FEATURE

Comparing Space Sectors Down Under

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In the last decade, the global space sector has grown dramatically. Part of this growth has been fueled by the privatization of the space sector. Unlike during the Cold War, nowadays private firms, not just governments, are taking leading roles in space activity. Investors are channeling significant funds into private business, and in 2019 space firms raised $5.8 billion USD over 198 investment rounds.[1] The largest new space firm, SpaceX, has launched 350 satellites to low Earth orbit to start creating Starlink, its constellation to provide satellite-based Internet.[2] Growth is being spurred not just by privatization but also by geographic diversification; the number of countries involved in space activity is growing beyond the traditional space powers. Global launch attempts increased 39 percent in the last decade, and 82 countries now have satellites in orbit.[3] Thirteen governments have established space agencies in the last decade.[4]

Two countries have made particularly dramatic strides: Australia and New Zealand. Australia's space sector recently crossed the $5 billion AUD revenue mark.[5] New Zealand's space sector is smaller at $1.69 billion NZD, but this is still impressive given the sector doubled in size between 2018 and 2019.[6] Both countries recently established space agencies—New Zealand in 2016 and Australia in 2018. New Zealand's space sector is notably defined by its hosting a successful up-and-coming launch-services firm called Rocket Lab—the firm launched six rockets last year from its launch facility in the Mahia Peninsula on the east coast of New Zealand's North Island.[7] Australia, on the other hand, which has long played a supporting role in terms of ground stations tied to National Aeronautics and Space Administration (NASA) and European Space Agency (ESA) missions, is supporting the development of its own sovereign launch capacity, as well as other business areas.[8] For both countries, the US connection is strong—for New Zealand, Rocket Lab is registered in the United States, and many of its customers are American government entities; and for Australia, government funding schemes often relate to upcoming NASA missions.[9]

At first glance, the two countries' space sectors appear similar. Both countries have close relationships with the United States. Both countries are building up their launch capabilities—New Zealand already has Rocket Lab, and Australia has a promising firm, Gilmour Space Technologies, that is developing its own rocket.[10] Both countries are English-speaking, which facilitates interaction with the largely monolingual American space sector, and both are located in the South

Pacific, which gives them similar geographic competitive advantages for certain types of launches. Both countries also have similar political economic systems; New Zealand and Australia are on the neoliberal end of the political economic spectrum, espousing free-market values and resisting explicit government intervention. Given all these similarities, are the two countries competing for the same role in the global space sector? Or may they end up playing complementary roles? Are they developing similarly, and will they continue to develop along similar lines? Or are they developing differently, and will they end up with space sectors unique from each other?

This article seeks to highlight how New Zealand's and Australia's space sectors are more different than they appear. Emphasizing differences builds a nuanced perspective about how the two space sectors have grown and will likely continue to grow. Such a perspective benefits individuals interested in the two countries' space sectors—it helps government bureaucrats devise policy, firms decide business strategy, and investors place their capital.

This article applies a comparative political economy perspective, based on the developmental state literature, to show that New Zealand's and Australia's governments are intervening differently in their space sectors than each other. This article first explains what similarities the literature indicates one would expect to find between the two countries' space sectors. Then, the article describes how there is little evidence for these similarities—comparing the two countries according to expected similarities instead highlights their differences. Finally, the article assesses what these differences imply for the two space sectors' continued development.

Expectations of Australia's and New Zealand's Space Agencies

The developmental state literature does not at first seem to be a relevant literature to analyze New Zealand's and Australia's space sectors—it was established in the 1980s to explain how Japan was able to so quickly develop its economy.[11] The literature is relevant, however, if one traces how it has evolved since the end of the Cold War up until the present day. In recent years, developmental state scholars have expanded the scope of countries of interest. In doing so, they have derived some conclusions about how countries like New Zealand and Australia intervene in markets, which is relevant to understanding how New Zealand and Australia are developing their domestic space sectors, and how they will likely continue to develop them.

As mentioned above, the developmental state literature originated to explain the impressive rise of Japan's economy, which was fascinating because Japan's "miracle" transformation came after its economy had been decimated during World War II.[12] How had Japan been able to reverse course, transforming from a war-torn country to an economic powerhouse? The founding scholar of the lit-

erature, Chalmers Johnson, proposed one of the reasons for Japan's rapid growth was because it was "plan rational"—in Japan, the appropriate role of government is to guide markets.[13] He contrasted this with the United States, which is "market rational"—the government's appropriate role is to remove barriers to doing business and to enforce rules of competition.[14] Japan's plan rationalism combined elements of each side of the Cold War capitalism–communism dichotomy—it "[conjoined] private ownership with state guidance."[15]

As more scholars joined the literature, they showed that other "developmental states" existed besides Japan, most notably Singapore, South Korea, and Taiwan.[16] They described how, besides plan rationalism, two other characteristics defined developmental states' approach to intervening in markets: their use of financial mechanisms to subsidize desired business areas; and their preference for channeling subsidies to firms that were already working in those planned business areas.[17] In other words, scholars identified three characteristics that define how developmental states tend to intervene: (1) government plans market growth; (2) government intervenes primarily via subsidies; and (3) government channels those subsidies toward firms that are already working in areas that align with planned growth areas.

The relevance to New Zealand's and Australia's space sectors is that, more recently, some developmental state scholars have begun examining market rational countries, herein called "regulatory states," which are the foil to the developmental states. Traditionally, developmental states are portrayed in contrast to regulatory states; developmental states are portrayed as being more interventionist than regulatory states, which use a light-touch approach to guiding markets. The issue is that regulatory states are traditionally given short shrift in the literature; they are briefly mentioned in passing before moving on to the real meat of the literature's intellectual enterprise: analyzing the developmental state. The recent intellectual turn toward focusing on regulatory states, however, means there is more understanding in the literature about how regulatory states intervene in markets. Scholars find regulatory states do not intervene less than developmental states but instead differently than developmental states; the difference is quality of intervention, not quantity of intervention.[18]

Three characteristics of regulatory states' approach to intervention parallel, yet differ from, the three aforementioned characteristics of developmental states' approach to intervention. The three characteristics are as follows: (1) government removes barriers to doing business, meaning it focuses on reducing unnecessary transaction costs; (2) government intervenes primarily via business support services, meaning it helps firms develop their business strategies through various means, such as networking support, market analysis, and gaining access to private financing; and (3) government prefers supporting firms that have viable business

plans, meaning it prefers supporting firms that can prove they are likely to succeed in the market.[19] These characteristics of regulatory-state intervention cohere with what one would expect from a market rational state that values free-market principles; government's role is to facilitate business by removing barriers and by helping competitive firms to refine their strategies.

New Zealand and Australia are regulatory states. More accurately put, they are likely regulatory states, since developmental state scholars have not yet explicitly defined what constitutes a regulatory state; to date, most scholars studying regulatory states have solely focused their research on the United States.[20] However, Australia and New Zealand are likely also regulatory states if one borrows a category from another comparative political economy literature. The category, from the varieties of capitalism literature, is the "liberal market economy," a type of political economy that is characterized by light-touch government intervention and institutionalized market transactions.[21] Conceptually, the "liberal market economy" is very similar to the regulatory state; developmental state scholars sometimes mention the similarity, and the exemplary case for both conceptual categories is the United States.[22] New Zealand and Australia are liberal market economies, and they are thus also very likely regulatory states.[23]

Using the liberal market economy as a proxy for the regulatory state indicates New Zealand and Australia should intervene in markets as one would expect regulatory states to do.[24] For both New Zealand and Australia, the lead government entities for intervening in their space sectors are the new space agencies. This means that, in terms of how those space agencies go about developing their national space sectors, one can expect to see them intervening as follows: (1) the two agencies will focus on removing barriers to doing business in their respective space sectors; (2) the two agencies will intervene in their space sectors primarily via business support services; and (3) the two agencies will channel support toward firms with strong business cases. These characteristics essentially define the agencies' missions, mechanisms, and preferences.

Is this in fact how the New Zealand and Australian agencies go about intervening in their space sectors? A review of government documents from both countries shows that both countries do not conform to these expectations. More specifically, New Zealand mostly does, and Australia mostly does not. New Zealand is more of a regulatory state than Australia is; the expectations mostly hold true for New Zealand, but hardly hold true for Australia. The section below explains these differences, setting the stage for the next section of this article, which discusses these differences' implications for the future development of the two countries' space sectors.

How do New Zealand's and Australia's Space Agencies Compare?

This section has three parts comparing how New Zealand's and Australia's space agencies intervene to develop their space sectors. The first part assesses the extent to which New Zealand and Australia hold true to their theorized mission: removing barriers to doing business in the space sector. The second part assesses the extent to which New Zealand and Australia hold true to intervening in their space sectors via the theorized mechanism: business support services. The third part assesses the extent to which New Zealand and Australia hold true to their theorized preferences: channeling support toward firms with strong business cases. These are the three indications—about missions, mechanisms, and preferences—from the literature about how the agencies are likely to support their space sectors' development.

Mission: Do New Zealand's and Australia's space agencies remove barriers to doing business?

Regarding the first indication, New Zealand's space agency very much aligns with expectations about removing barriers to doing business. On its website, the agency highlights its regulatory functions: issuing permits, meeting international obligations, and managing liability.[25] The purpose of these various regulatory functions is to remove barriers to doing business: "Our laws minimize unnecessary prescription, by including detailed requirements in regulation. Compliance costs are also minimized, by enabling overseas licenses to satisfy New Zealand requirements."[26] The first sentence is quintessentially what one would expect of a regulatory state: its mission is to create clear rules that reduce transaction costs and "level the playing field" for all firms about understanding what the rules are for doing business.

The second sentence similarly focuses on reducing costs, but it is quite stunning when one considers it; it allows companies to use other governments' licensing to facilitate doing business in New Zealand. This lowers the cost of doing business in New Zealand for firms by allowing them to, at least partially, secure permits from their home governments to do business in New Zealand. In what other instance does a government outsource permit processes to enable rocket launches? This author is not aware of any other instances. These regulations primarily benefit Rocket Lab, which can secure launch licenses from America's Federal Aviation Administration and then use those licenses to launch in New Zealand.[27]

As expected, since New Zealand is a regulatory state, the New Zealand Space Agency (NZSA) does not indicate it "transforms" or "leads" business activity, which is what one would expect to find in a developmental state. It instead describes itself as a facilitator, not as a leader. The agency characterizes New Zealand as being "an

ideal location for New Space" because of geographical and cultural factors.[28] Growth in the space sector is only natural, in other words. The role of New Zealand's space agency is to enable firms to work in the space sector, not to lure them in.

Turning to the Australian Space Agency (ASA), there is a significant contrast: the agency's mission does not appear to be removing barriers to doing business. Instead, its stated purpose is to "transform the space industry"; it has a plan for how the market should grow and it intends to influence firms to work in ways that align with that plan.[29] When summarizing its role, the agency highlights its "industry programs and funding" more than its regulatory activities, thus emphasizing its role of incentivizing certain types of planned business behavior.[30] The agency describes itself as "coordinating Australia's domestic civil sector activities . . . supporting the growth of Australia's space industry and the use of space across the broader economy . . . leading civil space engagement . . . [and] inspiring the Australian community and the next generation of space entrepreneurs."[31] This all sounds very much like the verbiage one would expect to hear from a developmental state, not a regulatory state. Whereas the New Zealand agency is a facilitator that enables business, the Australian agency is a leader that guides it.

The ASA makes a few nods to free-market principles. For instance, in order for firms to access financing under its International Space Investment initiative, firms must show their projects "target a gap in the market, market failures, and inefficiencies."[32] And the agency describes its regulatory role as ensuring "regulations meet technology advances and don't unnecessarily inhibit innovation"; like New Zealand, the stated purpose of the agency's regulatory function is to give firms greater freedom.[33] Generally, though, despite these nods to neoliberal values, the ASA emphasizes how its function is to incentivize particular types of business activities. The emphasis of its self-described mission is not facilitating business. It is instead leading business. In this sense, the agency's mission is similar to what one would expect to see for government entities in developmental states like Japan and Singapore.

Mechanism: Do New Zealand's and Australia's space agencies give business support services?

The second indication from the literature is that New Zealand's and Australia's space agencies are likely to intervene primarily via business support services. Unlike developmental states, which primarily intervene via financial incentive schemes, regulatory states are expected to help firms refine their business strategies. Is this the case? In fact, neither the New Zealand nor Australian agencies align with expectations. The NZSA does not provide any significant business sup-

port services; the agency instead primarily restricts its intervention to regulatory matters. The ASA, on the other hand, primarily intervenes in the space sector through financial incentive schemes, as one would expect of a developmental state.

Turning to the NZSA first, the agency rarely works directly with firms in the space sector; it provides little assistance in terms of financing or research and development support, for instance. There are government programs for space-sector firms, but these programs do not pertain to the NZSA—instead, the agency's parent ministry, the Ministry of Business, Innovation, and Employment (MBIE), manages such programs. The American space debris management firm LeoLabs, for instance, received support via MBIE's Innovative Partnerships program, which gives access to investment, research-and-development (R&D) support, tax breaks, commercialization assistance, and special visas. [34] The New Zealand satellite thruster company Dawn Aerospace, on the other hand, received financial assistance via MBIE's Catalyst Fund.[35] MBIE is also cofinancing a methane-detecting satellite to be launched in 2022 (most financing will be from the American nongovernmental organization the Environmental Defense Fund).[36] Another entity supporting firms is Callaghan Innovation, which is another MBIE daughter organization and thus a sister entity to the NZSA. The only support coming from the space agency itself toward specific recipients is a small internship program that funds students to go to the United States and gain work experience with NASA.[37]

The literature indicates a regulatory-state agency will primarily intervene by helping firms to refine their business strategies, but the NZSA is not involved in such activities. The agency focuses almost exclusively on regulatory support and helps students go abroad on internships. It is true that the government provides some firm-specific support, but this support comes mostly from the space agency's parent organization MBIE. That support includes business support services, which one would expect of regulatory states (i.e., R&D support and commercialization assistance), but it also includes financial incentives, which one would expect of developmental states (i.e., grants and tax breaks).

The ASA also intervenes in unexpected ways, though differently than the NZSA. The ASA conforms to expectations one would have for a developmental state, not a regulatory state—the space agency's favored mechanism for intervention is financial incentive schemes, not business support services. The ASA oversees three major financing schemes: the International Space Investment initiative, the Space Infrastructure Fund, and the Moon to Mars initiative. The first two are elements of the Australian Civil Space Strategy, which is the Australian government's overarching plan for developing the space sector and which is implemented "through the [space] agency."[38] The Moon to Mars initiative was formed after the

creation of the Australian Civil Space Strategy and is thus not mentioned in the strategy, but the space agency is described as having "launched" it.[39]

The Mars to Moon initiative is not yet fully implemented, but the International Space Investment initiative and the Space Infrastructure Fund have both been underway for some time and they have already begun distributing funds. The International Space Investment initiative provides grants to firms that range from $100,000 to $4 million AUD.[40] In total, the initiative is providing $15 million AUD in such funding over three years.[41] The Space Infrastructure Fund, in turn, is investing $19.5 million AUD in seven space-related infrastructure areas.[42] There is little indication on the ASA's site that it provides the business support services that one would expect of a regulatory state's government agency. Australia's agency is not, for instance, providing R&D support, nor is it helping firms strategize about how to go about commercializing their technology. Rather, the agency's main mechanism for intervening is financial incentive schemes, precisely the favored mechanism used by developmental states.

Preference: Do New Zealand's and Australia's space agencies prefer helping competitive firms?

The third indication from literature regards preference; according to the literature, regulatory states prefer supporting competitive firms—the firms that can prove they are most likely to achieve business success are those which government prefers to support. This is unlike in developmental states, where government prefers supporting firms that align with economic development plans; the most important criterion in developmental states is alignment with development plans. On this third matter, the NZSA behaves as expected—it supports competitive firms. Australia's agency, on the other hand, acts like a developmental state agency—its main preference criterion is how much firms align with development plans.

Turning to the NZSA first, as previously discussed, it sticks mostly to regulatory oversight as opposed to firm-specific support, but even so, it has preferences about which firms should benefit from its regulations. This is abundantly clear in the case of Rocket Lab, which is prominently featured on the agency's website as the most notable company in New Zealand's space sector. Rocket Lab launches from the Mahia Peninsula, but it is only able to do this because of agreements made among the New Zealand government, Rocket Lab, and the United States government. In June 2016, the two governments agreed to allow US launch vehicles to launch from New Zealand.[43] In September 2016, the New Zealand government and Rocket Lab agreed to allow Rocket Lab to launch from New Zealand; the launches needed to hold "a US license and all other necessary licenses,

approvals, authorisations and consents required under the laws and policies of the United States of America."[44] In May 2017, the US Federal Aviation Administration permitted Rocket Lab to carry out launches from New Zealand.[45]

All these agreements were made shortly after the NZSA was established in April 2016. The space agency administers the main piece of legislation that guides oversight of launch activity in New Zealand, including requirements related to the treaty with the United States.[46] On its website, the space agency advertises how these agreements let firms launch from New Zealand by using "overseas licenses to satisfy New Zealand requirements."[47]

Rocket Lab very much fits the mold of the sort of company that one expects government agencies in a regulatory state to support; it had a strong business case. Although Rocket Lab had not yet provided launch services when the agreements were put in place, the company had already received millions of dollars in American government financing.[48] Rocket Lab was at the time indicating that it wanted to return to New Zealand to set up launch operations; Rocket Lab was originally registered as a New Zealand company before it re-registered in the United States, and the founder, Peter Beck, repeatedly stated he would like the firm to launch from New Zealand.[49] Rocket Lab likely re-registered in the United States to gain access to larger sources of private financing and also contracts with the American government.[50] With close ties to the United States military–industrial complex, the largest demander of launch services in the world, Rocket Lab was a firm with strong commercial potential. The NZSA made a typically regulatory-state decision to put agreements in place to facilitate this promising firm's ability to do business in New Zealand. No other space firm has benefited as much from New Zealand government support as has Rocket Lab.

Compared to its New Zealand counterpart, the ASA has different support preferences that are very akin to what one would expect of a developmental state. The agency does not facilitate business for large firms with solid prospects like Rocket Lab, as New Zealand's space agency did. The ASA instead has a vision about which business activities it would like to see grow in Australia, and the agency targets its support to firms in such business areas. It prefers channeling support toward firms that align with economic development plans.

The ASA has a clear preference, for example, to spur the growth of local small- and medium-sized enterprises (SMEs). Of the Space Infrastructure Fund's seven tracks, for instance, four of their descriptions highlight roles for SMEs.[51] To be eligible for financial assistance on such projects, applicants must be active Australian (i.e., not foreign) firms.[52] The space agency has signed several memoranda of understanding (MOUs) with international corporations like Airbus and with state governments. These MOUs often mention benefits for Australian SMEs

and startups.[53] Intervention is, in other words, designed to spur the SME portion of the space ecosystem.

In terms of specific functional business areas, the International Space Investment initiative has several priorities: position, navigation, and timing; Earth observation; communications technologies and services; space situational awareness and debris monitoring; leapfrog R&D; robotics and automation on Earth and in space; and access to space.[54] This is a specific list of functional areas in which firms must be active to access government financial support. This is quite unlike the NZSA, which essentially facilitated regulatory requirements in response to Rocket Lab's intention to launch from New Zealand. The NZSA, unlike the ASA, does not have a list of aspirational business areas that it is trying to make more attractive through the creation of regulatory frameworks.

One last preference for the ASA worth noting is its push for firms to deepen ties to the American space sector. The International Space Investment initiative invests in "strategic space projects that grow the Australian space industry and build collaboration with international space agencies."[55] Though this does not specifically mention the United States, NASA is the best-funded space agency in the world and already has an established presence in Australia, which clearly makes it the most likely "international space agency" with which applicants will collaborate.[56] The agency's Moon to Mars initiative, on the other hand, explicitly focuses on linking Australian firms with the American space program.[57]

What Do the Differences Mean?

The preceding section shows that New Zealand's and Australia's space agencies intervene differently to develop their respective national space sectors. The NZSA behaves more or less as one would expect a regulatory-state government entity to behave. The ASA, on the other hand, behaves more unexpectedly like a developmental state government entity. The table below summarizes the differences:

Table 1. Differences between the two agencies

	New Zealand Space Agency	Australian Space Agency
Mission	Regulatory; mission is to remove barriers to doing business	Developmental; mission is to plan and coordinate business activity
Mechanism	Unexpected; refrains from providing firm-specific support	Developmental; favors using financial incentive schemes
Preference	Regulatory; prefers supporting firms with competitive business cases	Developmental; prefers supporting firms that align with plans

What does this mean in terms of how New Zealand's and Australia's space sectors will evolve? Given the above differences in terms of the space agencies' missions, mechanisms, and preferences, the two space sectors seem bound for

different trajectories. The rest of the section is broken down into four parts: the first three parts respectively address the implications of each of the differences, and the fourth part outlines areas for future research. A final brief section follows with some concluding remarks.

Implications of Mission Difference

The first difference relates to the space agencies' missions. The NZSA is first and foremost focused on removing barriers to doing business in New Zealand's space sector. Two implications arise from this mission focus for New Zealand: (1) the space sector will likely see more domestic growth in industries with relatively few barriers; and (2) business will come from other countries into industries that are relatively barrier-free in New Zealand. In terms of the first implication, wherever barriers are fewest, firms in the domestic market will likely grow faster. For instance, if the NZSA focuses on reducing barriers to doing business in the ground communications industry, but not for satellite manufacturing, then there will likely be more growth in ground communications than in satellite manufacturing. If it becomes cheaper to get a permit for operating a ground station, whereas the price of getting a permit to manufacture satellites remains the same, then all else being equal, there will be a proliferation of ground station operators compared to what there would have otherwise been. Where the agency focuses on reducing barriers, therefore, will shape the sector's growth.

In terms of the second implication about attracting foreign business into industries with relatively few barriers, this means that for some industries, the relative absence of barriers compared to barriers in other countries will lure in foreign business. Rocket Lab's history in New Zealand is a case in point. Peter Beck wanted to launch from New Zealand, but he only ended up doing so because the NZSA designed and implemented agreements to facilitate launches. If the New Zealand government had not allowed US permits to facilitate launches in New Zealand, then this would have made New Zealand a significantly more difficult place to work for Rocket Lab—the firm would have had to deal with more bureaucratic processes to secure authorization. Given that the NZSA continues to advertise it allows other countries' permits to facilitate launches, New Zealand likely will continue to attract launch service providers from other countries. If a foreign launch service provider is looking for a country from which to launch, New Zealand will be relatively attractive compared to other jurisdictions where governments require meeting multiple sets of regulatory requirements. The relative absence of barriers could occur in other industries, also; in industries where the space agency reduces barriers compared to other countries, international business will flow in.

By comparison, the ASA has a different mission: it plans and coordinates business activity. The implications of this mission for Australia's space sector are twofold: (1) domestic business growth is most likely to occur in industries that the agency plans to grow; and (2) business from abroad will be attracted to industries in Australia where government incentives are more abundant compared to incentives elsewhere. The first point is relatively straightforward. The government will sustain support for certain industries, and it is in these industries where local firms will grow more than they would otherwise. If the ASA, for instance, commits to supporting Earth observation (as indeed it does according to its International Space Investment initiative), but it is not committed to supporting space resource extraction, then there will be more business growth in the first industry.

The second implication is that, in the industries in its space sector where the ASA is offering relatively abundant incentives, international firms will come to Australia more than they otherwise would. The more resources Australia commits to supporting growth in an industry, relative to the overall amount of resources all governments around the world are committing to that industry, then there will be more inflows of international business. If Australia, for instance, doubles the amount of resources it commits to supporting the growth of the Earth observation industry, but no other governments increase their resource commitments to that industry, then more international business will flow into Australia's Earth observation industry. The industries that the agency plans to grow, in other words, will grow faster than they otherwise would, both due to domestic and international business activity.

Implications of Mechanism Difference

The second difference between the two countries regards their mechanisms for intervening. Unexpectedly, the NZSA does not favor using firm support services. Rather, it focuses on designing and implementing regulations. There are two implications that stand out from this regarding the likely future trajectory of New Zealand's space sector: (1) there will be relatively few government-financed firms; and (2) growth will concentrate in industries where there is clear market demand. The first implication is fairly obvious. If the government refrains from providing support to specific firms, then there will be few government-financed firms. There will be few firms, in other words, that depend on government finance, whether directly (e.g., via up-front funding) or more indirectly (e.g., via government contracts on the backend).[58]

The second implication is growth will likely be in industries with clear market demand; business will grow in industries where other market actors seek goods or services. If, for instance, supply of launch services exceeds demand—a possibility

given the likely impending global recession due to COVID-19—then there will be little incentive for launch services firms to build up their business in New Zealand. If, however, there is clear demand for services based on satellite-provided data, then there would be a growth in related business areas—firms using satellite imagery to provide precision farming support services, for instance. This responsiveness to markets will be more than it otherwise would be if the government were actively intervening with financial incentive schemes. If that were the case, its incentives schemes would distort demand—government incentives would increase demand for certain types of business.

The ASA, on the other hand, favors intervening with financial incentive schemes. As such it seems likely that Australia's space sector will evolve as follows: (1) there will be relatively many government-financed firms; and (2) growth in the sector will depend on government support. The first point is that there will be many firms that directly or indirectly depend on government financing. To use launch services as an example, if the government provides significant financial incentives to facilitate "access to space," as is indicated in its International Space Investment initiative, then there will likely be more firms in the launch services industry that depend on government financing than there otherwise would be. This dependence could come up front in the form of loans or grants or tax breaks. It could also come at the backend—the government could be a customer that purchases launches, or it could subsidize other entities' buying launches. In both cases, firms depend on government financing.

The second implication, tied to the first, is that growth in the sector will depend on government support. Financial incentives essentially amount to subsidies, and a well-known shortcoming of subsidies is that they lead to dependence. In some cases, government subsidies can spur particular industries' growth, and then government financing can be scaled back to form a self-sustaining industry. This has arguably happened in Brazil, for instance, with the production of plant-based fuel alternatives for vehicles.[59] It will therefore be of interest to anyone participating in a growing industry in Australia's space sector to monitor the ASA's associated financial incentive schemes. There will be a risk that if those schemes are shrunk, then the industry's growth will slow significantly. If, for instance, the ASA incentivizes growth in Earth observation and this leads to a proliferation of Earth observation firms, then those firms should be wary of what will happen if the agency shrinks incentive schemes.

Implications of Preference Difference

The third major difference between the two agencies relates to their preferences—how they decide where to channel their support. The NZSA prefers sup-

porting firms with strong business cases that appear likely to succeed. As such, New Zealand's space sector will likely: (1) be defined by large successful firms; and (2) be difficult to enter for latecomers. The two implications are related. The first one is simply highlighting the fact that removing barriers to doing business for strong firms has the potential to have a multiplier effect on their success. In another unrelated sector in New Zealand's economy, the primary goods industry, one can arguably see this is the case with Fonterra, which is a powerful producer of dairy products that disproportionately benefits from government intervention to facilitate the exports of dairy products.[60] The same possibility holds true for the space sector. Reducing barriers to doing business in New Zealand's launch industry, for instance, has clearly benefited Rocket Lab more than other aspiring launch providers like Dawn Aerospace, a Christchurch-based satellite thruster firm that is also developing technologies to provide launch services.[61]

The second implication relates to the first. As the government removes barriers to doing business, this primarily benefits firms that are already successful and paradoxically grows barriers to entering the industry for latecomers. Again, the Rocket Lab–Dawn Aerospace comparison is illustrative. It may be that Dawn Aerospace becomes a successful launch company, but it now faces a steep uphill battle to win market share from Rocket Lab. This is due to economies of scale—the more market share a firm has, the better it can defend that market share. This is especially so in capital-intensive industries, which the launch services industry certainly is. The NZSA enabled Rocket Lab's growth and entrenched the firm's market position. Furthermore, the agency's neoliberal ideology means it may hesitate to intervene to prevent monopolization; government should not, after all, from a market rational perspective, be hindering successful business.[62] The end result of all this is that the NZSA's preference for supporting successful firms may make certain industries more difficult to access for newcomers.

Australia's space agency differs from New Zealand's in that the ASA prefers supporting firms that align with economic development plans. This preference seems likely to have two implications for the future evolution of Australia's space sector: (1) the sector may come to be defined by firms that specialize in accessing government incentive schemes; and (2) for firms that do not align with government plans, it will be difficult to succeed. The first implication means that if large financial incentives schemes become important enablers of success, firms will naturally tailor their activities to increase their chances of accessing those incentive schemes. The more firms succeed in accessing incentive schemes, the greater will be their ability to succeed in accessing future incentives; they will build up specialization in accessing incentives schemes.

The second implication relates to the first. If a key determinant of success in Australia's space sector is accessing financing schemes, and if specialization for accessing them concentrates in a select number of firms, then it will be difficult for all other firms to access the incentives. Thus, it will be difficult for the nonspecialists to succeed. As stated in the previous section, the International Space Investment initiative provides grants to firms that range from $100,000 to $4 million AUD. If the Australian government continues to regularly put out grant offerings for which firms must compete, some firms will start to specialize. The more incentives a firm succeeds in accessing, the better it will become at accessing such schemes in the future—a firm that successfully wins three grants knows better than a firm with no experience how to win an upcoming funding round.

Areas for Future Research

The implications described above are not certain. To better understand if these trajectories are likely, there must be more research done regarding comparative space-sector development. Four areas stand out as potentially fertile grounds for research. First, more countries need to be studied to better understand the differences between space agencies in terms of their missions, mechanisms, and preferences. As mentioned early in this article, several governments have created space agencies in the last decade. How do these space agencies compare to their counterparts in New Zealand and Australia? By focusing on New Zealand and Australia in this article, differences between them are stark. But perhaps in comparison to space agencies in the Philippines and Turkey, for example, the New Zealand and Australian space agencies' approaches to intervention will appear more similar. The more countries' space agencies that are examined, the better one can identify the characteristics that make each of them unique, and thus the better one can identify implications for how their space sectors will develop.

Second, research ought to be done to monitor the evolution of space sectors to understand if the implications listed above have any validity. While the differences between New Zealand and Australia in terms of missions, mechanisms, and preferences are backed by empirics, the implications of these differences for the future development of their space sectors are speculative. Will it actually turn out to be the case that New Zealand's space sector will be dominated by private firms, whereas Australia's space will feature more state-subsidized firms? To know whether these implications about trajectories are valid requires monitoring the situations in both countries. What is to be monitored will, of course, depend on if more countries are studied—as discussed above, if a greater number of countries are examined, then understanding of their differences and the implications of those differences will likely change.

A third area for research is studying historical cases of space-sector development. The theorized differences discussed in this article are based on developmental state scholars' analyses of political economies. Those scholars, however, do not specifically examine space sectors; instead, they focus on other sectors like renewable energy and consumer electronics.[63] Perhaps by looking at historical cases of space-sector development, especially in well-known developmental and regulatory states like Japan and the United States, clearer implications will emerge for how the space sectors of New Zealand, Australia, and other countries will evolve.

A fourth area of research is to compare New Zealand and Australia again, but to this time focus on more than just their space agencies. The literature clearly indicates that in developmental states there are lead agencies that intervene, but there is less certainty about the importance of lead agencies in regulatory states like New Zealand and Australia.[64] In either case, it is not necessarily the case that the space agencies are in fact the lead agencies. As noted in this article, for instance, Callaghan Innovation, a sister organization to the NZSA, intervenes with firm-specific support in the space sector. Perhaps the differences between New Zealand and Australia would be different if more than just their space agencies were examined. It is thus worth comparing the two countries' intervention in all-of-government terms rather than solely in terms of the space agencies.

Conclusion

This article started with the question of whether New Zealand and Australia's space sectors are likely to develop along similar trajectories. Will they end up occupying similar niches, or will they occupy different positions in the global economy? Will they complement or compete with each other? The findings of this article are admittedly tentative, but they indicate that New Zealand's and Australia's space sectors will indeed diverge in terms of their future development. More research should be done to confirm that this will be the case, in line with the suggestions above. It seems safe to assume that if the global economy can sustain growth in both of their national space sectors, New Zealand and Australia will not be occupying the same niche.

A bigger outstanding question, though, is whether the global space sector will indeed be large enough to sustain growth in the national space sectors of New Zealand, Australia, and other countries. This was already an open question, but now that the COVID-19 pandemic indicates the global economy is set for a recession, many sectors will likely experience limited growth for many years to come. It is easy to imagine the space sector will be especially hard-hit, given its benefits to society are not widely appreciated. Just as individual space-sector firms are about to undergo a "great winnowing" as a result of the pandemic, so too will

national space sectors.[65] The fate of New Zealand's and Australia's space sectors, therefore, depends on more than just their ability to occupy unique niches—which this article indicates will likely be the case—but also on whether the global economy will be big enough to provide them with niches to fill. ✪

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Notes

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2. Amy Thompson, "SpaceX launches 60 Starlink satellites into orbit, misses rocket landing," *Space.com*, 18 March 2020, https://www.space.com/.

3. Theresa Hitchens, "Space Launch & Sector Employment Jumps in 2019: Space Foundation," *Breaking Defense*, 31 March 2020, https://breakingdefense.com/.

4. Neel V. Patel, "There has never been a better time to start a small space agency," *MIT Technology Review*, 26 November 2019, https://www.technologyreview.com/.

5. This is in Australian dollars. For further information, see: "Australia's space industry crosses $5 billion revenue mark," *Consultancy.com.au*, 17 February 2020, https://www.consultancy.com.au/.

6. This is in New Zealand dollars. This value and the value of Australia's space sector were calculated by different entities, so their comparability is not exact. Nevertheless, they show that New Zealand's space sector is quickly growing and that it is still likely smaller than Australia's space sector, as one would expect given the relative sizes of the two countries' overall economies. For further information, see: Luke Malpass, "NZ space economy reaches take off, totaling $1.69 billion," *Stuff*, 14 November 2019, https://www.stuff.co.nz/.

7. "Completed Missions," *Rocket Lab*, https://www.rocketlabusa.com/.

8. Nicholas Borroz, "Australia Should Coordinate with New Zealand in Space," *The Diplomat*, 26 July 2019, https://thediplomat.com/.

9. Stephen Clark, "Rocket Lab successfully launches NRO satellite," *Spaceflight Now*, 31 January 2020, https://spaceflightnow.com/; and Jeff Foust, "Australia to cooperate with NASA on lunar exploration," *SpaceNews*, 23 September 2019, https://spacenews.com/.

10. Darrell Etherington, "Rocket startup Gilmour Space gets a $3M grant to develop lighter fuel tanks," *TechCrunch*, 14 February 2020, https://techcrunch.com/.

11. Peter Evans, *Embedded Autonomy: States and Industrial Transformation* (Princeton, NJ: Princeton University Press 1995), 55.

12. As indicated in the title of Chalmers Johnson's book, *MITI and the Japanese Miracle: The Growth of Industrial Policy, 1925–1975* (Stanford, CA: Stanford University Press, 1982).

13. Johnson, *MITI and the Japanese Miracle*, 26.

14. Johnson, *MITI and the Japanese Miracle*, 19–21

15. Meredith Woo-Cumings, "Introduction: Chalmers Johnson and the Politics of Nationalism and Development," in *The Developmental State* (Ithaca, NY: Cornell University Press, 1999), 2.

16. Peter Evans and Alice H. Amsden each wrote about developmental states in South Korea, respectively in *Embedded Autonomy: States and Industrial Transformation* (Princeton, NJ: Princeton University Press 1995) and *Asia's Next Giant: South Korea and Late Industrialization* (New York: Oxford University Press, 1989).

17. Developmental states' emphasis on using financial incentives was well summarized by Alice H. Amsden in *Asia's Next Giant*, where she stated that developmental states intervene by "providing private investors with a battery of incentives that, simplified, boil down to subsidies" (13). Peter Evans provided extensive accounts of developmental states' focus on channeling support to firms in desired business areas in *Embedded Autonomy*. He described this focus as developmental state governments openly embracing "midwife" or "husband" roles; government's proper function is to cultivate business areas that align with developmental goals (80–81). In fact, there are other key characteristics to developmental states' approaches to intervention besides these three. However, it is these three characteristics that stand most in contrast to the characteristics of so-called "regulatory states" like Australia and New Zealand. It is these three characteristics that are thus worth highlighting in this paper.

18. These findings parallel similar discussions in public administration scholarship. As the public administration scholars put it, liberalization's spread is not so much a "retreat of the state," but it is rather "public authority . . . expanding by colonizing new areas with more formalized regulation" (Magetti 2014, 281). Put succinctly, "What is observed in practice is never a dismantling of all regulation – a return to a situation of *laissez-faire* which in fact never existed" (Majone 1996, 2). In other words, neoliberalization does not mean less intervention. It just means a different sort of intervention. Regulatory state scholars agree. See the following for reference, Martino Magetti, "Institution change and the evolution of the regulatory state: evidence from the Swiss case," *International Review of Administrative Sciences* 80, no. 2 (2014): 276–97; and Giandomenico Majone, "Introduction," *Regulating Europe* (New York: Routledge 1996), 1–5

19. This summation of the characteristics of regulatory state intervention is based off reading of three primary texts: Fred Block, "Swimming Against the Current: The Rise of a Hidden Developmental State in the United States," *Politics & Society* 36, no. 2 (2008): 169–206; Robert MacNeil, "Seeding an Energy Technology Revolution in the United States: Re-conceptualising the Nature of Innovation in 'Liberal-Market Economies'," *New Political Economy* 18, no. 1 (2013): 64–88; and Linda Weiss, *America Inc.? Innovation and Enterprise in the National Security States* (Ithaca, NY: Cornell University Press, 2014). It is worth noting that there is no consensus about these characteristics defining regulatory state intervention. Unlike the core developmental state literature, the offshoot that studies regulatory states is still nascent. There is a notable absence of review articles summarizing consensus views about regulatory states. There are many such articles for developmental states.

20. The three authors mentioned in the previous note—Fred Block, Robert MacNeil, and Linda Weiss—all focus on the United States. A notable exception to the focus on the United States is Seán Ó Riain, who wrote about Ireland's "developmental network state" in *The Politics of High-Tech Growth: Developmental Network States in the Global Economy* (Cambridge: Cambridge University Press, 2004). Ó Riain is an intellectual inspiration for the others; Block and MacNeil both directly respond to Ó Riain, and Weiss indirectly does, since she directly responds to Block.

21. Peter A. Hall and David Soskice, "An Introduction to Varieties of Capitalism," in *Varieties of Capitalism: The Institutional Foundations of Comparative Advantage* (New York: Oxford University Press, 2001), 1–68.

22. Weiss, in her aforementioned 2014 book, studies the United States. She quite forcefully states that the liberal market economy category in the varieties of capitalism literature, just like the regulatory states in the developmental state literature, underestimates the extent of state intervention: "[Varieties of capitalism] theorists link US success in transformative innovation to the predominance of the free market. . . . This makes sense, of course, only if you fence off a large part of the system. . . . This is precisely what the [varieties of capitalism] approach has done" (12). The United States is the most often referenced regulatory state in the developmental state literature (including in the founding text written in 1982 by Chalmers Johnson). The United States is also the quintessential liberal market economy as described in the varieties of capitalism literature (including in the founding text by Peter A. Hall and David Soskice—see next endnote).

23. Peter A. Hall and David Soskice, *Varieties of Capitalism: The Institutional Foundations of Comparative Advantage* (New York: Oxford University Press, 2001), 1–68.

24. As mentioned above, Weiss, in her book *America Inc.?*, indicates the liberal market economy category is a proxy for the regulatory state.

25. Ministry of Business, Innovation & Employment, "New Zealand Space Agency," https://www.mbie.govt.nz/.

26. Ministry of Business, Innovation & Employment, "Space-related opportunities in New Zealand," https://www.mbie.govt.nz/.

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28. Ministry of Business, Innovation & Employment, "New Zealand is the ideal location for New Space," https://www.mbie.govt.nz/.

29. Department of Industry, Science, Energy and Resources, "Transforming our space industry," https://www.industry.gov.au/.

30. Department of Industry, Science, Energy and Resources, "Strategies for the Future," https://www.industry.gov.au/.

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32. Department of Industry, Science, Energy and Resources, "International Space Investment initiative," https://www.industry.gov.au/.

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35. Ministry of Business, Innovation & Employment, "Catalyst: Strategic – Space 2019," https://www.mbie.govt.nz/.

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37. Ministry of Business, Innovation & Employment, "NASA internships and New Zealand Space Agency scholarships," https://www.mbie.govt.nz/.

38. Department of Industry, Science, Energy and Resources, "Space Infrastructure Fund," https://www.industry.gov.au/; and Australian government, "Advancing Space: Australian Civil Space Strategy 2019–2028," https://publications.industry.gov.au/.

39. Department of Industry, Science, Energy and Resources, "Australia to support NASA's plan to return to the Moon and on to Mars," https://www.industry.gov.au/.

40. business.gov.au, "Grants to unlock opportunities and expand Australia's space sector," https://www.business.gov.au/.

41. Department of Industry, Science, Energy and Resources, "International Space Investment initiative," https://www.industry.gov.au/.

42. Department of Industry, Science, Energy and Resources, "Space Infrastructure Fund," https://www.industry.gov.au/.

43. New Zealand Treaties Online, "Agreement between the Government of New Zealand and the Government of the United States of America on Technology Safeguards Associated with United States Participation in Space Launches from New Zealand," https://www.treaties.mfat.govt.nz/.

44. Ministry of Business, Innovation & Employment, "Agreement between the NZ government and Rocket Lab," https://www.mbie.govt.nz/.

45. Federal Aviation Administration, "Commercial Space Transportation License."

46. Ministry of Business, Innovation & Employment, "Our regulatory regime," https://www.mbie.govt.nz/.

47. Ministry of Business, Innovation & Employment, "Space-related opportunities in New Zealand," https://www.mbie.govt.nz/.

48. Ollie Neas, "What lies inside Rocket Lab's secret US military contracts?," *The Spinoff*, 20 November 2018, https://thespinoff.co.nz/.

49. Eleanor Ainge Roy, "Aiming for the stars: how New Zealand's space industry is causing turbulence," *The Guardian*, 24 January 2020, https://www.theguardian.com/.

50. See the following two citations respectively for accounts of the access to finance and the access to government contracts: Grant Bradley, "Rocket Lab founder Peter Beck blasts lack of NZ venture capital for other firms," *New Zealand Herald*, 22 April 2018, https://www.nzherald.co.nz/; and Neas, "What lies inside Rocket Lab's secret US military contracts?."

51. Department of Industry, Science, Energy and Resources, "Space Infrastructure Fund," https://www.industry.gov.au/.

52. business.gov.au, "Funding to establish a Mission Control Centre in Adelaide, South Australia," https://www.business.gov.au/.

53. Australian Government, "Joint Statement of Strategic Intent and Cooperation Between Australian Space Agency and Airbus," https://www.industry.gov.au/.

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56. Loren Grush, "The Trump administration calls for big budget increases for NASA to fund Moon-to-Mars program," *The Verge*, 10 February 2020, https://www.theverge.com/; and National Aeronautics and Space Administration, "History of Tracking Stations in Australia," https://www.cdscc.nasa.gov/.

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58. This implication is based on a comparative analysis of the two space agencies. As will be discussed in the final section of this article, if one takes an all-of-government perspective, an entirely different set of implications may emerge. As has already been discussed, the space agency's parent entity MBIE and its sister entity Callaghan Innovation both provide firm-specific financial support. Comparing New Zealand and Australia in terms of their total government intervention, not just the intervention of their space agencies, could lead to a different set of implications.

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63. Robert MacNeil, "Seeding an Energy Technology Revolution in the United States: Re-conceptualising the Nature of Innovation in 'Liberal-Market Economies'," *New Political Economy* 18, no. 1 (2013); and Peter Evans, *Embedded Autonomy: States and Industrial Transformation* (Princeton, NJ: Princeton University Press 1995).

64. Chalmers Johnson emphasizes the importance of a lead agency in developmental states in his book, *MITI and the Japanese Miracle*. The "MITI" in the book's title is short for the name of the lead agency for Japan: the Ministry of International Trade and Industry. Regulatory state scholars problematize the idea of a lead agency. *See* Fred Block's discussion of the regulatory state's "decentralized structure" in "Swimming Against the Current: The Rise of a Hidden Developmental State in the United States," *Politics & Society* 36, no. 2 (2008), 174.

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