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Dynamic clustering of Asian regionalisms: Empirical testing of United Nations multilateral treaty participation by social network analysis

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Abstract: This paper investigates the evolving clustering and historical progression of “Asian regionalisms” concerning their involvement in multilateral treaties deposited in the United Nations system. We employ criteria such as geographic proximity, historical connections, cultural affinities, and economic interdependencies to identify twenty-eight candidate countries from East Asia, Southeast Asia, South Asia, and Central Asia for this empirical testing. Using a social network analysis approach, we model the network of these twenty-eight Asian state actors alongside 600 major treaties from the United Nations system, identifying clusters among Asian states by assessing similarities in their treaty participation behavior. Specifically, we observe dynamic changes in these clusters across three key historical eras: Post-war reconstruction and transformation (1945–1968), Cold War tensions and global transformations (1969–1989), and post-Cold War era and globalization (1990–present). Employing the Louvain cluster detection algorithm, the results reveal the evolution in cluster numbers and changes in membership status throughout the world timeline. The results also identify the current situation of six distinct Asian clusters based on states’ inclinations to engage or abstain from multilateral treaties across six policy domains. These findings provide a foundation for further research on the trajectories of Asian regionalisms amidst evolving global dynamics and offer insights into potential alliances, cooperation, or conflicts within the region.

Keywords: Asian regionalism; multilateral treaty; social network analysis; cluster detection; Louvain algorithm

1. Introduction

The paper endeavors to empirically test the sustainability and historical development of what we denote as “Asian regionalisms” within the context of participating in multilateral treaties. The term “regionalism” encompasses the diverse forms of collaboration, integration, or cooperation among countries within a specific region. This includes establishing initiatives, agreements, or organizations designed to strengthen connections, address common challenges, encourage economic cooperation, and bolster political, social, or cultural relations among nations. When delving into regionalism, it considers both the commonalities and distinctions among countries within the same geographical area. Consequently, our identification of prospective participants for empirically testing Asian regionalisms is initially grounded in specific criteria such as geographic proximity, historical relationships, cultural affinities, and economic interdependencies among states.

The selected candidates for empirical testing of Asian regionalisms consist of twenty-eight countries of four distinct regions: East Asia (encompassing China, North Korea, Japan, and South Korea), Southeast Asia (comprising Brunei, Cambodia,

Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam), South Asia (consisting of Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka), and Central Asia (including Kazakhstan, Kyrgyzstan, Mongolia, Tajikistan, Turkmenistan, and Uzbekistan). Geographically, all four regionalisms are closely situated on the four sub-areas of the Asian continent. Historically, Central Asia was previously a community dominated by various tribes operating as a republic within the former Union of Soviet Socialist Republics. Southeast Asia underwent a period of colonial rule by European and American powers, punctuated by Japan's assertive and aggressive invasions. South Asia, in contrast, was predominantly under the influence of the British East India Company, with British government oversight from 1857 to 1947. Lastly, East Asia experienced Western (including American and Russian) as well as Japanese colonialism, with Japan's forceful and aggressive actions contributing to movements for independence (Le et al., 2023). Furthermore, each regionalism currently confronts shared challenges, including climate change, transnational crime, terrorism, and concerns related to regional security.

Simultaneously, regionalism recognizes the diverse array of nations within a given region. When discussing Asian regionalisms, the aim is not to homogenize or disregard these differences, but rather to acknowledge them as integral components of the region's identity and dynamics. Asian regionalisms showcase unique cultures, languages, histories, political systems, economic structures, and developmental levels, emphasizing the richness and complexity of the continent.

Indeed, cultural and historical influences play a pivotal role in shaping the identity and development trajectories of countries within each Asian regionalism. For example, East Asian nations have been profoundly shaped by Confucianism, Buddhism, and various dynastic empires. In contrast, Southeast Asian countries boast a vibrant tapestry of indigenous cultures, influenced by Hindu-Buddhist traditions and Islamic practices. These diverse cultural and historical backgrounds contribute to the distinctiveness of each regionalism. Moreover, economic disparities are also noticeable among Asian regionalisms. East Asia, home to economic powerhouses like China, Japan, and South Korea, stands out as a formidable force with advanced industrial sectors. Southeast Asia presents a varied mix of developing and emerging economies, while South Asia encompasses nations with varying degrees of economic development, including those grappling with high poverty rates. In Central Asia, the region is characterized by resource-rich nations transitioning from a Soviet-era economic system, further illustrating the economic diversity within the Asian continent (Le et al., 2023).

In this context, we explore the potential clustering of Asian regionalisms in response to evolving global dynamics, as evidenced by their willingness to engage in multilateral treaties. States engage in negotiations, drafting, and ratification of treaties and agreements that establish rules and regulations governing specific global issues. These instruments often resemble legislative acts, setting standards, obligations, and norms that participating states commit to uphold. Numerous scholars and experts in international relations have extensively discussed and analyzed states' roles in creating, implementing, and adhering to global norms, treaties, and agreements, contributing to the conceptualization of regionalism.

The behavior of a state in participating in multilateral treaties can significantly reflect its inclination towards clustering with other countries to form regionalism. Firstly, states favoring regionalism often demonstrate consistent patterns in their multilateral treaty participation, prioritizing agreements within their regional blocs over global treaties. For instance, a country heavily involved in regional trade agreements might prioritize such pacts over broader global trade initiatives. Additionally, the focus of a state's participation in multilateral treaties can unveil its regional preferences. If a country predominantly engages in treaties addressing regional issues—such as security, trade, or economic cooperation specific to its region—it signals a preference for regional solutions and integration. Moreover, a state's treaty participation also mirrors its alignment of interests with neighboring or regional countries. States sharing common challenges or objectives with nearby nations may choose to collectively address these issues through global treaties. It is noteworthy that states often balance their participation in global and regional treaties based on strategic priorities. Those leaning more towards regionalism may prioritize treaties closely aligned with their specific regional concerns while aligning with broader international objectives. In summary, a state's behavior in multilateral treaty participation serves as a key indicator of its inclination towards clustering with other countries to form regionalism. The emphasis on regional solutions and alignment of interests with neighboring nations collectively reveal a state's commitment to fostering cooperation and integration.

In this study, it is captivating to note that regionalism in Asia acknowledges and adapts to the diversity and evolution among states in the context of the United Nations multilateral treaty adoption. Particularly noteworthy is our use of the innovative framework of social network analysis to identify clusters of multilateral treaty adoption among Asian states. Leveraging a comprehensive dataset encompassing 600 major multilateral treaties deposited in the United Nations system, covering diverse global issues, and providing detailed information on participating countries, our focus lies in identifying relevant attributes or characteristics of the treaties. These include the domain of cooperation, aiding in the measurement of similarity or dissimilarity among the twenty-eight Asian countries. This approach allows us to apply clustering algorithms to group these countries based on their similarities in multilateral treaty participation behavior. We will employ commonly used network metrics and clustering algorithms in our analysis. Additionally, special attention will be dedicated to critical junctures in world history. Building upon this trajectory, our exploration will extend to examining potential shifts in regionalism's membership along the world timeline. This endeavor aims to lay the groundwork for constructing future scenarios for the four Asian regionalisms and the broader Asian context.

The subsequent section of this paper will commence with a presentation of literature focusing on the intricate relationship between regionalism and multilateral treaty participation. Following this, the theoretical framework of social network analysis (SNA) will be elucidated. Subsequently, we will delve into the details of data collection and network modeling, paving the way for the visualization and in-depth analysis of the clustering of countries. Finally, the paper will conclude with a comprehensive discussion of the results obtained about Asian regionalism.

2. Literature review

2.1. The interplay between regionalism and multilateral treaty participation

Various theoretical frameworks, including neorealism, constructivism, and functionalism, have been used to understand regionalism and the role of global norms in shaping regional dynamics. Waltz (Waltz, 1979) provides an example of neorealism that emphasizes the role that power relations between states play in determining regional cooperation. Constructivist viewpoints, as expressed by Wendt (Wendt, 1999), place a strong emphasis on the contribution that shared identities, norms, and ideas provide to regional integration. The theories of complex interdependence (Keohane and Nye, 1977) and functionalism (Haas, 1958) offer valuable perspectives on the function of functional cooperation and economic interconnections as catalysts for regional integration.

Moreover, the complex relationship between regionalism and participation in multilateral treaties has also been addressed in literature more and more. A multitude of academics and specialists in the field of international relations have participated in conversations and examinations on how states influence the formulation, execution, and compliance with international conventions, treaties, and accords, thereby contributing to the concept of regionalism. Prominent academics have studied how global norms and ideas spread throughout different geographical areas. Martha Finnemore (Finnemore, 2017) explores how international norms are adopted and disseminated, as well as how they affect state conduct in international relations. She looks at the spread of norms, showing how they form part of a state's identity and shape its foreign policy decisions. Conversely, Keck and Sikkink (E Keck and Sikkink, 1998) examine the function of transnational advocacy networks in the dissemination of norms. They study how these networks facilitate the regional spread of norms, especially those about human rights. Even though their research has contributed differently to our knowledge of norm dispersion, their ideas frequently emerge in discussions on how global standards propagate, get accepted, and become popular in different parts of the world. Their work has clarified how norms impact regional dynamics and has had a major impact on conversations about how norms spread in international relations.

Joseph S. Nye Jr. and Robert Keohane emphasize the critical role that power and persuasion play in forming global standards in a different setting. Significantly powerful states frequently take the lead in establishing and defending these norms globally, and their influence can seep into regional dynamics since strong states may direct the processes that establish regional norms. They explore the complex relationships between power and dependency in the international system, particularly in their landmark book "*Power and Interdependence: World Politics in Transition*" (Keohane and Nye, 1977). Parts of their argument touch on the role of powerful states in forming global norms, even if their main focus is on the larger dynamics of power, interdependence, and international institutions. Nye and Keohane place special emphasis on the idea of "complex interdependence," according to which powerful states not only control international organizations but also actively participate in the

creation and advancement of norms that serve their interests. This influence extends to the global arena and, by extension, into regional dynamics. While Nye and Keohane's work does not specifically center on regional norm-setting processes, their discussion of power and influence in the international system lays the groundwork for understanding how powerful states can shape and propagate norms globally, which can subsequently influence regional dynamics and norm-setting processes within regions.

Understanding states' commitment to and adoption of international rules has benefited greatly from the work of Alexander Wendt. His broader theoretical framework provides insights into how states engage with and respond to global standards, even though his specific work does not directly address states' selective adherence to global agreements affecting regional interests. Wendt presents a constructivist theory of international relations in his book "*Social Theory of International Politics*" (Wendt, 1999), contending that social structures and shared meanings influence state conduct. Depending on how they understand their interests and the applicability of international norms in their own domestic and regional settings, they may choose to selectively abide by them. According to Wendt's constructivist viewpoint, governments respond differently to outside stimuli like international rules. Rather, the social context in which these standards are presented, identities, and relationships all influence how they respond. Through this perspective, it is possible to analyze how nations may choose to accept or reject global norms according to how well they align with local interests or identities.

Anne-Marie Slaughter, a legal expert, has written about the idea of legal pluralism—the practice of states having several legal regimes in place at the same time (Slaughter, 2004). States function within a variety of regional and worldwide legal systems, which adds to the intricacy of international administration. This tendency results in "disaggregated sovereignty," which is the division of state sovereignty among several governing bodies and levels. Legal pluralism, as defined by Slaughter, emphasizes that governments are now active participants in a complex web of international legal systems rather than being merely subject to domestic laws. States must negotiate many sets of laws, customs, and institutions at the international and regional levels, which adds to the complexity and difficulties of international governance.

Fawcett and Hurrell (Fawcett and Hurrell, 1996) look at how regional institutions in particular regional contexts institutionalize global norms. It explores how regional institutions engage with global norms, modify them for regional settings, and help create distinctive regional norms that may coincide or correspond with more general world ideals. Hurrell and his colleagues delve into case studies and theoretical frameworks that demonstrate how regional institutions function as platforms for the application and modification of global standards to accommodate regional dynamics. Their research sheds insight on how regional dynamics overlap and impact broader global principles within international relations through his larger body of work, which includes his articles on regionalism and global governance. Their work also explores interconnections between global and regional norms and institutions.

Amitav Acharya, with another perspective, concentrated on Asia specifically, points out that regions can serve as arenas for contesting global norms that may not

coincide with local preferences or values (Acharya, 2004). This may result in the development of substitute regional norms or the modification of international rules to conform to local circumstances. In the framework of Asian regionalism, Acharya explores the dynamics of norm localization, highlighting how regions—in this case, Asian countries—act as forums for the contestation and adaptation of global norms to suit local preferences or values rather than their passive adoption. His research shows how regional players frequently contest global norms that they view as incompatible, which can result in the formation of substitute regional norms or the modification of global norms to better-fit area particulars. This viewpoint clarifies how geographical areas might impact how global norms develop.

Glas and colleagues (Glas et al., 2018) with a novel approach, conducted research focusing on the frequency of common multilateral treaties signed by states, interpreting these treaties as indicators of the strength of inter-state ties within a network. Drawing on tools from network theory, they explored the structural characteristics of state networks formed through multilateral treaty-making. This methodology enabled them to determine the position of individual states within the network and assess how inter-state relationships influence their behavior. Through their analysis of the observable implications of multilateral treaty-making practices, Glas's research shed light on the dynamics between states and the global system. They provide insights into how treaties shape inter-state relations, contribute to the establishment of state networks, and influence behavior within the international arena.

To sum up, these researchers' work demonstrates the complex interplay between states' adherence to international conventions, treaties, and accords and how it relates to the growth, convergence, or divergence of regionalism. In the field of international relations, their work highlights the intricacies and subtleties involved in comprehending how regional and global dynamics interact and impact one another. Nevertheless, more study in this field is still necessary as the global system changes, benefiting researchers, practitioners, and policymakers alike.

2.2. Gaps in the existing literature

While scholars have extensively explored various facets of regionalism, including its emergence and impact on global governance, the literature review indicates a predominant reliance on qualitative research in this domain. This study seeks to contribute a quantitative framework to the analysis of the engagement of Asian sub-regions with global issues through their participation in multilateral treaties, thereby addressing a gap in the predominantly qualitative literature. The investigation utilizes the network modeling of the United Nations multilateral treaties to explore questions concerning the changing dynamics and clustering of Asian states with others over time through their adaptation to these treaties.

More specifically, the motivation behind our study is the application of clustering analysis techniques to understand the structural dynamics and patterns within multilateral treaty networks comprehensively. By doing so, we aim to uncover hidden patterns of collaboration, consensus-building, and diplomatic relationships among participating states within the framework of multilateral agreements. Specifically, our analysis aims to elucidate the emergence of distinct clusters or communities within the

network of treaty relationships, shedding light on the clustering of states based on shared interests, geographic proximity, or other factors.

For that purpose, this research employs an empirical dataset of 600 major multilateral treaties deposited in the United Nations system, applying social network analysis to unveil patterns, trends, or correlations in treaty participation across different policy areas encompassing diverse global issues. The examination of the multilateral treaty participation network provides a systematic approach to understanding how Asian sub-regions prioritize and engage with global issues in domains such as trade, environment, peace, or human rights. Through a comparative analysis of Asian states' engagement, the study aims to highlight variations or similarities in their priorities, potentially shedding light on regional dynamics and their interaction with global governance over time.

By introducing a quantitative framework for analyzing the engagement of Asian sub-regions with global issues through multilateral treaties, this study has the potential to offer a distinctive perspective on regional dynamics and their interaction with global governance. Moreover, the integration of quantitative methods into the study of regionalism's impact on global governance could provide a more comprehensive understanding of how Asian sub-regions interact with and contribute to global issues through their treaty engagements. This empirical foundation is poised to enrich existing literature, furnishing a quantitative basis for discussions on the role of regionalism in shaping global governance structures. Overall, this analysis of treaty networks promises valuable insights into the formal agreements and collaborations between states, both at regional and international levels.

3. Theoretical framework

Social network analysis (SNA) is a widely used methodological approach for examining patterns of relationships and interactions among actors. In the specific context of this research, these actors correspond to Asian countries participating in the United Nations multilateral treaty system. The application of the SNA approach aims to delineate the temporal evolution of the global governance structure in terms of state-by-state networks.

While the application of SNA provides valuable insights into the patterns of relationships and interactions among Asian countries within the United Nations multilateral treaty system, it is important to recognize its limitations. Specifically, SNA may not always be the most suitable method for analyzing sparse data, particularly when dealing with co-membership tables containing limited connections between actors. In such instances, researchers must grapple with the challenge of aggregating data over extended time spans to extract meaningful findings.

Moreover, as the world becomes increasingly interconnected, the divergence in states' positions within global politics becomes more pronounced. This divergence leads to growing disparities among groups of countries, complicating the interpretation of relative positions represented in a two-dimensional graphical layout of the social network approach. While SNA focuses on relationships among actors, it may overlook other important attributes that influence the behavior of each state-actor within the network.

Therefore, it is essential to acknowledge and accept the limitations of the SNA approach in capturing the full complexity of state interactions and behaviors within the global governance structure. By doing so, this research aims to explore a complementary methodology or approach that offers a more comprehensive understanding of the dynamics at play in the evolving landscape of international relations.

For the next part of this article, the initial step involves presenting the theoretical background and the applications of the SNA approach. Following this, we provide an overview of the terminology and technical procedures adopted for our network modeling.

3.1. Theoretical background and the applications of SNA

In recent decades, the social and behavioral science community has shown a great deal of interest in and attention to the idea of social networks and the methodology of social network analysis (Wasserman and Faust, 1994). However, the roots of network analysis date back many years to the subject of graph theory, with a concentration on mathematical structures used to depict pairwise relations between things. According to Biggs, Lloyd, and Wilson (Biggs et al., 1986), Leonhard Euler's paper on the *Seven Bridges of Königsberg* in 1736 is regarded as the foundational work in the history of graph theory, offering early insights into the mathematical representation of relationships. This issue turned into a historic one, influencing the development of graph theory and hinting at the idea of topology (Shields, 2012).

Recently, SNA has emerged as a key method in modern sociology, with wide-ranging applications in multiple fields, such as development studies, anthropology, biology, economics, geography, history, information science, organizational studies, political science, and social psychology. Understanding relationships between social entities is the main focus of the social network viewpoint. Examples of such relationships include communications inside a group, economic transactions between firms, and trade or treaties among states (Wasserman and Faust, 1994). Rather than focusing on the characteristics of individual actors, network analysis focuses on the relationships between individuals. This method is based on three basic ideas: actors and their actions are interdependent; relationships between actors act as conduits for the transmission of nonmaterial (such as information, beliefs, and norms) as well as material (such as weapons, money, or disease); and persistent patterns of association among actors result in structures that have the power to define, permit, or limit actor behavior (Wasserman and Faust, 1994). By offering a clear and formal definition of elements within the political, economic, or social structural environment, the network perspective has been acknowledged by researchers as a novel approach to standard social and behavioral science research questions (Wasserman and Faust, 1994).

In the realm of international relations, the SNA approach has become increasingly popular, especially in studies that concentrate on the governance of global challenges (Hafner-Burton et al., 2009). A growing body of sociological research highlights how contemporary state policies—like expanding education, preserving the environment, and upholding human rights—are shaped by their integration into the global political system (Beckfield, 2010). In her presentation, Beckfield provides a

succinct overview of the research on how membership in international organizations affects laws about population, education, women's suffrage, environmental protection, human rights, and democracy. Systematic empirical research that conceptualizes a network of governments, societies, and international organizations has provided a large portion of this knowledge.

The primary benefit of SNA for researchers is its ability to provide visual representation. It makes complicated network visualization possible, allowing for an easy-to-understand comprehension of the relationships and structures inside the system. Furthermore, SNA provides quantitative measures that make it easier to compare and analyze diverse network features, providing factual evidence in support of different research conclusions. Additionally, SNA helps reveal patterns of cooperation and power dynamics inside the network by pointing out important nodes and subgroups. Due to these benefits, SNA is now widely used in international relations to analyze a variety of networks, such as trade, alliance, and diplomatic networks. It creates a mathematical framework for understanding the dynamics and structure of global interactions. In this study, SNA makes it easier to investigate the connections between Asian nations through their shared membership in the United Nations multilateral treaties. Patterns of collaboration, influence, and strategic alliances can be found through this analysis.

Although SNA offers strong analytical tools, it is important to recognize its limits, which include data availability problems, potential biases in network representation, and the requirement to interpret findings in light of the particular research question. This research attempts to obtain important insights into the dynamic connectivity of Asian regionalisms through their participation in the United Nations multilateral treaty system by using SNA as a methodological framework. This method provides an organized and methodical way to investigate the many relationships found in this sophisticated global system.

3.2. Key concepts in SNA

The objective of this section is to introduce and apply key concepts from SNA to depict the relationships among Asian states that contribute to shaping the global governance structure. Global governance encompasses a diverse array of formal and informal institutions, codes, and norms, driven or enforced by international organizations or coalitions. These elements regulate and facilitate economic, cultural, social, and political activities, as well as other trans-border relations between states. Therefore, employing the social network approach, our focus is to leverage the relationships between states, the primary institutional actors in global governance, based on their network positions and behaviors in interacting with other countries to establish the system of international regimes, primarily in the form of multilateral treaties deposited in the United Nations system.

Given that a network is composed of nodes and edges, two crucial decisions must be made: defining what constitutes a node and determining the nature of an edge. To represent a state's act of ratifying a specific multilateral treaty, a bipartite graph G (**Figure 1**) is constructed as follows:

$$G = (U, V, E) \tag{1}$$

where U represents a set of countries and V represents a set of treaties. E is the set of edges created by the ratification acts of the countries. It is defined that if a country ratifies a given treaty, there exists an edge from a country to that treaty.

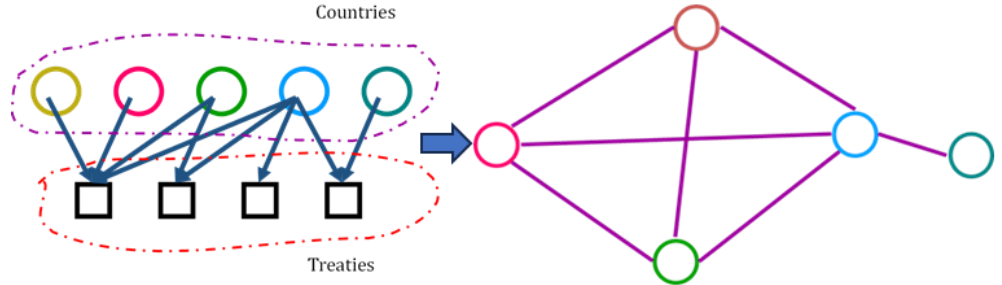


Figure 1. Transformation from bi-model graph (country-treaty) to uni-model graph (country-by-country).

The bipartite graph represents the relational data between a country and a multilateral treaty, thus is also called a bi-model graph of country-treaty relationship. In this research, this kind of relationship can be mathematically noted as a 28×600 binary matrix (28 Asian states and 600 treaties) where an entry in cell x_{ij} indicates whether the ratification of state i for treaty j exists or not. More precisely, the value of 1 indicates that state i had already ratified the treaty j , while 0 means that the act of ratification has not yet been carried out (**Table 1**).

Table 1. Matrix of country-treaty relation.

$i \backslash j$		Treaty 1	Treaty 2	...	Treaty 600
1	Country 1	0	0	...	1
2	Country 2	1	1	...	0
...
28	Country 28	1	1	...	0

From this bi-model graph of the country-treaty matrix, the country-by-country square matrix representing the co-membership between a pair of countries can be generated. This is the matrix that every cell x_{ij} shows the numbers of multilateral treaties that state i and state j hold common membership in. **Figure 1** is the example of the network gained after converting the bi-model graph representing the relation country-treaty into the uni-model graph that only shows the relation among countries. Mutual memberships create ties between states, and the strength of these ties increases with additional joint memberships. In other words, the number of shared memberships measures the strength of a tie between two states. These ties define states' relative positions in social hierarchies in the international system. While many social network studies of international relations only determine whether a tie exists or not between two nodes, in this study, the strength of a tie representing a quantitative measurement of the co-membership can be used to perform a more in-depth analysis of the structure of a network. In that way, the visualization of how states form social networks through membership in multilateral treaties can be provided.

3.3. Cluster detection driven by using the Louvain algorithm

In a network, SNA makes it possible to identify subgroups or clusters where nodes are more closely connected. Several noteworthy techniques are developed for cluster detection in SNA to find groupings of nodes (individuals, entities, etc.) that are more densely connected internally compared to connections with nodes outside the group. The methods used by these algorithms vary, as does their computing complexity and capacity to manage various kinds of networks and community structures. The size, structure, and particular objectives of the study all play a role in selecting the best algorithm.

This study selected the Louvain algorithm (Rani and Mehrotra, 2019), a common technique for community recognition in SNA. The purpose of the Louvain algorithm is to use the pattern of connections between nodes in a network to identify communities or groupings of nodes. Every node in the network is first regarded as a distinct community. The algorithm seeks to maximize modularity by calculating a quality function. The density of links within communities relative to connections across communities is measured by modularity. Maximizing this modularity value, which indicates stronger intra-community ties than inter-community ties, is the aim of this algorithm. By combining communities, the algorithm iteratively attempts to increase modularity. To achieve this, it looks at nodes inside communities and determines whether relocating a node to a nearby community would improve modularity overall. Nodes are merged into communities iteratively until a stopping requirement is satisfied. The algorithm reassesses modularity after every iteration and rearranges nodes into communities if doing so raises the modularity score. Finally, the algorithm creates a network segmentation into communities after it converges. It is anticipated that nodes in the same community will be more connected to one another than to nodes in different communities.

One of the best-known applications of the Louvain method is for large-scale network management, where it generates moderately stable cluster architectures (Li et al., 2021). A large-scale network typically refers to a network with a large number of nodes and connections between nodes. This kind of network is sufficiently large in size to pose challenges for analysis and visualization, often requiring specialized algorithms and computational methods to handle effectively. In our research, the network involving 28 countries and 600 treaties qualifies as large-scale, posing computational and analytical challenges. In this case, the Louvain method is distinguished from all others by its scalability, flexibility, and accuracy, when compared to other algorithms (Zhang et al., 2018), as follows:

- The Louvain algorithm's efficiency in managing large-scale networks makes it suitable for analyzing intricate networks involving numerous Asian countries and their engagements in regionalism.
- The algorithm stands out in recognizing communities or clusters within networks, enabling us to unveil fundamental patterns of connections and interactions among Asian nations engaged in regionalism endeavors.
- The Louvain algorithm's adaptability to different network types and data variations allows for versatile analysis of various aspects of Asian regionalism, spanning trade agreements, diplomatic ties, and security collaborations.

- With its capability to optimize network partitions' modularity, the algorithm aids in identifying distinct clusters or communities of Asian countries based on their involvement in regionalism affiliations.

For these reasons, the choice of the Louvain algorithm underscores this study's purpose of employing efficient methodology to analyze the complex network dynamics of Asian regionalism and derive meaningful conclusions from our dataset.

4. Data collection and network modeling

4.1. Dataset of United Nations multilateral treaties

Treaties and international agreements are the subject of a plethora of information; approximately 40,000 bilateral or multilateral treaties registered with the United Nations have been reported (Barker, 2004). According to Glas (Glas et al., 2018), states have negotiated up to ten times as many bilateral treaties as multilateral ones.

While acknowledging the value of including both bilateral and multilateral treaties in the analysis, the data utilized in this study is composed solely of multilateral treaties. This limitation primarily stems from the availability and accessibility of data sources, as multilateral treaties are generally more readily accessible compared to bilateral agreements. Unlike multilateral treaties, which are often deposited with international organizations such as the United Nations and are more likely to be collected in large sets, bilateral treaties are not always deposited with international bodies, making them less readily accessible for analysis. The United Nations Treaty Series is indeed a valuable resource, providing texts of over 34,000 bilateral and multilateral treaties in their original languages, as well as translations into English and French. However, conducting an analysis that encompasses all these treaties poses significant challenges in terms of data collection and management.

One of the most extensive investigations into multilateral treaty-making to date is Denmark and Hoffmann's collaborative endeavor in 2008 (Denmark and Hoffmann, 2008), referred to as the Multilateral Agreements and Treaties Record Set (MATRS). This initiative entailed assembling a vast dataset comprising 7000 agreements, encompassing both bilateral and multilateral treaties, negotiated between 1595 and 1995. The treaties documented in the MATRS collection were categorized into six broad thematic areas, covering social affairs, war and peace, communication and transportation, environment, states and relations, and trade and economy. Their analysis of the MATRS dataset aimed to discern patterns of treaty-making across temporal, geographical, and thematic dimensions spanning four centuries. However, it is noteworthy that this collection has not been made publicly available yet.

For these reasons, in our study, we primarily focus on multilateral treaties due to the challenges associated with accessing bilateral treaty data. By narrowing our focus to multilateral treaties, we aim to conduct a comprehensive analysis within a manageable scope. Despite this constraint, it is important to recognize that participation in multilateral treaties can still provide valuable insights into international cooperation and consensus-building among multiple actors.

Indeed, multilateral treaties continue to serve a separate purpose and have a unique historical background (Glas et al., 2018). Multilateral treaties become a more practical and efficient choice when national responses to global crises are insufficient

and joint solutions are needed. They entail the consent of independent nations to tackle issues through multilateral means. Complexities may emerge as new treaties or accords are introduced over time.

Therefore, we concentrate our study on a sample of 600 multilateral treaties that have been deposited with the United Nations system between 1945 and 2022. Several important factors drove this decision. There have been many more treaties since 1945, and each one deals with a different part of global challenges (Hale and Held, 2017; Le et al., 2014). The founding tools of the primary organs of the United Nations are highly significant in world politics. The multilateral treaties of the United Nations system address a broad range of issues, such as environmental protection, human rights, peace, and disarmament (United Nations Treaty Collection, 2022). The key open-access resources from which this data was gathered were the United Nations Treaty Collection (UNTC), the Information System on International Labour Standards (ILO), and the administered treaties collection of the World Intellectual Property Organization (WIPO). The dataset encompasses six domains of global governance, including 52 treaties for the environment, 53 for human rights, 36 for intellectual property, 110 for labor and health, 84 for peace and disarmament, and 265 treaties for trade, commerce, and communication, as seen in **Table 2**.

Table 2. Six policy issues covered in the dataset.

Policy domain	Number of treaties	Source of collection
Environment	52	UNTC
Human rights	53	UNTC
Intellectual property	36	WIPO
Labor and health	110	ILO
Peace and disarmament	84	UNTC
Trade, commerce, and communication	265	UNTC
Total	600	-

4.2. Critical milestones of observing the dynamic clustering

This study’s primary goal is to track changes in the clustering of Asian states through their participation in multilateral treaties over historical eras. Multilateral treaties are categorized into three distinct periods by the study according to the year of creation, which is the year the treaty was made available for ratification. Global dynamics, geopolitical events, and shifts in leadership may have influenced the negotiation of treaties among nations over time. Thus, it is essential to examine whether there have been any temporal changes in clustering patterns among states.

In this research, the three periods that have been identified for our observation are as follows: Post-war reconstruction and transformation (1945–1968), Cold War tensions and global transformations (1969–1989), and post–Cold War era and globalization (1990–present). Several reasons led to the selection of the years 1968 and 1989 as the critical junctures in our empirical testing. First, the observation through our data collection suggests that these years saw a significant growth in the number of multilateral treaties (**Figure 2**). Since 1968 and 1989, one of the most notable trends in international relations has been the widespread proliferation of

treaties addressing a broad spectrum of global issues, ranging from human rights and environmental protection to matters concerning global peace and disarmament. Most notably, there has been a significant increase in the number of trade and commercial multilateral treaties.

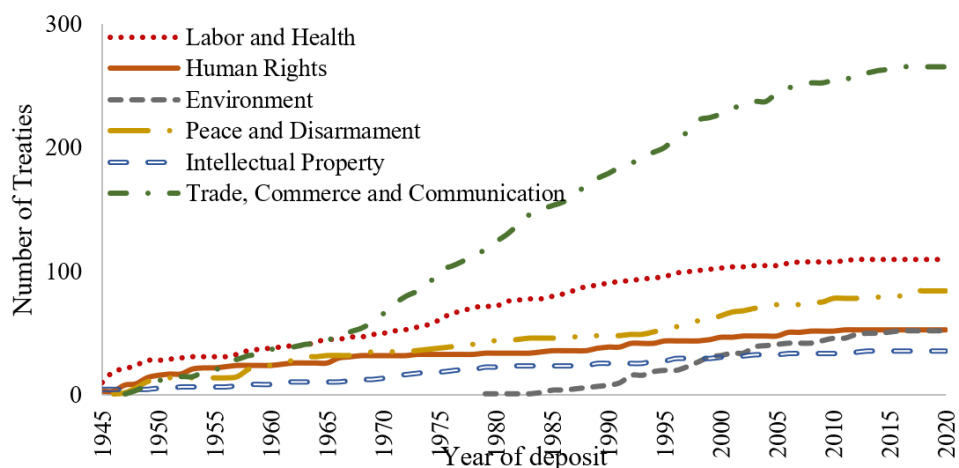


Figure 2. The growth in the number of United Nations multilateral treaties by year.

Beyond this statistical finding, it is important to note that 1968 and 1989 were selected as transition periods because they both were critical turning moments in world history that led to profound changes in the international system. In 1968, a year marked by intense political and social upheaval, significant paradigm shifts in society occurred, leading to questioning of established systems defining the era. Later, 1989 represented a sea change in the world order, the end of the Cold War, and the beginning of a new period characterized by democratic movements and geopolitical realignments. These specific years mark pivotal moments that have significantly altered the course of international relations and the geopolitical environment on a worldwide scale. These divisions highlight not just major historical occurrences but also shifting dynamics in politics, economy, and culture, demonstrating how the international system has changed throughout several stages of development.

5. Cluster detection results and discussion of dynamic clustering of Asian regionalism

5.1. The clusters formed during the Post-war reconstruction and transformation period (1945–1968)

The cluster detection results based on the Louvain algorithm for the multilateral treaty participation of Asian states during the period from 1945 to 1968 show that there are 18 countries grouped into three main clusters based on their treaty participation patterns. The other 10 countries behave distinctly from others (**Figure 3**). The first cluster consists of Japan, Malaysia, Thailand, Cambodia, Laos, and Nepal, indicating shared patterns in their approach to treaty-making until 1968. The second cluster includes South Korea, China, Indonesia, Myanmar, Vietnam, Afghanistan, Sri Lanka, Maldives, and Mongolia, suggesting commonalities in their treaty negotiation strategies during the post-war era. In the third cluster, we identified Singapore, India,

and Pakistan as exhibiting similar trends in their engagement with multilateral treaties. Additionally, we found ten non-clustered countries: North Korea, the Philippines, Brunei, Bangladesh, Bhutan, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, and Turkmenistan. These countries did not align closely with the patterns observed in the other clusters, indicating unique treaty negotiation dynamics or potential outlier status within the dataset. This analysis offers valuable insights into the diverse approaches taken by countries in navigating multilateral treaty negotiations in the Post-war reconstruction and transformation period from 1945 to 1968.

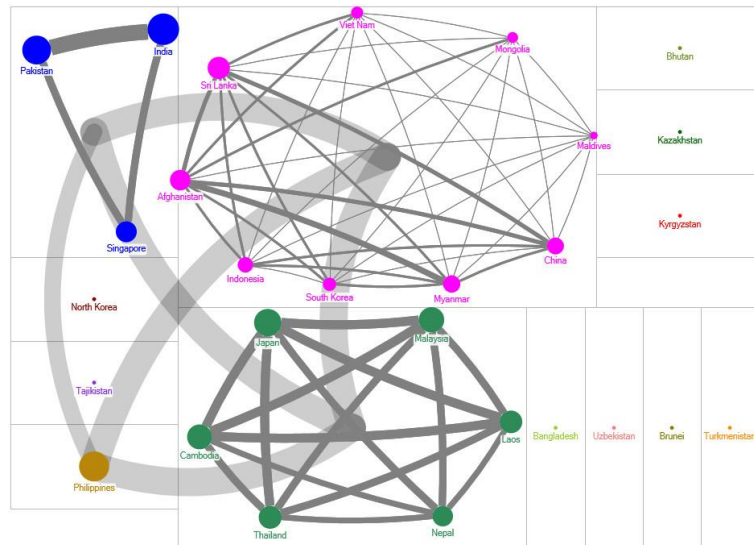


Figure 3. The clusters formed during the Post-war reconstruction and transformation period (1945–1968).

For these ten non-clustered countries, we could investigate the reasons why certain countries did not cluster with others. It could be due to a variety of factors, such as neutral foreign policies, unique geopolitical positions, or specific historical circumstances that set them apart from the rest. The fact that North Korea, Philippines, Brunei, Bangladesh, Bhutan, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, and Turkmenistan are non-clustered during the period from 1945–1968 can lead to potential explanations. Firstly, some of these countries gained independence or were formed after 1945. For example, many Central Asian countries like Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, and Turkmenistan gained independence from the Soviet Union in the early 1990s. Secondly, newly established, or recently independent nations might have had limited international engagement during the initial years of their existence. This could be due to various reasons such as focusing on domestic issues, formulating foreign policies, or establishing diplomatic ties. Some of those countries might have adopted a neutral stance in their foreign policies, not aligning closely with any specific geopolitical bloc or regional alliance. This could result in their non-clustering with other nations during the specified period. In addition, each of these countries has its own unique historical and geopolitical context. Factors such as regional conflicts, internal dynamics, and the absence of strong diplomatic ties might contribute to their non-clustered status. Moreover, certain countries might have experienced geopolitical isolation or been less active in international affairs during

this timeframe, contributing to their non-clustered status. Finally, smaller countries with limited resources and smaller populations might have had less capacity for extensive international engagement during the early years of their existence.

5.2. The clusters formed during the Cold War tensions and global transformations period (1969–1989)

The cluster detection results for the multilateral treaty participation of 28 Asian states during the period from 1969 to 1989 reveal a dynamic geopolitical landscape. The findings for this specific period show that there is an evolution of clusters. The increase in the number of clusters from 3 to 5 and the decrease in the number of non-clustered countries from 10 to 7 suggest a more complex and diverse set of diplomatic relationships during this period (Figure 4). This could be indicative of evolving geopolitical dynamics, global events, and changing priorities among Asian states.

The first cluster, which includes Japan, Malaysia, Thailand, Indonesia, Cambodia, Laos, and Singapore, may suggest a regional economic focus. By exploring the dataset, we can observe a significant number of share treaties these countries collaborated on economic initiatives and trade agreements during this time. The second cluster, comprising North Korea, Myanmar, Vietnam, Afghanistan, Bangladesh, Bhutan, and Mongolia, appears to have a focus on Northern and Central Asian countries. Shared historical, cultural, or geopolitical factors may contribute to this clustering. The third cluster includes major players like China, India, and Pakistan. Yet, it is worth noting that the pairing of Nepal with Maldives and South Korea with Brunei represent specific diplomatic or geopolitical affinities. As compared to the previous period, there are less number of countries, including the Philippines, Sri Lanka, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, and Turkmenistan, that are not clustered with any other.

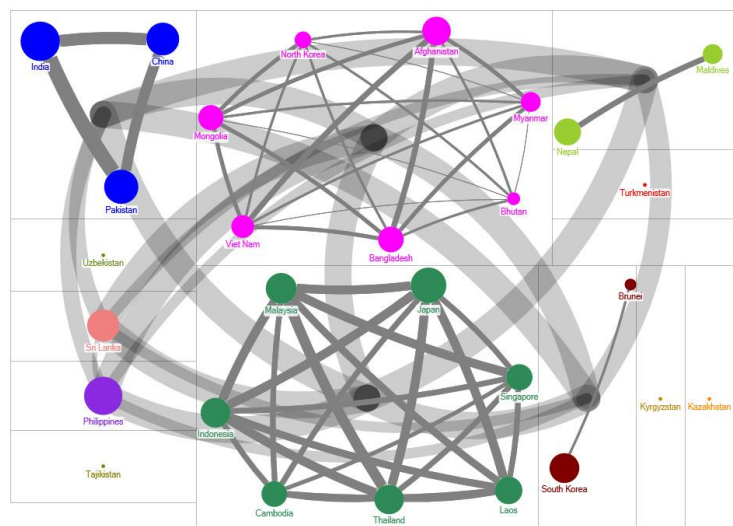


Figure 4. The clustering formed during the Cold War tensions and global transformations period (1969–1989).

5.3. The current state of clustering among Asian states

The cluster detection algorithm running on the whole dataset of multilateral treaty

participation until the year 2022 reveals an interesting current state of clustering among the 28 Asian states. Our research results identified all Asian states are clustered together to form six distinct groups based on their current participation status in multilateral treaties (**Figure 5**). This clustering provides valuable insights into the diverse approaches to international cooperation and treaty negotiation within the Asian region. By categorizing these countries into coherent groups, we could gain a deeper understanding of the complex dynamics and shared interests that shape diplomatic interactions and policy decisions across Asia.

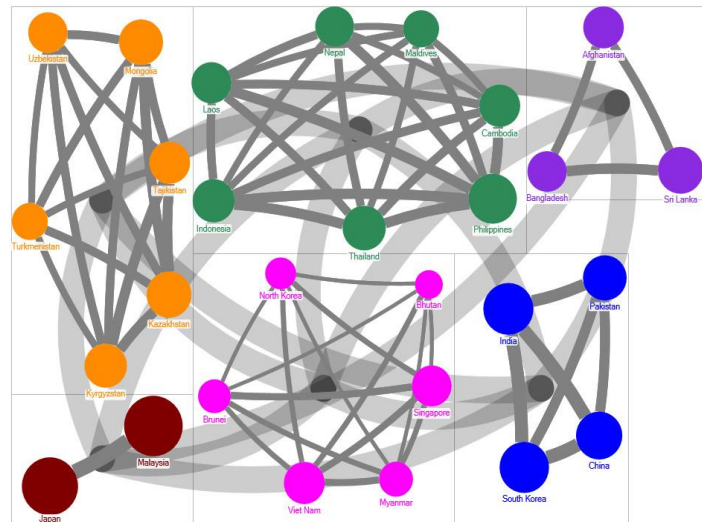


Figure 5. The current state of clustering among Asian states.

5.3.1. Cluster 1: Philippines, Thailand, Indonesia, Cambodia, Laos, Nepal, Maldives

This cluster includes countries that share geographical proximity and regional ties. For instance, the Philippines, Thailand, Indonesia, Cambodia, and Laos share common membership and engagement in ASEAN (Association of Southeast Asian Nations), fostering collaboration and interaction among these nations. Similarly, Nepal and Maldives are engaged in SAARC (South Asian Association for Regional Cooperation), further strengthening ties and cooperation.

This cluster also denotes a grouping of countries that may share similar tendencies or behaviors in engaging with multilateral treaties within the United Nations. These nations could potentially have common interests, policies, or concerns that align their approach to international agreements. The Philippines has participated in a total of 181 multilateral treaties, with a notable focus on the treaties of the three domains of labor, peace, and human rights, by joining 47, 41, and 32 treaties, respectively. In terms of the number of treaty memberships, the Philippines is ranked 61st globally. Thailand and Indonesia follow closely, having joined 145 and 136 treaties of the United Nations, respectively, and are ranked at 98th and 111th positions worldwide. Not only is the total number similar, but the number of treaties in each domain ratified by these states also shows considerable resemblance, establishing them as active participants in the Southeast Asia region. Slightly less active, Cambodia, Laos, and Nepal have each ratified approximately 120 treaties, placing them in the group of 130th position globally. At the lower end of the ranking are the Maldives and

Nepal, participating in 89 treaties.

5.3.2. Cluster 2: Vietnam, Singapore, Myanmar, Brunei, Bhutan, North Korea

This cluster appears diverse yet cohesive based on their treaty participation behavior. It is intriguing because these countries may not share immediate geographical proximity, yet their engagement in multilateral treaties showcases some commonality.

Until 2022, Singapore and Vietnam have ratified around 120 treaties, placing them in the group ranked around the 130th position in terms of the number of treaties. The substantial involvement of Singapore and Vietnam in these treaties underscores their dedication to addressing a diverse array of global issues. This shared commitment is a testament to their recognition of the importance of multilateralism in fostering international relations, cooperation, and the pursuit of common goals. By actively participating in treaties, Singapore and Vietnam contribute to developing a rules-based international order. Their involvement in various agreements reflects a willingness to work collectively on matters of global significance, such as trade, environmental conservation, human rights, and more. As these nations continue to engage in multilateral initiatives, their standing in the global community is enhanced, solidifying their roles as responsible and proactive contributors to the evolving landscape of international relations. The collaborative spirit demonstrated through treaty ratification positions Singapore and Vietnam as valuable partners in pursuing shared global objectives.

Myanmar and Brunei have participated in a modest number of ratified treaties within the ASEAN group, with 89 and 83 treaties, respectively. Myanmar, while progressing slowly in economic development and political liberalization, joined ASEAN in 1994. Since then, Myanmar has actively participated in United Nations multilateral treaties, particularly in trade, peace, environment, labor, and health. Brunei, which became a United Nations member in 1984 and also joined ASEAN in 1994, has flourished economically with oil exports, actively engaging in global trade, environment, peace, labor, and health regimes since the post-Cold War era.

At the lower end of the ranking is Bhutan, with 83 ratified treaties. Bhutan, isolated for centuries, is adapting to globalization while preserving its traditions. North Korea stands out in Asia, having been isolated from multilateral treaty participation from 1953 to 1975 due to its self-reliance ideology and centralized system. In the early 1980s, it joined intellectual property treaties, and since the 1990s, its participation has surged in various domains, including peace, trade, environment, intellectual property, human rights, labor, and health. The trend of North Korea's participation is broadly in tandem with its proactive diplomacy when the neighboring countries of Vietnam, and Singapore visibly and tangibly moved up the ladder of economic development. In the 2000s and 2010s, it joined many other multilateral treaties in the domain of intellectual property. As of 2022, North Korea has registered participation in 74 multilateral treaties, ranking modestly at 179th among 193 United Nations member states.

5.3.3. Cluster 3: Mongolia, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, Turkmenistan

This cluster potentially indicates a regional bloc or alignment among Central Asian countries, suggesting a collective tendency in their approach to multilateral

treaties, possibly influenced by regional dynamics, historical ties, or shared geopolitical interests.

The Central Asia sub-region encompasses both upper-middle and low-income countries and holds significant strategic importance due to its geographic location and natural resource endowments. While historical border and resource disputes strained relations among Central Asian countries, a shift occurred following leadership changes in Uzbekistan in 2016, presenting new possibilities for regional cooperation (European Parliament, 2022a, 2022c, 2022b, 2022d).

All Central Asian countries pursue multi-vector foreign policies, aiming to balance ties with Russia, China, the EU, and the US. In 2019, the EU updated its strategy for Central Asia, focusing on resilience, prosperity, and regional cooperation (European Parliament, 2022a, 2022c, 2022b, 2022d). Despite this, Central Asian states exercise caution in their legislative behavior regarding multilateral treaties, participating in less than 150 treaties out of the total 600 United Nations multilateral treaties (only a quarter). These states share an extraordinary dependence on and vulnerability to overseas markets and external forces for their survival (Inoguchi et al., 2021).

Caution is particularly evident in international trade, commerce, and communication, where Central Asian republics exhibit limited involvement despite transitioning to market economies. Only Kyrgyzstan, Tajikistan, Kazakhstan, and Mongolia have joined the World Trade Organization, while Kazakhstan and Kyrgyzstan are members of the Eurasian Economic Union.

Central Asia also demonstrates modest participation in global peace and labor regimes, averaging around 25% of the total related United Nations treaties. Turkmenistan, primarily closed to the outside world, maintains a ‘permanent neutrality status’ recognized by the United Nations (European Parliament, 2022a, 2022c, 2022b, 2022d), reflected in its participation in 100 treaties and a ranking of 157th position.

5.3.4. Cluster 4: India, South Korea, China, Pakistan

This cluster brings together major powers and regional players in Asia, suggesting a shared level of behavior or interest in engaging with multilateral treaties. This grouping may reflect their geopolitical significance and the complexities of their relationships, both cooperative and competitive, within the international arena.

China, India, and South Korea are major economic powers in Asia, significantly contributing to the region’s GDP and international trade. They share various trade relationships and economic collaborations, influencing their engagement in multilateral treaties to foster trade and economic growth. Actively committed to 189 multilateral treaties until 2022, South Korea exhibits industrial growth similar to Japan. The period from 1976–1977 saw a surge in ratified treaties, especially in peace disarmament and trade-commerce-communication. South Korea has joined treaties in labor and health, intellectual property, human rights, and the environment, ranking 58th globally in the number of treaties participated. China’s engagement in multilateral treaties experienced intervals of disinterest before 1978, aligning with its isolationist and protectionist policies. After opening up in 1978, China entered the multilateral treaty arena, particularly in trade from the mid-1970s onward. As of 2019, China has registered to participate in 166 multilateral treaties, with a focus on peace,

trade, labor and health, intellectual property, human rights, and the environment, ranking 68th globally. Participating in 194 treaties, India is ranked 1st among South Asian states and 55th among 193 United Nations members. India's active commitment is evident in the peace (44 treaties), trade (42 treaties), and labor and health (42 treaties) domains. However, cautiousness is observed in human rights, where it has ratified 26 out of 53 deposited treaties.

Despite political turmoil, Pakistan is a member of 148 multilateral treaties, ranking 96th worldwide. Its participation spans peace and disarmament, trade, commerce, and communication, labor and health, human rights, the environment, and intellectual property. However, the number of treaties in intellectual property is relatively low, with only 9 treaties.

This diverse cluster reflects a convergence of interests and behaviors among major Asian powers, showcasing the intricate dynamics of their relationships and the impact on multilateral treaty participation.

5.3.5. Cluster 5: Sri Lanka, Afghanistan, Bangladesh

This cluster seems to unite countries that may be influenced by shared regional dynamics or specific challenges, shaping their approach to participating in multilateral treaties. This alignment could indicate their common interests or concerns that set them apart from other groups.

Strategically positioned between the two emerging Asian powers, China and India, Afghanistan, Bangladesh, and Sri Lanka adopt a foreign policy focused on balancing the interests of both Western and neighboring countries (Ahmed, 2019; Pyakurel, 2019; Roy, 2019). Consequently, these three nations exhibit similar membership patterns towards approximately 120 treaties, ranking equivalently at around 130th worldwide.

5.3.6. Cluster 6: Japan and Malaysia

The smallest cluster, comprising only two countries, indicates a unique behavioral pattern distinct from larger clusters. These two nations may have specific reasons or approaches that set them apart from broader Asian regionalism when engaging in multilateral treaties.

Among the 28 Asian states examined in this research, Malaysia and Japan exhibit the most active participation in multilateral treaties. Malaysia is a party to 265 treaties, while Japan is involved in 243. Malaysia and Japan are also ranked at 40th and 42nd positions among 193 United Nations members, respectively.

In terms of United Nations multilateral treaties, Japan leads in East Asia by joining 243 treaties. This prominence is expected, given its status as one of the few OECD club countries outside the West with numerous multilateral commitments. Japan gained United Nations membership in 1955, primarily engaging in policy domains such as labor and health, measurements and standards, intellectual property, trade, commerce, communications, and human rights during the 1950s. In the 1970s, Japan became part of the Group of Seven (G7), contributing to a significant increase in multilateral treaties from the 1970s to the 1990s. The post-Cold War era witnessed a steady rise in Japan's participation, particularly in the domains of intellectual property, human rights, and the environment. By 2022, Japan had joined 94 out of 265 treaties related to trade, commerce, and communication, 47 out of 84 treaties in peace

and disarmament, 39 out of 110 treaties in labor and health, 27 out of 36 treaties in intellectual property, 19 out of 52 treaties in the environment, and 17 out of 53 treaties in human rights, ranking 42nd globally in multilateral treaty participation.

Malaysia holds the top position among the Asian states, ratifying 265 United Nations treaties, and securing the 40th rank globally in multilateral treaty participation. Malaysia's distinct position in the region is primarily due to the number of treaties ratified in the trade, commerce, and communication domain, which is five times more than those joined by other regional members.

In summary, these results highlight the current situation of six distinct Asian identified based on states' tendencies to participate in or refrain from multilateral treaties across six policy domains. Despite a shared aspiration among Asian states to promote prosperity through economic growth, scientific progress, compliance with international law, and ethical principles in the 21st century, there is considerable diversity in their levels of adoption. These differences contribute to the complex dynamics and intricacies of Asian regionalisms, shaping their interactions, cooperation, and endeavors toward regional integration.

6. Conclusion

In this study, we utilized a social network analysis approach to identify clusters of multilateral treaty adoption among Asian states. By analyzing a dataset containing 600 major multilateral treaties deposited in the United Nations system, covering various global issues, and providing information on participating countries, we focused on identifying relevant attributes such as the domain of cooperation within these treaties. These selected features were used to measure similarities or differences between pairs of countries, enabling us to apply clustering algorithms to group countries based on their similarities. We utilized the commonly used clustering algorithm-Louvain algorithm to examine shifts in regionalism's membership dynamics. Our findings illuminate the diversity and complexity of Asian regionalisms in their engagement with multilateral treaties. The evolving clustering throughout the world timeline suggests shared interests, historical connections, geopolitical dynamics, and regional affiliations that influence countries' behaviors in international agreements. This discovery sets the groundwork for further research on the potential trajectories of the four Asian regionalisms amid evolving global dynamics, considering their willingness and ability to participate in multilateral treaties. Moreover, these identified clusters could serve as a framework for understanding potential alliances, cooperation, or conflicts within the region, impacting geopolitical strategies, economic partnerships, and diplomatic relations among these countries.

Future research could delve into the underlying reasons for these groupings. Factors such as historical connections, economic interdependence, security considerations, cultural similarities, or geopolitical ambitions could be influencing these clusters. Additionally, exploring how these clusters might evolve in response to changing global dynamics could offer deeper insights. Furthermore, our forthcoming studies could aim to incorporate bilateral treaties or explore alternative datasets to further enrich the analysis and provide a more comprehensive understanding of treaty-making processes and their implications. Looking ahead, it would be beneficial for

subsequent studies to investigate methodologies for integrating other Asian actors, such as Taiwan, and their unofficial diplomatic efforts into analyses of regional dynamics and multilateral cooperation in Asia. This approach can lead to a more comprehensive understanding of the intricacies of Asian affairs and the varied range of actors influencing regional relations.

Author contributions: Conceptualization, LTQL and DQH; methodology, LTQL; software, DQH; validation, LTQL and DQH; formal analysis, LTQL and DQH; investigation, LTQL and DQH; resources, LTQL and DQH; data curation, LTQL and DQH; writing—original draft preparation, LTQL; writing—review and editing, LTQL; visualization, DQH; supervision, LTQL; project administration, LTQL; funding acquisition, LTQL. All authors have read and agreed to the published version of the manuscript.

Data availability: The dataset analyzed during the current study is available in the Dataverse repository: <https://doi.org/10.7910/DVN/TIEHZK>. This dataset was derived from the following public domain resources: Multilateral Treaties Deposited with the Secretary-General, United Nations, New York, as available on <https://treaties.un.org/Pages/ParticipationStatus.aspx>; NORMLEX - Information System on International Labour Standards as available on [https://www.wipo.int/treaties/en/](https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:1:0;WIPO Administered Treaties as available on <a href=).

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