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Transgovernmental Network Governance and the Co-Competition of Asian Space Governance¹

K.-Ho Yeh, G. Ni

Kuang-Ho Yeh—PhD Candidate in International Relations at Institute of International Relations, Nanjing University; 163 Xianlin Road, Qixia District, Nanajing, Jiangsu Province, 210023, China; ry1207@gmail.com

ORCID: 0009-0002-4505-4670

Guihua Ni—Postdoctoral fellow in School of Humanities and Social Science, The Chinese University of Hong Kong, Shenzhen; 2001 Longxiang Boulevard, Longgang District, Shenzhen, China; niguihua@cuhk.edu.cn

Abstract

With the facilitation of globalization and technological advancements, the growing complexity of global issues has expanded the spatiotemporal scope of their impact. In international relations, sub-units beneath the primary actors—states—have emerged as critical actors with a demand for effective and real-time responses to global affairs. Transgovernmental network governance, operating by the sub-units in a decentralized and centrifugal architecture, has emerged as a diverse and flexible governance model that transcends inter-state interactions. Simultaneously, international regimes have expanded based on small-scale cooperation. When niches exist in specific issue areas, major powers have initiated the construction of transgovernmental network governance, positioning themselves as pivotal actors. In the realm of space governance in Asia, China and Japan have each established transgovernmental network governance mechanisms promoting capacity building and cooperation centered around themselves—the Asia-Pacific Space Cooperation Organization (APSCO) and the Asia-Pacific Regional Space Agency Forum (APRSAF). Case studies toward the aforementioned organizations further reveal that when plural transgovernmental networks operate within the same issue area, the governance landscape takes on a

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derived form of coexistence between competition and cooperation, which is the transgovernmental network governance of “co-competition”. Across multiple analytical levels, such characteristics indicate a flexible space of proliferation, expansion, and transformation.

Keywords

Transgovernmental network governance, Epistemic community, Structural network analysis, Leadership, Co-competition

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1. Introduction

In order to gain a comprehensive understanding of transgovernmental network governance—a mechanism that offers a nuanced and collaborative strategy for tackling contemporary global challenges—it is imperative to integrate existing governance paradigm research and relevant discourse concerning network power structures and dynamic processes. The formulation of an overarching analytical framework that adeptly articulates the interweaving co-constructive and co-competitive effects among actors within the background of transgovernmental network governance is crucial. On the other hand, by focusing on the distinctive characteristics of transgovernmental network governance and tracing its development trajectories, this article opts to examine two major transgovernmental network mechanisms within Asian space governance: the Asia-Pacific Space Cooperation Organization (APSCO) and the Asia-Pacific Regional Space Agency Forum (APRSAF). Given the burgeoning aspirations of its major stakeholders and the complex geopolitical configuration, Asia emerges as a salient region where such networks wield significant influence in the domain of outer space exploration and utilization. The comparative analysis not only provides a micro-level view of organizational ecology of space transgovernmental networks, but also reveals the “alienation” of mechanisms beyond traditional transgovernmental network governance at the macro-level. Consequently, it addresses the less explored “inter-network” agenda within the framework of the previous transgovernmental network theories by providing a holistic understanding of the evolving nature of transgovernmental network governance in the Asian space milieu.

The subsequent article embarks on academic exploration, delving into the theoretical underpinnings of transgovernmental network governance and elucidating pivotal discourse and principles. From this foundation, the research crafts an analytical lens

contextualizing the genesis, evolution, and significance of such networks in a multifaceted landscape. A focal point of the empirical study is the in-depth examination of the APSCO and the APRSAF, highlighting their inception, aims, milestones, and impediments. These entities illuminate iconic dynamics of space transgovernmental network governance, which are deeply influenced by regional geopolitics, national agendas, and the ambitions of preeminent space countries. Synthesizing these insights, the research proposes profound ramifications while envisioning the prospective contours of Asian space governance in the broader schema of international cooperation at the further stage. Finally, the article conducts the initial exploration into theoretical evolution and case application with the analytical framework, aiming to consummate theoretical modeling, refine the generalization regarding the comprehensive mechanisms, and providing insights for explaining phenomena and forecasting the development of transgovernmental network governance.

2. Literature Review

Researches on transgovernmental network governance can be traced back to the 1970s. Robert Keohane and Joseph Nye defined transgovernmental relations as the foundation of transgovernmental networks. They outlined three types of relations: interstate, transnational, and transgovernmental interactions. This correction refined the oversimplified perspective of state-centrism and further delineated the categories of actors in international politics (Keohane & Nye, 1972).

After the Cold War, multiple roles of non-state, sub-national, and supranational actors engaged in global issues in economics, society, and the environment, shaping a series of complex and multi-layered collaborative systems linked by international networks. Scholars in international law like Thomas Risse-Kappen (1995) and Kal Raustiala (2002) scrutinized the structures of existing mechanisms, summarizing the general characteristics of transgovernmental network governance. Anne-Marie Slaughter is a leading advocate of contemporary transgovernmental network governance. She integrates fragments of prior researches, approaches the subject from a functional standpoint, and positions transgovernmental network governance in the context of a “disaggregated sovereignty,” the terminology she employs to describe the pattern of globalization.² Slaughter also conducts a great deal of empirical analysis, establishing the foundational and comprehensive discourse for the theory of

² In their 2015 study, Raymond and DeNardis proposed a concept similar to the “disaggregated sovereignty” based on the perspective of network governance, termed “multistakeholderism.” At its core, multistakeholderism is characterized by “pluralistic authority relationships constituted by procedural rules.” Stakeholders include a range of state and non-state (including firm and civil society) actors who control relevant information and resources, thereby facilitating status change. Refer to Raymond, M., & DeNardis, L. (2015). Multistakeholderism: anatomy of an inchoate global institution, *International Theory*, Vol. 7, No. 3, pp. 572–616.

transgovernmental network governance (Slaughter, 1997).

During the same period, other scholars have also begun to explore the paradigm of transgovernmental network governance across various levels and issue domains. Gstohl (2007) focused on the G8 to find out transgovernmental networks within international organizations. Hollis (2010) delved into transgovernmental network governance at the supranational level of the European Union, while Jordana et al. (2022) further focused on the practices of transgovernmental regulatory networks within the EU. Martinez-Diaz and Woods (2009) examined the governance practices of transgovernmental networks in developing countries. Alcaniz (2016) narrowed the focus to transgovernmental networks and cooperation among the Global South within the discourse of international politics. In specific issue areas, Keck and Sikkink (1999) explored routes through which non-state actors influence international politics, outlining the concept of transgovernmental advocacy networks within civil society. Bach and Newman (2010) investigated the interplay between transgovernmental networks and domestic politics from the financial perspective. Shyrokykh (2022) discovered that transgovernmental networks play the role of the driving force behind the European Union's climate governance.

On another theoretical aspect, Provan and Kenis (2008) initiated research on the different patterns of actor interactions within the governance of transgovernmental networks. Gaus (2015) concentrated on examining how power and control are exercised in transgovernmental networks. Mette Eilstrup-Sangiovanni (2016) used deductive methods to analyze structural traits and developmental transitions underlying the phenomenon of transgovernmental network governance. She unveiled the crucial variables influencing the formation and alteration of transgovernmental network governance: the power dynamics among network actors. By grasping the development trends of specific cases, her research targeted on numerous transgovernmental network governance mechanisms within the realm of international relations, thus compensating for the limitations of Slaughter's static theoretical emphasis.

In this regard, this article endeavors to construct a comprehensive analytical framework for transgovernmental network governance, with the goal of providing more in-depth explanations and broadening the scope of theoretical applications. To attain this objective, it is necessary to integrate the descriptive concepts from traditional transgovernmental network governance theories, thereby enhancing the comprehensiveness and applicability of the theory across a wider spectrum.

3. Theory and Methodology

This section explores the “Four Pillars” of transgovernmental network governance: transgovernmental network architecture, epistemic community, structural network relationships, and leadership. Building upon these elements, a well-rounded framework

for conducting case studies of transgovernmental network governance is proposed.

3.1. Theoretical Core Components

Transgovernmental Network Architecture: Cornerstone of Transgovernmental Network Governance

In 1972, Francis Bator, former U.S. Deputy National Security Advisor, testified before Congress with the following statement: “It is a central fact of foreign relations that business is carried on by the separate departments with their counterpart bureaucracies abroad, through a variety of informal as well as formal connections.” (Slaughter, 2001) Two years later, Keohane and Nye proposed the classic definition of transgovernmental relations as a series of direct interactions among “sub-units” of different government entities, which are not tightly controlled by the higher authorities. Instead, the policies of the central government are viewed as overarching guiding principles when these units interact. Sub-units collectively exert influence to impact the decisions of their respective governments. Transgovernmental relations brought about a loosening of traditional hierarchical and representative chains in the conventional administrative structure. Decision-making power was decentralized to various functional positions, and officials, along with their global counterparts, established informal decision-making frameworks (Keohane & Nye, 1974). This pattern was initially observed in the 1970s within negotiations “clubs” composed of ministers from developed countries. These clubs established rules pertaining to their expertized policy areas and reached agreements, subsequently reporting the outcomes to their own public audiences and legislative bodies (Slaughter, 2003). Examples include the General Agreement on Tariffs and Trade (GATT) dominated by meetings of trade ministers, and the Bank for International Settlements, which convenes central bank governors.

Since the 1990s, the scope and dimensions of communication and cooperation among sub-units have continuously expanded. Abbott compared two mechanism types: intergovernmental and transgovernmental. The former involves cooperation among states, where each state upholds a single policy stance, and interactions take place through professional agents—diplomats. The latter entails direct cooperation between government departments of different countries in the absence of strict top-down control, with a central administration decomposed into multiple functional components (Abbott et al., 2018). In 1997, Slaughter introduced the concept of “transgovernmental networks,” noting that nation-states, once the primary entities in international politics, were gradually being decentralized. Transgovernmental networks involved establishing specific connections with foreign counterparts, such as judicial, legislative, and regulatory agencies, forming tight relationships and thus constructing new governance orders. She defined transgovernmental networks as regular and purposeful modes of contact between government departments across state boundaries. Amidst the wave of

globalization, states relinquish decision-making powers to emerging governance mechanisms consisting of transgovernmental entities of the same functional type. International officials have established autonomous formal or informal organizations in response to the growing demand for the depth of issue cooperation (Slaughter, 2004). According to Slaughter, transgovernmental networks occupy an intermediate position between traditional international organizations and task-specific ad hoc ones, enabling immediate responses and serving as organic reactions to complex global issues and problems (Slaughter & Zaring, 2006).

Slaughter identified two categories of transgovernmental networks based on the established relationships and performed functions. In the first category, horizontal networks involve officials at the same level from different countries, while vertical networks encompass connections between supranational entities, international organizations, and national-level officials. Beyond the directional distinction, networks can be grouped based on three functional orientations. Information networks gather specialized technical and empirical information, promoting cross-government communication and exchange through technical assistance, information sharing and training programs. Enforcement networks involve planning and execution between government officials for collaborative cases. Harmonization networks, authorized by international treaties or agreements, assemble regulatory forces to ensure that substantive administrative actions comply with consensus rules and standards (Slaughter & Hale, 2011).

Generally speaking, from the beginning of discussions on transgovernmental relations, to the emergence of the fundamental elements of transgovernmental networks, the transgovernmental network architecture has since formed a robust outline as the cornerstone of the theory of transgovernmental network governance.

Epistemic Community: The Core Actor in Transgovernmental Network Governance

The concept of epistemic community originated from Thomas Kuhn's notion of a scientific community, which referred to a group of individuals from a particular discipline working under shared beliefs and standards for scientific methodology (Kuhn, 1962). Ernst Haas introduced this concept into the field of international relations, influencing scholars like John Ruggie, and his son, Peter Haas. Ruggie argues that epistemic communities emerge from bureaucratic positions, technocratic training, shared intentions, expectations, and behavioral rules, forming a "reality" within the institutionalization of international society (Ruggie, 1975).

Peter Haas provides a detailed interpretation, asserting that an epistemic community comprises recognized professionals with specific competence and knowledge. They form a network for knowledge exchange and hold authoritative claims within a particular issue area towards policymaking, thereby exerting impacts on governments

of different countries (Haas, 1992). He argues that cross-border cooperation initially stems from the motivation to acquire knowledge and achieve recognition. Functional departments engage in transgovernmental networks with corresponding departments in other countries based on their professional expertise. Once decision-makers internalize the knowledge from the epistemic community through “socialization,” they influence each other in terms of interest assessment and behavior similarities. This reinforces administrative coordination, creating a knowledge-based transgovernmental order, and contributing to the establishment of international institutions. Ultimately, the epistemic community serving as the underlying pillar receives formal recognition.

Damro (2015) argues that transgovernmental networks exert global influence through their expertise and internal cohesiveness. Mai’a Davis Cross points out that the uncertainty surrounding crises or specific issues constitutes an endogenous element for the influence of epistemic communities. The key variables in this context encompass the interaction between epistemic groups and decision-makers, including the frequency of meetings, the level of consensus, and the characteristics of policies. The influence of epistemic communities correlates with the technicality, quantifiability, and scientific nature of issues, with professionalism serving as an internal driving force (Cross, 2013). Furthermore, Cross emphasizes that epistemic communities are specific subsets that cannot encompass the entire spectrum. Therefore, competitive epistemic communities exist, and these communities, while competing in professionalism and niche realms, place a greater pursuit on consolidating legitimacy.

Structural Network Relationships: Dynamic Root of Transgovernmental Network Governance

“Network” has long been used to analyze interactions within human society and economic systems. Elstertrup-Sangiovanni was one of the pioneers in exploring the implication of network relationships in transgovernmental network governance. She argues that informal characteristics such as flexibility, consensus-driven approaches, and non-coerciveness are less significant than the straight power relationships among the actors within the transgovernmental network. Power asymmetry is a prerequisite for effective cooperation among network actors. Autonomous power concentration is a driving force in transgovernmental network governance, offsetting the need for central executions. Based on the major powers’ preference for informal cooperation, the distribution of power and interests generated within the network becomes a determining factor in network construction. The number of actors is another crucial factor, with simpler policy coordination, information dissemination, effective regulation, and direct reciprocity being most efficiently demonstrated in the cooperation of groups with a small number of actors (Elstertrup-Sangiovanni, 2016).

At the micro-level, Elstertrup-Sangiovanni introduced the method of Structural

Network Analysis (SNA), concentrating on the relational links between different actors and how they affect the overall structure in the processes of “empowerment” and “disempowerment.” SNA considers each actor within the network as distinct nodes, with the ties between nodes symbolizing the interactions among actors. The relative positions of each node in the network depict individual attributes of power and influence. Attributes include density, centrality, segmentation, homophily, and multiplexity (Elstertrup-Sangiovanni, 2014). Variations in these attributes have implications for power transitions within the network. Density represents the proportion of ties between nodes in relation to the total number of ties in the bounded group. Higher density signifies a high level of connectivity among actors, leading to greater system efficiency of resource aggregation and distribution. Centrality refers to the tendency of a single node to be more central compared to others in the network. The degree of centrality determines the networks’ stability. In transgovernmental networks, lower centrality implies the inclusion of a diverse subset of actors, thereby expanding the issue scale and range within the network. Segmentation expresses that the network configuration tends to fragment into loosely connected sub-clusters. Different clusters exhibit high densified connections among member actors and sparse out-group connections. Homophily measures the extent of connection between similar type of actors within the network, while multiplexity assesses the number of separated homophilic actors within the overall ties of relationship.

In the situation of power asymmetry, cooperation within the network necessitates key actors to assume leadership due to the lack of hierarchical administrative support. These leading actors establish connections with relevant stakeholders to facilitate networks. Leadership in the context of power asymmetry is especially critical in the high political arena. Effective networks rely on a willing and capable leading state that can inspire substantial participation from other actors and ensure adherence to consensus norms. This minimizes the potential risks for enforcement or regulation, fostering common interests within the network.

Leadership: Manifestation in Transgovernmental Network Governance

Oran Young defines international regimes as agreements among specified groups that delineate their rules of authority, rights and liabilities, as well as behavioral obligations, noting the crucial role of convergent expectations (Mitchell, 2012). International regimes encompass a wide range of functions, geographical spaces, and member types, with the primary actors from the “subsets” of the international community. Young’s definition is connected with the expression of transgovernmental network. On the other hand, within the governance process of regimes, various obstacles arise from collective action, leading to individual efforts to address or circumvent these issues, where a process of leadership emerges (Young, 1991). Actors with leadership capabilities exert

their capabilities by seeking common interests, designing cooperative solutions but not relying solely on coercion or direct transfer of benefits. Instead, they accumulate reputation and feedback in the process of formulating regimes (Chen & Guan, 2015). Young categorizes leadership into three forms: structural, entrepreneurial, and intellectual leadership.

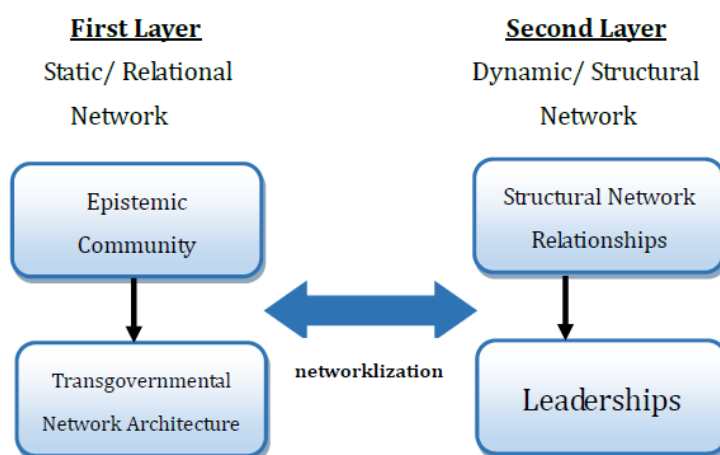
Structural leadership leverages structural power—the ability to control the possession and allocation of material resources—and transforms it into bargaining power for institutional arrangements. Entrepreneurial leadership focuses on resolving governance process issues through negotiation skills and designing feasible solutions that benefit all parties, ultimately achieving overall surplus within the stakeholders. Intellectual leadership utilizes knowledge capital as a tool to assist different actors in gaining a thorough understanding of the issues at hand, providing information to shape the expectations in the governance process (Young, 2013). The achievements of intellectual leaders are typically reflected in their ability to promote effectiveness and the subsequent reputation they gain. This aligns with the concept of the aforementioned epistemic community. Young suggests that the establishment of international regimes often necessitates more than one form of leadership, needed to coordinate dynamics such as negotiation and knowledge dissemination synergistically. From a broader perspective, leadership applies to any governance environment where there is a power asymmetry among actors. This responds to Elstertrup-Sangiovanni’s viewpoint of structural network relationships and provides further explanation for analyzing transgovernmental network governance.

3.2. Theoretical Integration—Overall Analytical Framework for Transgovernmental Network Governance

Building upon the four pillars, this article endeavors to propose a dual-layer analytical framework encompassing both static phenomenal networks and dynamic “networklization” content. At the typology level, it focuses on the essence of transgovernmental network governance—the transgovernmental network architecture, and the major groupings of actors—epistemic community, as elemental criteria for examining transgovernmental network governance. At the dynamic level, it utilizes structural network relationships to analyze power transitions and categorizes the required leadership for target mechanisms. This interpretation elucidates both the objective narration, and the energetic networklization within transgovernmental network governance. Figure 1 illustrates the dual-layer analytical framework encapsulates the theoretical perspective: transgovernmental network governance is not only an existing governance “phenomenon” built around epistemic communities through transgovernmental network architecture (the first layer), but also a governance “process” involving objective power interaction, member cohesion, and subjective

leadership (the second layer). The fine arrows point towards the direction of dynamic formulation within different network layers, while the bidirectional thick arrows represent the initiation of networklization—a mutual-constructed configuration between these two layers within the overall framework. This demonstrates the entire paradigm of transgovernmental network governance. In the third part, the development and interaction processes of two transgovernmental networks in the field of Asian space governance: the Asia-Pacific Space Cooperation Organization (APSCO) and the Asia-Pacific Regional Space Agency Forum (APRSAF), are examined to assess the suitability of the proposed framework for transgovernmental network governance.

Figure 1: Dual-layer Analytical Framework of Transgovernmental Network Governance



Source: own illustration

4. The Practice of Transgovernmental Network Governance in Asian Space

4.1. An Overview of APSCO and APRSAF

The Asia-Pacific Space Cooperation Organization (APSCO) originated from the Multilateral Cooperation on Space Technology Applications Initiative in the Asia-Pacific Region (AP-MCSTA), established in 1992 through a memorandum of understanding signed by China, Pakistan, and Thailand. In 2005, eight countries, including Bangladesh, China, Indonesia, Iran, Mongolia, Pakistan, Peru and Thailand, signed the APSCO Convention, with Turkey joining the following year, bringing the total members.³ China is the only recognized spacefaring nation among the APSCO members. The foundational document of APSCO is the APSCO Convention, an international treaty that delineates governing rules for the organization’s activities, finances, and dispute resolution. APSCO’s principal objective is to undertake

³ However, of the eight initial signatory countries in 2005, only Indonesia has not yet ratified the APSCO Convention and therefore has not become a full member of APSCO. Additionally, Mexico joins the APSCO in 2015 as an observer state. Refer to Nasution, H. et al. (2018). Indonesia Membership on Asia-Pacific Space Cooperation Organization (APSCO): Cost and Benefit Analysis, *Jurnal Hubungan Internasional*, Vol. 11, No. 1, pp. 121-140.

collaborative development projects that advance the common interests of member countries in space, encompassing infrastructure development, technology applications, information sharing, and education. Programs implemented by APSCO to date include the data sharing platform, satellites and navigation systems projects, atmospheric research, and ground-based optical observations. APSCO has accomplished several milestones since its establishment. However, there have been instances where the progress of interaction has fallen short of expectations. For example, in the Small Multi-Mission Satellite (SMMS) program, an effort between China and Thailand, the Chinese HJ-1A satellite has independently handled the operations. Similarly, the Asia-Pacific Optical Satellite Observation System (APOSOS), a collaboration between China and Turkey for satellite collision warning, has experienced slow progress. Aside from China, other APSCO members face various scenarios involving technical or financial challenges in space development (Du, 2014).

The Asia-Pacific Regional Space Agency Forum (APRSAF) is a space forum established in 1993 by the Japan Aerospace Exploration Agency (JAXA) and the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT). It operates based on the principles of openness and voluntarism, emphasizing non-binding conclusions. APRSAF serves as an information and technology exchange platform for various space actors, including government agencies, non-governmental organizations, and international organizations, with a focus on addressing cross-disciplinary issues in the Asia-Pacific region through the applications of space technology. Its hallmark event is the annual conference with over 20 years of history. APRSAF convenes more than 400 participants from over 50 countries.⁴ Regarding the composition of participating actors, taking Japan as an example, these entities include government departments (such as the Ministry of Economy, Trade, and Industry), non-governmental organizations (the Japan Society of Science Education), industry members (Mitsubishi Heavy Industries), and research institutions (the University of Tokyo). Furthermore, nine intergovernmental international organizations, including the Asian Development Bank, the ASEAN Secretariat, the European Space Agency, and the United Nations Office for Outer Space Affairs (UNOOSA), are actively engaged (APRSAF, 2019). APRSAF is not dominated by state actors. However, its flexibility has faced criticism from Japanese politicians arguing that Japan has not played an active leadership role and has not supported the space needs in the same way that China has done for APSCO through technology transfers to strengthen multilateral relations (Suzuki, 2010). Japan has taken a series of measures in recent years to promote the formalization of APRSAF,

⁴ As of 2019, there are 52 members in APRSAF as countries and regions spanning five continents, including nations such as Australia, China, South Africa, the United States and the United Kingdom, while more than half of these members are from Asian countries. Data available from: <https://www.aprsaf.org/participants/>

establishing the APRSAF Executive Committee in 2012 and introducing a set of organizational principles since 2013 (Pekkanen, 2020).

4.2. Asian Space Transgovernmental Network Governance in the Perspective of the Overall Analytical Framework

The following propositions, built upon the theoretical pillars, are employed to scrutinize the constituent elements related to the formation and growth of APSCO and APRSAF in accordance with the overall analytical framework for transgovernmental network governance. This analysis aims to uncover the commonalities, configurations, and evolving attributes of the two transgovernmental networks, thereby broadening the rationale for theoretical and application discussions.

Proposition 1: Transgovernmental network governance incorporates transgovernmental linkages among sub-units of each state within specific issue domains.

By reviewing the official documents of APSCO and APRSAF, we can establish the ontologies of both organizations as the foundation for verifying the governance of the Asian space transgovernmental network.

APSCO was initially organized through the Memorandum of Understanding as a relatively loose transgovernmental network (Slaughter, 2003). Subsequently, as an intergovernmental international organization with legal personality, where APSCO's members are represented as individual states. The Council serves as the highest decision-making body, and a secretariat serving as the executive unit. The APSCO Convention stipulates that the Council is composed of ministers or minister-level representatives responsible for space affairs designated by member states (APSCO, 2018), reflecting the core principle of transgovernmental networks—direct interaction among government sub-units. A symbiotic relationship exists between traditional intergovernmental international organizations and transgovernmental networks. According to Slaughter, the norms of intergovernmental international organizations are comprised of formal state representatives, while the actual operations are carried out through meetings and forums among heads of specialized government departments (Slaughter, 2004) creating various issue networks within these organizations. Transgovernmental networks bundling with international organizations can infuse vitality into the organization and mutually shape the entire entity. APSCO's structure represents a fusion of intergovernmental international organization (externally) and transgovernmental network (internally) operations, making it a compatible governance model.

As the earliest space exchange platform in Asia, APRSAF does not possess charters but places a strong emphasis on guiding principles of promoting peaceful use of space. Each state and non-state actor adheres to orientations of problem-solving, voluntariness, and openness. APRSAF embodies the features of a transgovernmental horizontal

information network, operating at a lower, informal level with a diverse range of members. Its primary focus lies in capacity building. In addition to Japan's contribution to advanced space technology, capacity building is also evident in the multilateral exchanges among various members in different issue areas, aiming to enhance regional policy coordination in addressing common challenges.

Proposition 2: The epistemic communities are the core actors in transgovernmental network governance.

The epistemic community in space fields is composed of scientists, astronauts, engineers, and agency officials. The formation of shared knowledge within the network arises from extensive communication and long-term interactions. Many groundbreaking initiatives often originate from a series of expert meetings that bring together the aforementioned people (Cross, 2020).

The operations of APSCO consist of two key networks, one for the sharing of space science resources and another for space technology application, with epistemic community playing a pivotal role in driving both networks. Talent development is a crucial aspect of APSCO's space capacity-building efforts. APSCO has established seven secondary working networks: the Data Sharing Network, the Space Segment and Ground Systems Interconnection Network, the Ground-Based Space Object Observation Network, the Disaster Monitoring Network, the Space Application Network, the Education and Training Network, and the International Cooperation Network. These networks correspond to the functions of information, enforcement, and harmonization networks within the paradigm of transgovernmental network governance (APSCO, 2018). Furthermore, APSCO Space Law and Policy Workshops provide legal insights into the peaceful use and management of space, scrutinizing the existing space legislation of its members while assisting them in improving academic field expertise.

As the largest space transgovernmental network in Asia, the core component of the epistemic community within APRSAF is the national research and development agency, JAXA. On the other hand, APRSAF's daily operations are executed by the four working groups: the Space Applications Working Group, the Space Technology Working Group, the Space Environment Utilization Working Group, and the Space Education Working Group. These groups regularly submit work reports and are accountable to APRSAF annual meetings, reflecting the nature of epistemic communities. APRSAF also hosts the Space Policy Practitioners Workshop with the aim of nurturing connections among space policy experts in Asia. During the 2019 annual meeting, more than 60 experts from 14 countries proposed the National Space Legislation Initiative to enhance the drafting and implementation of space legislation within Asia-Pacific countries in accordance with international law standards (APRSAF, 2020).

Proposition 3: The establishment of transgovernmental network governance requires a capable and willing state to take the lead in constructing networks in the context of power asymmetry.

Schout et al. (2019) argue that in the area of space governance, there are major differences among member states in terms of innovation capacity, economic relevance, and security ambitions. Since its establishment, APSCO has become appealing to many developing countries' space attempts due to the significant disparity in space capabilities between China and other states. This indirectly led to the marginalization of APRSAF, which was established earlier (Aliberti, 2013). In the context of a small number of members and power asymmetry factors, APSCO, comprising of 12 members and quasi-members (associate members and observers) on a state basis (APSCO, 2018), exhibits a lower degree of change compared to APRSAF. The node attributes of APSCO reflect a pronounced power asymmetry, while Japan's asymmetry in APRSAF is diluted by numerous and complex member composition.

At the micro-level, APSCO's composition consists of highly interactive connections among nodes, representing a high-density structure. In contrast, APRSAF's constituents encompass all actors engaged in space activities, leading to complex connections and diverse node groups, including state and non-state node groups, as well as connections across different issue areas and epistemic communities. There is a lack of common proxy nodes bridging the gaps between different actors or issue areas, resulting in a lower network density. The two organizations display significant differences in network centrality. APSCO demonstrates high centrality with China at its core, while APRSAF's characteristics limit Japan's network influence, resulting in much lower centrality. Segmentation is reflected in their operational units: working networks and working groups. APSCO, as an intergovernmental international organization, maintains a secretariat overseeing the operations of specified working networks, reporting to the Secretary-General with well-defined hierarchical responsibilities. In contrast, APRSAF's individual working groups operate with high independence and only report to the plenary session during APRSAF annual meetings, indicating a higher degree of segmentation. APSCO and APRSAF exhibit different homophily. China and Japan demonstrate high homophily in the roles as regional space leaders, whereas the space network governance constructed by each country exhibit low homophily in compositions between leaders and subordinates due to different phases in space development.

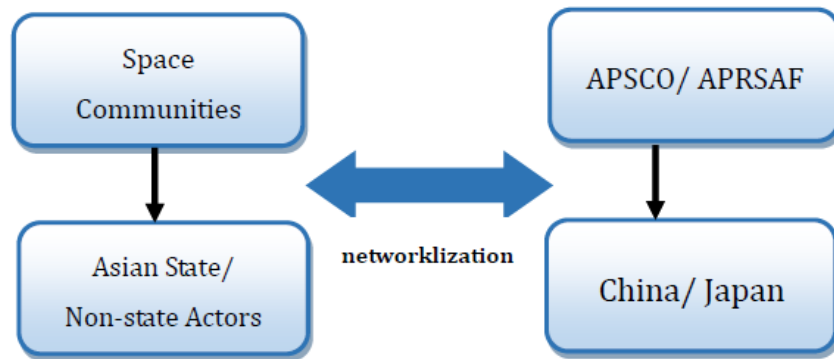
Proposition 4: Different types of leadership are practiced within transgovernmental network governance.

The establishment of the reputation representing an epistemic community through the inward expansion and outward diffusion of knowledge is a crucial urge shaping

leadership. China and Japan have established reputation as network leaders by showcasing their achievements in Asian space governance. This has laid a solid foundation for transgovernmental network governance and bolstered the supportive potential through knowledge transfer during organizational expansion. Intellectual leadership is the driving force behind Asian space transgovernmental network governance and serves as the starting point for other types of leadership. Structural leadership entails transforming controlled material resources into chips for building networks. China, as a technology provider and network architect, has established robust structural leadership in APSCO. Japan initially assumed a same role in APRSAF. However, APRSAF's openness gradually forced Japan to downplay its structural leadership and transitioned toward entrepreneurial leadership by integrating stakeholders to achieve the network objectives. Japan leveraged the soft leadership qualities, making the APRSAF annual meeting a hub for communication among different actors and the convergence of consensus. Through the APRSAF platform, space policy became a medium for Japan to deepen economic and social cooperation with Asian countries. Hirschman's concept of asymmetric interdependence provides an explanation for Asian space transgovernmental network governance (Wagner, 1988). Owing to differences in the levels of space development and the content of network cooperation, the degree of system dependence in the interdependent network is unequal, leading to an imbalanced network pattern. In such context, intellectual leadership stands at the core, structural leadership is the predominant form, and leadership transitions to entrepreneurial leadership in specific issue concerns.

In summary of the verification of the four propositions, Figure 2 illustrates the formation pathway of the Asian space governance mechanism manipulated within the dual-layer analytical framework. It begins with the presence of the space epistemic community in the space transgovernmental network architecture composed of state and non-state actors, forming the first-layer network structure. This is further augmented by the leadership of major space countries under the transmission and interaction of hard and soft space power via their premier space organizations. The networkization processes create the second-layer structure by constructing different forms of network governances. Subsequently, within the intertwining processes in these two mutual-constructed network layers, the overall Asian space transgovernmental network governance structure emerges.

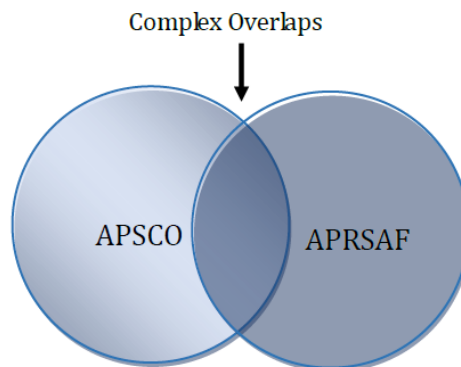
Figure 2: Formation of the Asian Space Governance



Source: own illustration

On the other hand, an intersection within transgovernmental network governance has emerged from the Asian space perspective, characterized by varying degrees of overlap among network members and functions. Typically, it begins with one major power leading the network establishment in a specific domain, followed by another major power initiating a homologous, competitive one. These major powers are not subordinate to each other and do not directly participate in the network governance formed by the other directly. The findings from the case analysis highlight the competitive phenomena within the picture of Asian space transgovernmental network governance (Figure 3) (Yao & Zheng, 2021). Further theoretical deduction reveals the “coexistence” of competition and cooperation inherent in transgovernmental network governance, a dimension that has been underexplored in previous studies.

Figure 3: Overlapping Network Configuration of Asian Space Governance



Source: own illustration

5. Current Circumstance and Future Prospects of Asia Space Governance

5.1. Competitive Transgovernmental Network Governance

Space development in Asia commenced relatively late, with major space powers having a limited history of efficient cooperation in space governance. The distinct transgovernmental network governance approaches of APSCO and APRSAF reflect

the complex interplay of competition and cooperation. Competition among governance mechanisms in space mirrors the traditional geopolitical atmosphere, prompting major powers to collaborate with partner countries that share consensus and common space-related goals. China and Japan utilize APSCO and APRSAF as platforms to provide space services while vying for leadership in astropolitics. These two countries are not aiming to defeat each other in space but are obeying international rules while projecting space capabilities into their foreign strategies. Nevertheless, the absence of formal coordination between two organizations highlights the inescapable competitive spiral in regional space governance. Pekkanen (2020) argues that national interests serve as the primary perspective for viewing the scenario of Asian space governance. This demonstrates that the relative power structures among actors are key elements in constructing transgovernmental network governance.

In the Chinese space program white paper (2021), APSCO is portrayed as a tool for leveraging space capabilities to exert political influence. China actively seeks to attract developing countries to its center-based transgovernmental network governance, which goes beyond mere space partnerships and is interpreted as an effort to monopolize network autonomy. As a result, APSCO has struggled to attract space middle powers, such as South Korea. Conversely, Japan's Basic Plan on Space Policy, introduced in 2009, emphasizes the importance of space diplomacy (Pekkanen, 2020). The Japanese Ministry of Foreign Affairs established the space office to assist Asian countries in building space infrastructure, signaling an intent to establish leadership through APRSAF, leveraging its unique role as the only Asian country participating in the International Space Station. A significant practice for transgovernmental network theory lies in Japan's attempts to modify the government-centric governance model through APRSAF, this involves placing more emphasis on professional frameworks and strengthening governance through coordination among space-related agencies, with the tendency towards "disaggregated sovereignty."

APSCO and APRSAF have exhibited overlapping dimensions in their development processes. Concerning network members, Thailand, Indonesia, and Turkey are simultaneously involved in both networks, resulting in an "identity" overlap. In terms of organizational functions, both entities promote activities in disaster management, space information exchange, academic training and education, reflecting a "functional" overlap. These complex overlaps extend to the geography of Southeast Asia, where it becomes a hotspot for strategic activities of major space powers. Southeast Asian countries have not clearly favored either the Chinese or Japanese networks. For these countries, competition among major space powers implies a greater bargaining opportunity. The challenge they face is to balance the strategic choices provided by major powers in space governance within their development goals and utilizing the

scale effect initiated by transgovernmental network governance (Sarma, 2019).

5.2. Transgovernmental Network Governance within Asian Space: the Context of Co-competition

The space interaction between China and Japan has not escalated to the security field, as seen in the relationship between China and the US. The interplay between APSCO and APRSAF is more accurately to describe as a “co-competition” relationship. The early practice of the co-competition concept was in outer space: the Apollo program in the 1960s is considered the climax of the Space Race, but in reality, the cooperative thread of lunar exploration was never severed. The Kennedy administration proposed joint missions to the Moon on multiple occasions in diplomatic settings. In 1975, the United States and the Soviet Union launched the historic Apollo-Soyuz Test Project (ASTP), making the first-ever international partnership in manned space flight missions. During ASTP, the Apollo spacecraft carrying a crew docked in Earth orbit to test the compatibility of rendezvous and docking systems and the possibility of space rescue (Brandenburger & Nalebuff, 2021). In 1998, the two countries began joint management of the International Space Station. In Asia, despite China and Japan navigating an ever-changing political atmosphere, cooperation continues in low-political domains. There is a reasonable expectation for deepening space cooperation within their relationship of co-competition. Here are possible development paths from different perspectives.

Collaboration in accordance with Global Space Governance Norms

The Outer Space Treaty, often referred to as “Space Constitution,” regulates that signatory states must adhere to principles of mutual assistance and consider the interests of others in the exploration and use of space. This reveals that both China and Japan are obligated to cooperate in accordance with international norms. Furthermore, as member states of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS), both countries participate in the COPUOS Legal Subcommittee, a platform for discussing cooperative initiatives. In 2012, a joint proposal initiated by China and Japan within the subcommittee, supported by the US, working on common principles and procedures for the development of transgovernmental space governance, setting reference standards for future implementation (UNOOSA, 2012). Regarding internal norms within the network mechanism, the APSCO Convention emphasizes international collaboration with other entities as the foundation for discourse on space cooperation. The provisions also encourage APSCO to establish partnerships with international organizations and states outside the UN system.

Cooperation and Challenges in Contemporary Transgovernmental Network Governance

The multi-dimensional overlaps in member identities and project functions between APSCO and APRSAF create a development niche with their mutual relationship.

Informal channels of interaction exist between the two organizations. APSCO has been attending APRSAF annual meetings since 2010. During the APRSAF-25 meeting, Chinese delegates from the China National Space Administration (CNSA) and leading aerospace universities participated (APRSAF, 2019). APSCO has also established a mutual visit arrangement with JAXA. During Yukihide Hayashi's visit to APSCO in 2009, the vice president of JAXA proposed the vision of cooperation over competition on behalf of the Japanese government, emphasizing the promotion of shared interests. APSCO Secretary-General Zhang Wei expressed the same willingness. Despite the friendly relations maintained through visits by senior officials, substantive discussions on coordinating overlapping space development issues have not yet taken place. Direct collaboration remains politically sensitive. APSCO's participation in APRSAF has not resulted in significant engagement, as APRSAF cannot grant observer status to APSCO, given that APSCO's observer status is restricted to UN member states or formal international organizations.

Cooperation within the Regional Power Pattern

The governance mechanism involving co-competition among major Asian space powers essentially reflects regional geopolitical realities. Space activities often prioritize security concerns. Moltz (2011) argues the differing perspectives and actions of China and Japan regarding Missile Technology Control Regime (MTCR) are the core factor presenting an obstacle to the integration of APSCO and APRSAF. China is not a signatory to the MTCR, whereas Iran and Pakistan, subject to MTCR sanctions and technology restrictions, are APSCO member states. Some Western countries have accused China of generously supporting rocket-related technologies, making it challenging for pro-Western APRSAF members to engage in substantive cooperation with APSCO. For China and Japan on the international political stage, the willingness shown by either side to become involved in the other's dominant governance mechanism could potentially alter the existing network balance of power. Given the complex historical entanglements and fragile mutual trust, the likelihood of rapid integration in Asian space governance is relatively low. On an optimistic note, both countries consistently emphasize efforts to normalize bilateral relationship, which also suggests that constructive cooperation in low-political domains may extend to the space field.

"Beyond Power"—Space Governance in Regional Integration

Transgovernmental network governance, as strategic tools in space field, manifest the preferences and intentions of major powers through the construction and agenda-setting of networks, while balancing the overall power structures and competing with existing mechanisms. Aliberti argues that without the existence of APSCO, APRSAF might have remained an initiative entity, but in competition with APRSAF, APSCO

demonstrates a broader ambition. Liao Liwen (2012) outlines the foreseen evolution of Asian space governance towards a “space regime complex” of shared policies among space actors. The complex consists of a series of partially overlapping structures encompassing various regional space organizations and initiative networks. In addition to APSCO and APRSAF, the complex includes networks such as the India-led Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP), as well as the ASEAN Subcommittee on Space Technology and Applications. The space regime complex embodies overlap features, broad scope, and flexible approaches, constituting a process of “soft regionalization” (Aliberti, 2013) that exerts an impact on space governance and sustainable space development. Asian space cooperation led by China and Japan will adhere to global normative principles, involving multiple network designs that integrate hard and soft law, formal and informal organizational structures, and domestic and international elements (Pekkanen, 2020).

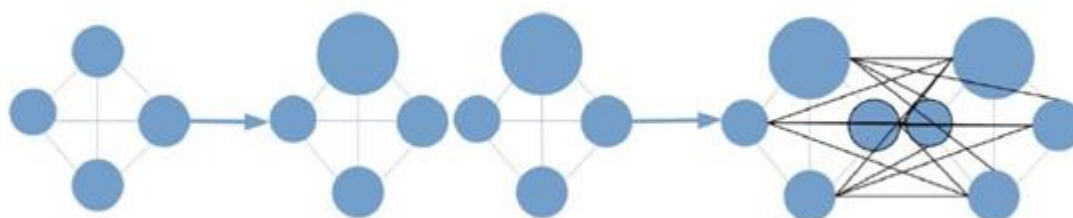
5.3. Transgovernmental Network Governance Complex: Evolving the Overall Analytical Framework with the Logic of Co-competition

Concerning the network governance of APSCO and APRSAF, cooperation in specific issue areas with working networks and working groups as the foundational units, offers a potential avenue for their future collaboration. The focus should be on issues with a robust consensus, such as disaster management, civilian satellite programs, and solutions for orbital debris. This approach aligns with the governance essence of transgovernmental network architecture and epistemic communities. In this context, the practical efforts undertaken by APSCO and APRSAF on space issues can contribute to advancing norms and fostering durable collaboration. Enhancing and broadening the network will facilitate a moderate power transition, ultimately shaping the “space transgovernmental network governance complex.”

The following illustrations consecutively depict the three-stage evolution of the transgovernmental network governance paradigm. Firstly, in examining the simplest network unit of a four-node grid, the left diagram draws the fundamental elements of traditional transgovernmental network governance: a network composed of sub-unit actors. The middle diagram elucidates the theoretical presentation of this article: the comprehensive analytical framework for transgovernmental network governance that incorporates structural network relationships and leadership adoption. Different node sizes represent varying degrees of structural power. The presence of two complete, independent networks signifies the nature of co-competition, which emerges as a higher level of the transgovernmental network governance paradigm. The right diagram presents the advanced stage of co-competition, where initially opposing network governance entities set aside competition and deepen cooperation, thereby progressing towards a three-dimensional integrated formation of transgovernmental network

governance: the transgovernmental network governance complex. This transformation marks the “qualitative change” in the analytical framework and the transition of networks from competition, co-competition to the ultimate cooperation, bridging differences in the process of “crossing over.” The synchronized evolution and interaction between network mechanisms represent the ideal of the dynamic nature of transgovernmental network governance.

Figure 4: The Evolution of Transgovernmental Network Governance Complex



Source: own illustration

6. Conclusion

Regarding the fundamental nature of transgovernmental network governance, it is observed that the static development within established network environments, along with the dynamic deployment in structures marked by power asymmetry, sketches a macroscopic trajectory of evolution. In reality, transgovernmental network governance is inextricably intertwined with the realm of power politics. When faced with the question of whether transgovernmental network governance dominated by the power factor will result in dysfunction, the key root hinges on whether the formation of governance mechanisms originated at the grassroots level, which can alleviate the adverse effects of competitive pressures among network actors from top to bottom by reconciling the power demands of various roles and issues. In this conceptual context, this article draws the outline of the enduring mutual-constructed effects among the four pillars of transgovernmental network governance. By examining these interrelations, a more distinct association between independent and dependent variables is reflected.

In the logic setting of “pure rationality”, cooperation-oriented transgovernmental network governance begins by concentrating on specific issue areas. Both quantitative and qualitative transformations occur with the growth in member composition of the network, the scope of covered issues, and the continuous expansion of network resources. Subsequently, the overall development then transitions to a multi-dimensional, co-competition approach under “bounded rationality.” The practical application with the nature of co-competition focusing on APSCO and APRSAF provides a vivid illustration of the dynamics and complexities of contemporary space governance. The developmental trajectory of a “space regime complex” in the space domain, and a “transgovernmental network governance complex” as the output of theoretical research of the article, signifies the progressive stage. It indicates a shift

towards more integrated and cooperative approaches that could potentially reshape the regional space governance landscape. Beyond the space domain, numerous mechanisms of transgovernmental network governance exist globally across multitude issue areas and analytical levels, characterized by overlapping attributes and stances of co-competition. For example, the ASEAN Defence Ministers Meeting led by ASEAN and the Shangri-La Dialogue initiated by Western countries in the regional security network governance. In the sphere of transboundary water resource governance, notable examples include the Lancang-Mekong Cooperation led by China, and the Greater Mekong Subregion Economic Cooperation led by Japan. Both major and minor actors engage in the paradigm of transgovernmental network governance, striving to seek optimal arrangements that serves their interests. The evolving direction represents a promising avenue for future research in this academic field.

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