MIDDLE POWERS IN THE SPACE DEVELOPMENT: A COMPARATIVE ANALYSIS OF SOUTH KOREA AND INDONESIA

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Abstract

"Middle powers" is an academic term that encompasses the external manifestations of a state actor, such as spatial scale, resource volume, economic strength, geostrategic position, and international influence. Research on middle powers has gradually progressed from area studies to governance research on specific development fields. This article begins by providing the theoretical definition of middle powers and reviewing the practices of state actors, then applies the concept of middle powers to the space field. By reviewing the new theoretical concept of "space middle powers" and designing the "Space Power Ladder" model in methodology, this article summarizes the development-related factors and analyzes comparative cases, highlighting the similarities and differences in the background and implementation paths of South Korea and Indonesia in the space field, which are middle powers in a general sense. By demonstrating the causal relationship between the space development of different middle powers and related influencing factors, this article proposes theoretical supplements and innovations for both typology and general research of global middle powers.

***Keywords**: Middle Powers, Space Middle Powers, Space Power Ladder, Space Law, Space Cooperation*

1. Introduction

Global governance is the main focus of international relations. From the perspective of structural analysis, it can be divided into hierarchical and behavioral dimensions. In terms of the first, global and regional levels are the primary differentiations. In the global arena, superpowers hold the core position, while in the regional stage, middle powers are the actors with influence in specific issue areas. On the other hand, Global Commons has emerged as a new topic for global governance, referring to resources and spatial domains that belong to all mankind outside state sovereignty, including the high seas and international seabed area, international airspace, the polar, cyberspace, and (outer) space (Ren, 2014: 120-126). Regarding space as global commons, space resources are the environment and materials that exist in space and can be utilized by humans, such as solar energy and planetary minerals. The spatial distribution includes the moon and Earth orbits, where satellites perform tasks. The space commons possess the contradictory attributes of non-excludability and competitiveness (Han, 2018: 2). Although the Outer Space Treaty, known as the Space Constitution, stipulates that all countries can freely explore space, the high cost of space activities means that only a few countries with both technological and economic capabilities can, in reality, carry out such endeavors, resulting in a power hierarchy rooted in material levels. In such a system, each country has different motivations, paths, and visions toward space development. This article discusses the application and extension of the concept of middle powers in international relations theory toward the space field. It is divided into the following parts: First, clarify the theory of middle powers and sets the concept of space middle powers as the derivation of the original theory, creating a framework for the positioning of middle powers in space. Second, through case studies of South Korea and Indonesia, addressing the research question: How do the two representative middle powers in their region show different development processes and achievements in space? By analyzing the practices, causal factors, and ideal paths of different middle powers in the space field, it draws a well-rounded outline of the development logic of the space middle powers.

2. Concepts of Middle Powers and the Practice of South Korea and Indonesia

The following section will interpret the basic concept of middle powers, exploring the positions and practices of South Korea and Indonesia as examples of middle powers. A country should have the material criteria, with a subjective stance of identity as a middle power. When facing diversified global issues, middle powers play the role of providing expert support to solve problems

(Cooper, 1993: 19-21). Additionally, the political foundation of middle powers is based on the regional level. The structural position of a country in the region affects its capacity building and highlights the representativeness of a middle power.

2.1. The Origin of Middle Powers

The concept of middle powers can be traced back to the description of the Italian thinker, Giovanni Botero, in the 16th century. Botero classified countries into three types: small, medium, and great countries according to their self-defense and autonomy. He proposed the prototype of middle powers as countries with moderate strength and wealth, which have the longest enduring regimes (Holbraad, 1984: 10-13). The contemporary theory of middle powers originated from the post-World War II period. The political elites of Canada and Australia proposed the positioning of middle powers as the strategic origin and the keynote of diplomatic activities. It gradually became a behavioral model for many countries with a strong sense of being a powerful state, despite their comprehensive strength is inferior to that of traditional great powers (Ding, 2014: 46).

Cui pointed out that the criteria for identifying a middle power derive from the quantitative values of national strength, such as population, territory, gross domestic product (GDP), and military expenditure, as well as non-material capabilities, such as domestic governance and diplomatic influence (Cui, 2019: 41). Soeya argued that the middle powers status is primarily determined by a country's resources and knowledge in specific global governance issues like human rights, environmental protection, and arms control. A middle power seeks to expand its influence in these agendas by utilizing relative advantages, or acting as a coordinator when disputes occur (Soeya, 2020: 8-11). For cutting-edge technology, middle powers tend to focus limited resources on specific industries. They may not lead the research and innovation but can still shape a niche network of representative industries through existing specialization and transnational supply chains. Canada and South Korea's remarkable success in artificial intelligence and semiconductors serve as excellent examples (Kim, 2021: 3). Özkan proposed the idea of Pivotal Middle Powers, which refers to countries with a certain population and territory size at important geopolitical locations, and with the ability to influence regional or global affairs through alliances or neutrality (Özkan, 2006: 77-95). The concept of middle powers also involves subjective identity, that is, whether a country has the mindset of a middle power. The role of a state actor is fluid, constructive, and inter-subjective while middle powers can identify their international roles and engage in corresponding issue areas (Lee, 2015).

2.2. South Korea and Indonesia from the Perspective of Middle Powers

South Korea's modernization was driven by emerging industries such as the electronic industry in the 1970s and became one of the Four Asian Tigers. Today, the country's GDP per capita ranks among the top 30 in the world, and, in 2021, was recognized as the fourth most developed country in Asia. South Korea's attempt to achieve a middle power status has been reflected in the foreign policies of successive leaders. The New Asia Initiative proposed in the Lee Myung-bak period aimed to strengthen South Korea's influence through international aid and free trade agreements, and discourse power in global issues such as climate change. During the Park Geun-hye administration, the Eurasia Initiative proposed to expand the transcontinental economic and trade networks with South Korea as the axis of connection. In 2013, South Korea invited Mexico, Indonesia, Turkey, and Australia to jointly establish the "MIKTA"[1], which was a significant practice of South Korea's involvement in global governance as a middle power. MIKTA is a cooperation platform, that acts as the catalyst for paradigm shifts in global governance and a coordination tool for appeasing great power conflicts. Overall, South Korea's construction and cognition of middle powers have developed in an orderly manner in the spatial perspectives, radiating from its sub-region (Northeast Asia) to the region (Asia), cross-region (Eurasia), and eventually to the whole world.

For Indonesia, it was not until the beginning of this century, that economic reforms were initiated after its domestic politics entered a more normalized track. With its large population and demographic dividends, Indonesia has demonstrated a strong development potential. In 2019, Indonesia's annual GDP was $1.21 trillion, ranking as the largest in ASEAN and the 16th largest economy in the world. On the other hand, Indonesia is the largest archipelagic country in the world, spanning across Asia and Oceania and controlling international waterways connecting the Pacific and Indian Oceans. In 2016, the Jokowi administration proposed the Poros Maritim Dunia (Global Maritime Fulcrum) to seek a stronger maritime power, reflecting that, facing lags in technology and its economy, Indonesia is utilizing its natural resources to expand national interests and enhance international prestige. In terms of ideology, Indonesia has upheld the Negara Besar (Big Country) vision and has put it into practice at the regional level through the integration of ASEAN (Abbondanza, 2021). Indonesia actively works on institutional construction and discourse output, consolidating its leadership in ASEAN (Bi, 2020: 21-24). Wang argues that Indonesia's middle power status has prompted it to adopt a "great power balance" in dealing with external interventions, operating power

[1] MIKTA is the concatenation of the first letters of the five countries.

levers in the competition among great powers to obtain more discourse in issues such as territorial disputes (Wang, 2020: 11-13).

Lee used five indicators: population, GDP, territorial scope, defense expenditure, and life expectancy, to evaluate the dynamic level of global middle powers (Lee, 2017: 26-30). Indonesia leads among others in population and territory representing natural endowments. Meanwhile, South Korea surpasses Indonesia in GDP and life expectancy, showcasing different facets of the middle powers. Regarding defense expenditure, South Korea lags slightly behind Japan in Northeast Asia, while Indonesia ranked second only after Singapore within ASEAN, highlighting the importance of military security at the regional level for both countries.

3. Middle Powers in Space: Development and Power Ranking of South Korea and Indonesia

As human history enters the space age, international politics has also expanded into that domain. This section focuses on the concept of space middle powers by combing space power theories and categorizations. Afterward, through the case studies of South Korea and Indonesia, it explores their actions in the limited resource and the latecomer status. Finally, relevant development elements are extracted for modeling and positioning the comprehensive level of space development between the two countries, serving as a theoretical basis for comparative research.

3.1. Space Power Equations and Space Middle Powers

Hays argued that the space power theory is a conceptual framework for interpreting the behavior and impact of state actors pursuing security, economic, and scientific goals in space. The space power theory is linked to Alfred Mahan's theory of sea power, which emphasizes the importance of maritime transport and naval strength for national prosperity, while the former concerns the mechanism through which space activities and material construction promote overall national development and power projection (Hays, Lutes, 2007: 206). Johnson recognizes that space power is intertwined with a country's composite national strength and international leadership. Countries pursue their interests by utilizing resources through the medium of space (Johnson, Pace, 1998: 5-8). According to the manual of the US Space Force—*Space Power: Doctrine for Space Force*, space power is the relative strength of a country's material construction in space for diplomatic, military, and economic purposes (*Doiron*, 2020: 12-13). Space programs conducted publicly reveal evidence of state actors' intention and capability to achieve national interests. Space power also refers to a country's ability to seek a secure situation in anarchic planetary space. A country with space power can maintain

its existing advantages, limit the participation of others in space and expand the power gap. The current global space power structure was shaped by the Cold War. With the dynamic changes in the international system, countries pursue their interests and challenge the traditional paradigm. For the latecomers in space, space activities motivated by prestige, such as joining multinational space programs or launching satellites, can achieve certain benefits while strengthening national pride.

Klein integrated the hierarchy of the international system with the degree of technological development, categorizing three types of space countries. Space middle powers, such as the United Kingdom, France, Japan, Israel, and India, have the capability of launching and operating satellites. Space superpowers, including the United States, Russia, and China, have the additional power of manned spaceflight technology. New entrants into the exploration of space are mostly capable of developing satellites but require the assistance of other countries' launch vehicles (Klein, 2012: 111). Harvey outlined the process of countries appearing in the space age. The space superpowers began with the Soviet Union's launch of the first artificial satellite in 1957 and subsequently engagement in the space race with the US. The space middle powers followed the footsteps of the US and the Soviet Union one after another as Japan, Israel, and India launched satellites after the 1970s (Harvey, Smid, 2010: 543-545). In the 1990s, some developing countries realized the necessity of entering space and began investing in space programs (Ahsan, 2019: 39). South Korea started a rocket program in 2009. Iran successfully launched its independently developed satellite Omid. The categorization of space countries also means the dynamic identity of individual countries in the development process. China started its space programs in the 1950s, and in 2003, Shenzhou 5 completed a manned space mission, making China the third space superpower.

Golston proposed indicators for judging space middle powers based on the theoretical foundation of middle powers in international politics. First, they have limited autonomy, relying on space services provided by space superpowers or international cooperation. Second, they have relatively abundant economic resources and supporting industrial networks. Third, they have respected status and a certain degree of discourse power globally (Golston, 2015: 2-4). Dennerley noted that the technological differences among space countries lead to an asymmetrical trajectory of space activities and space-industrial ecosystem. Compared with the high politics of space security and strategic competition among space superpowers, space middle powers are more concerned with space governance and actively participate in relevant international norms and technical standardization (Dennerley, 2016: 28).

3.2. Development and Achievements of South Korea and Indonesia in Space

South Korea

South Korea entered space relatively late. In 1989, the Satellite Technology Research Centre (SaTReC) was established to develop microsatellites. The Korean Aerospace Research Institute (KARI) was founded as a specialized national agency in the same year. In 1992, South Korea collaborated with the UK's Surrey Satellite to launch its first satellite, Kitsat-1. In 1999, South Korea launched the first self-developed Low Earth Orbit (LEO) satellite, the KOMPSAT-1 (Hwang, 2006: 197), followed by several KOMPSAT series mapping and meteorological satellites for Earth exploration. In 2010, the self-developed geostationary orbit (GEO) satellite COMS-1 was successfully launched. During the same period, Yi So-yeon became the first Korean to go into space when she arrived at the International Space Station in 2008 (Lele, 2013: 73-76).

South Korea has always faced constraints in space development due to the lack of satellite launch technology. Rocket tests conducted in 2009 and 2010 ended in failure until KARI successfully launched the Naro-1 (KSLV-I) in 2013. However, the core components of the rocket were manufactured by Russia, meaning it cannot be regarded as an independent achievement. In 2022, South Korea launched the Nuri (KSLV-II), which successfully sent a simulated satellite into orbit, marking a historical milestone in space programs. The rocket was independently designed, manufactured, and operated by South Korea, demonstrating the country's rapid growth as a latecomer. The development process of the Nuri shifted from a government-led model to a private-driven one, with over 300 local enterprises participating, highlighting the integrity of industrial links across rocket technology, positioning systems, and space materials. In the same year, the lunar probe "KPLO Danuri" was launched on the Falcon 9 rocket of SpaceX, successfully entering the predetermined orbit to conduct one-year research on the lunar environment. South Korea became the seventh country in the world to conduct moon exploration (Dobrijevic, 2023). South Korea plans to launch over 100 communication and observation satellites by 2030, while Samsung proposes the blueprint for a Space Internet constellation comprising 4,600 microsatellites (Liu, Yin, 2018: 59). In terms of space infrastructure, the Naro Space Center was built in 2009 as KARI's first launch site, with rocket missions being launched from the center over the years. After the success of the Nuri, South Korea became the seventh country globally to use a domestic rocket to launch satellites into space.

Moreover, to address the long-term military threat from North Korea, the South Korean military has developed a "three-axis defense system" including a kill chain, a missile defense system, and a punitive retaliation system. Space technology has been integrated into the military domain with precise satellite positioning being a crucial component. In 2015, the South Korean Air Force established the space warfare center to carry out surveillance activities as a preliminary step towards building a space force (Liu, 2018: 27). In 2021, the Air Force Space Center, responsible for formulating space defense policies, was established. The Center plans to launch reconnaissance satellites before 2025 to enhance space situational awareness, with the ultimate goal of establishing an expert space force before 2050 (Choi, 2021).

Indonesia

Based on vast archipelago territory and important geopolitical position, Indonesia started its space program in the early 1960s to facilitate land and resource management, as well as pursue national security. In 1963, the National Aeronautics and Astronautics Commission (Dewan Penerbangan dan Antariksa Nasional Republik Indonesia, DEPANRI) was established to formulate space policy and coordinate resource allocation, while, during that same year, the National Institute of Aeronautics and Space (Lembaga Penerbangan dan Antariksa Nasional, LAPAN) was created to implement the space program. LAPAN initially focused on satellite programs and successfully launched the self-developed Palapa-A1 communication satellite in 1976, which began transmitting telephone and television signals to receiving stations scattered throughout the islands, making Indonesia the first developing country to have its satellite (Barker, 2005: 703). Subsequently, several Palapa series were launched completing a communication satellite network. These satellites not only improved the living conditions and basic infrastructure for the people but also served as political engineering to unite ethnic groups and consolidate the unity of the country (Ibrahim, 2004: 5-7). In the 21st century, Indonesia cooperated with Germany in 2007 to launch the LAPAN-Tubsat remote satellite and then developed the LAPAN A2 and LAPAN A3 micro remote satellites based on the former. Those two were launched into orbit respectively in 2015 and 2016 providing multipurpose telemetry services (Sarma, 2019: 6).

Despite certain achievements in satellite application, Indonesia lags relatively behind in launch technology. LAPAN has launched several RX series rockets since the 1980s, and in 2009, the RX-420 rocket reached the highest altitude of 66 kilometers, far below the international space boundary of 100 kilometers, known as the Kármán line (Maulia, 2014). Hindered by macroeconomic underperformance and political instability in the early 2000s, Indonesia conducted small rocket tests collaborating with China until 2020. In

2017, LAPAN released the "2016-2040 National Space Development Blueprint", which outlined short, mid, and long-term goals. The blueprint aimed to start the rocket program by 2029, complete the vehicle by 2039, and finally launch a domestic satellite in 2040 (Pratistha, 2020).

3.3. Analytical Framework and Development Model of Space Middle Powers

The Space Power Ladder Model

There are no comparable categories of conceptual cognitions as space development being a common pursuit of normal states in the perspective of international politics. At the material dimension, based on the progressive indicators of the complexity of the construction of space institutions, the development of different orbital satellites, and launching operations, Wood and Weigel classified and analyzed different cases of space programs in developing countries in Asia, Africa, and Latin America, and summarized the reference paths that state actors can follow in different space development stages (Wood, Weigel, 2012: 211-236). Scatteia approached the issue from the perspective of space activities assisting socioeconomic development, using indicators such as access to space, and participation in international space cooperation to evaluate different types of space countries (Scatteia, 2020: 3-6). On the aspect of security, the Copenhagen School advocates that security issues are a social construction process. States securitize things that originally have no security significance and constantly elevate existential threats, mobilizing resources to respond (Chen, 2008: 115). Today, the process of space securitization has become a trend (Peoples, 2010: 206) containing two concepts: space weaponization and space militarization. The former refers to the deployment of weapons in space aimed at destroying targets in orbit or on Earth, while the latter refers to the extension of space as a military entity on Earth. Once space technology is applied for military purposes (weaponization), it irreversibly leads to changes in warfare (militarization). The two concepts show the logical relationship of space securitization.

Through defining the concepts of space country levels, referring to relevant research on space power assessment, and combining classic international relations theory, this article proposes the comparative analysis framework for evaluating the space development of different countries, the Space Power Ladder model. This model consists of three progressive categories: space institution construction originating from liberalism in international relations, the development level of key space technologies representing realism, and the degree of space securitization representing constructivism. The model includes eight sub-indexes under each category.

Based on this, space countries are classified, and a comparative study of South Korea and Indonesia is conducted in the following text.

The starting point of the Space Power Ladder is the establishment of a national space institution. Space countries establish specialized agencies, propose clear strategies and goals, regularize space activities, and serve as representatives in the international space community (Kommel, 2020). Countries as space new entrants mostly establish expert offices consisting of cross-disciplinary experts to plan initial policies. Space middle powers and space superpowers set up official administrative units responsible for executing space plans and managing conventional activities. The second-layer indicator is the development level of key space technologies that symbolizes the extent of a country's industrialization. Satellites are the basic threshold for space countries. Space new entrants usually can develop and operate satellites but lack launching capabilities. Space middle powers further develop carrier rockets with the ability to launch satellites. Space superpowers go beyond these two steps, having manned spacecraft capable of interplanetary landing and being involved in the operation of space stations. The highest level of the model is the level of space securitization in the ideological hierarchy. Space superpowers, at the top of technology, seek space hegemony or strategic balance. They are the most aggressive in space securitization and have military branches to deal with space warfare. Space middle powers have a certain scale of space military-industrial capacity and are gradually developing their space military sectors. However, they tend to advocate international norms for space arms control and maintain space security through cooperation. Space new entrants have not yet entered the field of space military and often support initiatives of space "de-securitization" (Shapira, Baram, 2019: 7-21). Table 1 displays the stage categories and the belonging sub-indicators in the matrix and assigns different features weight based on the level of development. The space superpowers (code S) are assigned a weight of 3, the space middle powers (M) of 2, and the space new entrants (N) of 1, which are then added up. The total weight score of 3 is for space new entrants, 8 for space superpowers, and 4-7 is the estimated range for space middle powers.[2]

[2] The research target of this article is the space middle power, thus a broad definition of weighted summation is used in the theoretical analysis to find out different development gradient spectra formed within the interval of space middle powers.

Table 1: *Space Power Ladder Model*

Corresponding IR Theories	Stage Categary	Space Power Ladder	Weight of Development
Constructivism	Degree of Space Securitization (L3)	(S3) Having the formal space force to conduct space strikes	3
		(M3) Having military-industrial capacity and developing space military	2
		(N3) Only non-security space agencies are established	1
Realism	Key Space Technologies (L2)	(S2) Having manned space capability and operating space stations	3
		(M2) Develop carrier rockets to launch satellites independently	2
		(N2) Develop and operate satellites but lack the launching ability	1
Liberalism	Space Institutional Level (L1)	(S1/M1) Official space administration agency implementing space programs	2
		(N1) The expert office responsible for initial policy planning	1
			(Total Weight)

Source: author's illustration

South Korea and Indonesia on the Space Power Ladder

According to the discussion of the current space development in South Korea and Indonesia, Table 2 summarizes the Space Power Ladder index of the two countries. It can be seen that South Korea ranks at the index ceiling of space middle powers in terms of space institution construction, key space technology, and space securitization. Indonesia lags in key space technology and has not yet been involved in space security affairs. This shows that although both countries belong to the same categorized interval of space middle powers, there is a great difference in their development contexts within that interval: Indonesia belongs to the initial stage of space middle powers, while South Korea, as a mature one, is gradually transforming into a space superpower.

Table 2: *Space Power Ladder Index of South Korea and Indonesia*

Stage Categary	Space Power Ladder	South Korea	Indonesia
Space Securitization (L3)	(M3) Having military-industrial capacity and developing space military	2	
	(N3) Only non-security space agencies are established		1
Key Space Technologies (L2)	(M2) Develop carrier rockets to launch satellites independently	2	
	(N2) Develop and operate satellites but lack the launching ability		1
Space Institution (L1)	(M1) Official space administration agency implementing space programs	2	2
	Space Power Index	6	4

Source: author's illustration

4. Policy Options, Regulations, and International Cooperation: Comparative Analysis of Space Middle Powers

South Korea and Indonesia belong to the MIKTA group of middle powers, and both consider space development as a national strategic priority. However, the situation and achievements of the two countries in space have resulted in a reverse tilt in the conceptual connection between traditional middle powers and space middle powers. Li argues that South Korea establishes its middle power position through soft power outputs such as economic exchanges and international aid, but the regional security architecture with external countries' intervention has weakened its overall representation in the traditional concept spectrum of middle powers (Li, 2016: 59-60). Conversely, security risks have been the driving force behind South Korea's rapid progress in space accomplishments. On the other hand, Indonesia's representation within ASEAN and its effective constraint on external countries in the region continuously reinforces the foundation of traditional middle power. However, despite the rise in comprehensive national strength, Indonesia has yet to escape from the process of poverty reduction, and there have been debates about the priority of financial investment and resource allocation exclusion effects for space programs. This article found that for a state actor, there is an inter-constructive relationship between the characteristics of a "middle power" and those of a "space middle power": the characteristics of a middle power are weaker than those of a space middle power, and the reverse one as the characteristics of a middle power are stronger than those of a space middle power. South Korea and Indonesia belong to the two different types separately. Through the comparison of the two countries in the attributes of traditional middle powers and space middle powers one can explain the different paths, performances, and related influencing factors of space actors under the given scenario of a middle power. This highlights the core research value of this article.

For both countries, there is the main research question to answer： What kinds of tendencies exist in the changes and integration between the traditional middle powers and the space middle powers presented in this article? Figure 1 shows the hierarchical categories of the Space Power Ladder model and the corresponding progressive timeline of the two countries' space development. For South Korea, KARI was established in 1989 as a permanent national space agency, marking the country's initial achievement as a space middle power (M1). It has subsequently completed various satellite deployments and successfully launched the rocket in 2022, marking the second milestone (M2) for space middle powers. Almost simultaneously with the rocket program, space military construction was also started (M3). In contrast, Indonesia established a national space agency in the early 1960s (M1). LAPAN

successfully developed the Palapa satellite (N2) in the 1970s. However, it has long been stagnant in launch technology and still relies on Chinese and Indian rockets nowadays. Indonesia had not carried out any space military construction until the emergence of a vision initiative in 2015 (N3) (Triharjanto, 2016: 74-81). Thus, one assumes that the main factors affecting the development of space middle powers are the functions of the state apparatus, such as establishing institutions and regulations, determining policy directions, and carrying out international cooperation. The following will focus on the observed variables in the space development processes of South Korea and Indonesia, comparing the specific phenomena of the two countries as space middle powers of different patterns.

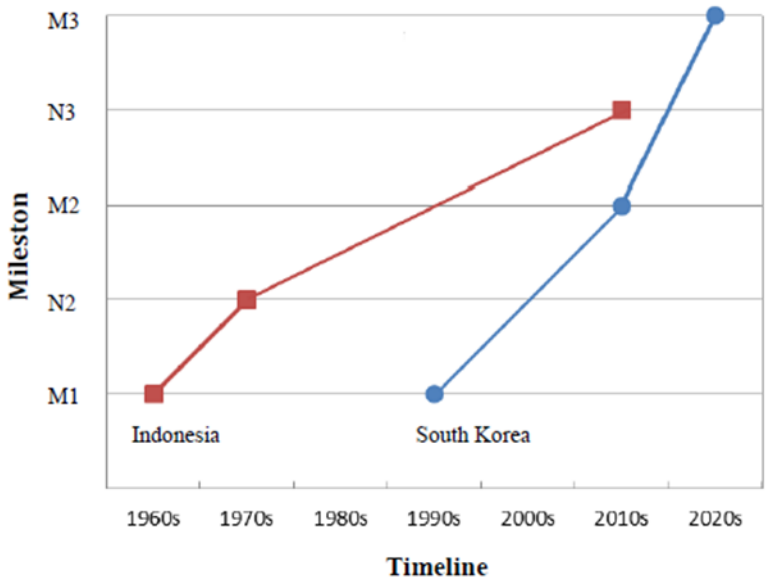

Figure 1: *Development Curves of South Korea and Indonesia on the Space Power Ladder*

Source: author's illustration

4.1. South Korea

Space Administrative Organization and Regulatory Framework

The Committee of Space Industry Policy Promotion established in 1980 was the beginning of South Korea's space policy research. In 1987, the Aerospace Industry Development Promotion Act was enacted, laying the regulatory foundation for space affairs (Kim, 2010). After KARI was established as the core unit, in 1996, the first official policy document, the National Space Development Plan 1996-2015 was released, confirming mid

and long-term strategy in areas such as satellites, launch vehicles, and space exploration (Gao, 2011: 36). The Space Development Promotion Act, formulated in 2005, was the milestone of space legislation by stipulating the space development system and the regulations of space activities. The Basic Space Development Promotion Plan introduced in 2007, was significant in setting the policy principles and goals of space development centered on ensuring core technology. Since then, South Korea's space development has moved from technology dependency to the route of technology independence (Wan, 2010).

The Space Development Promotion Act has restructured the three-level governance system of decision-making, management, and research and development for space development. In 2005, the Korean National Space Committee, which is the highest decision-making body for space development, was established, responsible for deliberating on space policies and laws. The Committee formulates the five-year Basic Space Development Promotion Plan and directly reports to the President. The Ministry of Science and ICT (MSIT) is the management department for coordinating, guiding, and being accountable based on the current Basic Plan. KARI is the research and development department responsible for the actual implementation of different projects in the Basic Plan and for coordinating the public and private space sectors. After 30 years of development, South Korea has established a legal system based on the Space Development Promotion Act as the fundamental law, supplemented by auxiliary laws such as the Space Industry Development Promotion Act, with the three-level governance setup, forming a sound mechanism for regulatory and administrative operations.

Industrial Development and International Cooperation

After the first Basic Space Development Promotion Plan was released in 2007, the development path of the space industry has centralized on private sectors. In the second and third phases of the Basic Plan in 2012 and 2018, the development goals of "expanding private sector participation and strengthening overall industry capacity" and "nurturing the space industry and creating related job opportunities" were proposed. According to statistics from 2016, the budget for South Korea's space sector accounted for only 3.91% of the government's total research budget, compared to 7.9% in Japan and 25.8% in the US. Practically, the Korea Aerospace Industries (KAI), a joint venture of chaebols between Samsung, Daewoo, and Hyundai, was responsible for the entire production process from part design to assembly of the local satellite systems (Wang, 2019: 11). Additionally, South Korea actively promotes the university-enterprise cooperation model to strengthen industrial competitiveness and cultivate professionals, while acquiring cutting-edge research know-hows

through international exchanges among academic institutions and reducing the political sensitivity.

As a latecomer in space, South Korea relies on international interaction to enhance domestic capabilities, shaping a quick path to achieve leapfrog space development. An important practice is cooperation with Russia. The core technology of the Naro was provided by the latter, which was also the behind-the-scenes supporter of South Korea's manned space mission. Space cooperation between South Korea and the United States mainly focuses on the civil domain. Since 2013, the "ROK-U.S. Space Cooperation Working Group" and the "ROK-U.S. Civil Space Dialogue" have been created as regular interaction mechanisms. In addition to bilateral interaction, South Korea is also committed to promoting multilateral space diplomacy. By participating in platforms such as the International Astronautical Congress (IAC), the Group on Earth Observations (GEO), and the Space Situation Awareness (SSA) initiative, South Korea exchanges information with other countries on risk management such as space debris disposal and space collision prediction, actively enhancing its influence in astropolitics (Liu, 2018: 29).

4.2. Indonesia

Space Administrative Organization and Regulatory Framework

Indonesia entered the space field with the creation of DEPANRI in 1963. Subsequently, LAPAN was established under the DEPANRI framework to be in charge of space research and executing the space program developed by DEPANRI. LAPAN initially aimed at rocket development and manned space engineering, but was ruined by the Challenger space shuttle disaster in 1986, prompting Indonesia to terminate cooperation with the US in such fields, dealing a blow to its frontier projects (Mayerchak, 1989: 97). Since then, LAPAN has turned to promoting space development for peaceful purposes with the primary goal of improving people's well-being. Originally DEPANRI was the highest space authority in Indonesia. It was chaired by the president, with the chairman of LAPAN serving as the executive secretary, and the general members include high-ranking officials related to the space field, such as the Minister of Defense and Security, the Minister of Communications, and the Chief of the Air Force. DEPANRI was responsible for assisting the president in formulating overall space policies, providing advice and recommendations, and drafting long-term development plans (Wiryosumarto, 1999: 37). However, since its establishment, DEPANRI has held only two joint conferences in 1994 and 1998. The mere achievements of the meetings were to clarify space development positioning, confirm the civil sector as the development orientation, incorporate space plans into the project of the national

development plan (Rencana Pembangunan Jangka Panjang, RPJP), and decide to formulate space laws (Supancana, 2022: 37-39).

The scope of law No. 21 of 2013 on Space Activities covers all space activities in Indonesia, codes of conduct for international space cooperation, and international obligations to be fulfilled under the space treaty system (Jones, 2014: 58). Along with the first space law, there was a major restructuring of the space administrative system that dissolved the ineffective DEPANRI and merged its decision-making and executive systems to LAPAN, which now assumes DEPANRI's previous functions, and is mandated to report to the president under the new law (Nugraha, Putro, 2022: 8).

Industrial Development and International Cooperation

Compared to South Korea's pursuit of independent development, the Indonesian space industry has been constrained by limited configurable resources and industrial lag, indicating a high dependence on international cooperation. Broniatowski argues that international cooperation in the space industry has direct and indirect benefits such as mastering technology, saving the sunk cost, promoting sustainability, and stabilizing the labor market (Broniatowski, 2006: 1-4). For Indonesia, international space cooperation can be divided into three different contexts: bilateral, regional, and global.

Early cooperation between Indonesia and the United States reflected the latter's leading position in the global space field, but the cooperation came to a halt with the interruption of Indonesia's early manned space program. Indonesia has turned its outreach towards China and India. Indonesia and China began space cooperation after restoring diplomatic relations in the 1990s. In 2013, the two countries signed a partnership agreement on the "development of space technology for commercial and peaceful purposes", with China providing surface environmental remote sensing data and rocket technology transfers. In 2015, the "Outline of Space Cooperation" decided to create a joint space committee, which was the first space cooperative organization established between China and Southeast Asian countries (Chen, 2017: 2). Indonesia launched the LAPAN-A1 and LAPAN-A2 satellites from the Indian Space Center in 2007 and 2015, and launched multiple microsatellites with the assistance of the Indian Space Research Organisation (ISRO). Besides, the UNOOSA's Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP) located in India has long assisted in the training of Indonesian space professionals.

As a traditional middle power, Indonesia adheres to a balanced stance reflected in its regional space cooperation with countries outside the region. Nasution pointed out that Indonesia joined the China-led Asia-Pacific Space

Cooperation Organization (APSCO) to strengthen both space cooperation and bilateral diplomatic relations with other member states, and to obtain technical support and training from APSCO. APSCO's satellite resources assist Indonesia in sharing telemetry data, enhancing the environmental monitoring and prediction capabilities, and reducing the losses caused by natural disasters common in the country (Nasution, Diana, 2018: 135-137). Indonesia also participates in the Asia-Pacific Regional Space Agency Forum (APRSAF) led by Japan which is open to regional governments and non-governmental entities. LAPAN and several local governments and research institutions are Indonesia's participating units in APRSAF. In 2015, the 22nd APRSAF annual meeting was hosted in Bali.

After joining the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) in 1973, Indonesia has participated in global space cooperation and ratified major international space treaties, including the Outer Space Treaty. For Indonesia, this participation enhances its national prestige and presence, while reflecting the common belief among Southeast Asian countries that space development symbolizes national modernization, thereby obtaining more public support (Klein, 2012). Anwar argues that Indonesia's contemporary space development embodies"national resilience" (Anwar, 1998: 485) in terms of identity, economy, and military after experiencing political and economic hardships at the end of the 20th century.

5. Conclusion

Two conclusions of analysis can be summarized regarding South Korea and Indonesia as traditional middle powers, comparing the factors that influence space development.

5.1. Time Impact in the Construction of Space Institutions and Regulations

The DEPANRI and LAPAN were established in the early 1960s in Indonesia. However, it was not until 50 years later that the first space law was enacted. DEPANRI's dysfunction led to a subsequent reorganization that had a negative impact on the continuity of space policy.[3] The mid and long-term space development plans were not revealed until the enactment of the space law in 2013 (Djamaluddin, 2015). In contrast, although South Korea established its

[3] The Indonesian government established the National Research and Innovation Directorate (Badan Riset dan Inovasi Nasional, BRIN) in 2021 and incorporated LAPAN into its structure. LAPAN's space administration, legal, and international representative functions were separated once again and became the subordinate unit of BRIN.

space institution nearly 30 years after Indonesia, KARI issued the National Space Development Plan only seven years after its establishment, which clarifies the directions of space policy and phased strategies. Nine years later, the Space Development Promotion Act completed the institutional mechanism of space development. The vertical system of decision-making, management, and R&D made the organizational structure and responsibilities clearer during the development process. Generally, South Korea grasps the essential progress compared to the discontinuity of Indonesia. Differences between the two countries highlight the importance of improving institutional foundations behind material development.

5.2. Differences under Specific Regional Roles

According to the Organization for Economic Co-operation and Development (OECD), the "sustainability of national security and research objectives" and the "expansion of upstream and downstream industries" are the main driving forces for future global space development (OECD, 2007). South Korea has long faced military threats from the north, which has led to a high awareness of security in the space field. The risk factors are reflected in the pursuit of the launch rocket projects. In contrast, Indonesia faces fewer geopolitical threats, resulting in a lower level of space securitization. Its rocket development lags behind most space countries, with a greater emphasis on developing the people's livelihood through space applications, forming a different development orientation. External pressure has also affected the efficiency of resource allocation in each country. South Korea is aware of the importance of expanding civil participation and building a complete industrial chain under resource limitation. Indonesia, however, has been impacted by chaotic management and the long-standing absence of space laws, resulting in external dependency driven by immediate planning needs, with much lower efficiency in industrial privatization.

This article combines existing theories with empirical case studies of South Korea and Indonesia to examine the conceptual connections, extensions, and variations between the traditional middle powers and space middle powers. The similarities and differences were found between the two, as well as identifiable factors and internal mechanisms. For the future development of the "sub-theory" systems defining paradigms of middle powers in other fields, based on the "meta-theory" of international relations, and for improving the overall conceptual framework of middle powers, this article provides an insightful implication for reference.

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