge gap" and optimizing factor quality.
Market/Platform X (e.g., E-commerce Giants, Industry Associations)	Building distribution networks, market matching, and brand incubation.	Restricted market access; poor alignment between supply and demand.	Network Expansion: Accelerating value chain integration and market penetration.

The logic for introducing "X" is rooted in the theory of specialized division of labor. By "modularly" embedding external advantageous resources, the model achieves precision compensation for the functional shortcomings inherent in the dual-core structure.

[1] *By Made Author*

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The stability of the "dual-core" structure between Xinjiang and Tashkent stems from the deep coupling and differentiated division of labor across spatial location, institutional supply, and industrial functions, as shown in Table 2.

Table 2
Functional Division of the "Dual Cores"[2]

Core Entities	Core Roles	Specific Functions
Xinjiang	Supply and Logistics Hub	1.Industrial and Technological Supply: Providing advanced technologies, equipment, and integrated solutions in key sectors such as agriculture and energy processing. 2.Cross-border Gateway Platform: Leveraging port clusters and the China-Europe Railway Express to serve as a bridge for factor mobility between China and Central Asia. 3.Policy Innovation Pilot Zone: Utilizing its strategic positioning as the "Core Area of the Silk Road Economic Belt" to pioneer pilot programs for trade and investment facilitation.
Tashkent	Institutional Interface and Regional Radiation Center	1.Institutional Coordination Interface: As the national capital, it facilitates the implementation of cooperation projects by streamlining legal regulations and administrative approval processes. 2.Market and Information Hub: Leveraging its status as an economic center, it provides critical market intelligence, distribution networks, and matchmaking services for business partnerships. 3.Regional Radiation Engine: Utilizing its centrality within the Central Asian urban network, it serves to demonstrate and propagate cooperation outcomes to the broader region.

This complementary functional division-where "Xinjiang cultivates supply and transit while Tashkent focuses on coordination and radiation" - achieves a Pareto improvement in cross-border collaboration efficiency. Furthermore, it establishes a robust structural prerequisite for the strategic embedding of "X" entities.

To systematically verify these propositions and reveal the causal chain from static composition to dynamic performance within the "2+X" network, this study constructs an integrated "Structure-Mechanism-Outcome" (SMO) analytical framework, as illustrated in Figure 1.

1. Structural Level (S): This level focuses on the static configuration of elements and the division of roles within the cooperation network. Key considerations include: The Complementarity Logic of the "2": Whether Xinjiang and Tashkent have formed a differentiated and highly synergistic spatial division of labor. Functional Attributes and Alignment of the "X": Whether the core competencies of "X" entities precisely correspond to and compensate for the critical shortcomings of the "dual cores." Network Connectivity Features: Whether the relationships between parties are characterized by loose, project-based coupling or institutionalized strategic synergy.

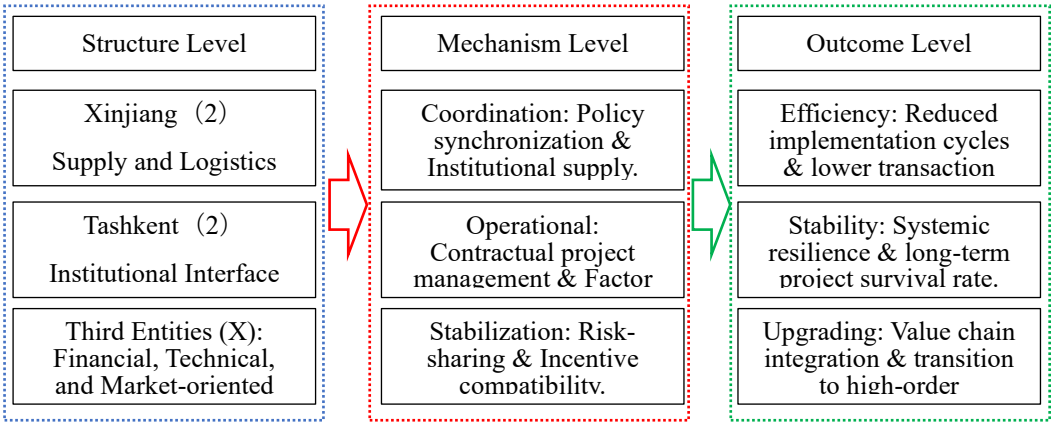

Figure 1: The "Structure[3]Mechanism Outcome" (SMO) Integrated Analytical Framework

[2] *By Made Author*
[3] *Researcher's development based on theoretical knowledge*

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2. Mechanism Level (M): Acting as the hub connecting static structure with dynamic performance, this level focuses on the operative processes that make cooperation effective. It primarily covers: Policy Coordination Mechanisms: How the two governments build normalized dialogue platforms and joint decision-making bodies to provide a stable and predictable institutional environment. Contractual Project Operation Mechanisms: Whether cooperation is anchored in tangible projects with clear rights, responsibilities, and commercial viability, and how decision-making, management, and supervision processes ensure multi-actor synergy.

3. Outcome Level (O): This level evaluates the ultimate performance of the cooperation model, providing empirical testing for the three theoretical propositions. The evaluation dimensions directly correspond to the aforementioned propositions: Outcome (O_1) Feasibility Test: Did the cooperation projects launch smoothly and achieve effective implementation? Were primary initial obstacles successfully overcome? Outcome (O_2) Stability Test: Did the projects demonstrate strong adaptability, resilience, and sustainable development capacity when facing external shocks? Outcome (O_3) Upgrading Test: Does the content of cooperation show an evolutionary trend from simple trade toward supply chain integration, innovative collaboration, or value chain advancement?

Table 3
Empirical Support of the Case Study for theoretical propositions[4]

Analytical Dimension	Empirical Evidence	Discussion on Support for Theoretical Propositions
Structure (S)	**• Complementarity of the "2": High-efficiency alignment between Xinjiang's technology export and Tashkent's institutional coordination.** **• Functionality of "X": Precision filling of gaps by the World Bank (Financial X) and CGIAR (Technical X).**	Validates the feasibility of the "2+X" structure in a real-world scenario; the division of labor between the dual cores and the embedding of X-actors forms an efficient network.
Mechanism (M)	**• Coordination Mechanism: Normalized Joint Working Group meetings enhanced project decision-making efficiency.** **• Risk Diversification: Independent third-party assessments reduced technical failure rates.**	Smooth mechanism operation successfully transforms structural advantages into process effectiveness, supporting Propositions 1 and 2.
Outcome (O_1): Feasibility	• The project implementation cycle was effectively shortened. • Technology promotion reached record areas, achieving significant crop yield increases.	**Strongly supports Proposition 1 (Feasibility): The intervention of X-actors directly reduced information asymmetry and accelerated project deployment.**
Outcome (O2): Stability	• Operations remained uninterrupted despite Uzbekistan's 2022 policy adjustments; the World Bank provided additional funding to mitigate risks. • The demonstration park became a long-term platform, spawning Phase II cooperation.	**Supports Proposition 2 (Stability): The networked structure (especially the Financial X) strengthened the system's capacity for risk mitigation.**
Outcome (O3): Upgrading	• Technical cooperation sparked discussions on "agri-product processing joint ventures"; Nestlé (Market X) expressed procurement intent. • Cooperation evolved from irrigation technology to smart agricultural management systems.	**Preliminary support for Proposition 3 (Upgrading): The synergy of X-actors drove value chain advancement, reflecting a "point-line-plane" evolutionary logic.**

This exploratory case study provides robust preliminary empirical support for the three theoretical propositions within the SMO framework. The evidence indicates that the "2+X" model, by introducing functionally complementary third-party entities and relying on effective operational mechanisms, demonstrates significant

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advantages in enhancing project feasibility, strengthening systemic stability, and catalyzing the upgrading of cooperation hierarchies.

However, as this study relies on a single case and the cooperation process is still evolving, the generalizability of its conclusions requires validation through more diverse and longitudinal comparative studies. Future research could employ process-tracing methods to more precisely delineate the causal chains of the "Structure-Mechanism-Outcome" (SMO) framework. Furthermore, attempting a quantitative assessment of cooperation performance would further solidify the theoretical foundation and define the application boundaries of the "2+X" model.

5. CONCLUSION

Based on the above analysis, we summarize the conclusions and the achieved results:

This paper develops and empirically tests the "2+X" subnational cross-border cooperation model, offering both theoretical innovation and practical guidance for Xinjiang–Tashkent collaboration. The model integrates New Regionalism, Growth Pole Theory, and functional complementarity, bridging gaps in existing research on the micro-dynamics of subnational cooperation. It clarifies the synergistic relationship between "dual-core" structures and "third-party" functional actors, explaining the shift from closed bilateralism to open, networked multilateral governance.

Empirical findings show three main efficiencies: enhancing feasibility through functional "X" actors that reduce information asymmetry, strengthening stability via a multi-centric, complementary network, and catalyzing upgradability by embedding diverse "X" entities to advance value chain integration. Key transformations include moving from bilateral to multilateral thinking, from project-based cooperation to platform development, and from relationship-based to rule-based governance. While based on a single case, the model provides a robust analytical tool for subnational cooperation and offers important insights for future research, including process tracing, quantitative evaluation, and testing in varied regional and industrial contexts.

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