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RESEARCH ARTICLE

Varieties of local content: Comparing ideas and institutions in Brazil and Malaysia's oil and gas sector

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Abstract

Local content policies (LCPs) are key instruments of industrial policy used by middle-income countries (MICs) to capture segments of global value chains (GVCs). While, in principle, LCPs are very similar, in practice, they are highly diverse. What to prioritize, how to measure it, while promoting firms' upgrade are decisions that create room for national varieties. Considering this background, we compare LCPs for the oil and gas sector in Brazil and Malaysia. Both countries have adopted different forms of LCP over time. While Brazil has adopted an inward-looking version of LCP focusing on import-substitution, job creation, and domestic production, Malaysia implemented a more outward-looking version, focusing on coownership by nationals and strategic supplier development with less emphasis on domestic production. We argue that two very diverse developmental policy paradigms embedded in each country explain these different trajectories. In Brazil, a productivist version of developmentalism focused on domestic output underplayed the importance of integrating in GVCs. In contrast, an ethnic-based version of developmentalism in Malaysia was more flexible and allowed a better integration of domestic companies in GVCs. Our analysis sheds light on the importance of the interaction between ideas, interests, and institutions, focusing on how LCPs can build internationally competitive companies.

Keywords: industrial policy; policy paradigms; local content; middle-income countries; oil and gas

Introduction

After decades of marginalization, industrial policy has re-emerged as a legitimate theme in debates on economic growth. Its academic revival is evident in recent reviews emphasizing the diverse purposes and instruments of industrial policy while seeking to update knowledge on successful strategies.[1] Amid this renewed interest, the experiences of middle-income countries with industrial policy have gained relevance, particularly in discussions surrounding the phenomenon of the *middle-income trap* (MIT).[2]

A growing body of literature on the MIT highlights a gradual shift in the debate—from normative discussions about which institutions and policies are "right" to analyses of the structural factors shaping political coalitions that support growth-enabling institutions and policies.[3] Ironically, both perspectives underscore elements that are necessary but insufficient on their own to overcome the MIT. Countries require inclusive "growth coalitions" that advocate for effective policies capable of driving sustainable innovation and productivity. In other words, weak coalitions supporting sound policies are as likely to fail in the long term as strong coalitions pursuing ineffective policies. While much research has focused on the challenges of forming robust growth coalitions, less attention has been paid to why seemingly

[1]Aggarwal and Evenett (2014); Bulfone (2023)
[2]Paus (2012); Doner and Schneider (2016)
[3]Fuentes and Pipkin (2024)

strong coalitions fail to adapt their beliefs and strategies in response to changing circumstances and empirical evidence.

One explanation for this failure lies in inadequate information exchange within coalitions. Weak information flows may result from the absence of formal institutions or informal networks that enable policymakers to access valuable insights into policy performance. Without such mechanisms, policymakers cannot engage in a learning process to update their understanding of how policies perform. However, as a growing literature on policy and behavioral studies reveals, even under ideal conditions, policy processes rarely follow a linear, rational cycle of evidence-based learning. This is largely due to cognitive biases that reinforce policymakers' existing worldviews and paradigms. Biases that, in many cases, can be reinforced by adversarial and polarized political contexts.

An important question to explore, then, is under what conditions beliefs align with a more *bayesian* dynamic—with actors rationally updating their paradigms based on new evidence—or, conversely, become rigid and resistant to empirical invalidation. For middle-income countries aiming to leverage industrial policy to achieve sustainable development, understanding these dynamics is critical to fostering adaptive and responsive policymaking in an ever-changing global economy.

In this article, we build on the policy paradigm literature to explore why middle-income countries have adopted substantially different strategies in their recent industrial policy efforts. We propose that institutional contexts characterized by political stability and continuity facilitate the insulation of policy domains, enabling the development of more flexible and adaptive policy paradigms. In contrast, contexts marked by intense political polarization and competition tend to transform policy domains into ideological battlegrounds, fostering rigidity among proponents of specific policy paradigms. Put simply, political stability creates an environment conducive to Bayesian-style policy learning, whereas heightened political competition favors adversarial reasoning, with actors selectively using evidence to reinforce their preferred policy views.

Empirically, we examine the evolution of local content policies (LCPs) in the oil and gas (O&G) sectors of Brazil and Malaysia, focusing on how these policies have adapted to the challenges posed by global value chains (GVCs). While LCPs share a common objective of requiring foreign companies to establish domestic linkages, their priorities and implementation mechanisms vary significantly, reflecting the policy paradigms that shaped their design. GVC dynamics challenge the traditional goal of LCPs—to integrate natural resource extraction with the domestic economy by onshoring large segments of the supply chain—given the global dispersion of production activities.

We compare Brazil and Malaysia because, despite similarities in their initial adoption of LCPs, the two countries have pursued divergent approaches influenced by distinct *developmental* policy paradigms. Brazil implemented an inward-looking LCP rooted in import substitution, emphasizing job creation and domestic production without prioritizing national ownership or GVC integration. In contrast, Malaysia adopted an LCP explicitly designed to benefit ethnic Malays (*bumiputera*), which gradually evolved into a more outward-looking strategy emphasizing co-ownership of foreign investments and strategic supplier development, with less focus on maximizing domestic production and greater emphasis on GVC integration.

These divergent strategies have resulted in distinct sectoral trajectories. In Brazil, LCPs have driven substantial domestic production of O&G equipment and services, but this output has been dominated by foreign suppliers, with few domestic firms becoming significant players or leveraging Brazil as an export platform. In contrast, Malaysia has successfully attracted key foreign suppliers while fostering highly internationalized domestic firms specializing in offshore O&G services. By providing an assessment of recent experiences of two major middle-income countries with LCPs, we hope to shed light on the potential of the policy to foster sustainable development in the current global economy.

We argue that Malaysia's dominant policy paradigm was more flexible in responding to the challenges and opportunities of GVCs due to the long-standing dominance of its Barisan Nasional-led governing coalition. This political stability allowed for the insulation of industrial policy and enabled Malaysian policymakers to integrate local content into a broader strategy of internationalizing O&G service companies. By the time the dominant party system fell in 2018, Malaysia's O&G policy

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development had already taken strong root and was not a point of political contention. In Brazil, by contrast, efforts to adopt a more outward-looking LCP in the early 2000s were undermined by intense political competition following democratization. Industrial policy, particularly in the O&G sector, became highly polarized, with proponents of traditional inward-looking approaches, dominant in the coalition led by the Workers' Party, reversing efforts to promote the international competitiveness of domestic companies. This inward-looking strategy, which prioritized import substitution and short-term job creation (e.g., in shipbuilding), persisted despite growing evidence of its unsustainability. The politicization of Brazil's LCP led to adversarial dynamics, pitting a policy aiming to increase domestic manufacturing against the international competitiveness of local companies as incommensurate goals.

To substantiate our argument, we analyze specific segments of the offshore O&G supply chain in each country, focusing on the shipbuilding industry in Brazil and offshore operations in Malaysia. Drawing on official documents, secondary literature, and over 60 interviews with policymakers and industry representatives conducted primarily in Brazil and Malaysia between 2014 and 2024, we trace the evolution of these policies and their outcomes.

Bringing policy paradigms into the "middle-income trap" debate

In recent years, political economists have shown a growing interest in understanding the role of ideas in policy and institutional reforms. This "ideational turn" has been a response to the limitations of traditional institutionalist approaches to properly explain processes of continuity and change.[4] More than a functional response to changing conditions, ideas have been recognized as a proper explanatory variable shaping institutions and interests. Ideas, for instance, have been used to explain policy change and continuity in several domains, such as education, civil rights, and climate.[5] In the realm of industrial policy, ideas have been mobilized as a key factor explaining the diversity of national traditions as they operate as "foundational principles" shaping the building of developmental institutions.[6]

While parsimonious, structuralist approaches that derive material interests of societal actors from their socio-economic position struggle to explain dynamics in which institutional settings and coalition of interests seem relatively similar. Recently, for instance, ideas about developmental goals have been mobilized to help explain the diversity in "resource nationalism" responses by Sub-Saharan countries to the last commodity super-cycle.[7] The limitations of structuralist approaches are also evident when changes take place without an evident exogenous shock or meaningful shifts in the underlying socio-economic structure of a country. In other words, endogenous processes of change are often better understood when looking at how actors actively reframe their policy ideas.[8]

In parallel to these theoretical developments, the literature focusing on the MIT has looked at developmental paths that could make middle-income countries achieve a virtuous cycle of increased productivity and innovation. This line of research has largely evolved from the 'getting policies right' perspective, aiming to identify which policies and reforms could bring structural economic change, to the challenges of building a supporting growth coalition that can continuously push for policies conducive to productivity and innovation. In other words, to escape the trap, the 'right' institutions and policies should be backed by broad societal coalitions able to give the necessary political support they require to be implemented and sustained in the long run.[9]

From the ideational turn perspective, there are two main blind spots in this debate. First, it struggles to account for the wide variety of strategies adopted by middle-income countries during their developmental efforts. Although extremely insightful, the interest-based perspective underlying the 'growth coalition approach' tends to give a limited explanation regarding the implementation of policies and their subsequent developments. Much attention is given to structural factors underlying conflicts

[4]Béland and Cox (2011).
[5]Mehta (2013); Lieberman (2002); Meckling and Allan (2020).
[6]Dobbin (1994); Sikkink (1991).
[7]Hickey et al. (2020); Pedersen et al. (2020).
[8]Mehta (2013).
[9]Doner and Schneider (2016).

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between different societal interests and less to the processes that shape specific policies. In the case of LCPs, for instance, while most developing countries easily achieve a consensus about its importance as an important instrument for promoting economic development and industrial upgrading, the format it acquires in different countries cannot be fully explained by mapping existing interests at a certain point in time. As Hay (2011) points out, there are no immediate interests deducted from material conditions, but only context-dependent conceptions of what agents' interests might be.

To address this limitation in a more systematic way, Campbell and Pedersen (2014) developed the concept of *knowledge regimes* to describe the sets of actors, organizations and institutions that are responsible for producing, disseminating, and perpetuating policy ideas. This work answers the question of origins and perpetuation of ideas by directly linking them to institutional settings that produce and disseminate policy ideas to decision-makers. Their focus is on understanding how expert communities formed by bureaucrats, think tanks, academics, and civil society representatives interact with political parties and institutions to promote their views about how to solve different societal challenges. Over time, this dynamic tends to create a path dependency in terms of which ideas endure and consolidate as a *policy paradigm*.

And what is a policy paradigm? While there is a larger debate about it, we opt for a more concise definition where we define it as a dominant framing about societal challenges that presents policy instruments and settings to address them. Analytically, we can make use of the classic three-level policy model developed by Hall (1993) to have a better appraisal of the definition. Using the degree of abstraction/concreteness as the main criteria of disaggregation, policy settings of a specific instrument are the first level. In our case, the first level would be, for instance, the percentage levels of local content in each sector. On the second level, we have the adoption of policy instruments as the focus. Here, we can consider the different tools to promote local content, such as mandatory levels of domestic input, tax incentives or level of domestic ownership. At a higher degree of abstraction, the third level would be the main goals or aims to be achieved by the policy. Again, looking at local content, this policy instrument would be part of a broader "developmental" ideology in which the national industry is an important element to achieve economic development, and the state should have an active role in nurturing it.

With these distinctions, we can intuitively understand that the first and second levels are more dynamic, and changes can occur without necessarily a replacement of the broader policy paradigm. The classical dynamic here is bureaucrats and politicians suggesting changes in percentages of local content requirements or its necessity in some sectors based on the performance of some pre-defined indicators. Suggestions for removal of local content requirements can take place without representing a demand for eliminating the instrument or for an ending of state intervention in market dynamics. At the same time, a change at the third level does not mean an immediate change or abolition of existing policy instruments altogether. Even if decision-makers and authority holders embody a new policy paradigm, a complete overhaul of policy programs and instruments can take longer than elected mandates or their time occupying a relevant position. In other words, new policy paradigms take time to establish themselves as a dominant one.

These dynamics hint to an understanding of policy resilience as a more dynamic process than the image of continuity suggests. While the resilience of policy paradigms is often seen in contrast to other alternatives, normally inspired by conflicting assumptions and values, changes can also occur within the same paradigm by reinterpretations of existing premises.[10] Recent studies explore how, even in cases of relative stability, there is a constant updating of existing paradigms regarding new events and challenges. Mechanisms of layering, conversion and drift are examples of policy processes of gradual updates that can produce significant long-term consequences for institutions[11]. However, the concrete and immediate result of these reinterpretations are often seen in argumentative adaptations of policy documents and in changes of the policy instruments mix deployed by governments. Within the same policy paradigm, governments can have a quite large room for creativity and innovation.

[10]Schmidt and Thatcher (2013); Daugbjerg et al. (2017).
[11]Hacker (2004).

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These acts of *bricolage*, while useful in stabilizing the status quo, can also produce significant changes in the long run as new policies can emerge because of new interpretations of an existing policy paradigm.[12] This perspective is important to allow us to understand that ideas are not static but constantly redeployed. Consequently, reinterpretations can either reinforce the conceptual orthodoxy or open spaces for alternative interpretations, leading to new policy instruments or goals. In other words, paradigms can be stable but are not immutable.[13]

This discussion takes us to the second blind spot in the MIT debate: what are the conditions and mechanisms underlying the updating of a policy paradigm by policymakers when considering whether to maintain or change the status quo? As Blyth (2013) proposes, one potential mechanism is a *bayesian* process in which actors constantly gather information about policy results to check whether it is achieving or not its purpose. Following this path, actors would gradually adjust policy instruments to try to maximize the desired results. Radical changes in policy paradigms would only occur in critical moments when the accumulated evidence about a policy failure reaches a breaking point and justifies adopting a new paradigm.

An alternative explanation proposed by Blyth is *constructivist* dynamic characterized less by an emphasis on rationality and consensuality of the actors in updating their views about a policy domain and more by the incommensurability between alternative policy paradigms and the incapacity of actors to incorporate empirical invalidation of their beliefs. Ultimately, tensions and conflicts arising from the incongruence between a policy paradigm and the empirical evidence is solved by the authority of key actors in a specific institutional context and not exclusively by the force of evidence or arguments.

The *bayesian* approach, nonetheless, is the basis for many analyses emphasizing the challenges faced by middle-income countries. In general, they would lack institutions capable of generating high-quality policy information and promoting its exchange in a deliberative manner. In other words, well-informed policymakers would be better positioned to make sensible adjustments over time. However, as recent studies in psychology and political behavior show, individuals are highly sensitive to the context in which information is processed and used. The more politicized a topic is, the more instrumentally individuals will process information to reach conclusions that support their own positions and preferences regarding the topic.[14] Recent studies present evidence that highly adversarial environments tend to engage individuals, particularly those with strong preferences for one position, in a selective search of evidence supporting their beliefs rather than a fair evaluation of all evidence available.[15] Even though most studies focus on voters, policymakers are not completely immune to the same cognitive bias identified in this literature.

By translating this dynamic to our discussion, we can hypothesize that in middle-income countries, when industrial policy becomes highly politicized and conflictive in contexts of strong electoral competition, we will identify more ideological rigidity by adepts of a developmental paradigm and conflicts being ultimately resolved by political authority. On the other hand, in countries where industrial policy has been more insulated from political debates and supported by stable electoral coalitions, conditions for a more incremental *bayesian* policy development could take place.

As we will discuss below, the evolution of developmental paradigms in Brazil and Malaysia was strongly shaped by the political contexts of each country and defined how recent iterations of LCPs should deal with the realities of GVCs.

A tale of two *Developmentalisms*

Despite clear cultural and historical differences on the surface Brazil and Malaysia present many similar traces in their modern trajectories of economic development. Both countries were emphatic adopters of a *developmentalist* model based on heavy state presence in the economy and import-substitution

[12]Carstersen and Röper (2022).

[13]The comeback of industrial policy in many developed economies is currently framed, for instance, as a necessary tool to promote *green* sectors and address climate change, not as a tool to achieve more economic growth.

[14]Groenedyk and Krupnikov (2021).

[15]Little et al. (2022); Peterson and Iyengar (2021); Goya-Tocchetto et al. (2022).

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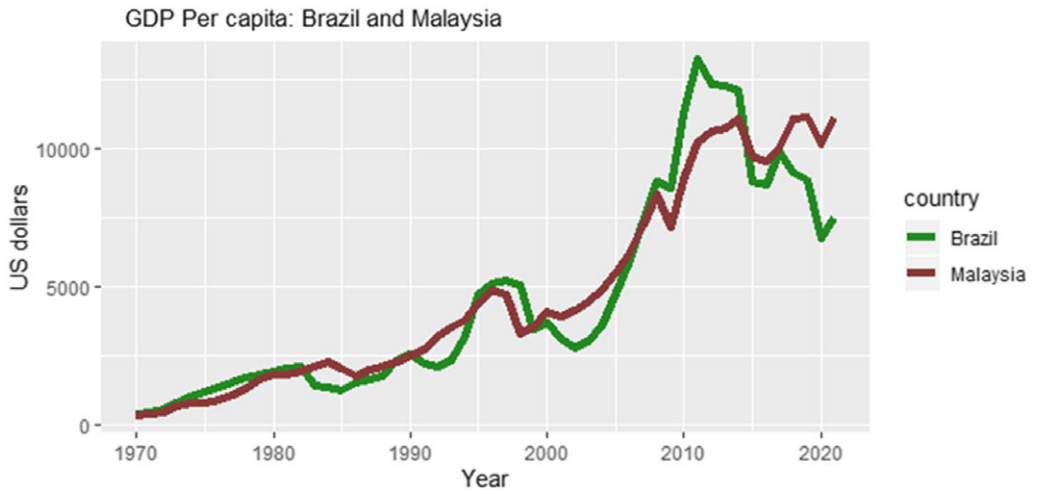

Figure 1. GDP per capita of Brazil and Malaysia (1970–2021).
Source: Authors with data from the World Bank.

industrialization policies during most of the post-war era. Similarly, both countries trended to a more liberalized economy and export-oriented industrialization model direction during the 1990s. In terms of the institutional setting for economic policymaking, both countries had common traits with the executive branch of the central government and its bureaucracy being the main actors in terms of formulation and implementation of industrial policy. The economic performance was also similar, resulting in both countries being often used as examples of high-middle-income countries. If we observe the evolution of the GDP per capita, Brazil and Malaysia have presented similar curves since the 1970s, with a decoupling only taking place after the 2010s (Figure 1).

Similarities put aside, there are constitutive differences in how the developmental policy paradigm established its roots in each country. In Brazil, developmentalism as a paradigm had a common ground in the rapid vertical industrialization of the country and the promotion of economic growth, with a main line of division being the role of foreign capital and the state. As Sikkink (1991) puts it, Brazilian developmentalists divided themselves among *cosmopolitans* and *nationalists* factions. The former was in favor of an industrialization process with extensive participation of the private sector and foreign capital, while the second was in favor of a greater participation of the state in the process of accumulation and more critical to foreign capital. The tension between these two views largely characterized economic debates in modern Brazilian history, putting the dynamics between domestic and foreign capitalists almost as a zero-sum game.[16] Despite this perennial tension, *nationalists* would often have a dominant position in the Brazilian government. During the authoritarian regime led by the military between 1964 and 1985, *nationalists* would secure an edge and push for large investment plans promoted by state-owned companies mainly focusing on securing national autonomy through a continuous import-substitution strategy.

In Malaysia, developmentalism had a different flavor, as a clear ethnic focus would inspire the economic policies devised after the 1970s to promote the creation of a "Malay bourgeoisie." Ethnic issues are known to completely dominate political life in Malaysia, and the country's move from a laissez-faire economic policy adopted since independence in 1957 to the state-led New Economic Policy (NEP) from 1971 was a reaction to intense ethnic conflicts in the country.[17]

In short, the Malays are the majority ethnic group of the country, but Malaysia's politics to this day have been shaped by conflicts arising from British colonial policies, when migration of ethnic Chinese and Indian reconfigured the ethnic mix of the country, reducing the share of the native population—or

[16]Bresser-Pereira (2017).
[17]Puthucheary (2008).

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the "sons of the soil" (known as *bumiputera*, mostly Malays). While an elite pact in 1957 paved the way to independence and electoral democracy in a consociational type of government, with a governing alliance of parties which represented the three majority ethnic groups (Malays, Chinese, and Indians), this arrangement did not survive the ethnic riots of 13 May 1969.[18] The NEP was then adopted as an ambitious social engineering policy designed to raise the living standards of the *bumiputera* and their share in the category of managerial, professional, and technical workers. Although redistributive in purpose, the NEP facilitated the adoption of industrial policies and local procurement as the government created public investment funds and state companies to reshape the economy. The national oil company, Petronas, created in 1974, would be one of the government instruments to promote the growth of businesses with *bumiputera* management and ownership.

Therefore, developmentalism in Malaysia was less focused in industrializing the country and promoting economic growth, and more with the redistribution of wealth between different ethnic groups in Malaysia (i.e. ethnic Chinese to ethnic Malay) and improvement of socio-economic conditions of the historically poor Malayan communities.[19] This affirmative action principle structured the boom of nationalizations and state-owned companies created during the 1970s and early 1980s. Malays were either put in charge of these businesses or were included through joint ventures in which foreigners or non-ethnic Malays were forced to have Malays as partners. The clear goal of this strategy was to create a Malay business class by giving them both know-how in different sectors and insert it into business networks. Consequently, the policy discussions in Malaysia were less about the origin of capital or state activity, and more about how to promote an increased participation of ethnic Malays in the national economy.[20] Moreover, economic growth and industrialization were not perceived as an end in themselves, but a means to empower ethnic Malays and establish a *Bumiputera Commercial and Industrial Community*.

A direct consequence of the different values inspiring the developmentalist paradigm in Brazil and Malaysia can be seen in the way each country has dealt with foreign investment and business ownership. In Brazil, there has always been a clear separation between foreign and domestic capital with the debate developing around which one would receive more benefits (e.g., tax exemptions). Historically, the resolution of this debate in Brazil was achieved by shifting the focus from the origin of the capital to where the activity was primarily conducted. In other words, a company would be considered national if its activities (e.g., manufacturing) took place within Brazilian borders, no matter if the ownership was of Brazilian nationals or foreigners. In contrast, Malaysia had as a structuring principle the requirement of any foreign investor or business from other ethnic groups (i.e., mainly ethnic Chinese) to partner with ethnic Malays for the establishment or pursuing of activities in Malaysia. Even though the exact percentage of minimum equity participation of ethnic Malays has varied and slowly flexibilized over the years, the principle is still in place today based on its original rationale of strengthening the *bumiputera*. Despite the continuity, there has been a reframing of the principle of favoring ethnic Malays within the larger economic policy paradigm over the decades. The original framing of interethnic justice and historical reparation for favoring *bumiputera* was gradually replaced by a framing in which the equity requirement was seen as an instrument for learning and transfer of skills to ethnic Malays to allow them to compete in an internationalized economy.[21]

An important difference in the paths followed by developmentalism in Brazil and Malaysia refers to how their broader economic policy paradigms incorporated the increasing globalization of the world economy and the rise of global value chains. Especially from the 1990s, with liberalizing reforms taking

[18]Horowitz (1989).

[19]Whah and Guan (2017). One important element to contrast with the Brazilian experience is the strong emphasis of developmentalism in Malaysia on improving educational levels of Malays. In Brazil, the authoritarian regime systematically neglected public education for the general population.

[20]The NEP had explicit targets of increasing economic ownership of ethnic Malays from 2.4 percent to 30 percent and reducing absolute poverty in general.

[21]This shift was clear in the launch of the National Development Policy (NDP) in 1991 as a replacement of the NEP. The main diagnosis of the document was that, although income inequality has been successfully reduced, corporate ownership goals for the *bumiputera* were not achieved.

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place in both countries, the debates about economic policy in each country headed in different directions regarding how to face changes in the global economy. To understand these differences, we need to look at the political context in which these discussions took place.

In Brazil, the tensions between cosmopolitans and nationalists were partially appeased by a strategy of accommodation by the military regime between domestic and foreign capital. While tax incentives for the entry of foreign capital and for domestic capitalists were continuously pursued, military governments were not shy of creating new state-owned companies or increasing investments of existing ones—mainly through an increasing foreign debt.

To achieve this conciliation of paradigms, the military governments implemented a process of increasing the state bureaucracy to both implement and monitor the different sectors and programs aimed to deepen Brazilian's industrialization, while also staffing the growing number of state-owned companies.[22] This dynamic created many challenges to a *bayesian* process within industrial policy. The first one was the fragmentation of public bodies and agencies responsible for producing and evaluating information about the economy. The proliferation of inter-ministerial councils under the authority of military presidents was an effort to address this issue by replacing the previous state-led corporatist model of the previous decades with a bureaucratic-led model. However, these councils were characterized by the lack of actual deliberation and more for the rubber-stamping of the dominant model of continuous economic growth. Largely, the absence of public political arenas with decision-making power during the military regime, transferred politics to the bureaucratic apparatus itself with business interests trying to lobby bureaucrats directly. The perverse incentive of this fragmented structure was to favor individualized strategies of political influence by companies themselves, hampering efforts to push for collective interest from business. Bureaucrats, in their turn, would either be co-opted or have a very narrow view of how a sector was performing.[23]

The overall result of this structure was an environment in which there was very little room for criticism or reappraisal of the developmental paradigm if the country was presenting significant rates of economic growth, mainly in the domestic manufacturing capacity. Instead of insulation, this system produced a gradual isolation of military governments from the business interests that originally supported them, with most industrialists feeling that they had no influence over the policy directions of the country.[24] Despite promoting a period of impressive economic growth—known in Brazil as the "economic miracle"—the military period struggled with a growing double crisis of hyperinflation and external debt leading to many business leaders to abandon the regime and support the redemocratization movement.

The transition from the authoritarian regime left the new democratic regime initiated in 1985 with a difficult conundrum to solve. How to deal with huge macroeconomic imbalances while needing to rethink Brazil's developmental model in a globalized economy, the Brazilian developmental debate became structured around proponents of an inward- versus an outward-look on the economic model.[25] While the former had a defensive view regarding globalization and GVCs as a threat to jobs and national manufacturing capacity, the latter had a more positive approach to the integration in the global economy and GVCs by emphasizing the need to explore competitive advantages and upgrade firms' capabilities. This debate acquired very defined political lines in Brazil with the center-right governments of President Cardoso (1995–2002) sponsoring a more outward-looking perspective and the center-left governments led by the Workers' Party (2003–2016) defending a more inward-looking perspective. As we will explore in the following sections, the O&G sector has become an arena for the confrontation of these two views, leaving little room for a more deliberative and consensual process for the adoption of a LCP.

In contrast, Malaysia managed to reconcile the premise of stimulating the consolidation of a *bumiputera* business class with a more open economy by adopting a more consensual outward-looking perspective since the 1990s. Institutionally, Malaysia also presented a rather different setting than Brazil. Despite being considered by many as a case of a competitive authoritarian regime, Malaysia

[22]Weyland (2002).
[23]Schneider (2004).
[24]Payne (1994, 78).
[25]Kasahara and Botelho (2019).

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61 years of electoral dominance by the Barisans Nasional coalition was characterized by a relatively consensual economic policy with government officials, bureaucrats, and business representatives having formal and informal channels of communication. In contrast to the Brazilian military regime, even with civil society and individual liberties often being disrespected by the Malaysian state over history, the minimalist democratic regime in the country still had strong incentives to pursue important social policies to reduce poverty and invest in the formation of human capital since the country's independence.[26] This also allowed for the pursuit of more stable macroeconomic policies, securing low inflation and more fiscal discipline than in Brazil.

The main contrast, however, can be identified by the process in which Malaysia embraced globalization with the election of prime-minister Mahatir Mohamad in 1981. Directly inspired by the experiences of Japan and South Korea, Mahatir started to implement an outward-looking orientation for Malaysian developmentalism. Even though the state would continue to promote investments and support ethnic Malays, the message transmitted by economic plans since the mid-1980s is that the *bumiputera*, to succeed, should be able to compete and thrive in a global economy by climbing up the technological ladder. Therefore, the requirement for equity participation of ethnic Malays was combined with a series of other policy instruments to promote R&D, human capital development, and upgrade of small and medium-size enterprises. In other words, Malaysian authorities had from early on embraced the realities of a global economy dominated by GVCs as the context to promote companies controlled by or with equity participation of ethnic Malays. Local content became gradually equated with "local" ownership and seen as one instrument among others to promote the integration of *bumiputera* in the global economy.[27] This paradigm created incentives for companies with ethnic-Malay equity holders to explore regional competitive advantages and acquire foreign companies during their strategies of internationalization in a way that Brazilian-based companies could not with most policy instruments focusing on increasing production in the country and in labor-intensive activities.[28]

In political terms, it is important to emphasize the stable support this perspective had in Malaysia's political establishment. The process of reorientation of the Malaysian economy took place relatively frictionless due to Mahatir's government strategy of promoting selected businesspeople to benefit from privatizations and government programs. Through the patronage and practices typical of crony capitalism, Mahatir's view of a modern capitalist economy could be implemented without public contestation.[29] Bayesian dynamics must also get into the mud of transactional politics.

What this summary of developmentalist traditions in Brazil and Malaysia indicate is that the broader policy paradigm in which local content instruments were devised for the O&G sector acquired very different flavors in each country. While in Brazil local content became an instrument to minimize job loss and capture opportunities to promote growth within an import-substitution framework, in Malaysia local content was seen as an opportunity to upgrade capabilities of ethnic-Malays and integrate them in global value chains.

A brief comparative history of the O&G in Brazil and Malaysia

The exploitation of oil and natural gas from underneath the seabed goes back to when the first offshore oil well was drilled in the Gulf of Mexico in 1947. Offshore extraction accounted for around 28 percent of both total oil and total natural gas production globally in 2019, with more than US$100 billion in

[26]Kuhonta (2011).

[27]One example of this perspective in Malaysia is the very selective way the state-controlled oil company Petronas would award their contracts for ships and platforms. Contrary to Brazil, Petronas would not award contracts of large platforms to local yards as they were not seen as competitive and sophisticated enough to conduct these projects. This was part of a national strategy to specialize Malaysian shipyards into the construction of small and medium-size vessels—a segment in which Malaysia could explore competitive advantages, according to Malaysian authorities (MIGHT, 2011).

[28]Between 2005 and 2015, Brazil adopted an explicit strategy of supporting the creation and internationalization of national champions. Most of the supported companies, however, were in sectors in which these companies already had an international presence with funds being used to promote the export of services or acquisitions of production facilities abroad with little spillover effects for small and medium-size suppliers (Hochstestler 2014; Musacchio and Lazzarini 2014).

[29]Gomez (2009).

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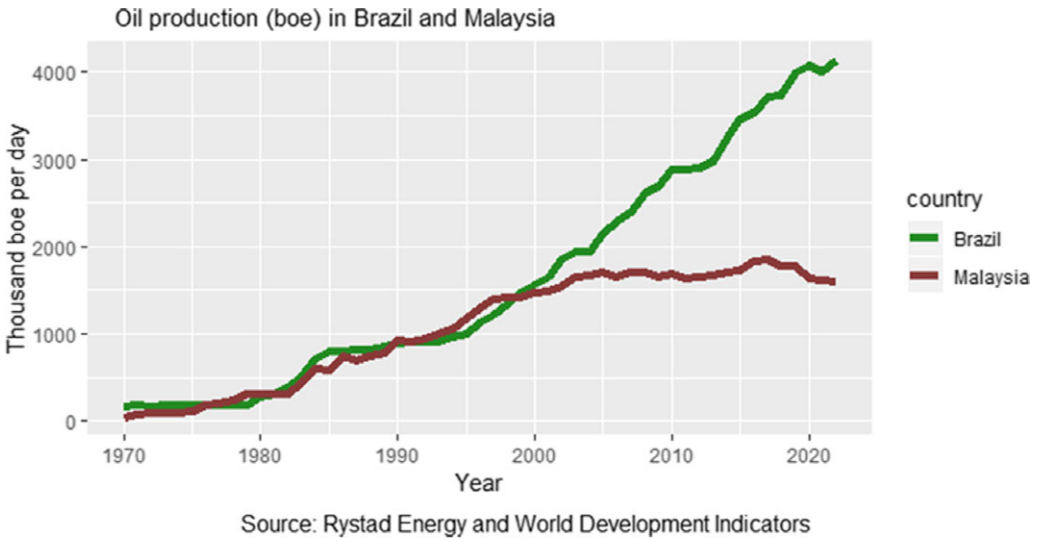

Figure 2. Oil production (boe) in Brazil and Malaysia.

planned investments for the same year.[30] OECD (2016) estimates that offshore fossil fuel extraction is the largest ocean-based industry, providing over a third of global ocean economy value added in 2010.

Besides being an industry producing a valuable commodity, one important aspect that makes the exploitation of O&G offshore reserves interesting for the purposes of industrial policy and economic development is the complex and large supply chain needed to extract these resources. From sophisticated seismic analyses and drilling equipment to subsea machinery and the huge vessels and platforms, there are many elements that need to be put together and create opportunities for countries owning these resources to develop domestic companies supplying some of these services and equipment. Not surprisingly, Brazil and Malaysia had historically looked at the sector as a main source of industrial growth.

In addition to the broader similarities emphasized above, Brazil and Malaysia show remarkable common background conditions that makes them well suited for a comparative study on industrial policy in the O&G industry. Both countries had once nationalized their resources and chosen a national oil company (NOC) to play a leading role in the oil sector: Petrobras and Petronas, respectively. In addition, Brazil and Malaysia were abundant in the more technically demanding offshore oil reserves and invested in localizing suppliers and service companies able to deliver solutions for these geological conditions. In terms of O&G output, for most of the 20th century, they had been very similar, except for the post-2000 period when Brazil's volume continuously increased with new findings while Malaysia's stabilized (Figure 2).

The institutional setting responsible for elaborating and implementing the industrial policy for the O&G in Brazil and Malaysia, however, have marked differences. In Brazil, the state-owned company, Petrobras traditionally had a dominant role in the policy formulation for the sector. In terms of industrial policy, however, Petrobras was historically characterized as being a poor stimulator of the development of domestic suppliers. With its focus on securing the supply of fuel to the country and building internal capabilities for identifying oil reserves, the company often prioritized foreign suppliers with sophisticated technological capabilities without looking for systematic development of strong domestic companies.

These mixed roles changed with the reforms implemented by the center-right Cardoso administration in 1997 when Petrobras lost its monopoly over the O&G sector and the regulatory National Agency of Petroleum, Natural Gas and Biofuels (ANP) was created. The Cardoso

[30]IEA (2020).

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administration was characterized by an explicit outward-looking orientation as a path to promote development and wanted to bring competition for the O&G production by establishing a clear separation between regulators and market actors. Petrobras would continue to be a state-controlled company but would have to compete with other domestic and foreign companies for new concessions.

The end of Petrobras' monopoly over the O&G sector was marked by many protests organized by unions and left-oriented parties during the period the bill was being discussed in Congress. It also required intense negotiation among Cardoso's coalition as many representatives were skeptical about liberalizing the sector. One concession made by President Cardoso was a promise to not privatize the oil company. Nonetheless, the liberalization of the sector was seen as an act against national sovereignty by the opposition who considered the monopoly a key element for further development of the country. The public arguments mostly presented during this episode represented well the two dominant developmental paradigms that would consolidate in the new democratic period as two rival poles competing for hegemony.

For Malaysia, in contrast to Petrobras, Petronas has kept its unique position of being simultaneously the regulatory agency for the sector and the main operating oil company of the country. In addition, Petronas is the *de facto* entity responsible for formulating the industrial policy for the sector as there is no ministry in charge of O&G policy or a separate regulatory entity (unlike in the electricity sector). Despite the real potential for conflict of interests and inefficiencies, Petronas has been historically successful in balancing these roles. The company not only managed to achieve high operational standards, but also to actively promote segments of the supply chain where Malaysian suppliers had been capable of achieving international quality standards. This unlikely success was mostly possible because of a two-pronged dynamic.[31] On the one hand, Petronas was kept insulated from direct political interference by the prime-minister's office over the decades in exchange for generating state revenues for patronage. The reduced amount of capital available for reinvestment led Petronas to seek continuous gains in operational efficiency and intense cooperation with international oil companies (IOCs) for technological transfers and learning. Cooperation with IOCs also requires a high degree of operational efficiency to secure the profitability of projects and the possibility of long-term partnerships. The positive performance of Petronas allowed for an early process of internationalization in joint-ventures with IOCs to explore O&G reserves in neighboring Southeast Asian countries.

As part of the government, Petronas was also pushed to execute the developmental goals to promote the *bumiputera*. Due to its political insulation and being a regulatory body, Petronas had a large space of maneuver in deciding how to implement these goals and learn from a process of trial-and-error. The focus of local content in Malaysia being primarily on the equity participation of ethnic-Malays, gave Petronas flexibility to choose segments to promote based on their technical judgments of capabilities to be developed by domestic suppliers in collaboration with foreigners. Simultaneously, Malaysian companies could more actively explore the competitive advantages of neighboring countries to build their own supply chains and manufacturing activities. This dynamic presents a stark contrast with the ideologically polarized Brazilian case of LCP as discussed in the next section.

Looking for synergies with the shipbuilding segment

For offshore O&G, the shipbuilding industry is one obvious candidate for receiving policy attention. After all, production and storage vessels and platforms, drilling ships and support boats must be built to extract oil from the sea bottom. However, despite an incredible growth in the number of shipyards during the commodities super-cycle of 2004–2014, the world shipbuilding market is increasingly concentrated in three countries: China, South Korea, and Japan. Despite many countries having invested in strengthening their shipbuilding industries during the first decade of the XXI century, the three Asian countries held a stable global market share of around 95 percent.[32] Among them, the

[31]Huebner (2020).

[32]The number of active shipyards around the world increased from 298 in 2001 to a top of 699 in 2007. By 2022, however, this number decreased considerably to 301 (BRS Group, 2023).

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important change was the consolidation of China as the largest shipbuilding nation in the world as it held more than 50 percent of the global market share of orders in 2022.[33] In the specialized vessels category, which includes those for the offshore O&G industry with higher complexity and much higher charter day rates than traditional carrier or container ships, shipyards from Singapore replace Japanese ones as the main players. Breaking down the value chain further, the maritime equipment industry, which designs, manufactures, and installs technical machinery for the shipbuilding industry, is estimated to contribute between 6 percent and 11 percent of the total output value of the shipbuilding industry in major shipbuilding countries.[34] Despite representing a relatively small share of a vessel's cost, the equipment market is highly specialized and technology-intensive with many suppliers being established companies from developed economies in Europe, Japan, and the United States.

These stylized facts about the offshore shipbuilding industry illustrate how the entry costs for newcomers are considerably high in terms of capital, skilled labor, and technological catch-up. Particularly for offshore vessels and structures for the O&G industry, such as Floating Production Systems (FPSs), Southeast Asia has become a main hub for a complex and global supply chain being responsible for the assembly of most units used (and expected to be used) around the world.[35]

By the beginning of the 2000s, despite being initially similar, the assessment of policymakers from Brazil and Malaysia about the potential of using the exploration of offshore O&G reserves to stimulate the development of shipbuilders and other specialized suppliers became widely different. As we argue, a closer analysis of the trajectories of the LCPs in each country shows that fundamental conceptions about development and the purpose of the LCP explain these differences.

The offshore shipbuilding industry in Brazil: an inward-oriented LCP paradigm amidst GVCs

As mentioned above, with regulatory changes in the Brazilian O&G sector in 1997, ANP became the institution responsible for formulating and implementing policies for the sector. Within these broad responsibilities, industrial policy became an accidental task in a period of low interest in ambitious developmental plans at the national level. After all, President Cardoso was elected in 1994 on a liberalizing platform aimed to control a decade-long hyperinflation and manage public sector indebtedness and the Ministry of Mines and Energy was silent about any industrial policy goal for the sector.[36]

In this context, the adoption of an LCP was unlikely to happen. Surprisingly, the newly created ANP, led by David Zylbersztajn, chose to reinstate a local content clause in new concessions for O&G fields. However, this clause was substantially different from the one conceived under the traditional import-substitution model of previous decades. As responsible for organizing bidding rounds for exploration blocks for O&G and granting the production licenses, ANP established for the first round of concessions in 1999 the local content requirement as a voluntary percentage of the total cost of the planned investments to be proposed by oil companies. These offers had no minimum or maximum requirements and oil companies could choose how to implement them in terms of their activities over the project period. As an incentive, the local content offer was set as a tiebreaker for similar bids. In addition, expenses in engineering and design activities were multiplied by two in terms of investment expenditures, as ANP considered these strategic segments for learning and developing future capabilities in the supply chain.

The main purpose of the policy was on the one hand to create incentives for oil operators to include competitive domestic companies in their supply chains and stimulate the further development of engineering capacities in the country. On the other hand, domestic companies would have an incentive to upgrade and become competitive. The idea was to use the LCP as a springboard for Brazilian

[33]BRS Group (2023)
[34]Gourdon and Steidl (2019).
[35]Laurent (2014); Botelho (2020).
[36]Mueller and Pereira (2002); Power (2010).

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companies to integrate in the global supply chain of the O&G industry. As Zylbersztajn explicitly stated: "If a Brazilian company supplies to Petrobras, it must be able to be a supplier to any oil company in the world. It must be competitive internationally."[37]

As supporting actions for this outward-looking view of local content, ANP also was directly involved in the creation of the National Organization of the Petroleum Industry (ONIP) in 1999. As a private organization representing different segments of Brazilian manufacturing and services sectors, ONIP was founded with the purpose to help Brazilian companies to become suppliers for the O&G sector. Its main activities were to guide companies on how to achieve minimal quality and technical standards for the O&G industry and manage a directory compiling Brazilian companies able to provide equipment and services for the different segments of the supply chain. The goal was to reduce information costs for oil companies when looking for potential suppliers in Brazil. In addition, ANP would also use resources from royalties paid by O&G companies to fund programs for R&D targeting universities to increase both human capital and technological development that could be eventually leveraged by domestic suppliers.

However, this outward-looking approach to LCP, with an emphasis on creating paths for Brazilian companies to integrate themselves in the O&G global value chain did not last long. The election of President Lula from the center-left Worker's Party (PT) in 2002 brought back a strong inward-looking view on LCP for the O&G sector. During the presidential campaign, Lula would explicitly criticize the liberalization of the sector and Petrobras for ordering oil tankers and platforms from shipyards abroad as a missing opportunity for job creation in the country.

To fulfill his campaign promises of bringing Petrobras' projects back to the country, his administration initiated a gradual change in the rules of the LCP. First, ANP lost most of its discretion over the policymaking process and definitions about LCP were relocated to the Ministry of Mines and Energy. Consequently, for the subsequent bidding rounds in 2003 and 2004, ANP announced changes in the local content clause and introduced a minimum offer with differentiated percentages for the procurement of Brazilian goods and services used in the exploration and eventual development of onshore and offshore blocks. In subsequent bidding rounds, ANP established spreadsheets mandating oil companies to allocate weights and percentages of local content to several items and subitems for the exploration and development stages.

The relevance of the inward-oriented developmental paradigm of President Lula's administration becomes more evident when we look at the context of the O&G sector domestically and abroad. International oil prices were relatively stable after recovering from the 1997–98 financial crisis and the commodity boom promoted by China's economic growth was still out of the radar of Brazilian policymakers. Domestically, there was not a clear constituency of companies that could benefit from these ambitious local content requirements, as the shipbuilding industry vanished during the 1980s and despite the prospects of new findings, proved oil reserves had been relatively stable at the time.

With the discovery of the immense pre-salt oil deposits off the Brazilian coast in 2005/2006, under extremely deep, thick layers of rock and salt requiring substantial investment, the bet of President Lula in the O&G sector seemed to have paid off. Based on expected incoming investments, local content was gradually increased for new concessions. For the pre-salt round the minimum required local content amounted to 37 percent for the exploration phase, and 55 percent for the modules of the development stage to start production by 2021.

Changes on the LCP to force oil operators to source more of their investments in the acquisition of equipment and services from suppliers based in Brazil were also accompanied by an active use of the state-controlled oil company, Petrobras. Being the main oil producer in Brazil, responsible for 90 percent of the country's production, the company is also the main buyer of the sector. Therefore, President Lula also created the Fleet Modernization and Expansion Program (PROMEF) to revamp Brazilian shipyards by directing Transpetro, a subsidiary of Petrobras, to order oil tankers with a

[37]In-person interview with the authors, Rio de Janeiro, 4 February 2015.

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minimum of 65 percent local content. In addition, Lula's government also created the Program for the Mobilization of the Oil and Natural Gas industry (PROMINP), a forum with the participation of Petrobras, representatives from industrial segments and unions to coordinate actions for the training of skilled labor demanded by the expected investments. Lastly, in 2010, the Brazilian government coordinated the creation of SETE Brasil between Petrobras, investment funds, and private Brazilian construction firms. Being a drilling-service company, SETE Brasil had the main purpose to order more sophisticated drilling rigs from newly created Brazilian shipyards.[38]

The inward-looking turn of LCP continued with the election of Dilma Roussef, also from PT, in October 2010. As the former minister of Mines and Energy of President Lula, Dilma was one of the main responsible for the reorientation of LCP to maximize employment and production in the country. She continued the orientation policy, even amidst increasing criticism from civil servants responsible for implementing the policy and Petrobras itself. From bureaucrats at the Brazilian National Socio-Economic Development Bank (BNDES) and ANP, the criticism was directed to the lack of strategic focus.[39] By trying to capture the whole supply chain of offshore O&G with indiscriminate high requirements for all segments, the country was losing the opportunity to develop consistently segments in which it could have a competitive advantage. From Petrobras, the increasing costs and delays imposed by LCP's high requirements were becoming a clear burden, leading its CEO, Graça Foster, to state publicly in March 2014 that local content requirements cannot harm the targets for oil production.

However, in the aftermath of the decline in oil prices from mid-2014, combined with large-scale corruption scandals involving payment of bribes to politicians in Petrobras's projects, the built-up capacity to exploit the offshore sector was virtually eliminated. The company went into a deep financial crisis and needed to cancel or postpone contracts, wiping out the previous investment boom into the country's shipyards sector. The buoyant shipyard sector, employing about 80,000 direct workers in 2013, saw this number crashing to a little more than 21,000 in 2022.[40] In addition, many small and medium-sized suppliers went bankrupt or left the O&G sector because of the double crisis Petrobras was facing.

The unfolding of the political crisis caused by Petrobras' corruption scandal was one of the main reasons behind the impeachment of President Dilma in 2016. The replacement by her vice-president Michel Temer promoted a new movement of changes in the LCP. As a historical politician from the centrist Brazilian Democratic Movement (MDB), Temer had a more liberalizing approach to industrial policy in general and supported the diagnostic of LCP's excessive requirements. Therefore, he transferred the responsibility for the LCP back to ANP and the agency worked on reducing requirements for upcoming bidding rounds while issuing vouchers for oil companies (mainly Petrobras) allowing them to reduce local content commitments signed in previous contracts. In 2017, the National Energy Policy Council (CNPE) defined a new local content system under the CNPE Resolution No. 02 (as of 11 April 2017) to be applied in the next bidding rounds, starting with the 14th concession round that took place in September 2017. The modifications included a reduction of local content as a scoring factor in bids and a simplification of commitments along with a reduction of the minimum required local content percentages and extinction of most requirements for specific segments and equipment within each stage.

Changes made during Temer's administration were kept during Bolsonaro's government mainly as a matter of granting regulatory stability to companies than any real interest in having a consequential industrial policy. With many cosmopolitans as economic advisors such as the finance minister Paulo Guedes, LCP became almost a reminiscence of the immediate past as it survived without any other supportive measures for developing capabilities of domestic suppliers. The erratic movement of LCP in the last 20 years reflects the incapacity of democratic Brazilian administrations to agree on a developmental paradigm amidst a sector that became highly politicized.

[38]Kasahara and Botelho (2019); Lima-de-Oliveira (2020).

[39]In-person interview with Division for Maritime and O&G projects representatives at BNDES, Rio de Janeiro, 10 October 2013; In-person interview with Department of Local Content at ANP, Rio de Janeiro, 23 March 2015.

[40]SINAVAL (2022).

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The case of Ocyan

The current decade is characterized by the leading role of South America in the market for offshore O&G production. Since 2020, Brazil and Guyana have awarded eighteen contracts for the construction of large-scale floating production, storage and offloading (FPSO) units. Brazil alone will receive thirteen of these new units, consolidating its position in the global FPSO market with 25% of all units worldwide. What is more striking, however, is the lack of significant Brazilian players in this market, either as suppliers or operators of FPSOs, including sub-contractors for engineering studies or manufacturers or hulls and topside equipment. The trajectory of the Brazilian O&G services company Ocyan, discussed in this section, is a good example of the limitations of the inward-oriented LCP that systematically ignored how sector-specific GVCs have dominated the world economy and harmed the chances of domestic companies in acquiring a relevant position. As presented above, high LCP levels in the early concession rounds constrained learning opportunities for competitive specialization of both domestic and foreign firms.

Formerly called Odebrecht Oil & Gas, created in 2006 as part of the Odebrecht Construction Group to provide integrated engineering and operational services for Petrobras and other oil companies in Brazil, Ocyan was the only national FPSO operator in Brazil until 2023, when it was bought by the US-based institutional investor EIG. Ocyan, following the former mother holding company Odebrecht business model and driven by the broad range LCP requirements, became a highly diversified business group with several diverse activities in the O&G offshore services sector ranging from maintenance solutions to rig construction and operation to the operation of subsea construction and decommissioning projects. Despite this diversification, it has a tiny share of the Brazilian FPSO operational segment with three units through its JV with Altera - the Cidade de Itajaí, Pioneiro de Libra and P-63 - and the P-61 dry-tree tension-leg wellhead platform.

Lacking a consolidated supply chain of shipyards to implement their engineering projects, Ocyan would have to rely on joint-ventures with foreign companies to acquire larger contracts from Petrobras. The partnership with the Norwegian-based Altera is an example of this strategy. Altera already had a contract to supply Petrobras with an FPSO unit for the Bauna field and was searching for a partner to help operate it after completion. The Cidade de Itajai FPSO was completely converted from an Aframax tanker hull at Semcorp's Jurong Shipyard in Singapore and put into production on the Santos basin field in February 2013. As Petrobras acquired the concession in 2003, the local content requirements for this field were still flexible enough to allow the main construction of the FPSO to be conducted abroad.

One of the main challenges for a gradual expansion of capabilities of Ocyan was the bottlenecks created by the increasing requirements of local content set by the Brazilian government. Ocyan had established a partnership with Sete Brasil to build drilling ships to be used in the development of pre-salt. It committed the shipyard of the Odebrecht group (Enseada Shipyard in Bahia) to build them, even though the shipyard itself was under construction and struggled to deliver on time and on budget many other projects requiring local content. Simultaneously, the incentives given by the Brazilian government to invest in drilling assets did not consider the outlook of the international market, characterized by an overcapacity of drilling rigs during the period.

In 2014, the partnership won a contract from a Petrobras-led consortium to supply an FPSO for extended well tests on the Mero field, formerly known as Libra and as conversion of a Suezmax tanker was just getting under way at Jurong Shipyard, Brazil's oil sector was rocked by the Car Wash corruption scandal. Although no Ocyan executives were accused of wrongdoing, Petrobras compliance procedures barred all Odebrecht group companies from participating in new tenders for more than four years, along with scores of other Brazilian companies. Supported by long-term Petrobras charters for five high-specification rigs, Ocyan managed to keep up bond payments underpinning the flagship Pioneiro de Libra FPSO project and navigated its way through a group-wide restructuring process in 2018.

Ocyan enjoyed a return to the fold with Petrobras, and the joint venture was among the bidders in a 2020 tender for two mid-sized FPSOs wanted for revitalization of the Marlim field, in Brazil's Campos basin. The Marlim charter contracts were eventually won by the leading FPSO supplier Modec (Japan)

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and Yinson of Malaysia. Similarly, it lost a tender by Enauta (later Brava Energia) a Brazilian independent oil company, for the Atlanta FPSO in the first half of 2021, to Yinson, which deployed the vessel in late 2023. By late 2022, Brazil's demand for FPSOs was on the rise but potential shipyard bottlenecks were feared due to strict local-content rules. Then, Petrobras already had dozens of FPSOs spread across the southeastern coast and by 2026 it planned to have 14 new FPSOs in operation in Brazil, of which 12 had already been contracted.

The sale of Ocyan to EIG in December 2023 is a good example of the focus of the LC policy in Brazil on jobs generation instead of a long-term strategy to generate competitive domestic suppliers. Supported by the Brazilian National Development Bank (BNDES), which owned much of the company's debt, the American group EIG bought Ocyan with plans to invest in building new FPSOs for the buoyant Brazilian offshore market. To what extent these investments will generate jobs in Brazil and promote capabilities of local suppliers is to be seen.

The Malaysian offshore service companies: leveraging ethnic-based LCPs for GVC participation

Malaysia's oil industry growth was contemporaneous to the country's ethnic-political conflicts and the rise of a more active state participation in the economy to redistribute wealth in favor of the *bumiputera*. The first significant oil discovery in the country was made by Shell, in 1968, followed by Exxon in 1969. After the first OPEC oil shock, in 1973, the government decided to revamp its regulatory framework from the more liberal concession system to one tightly controlled by the government. This led to the creation of Petronas in 1974 as the sole regulatory entity of the sector and a direct partner in every producing asset.[41]

The high cost of production and more sophisticated technical requirements of offshore oil production were perceived by the Petronas management team as a business and learning opportunity, which would also help them to fulfill their mission to promote the NEP objectives, which included developing new local companies with *bumiputera* capital.[42] Tengku Razaleigh Hamzah, Petronas' first chairman and a former Minister of Finance, pushed the Malay suppliers and workers to join the oil industry value chain. As he stated in an interview, "As chairman, I took a very particular interest in this . . . It was not [an industry] indigenous to the Chinese . . . This was a new field, a new business. So, I thought, I'm quite safe to say: okay, let's try the Malays out."[43]

Since the first contracts were signed with oil operators, Petronas added a clause on procurement, which required them to buy goods and services from licensed companies or agents. By controlling the list of suppliers and vetting the oil companies' yearly work programs, Petronas has implemented industrial policies that aimed to transfer production from abroad to Malaysia and replace expatriates with Malaysian workers. To operationalize this industrial policy, the company created a public registry of suppliers and defined a list of Standardized Work and Equipment Categories (SWEC) by separating the numerous activities of O&G into specific tasks and goods, each with a list of licensed suppliers. One key requirement is that each company must have *bumiputera* in its ownership capital and board of directors. For imported goods and services, an international supplier must set up an exclusive representative agent in Malaysia with minimum 51 percent *bumiputera* capital, while companies engaged in local manufacturing have a 30 percent requirement.

In a recent list (as of August of 2022), there were 1,136 categories, each with specific SWEC description and capital requirements. For instance, a service like geophysical feasibility study is listed under a specific code (17101100S) while the actual execution of geophysical data acquisition and data processing is a separate one (17101200S). This system of fine-slicing activities was designed to facilitate the entry of local firms into the oil industry, from virtual zero participation when the industry began in the country to one of its most important activities.

[41]Gale (1981); Hashim (2004).
[42]Bowie (2001); Hashim (2004).
[43]In-person interview, Kuala Lumpur, 13 July 2018.

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Furthermore, Petronas operates a Vendor Development Program (VDP) to upgrade local suppliers to acquire capabilities and broaden their scope of work.[44] Another instrument used to guide the supply chain is the publication of an *activity outlook* which describes its multi-year investment plans, signaling where demand exists, and which segments are unlikely to see much activity.[45] The report includes the number of wells that the company plans to drill, the number of drilling rigs which are expected to be used, subsea structures and pipelines which will be needed, etc. By anchoring expectations, the "activity outlook" aims to prevent overcapacity in the domestic sector (which would lead to unsustainably low margins for the supply chain) and underinvestment (which could result in capacity bottlenecks for project execution).

While Petronas plays a key role in managing the O&G supply chain, the Malaysia Petroleum Resources Corporation (MPRC) was established in 2011 as a government agency to deepen the productive linkages within the domestic O&G services and equipment industry and attract foreign suppliers to Malaysia. The agency oversees executing the government's 2021-2030 blueprint for the sector with the intention to "build greater competitiveness among Malaysian OGSE companies to expand into new markets abroad" (EPU 2021, 6) and explore adjacent industries, like renewables. The blueprint estimates that the sector comprises over 4.000 vendors, employing 59.000 people with a contribution to the GDP of 5 to 8 percent (in comparison, the total O&G industry in Malaysia is estimated to be 14.5 percent of the GDP).

Taken together, the Malaysian government has implemented several industrial policy instruments since the creation of Petronas in 1974 to bring domestic players to the O&G supply chain and continuously upgrade them. In a highly internationalized market with few major global companies in the equipment and services market (e.g., Schlumberger, Baker Hughes, Halliburton, FMC Technip), the Malaysian ecosystem is characterized by several players of domestic (mostly *bumiputera*) capital, while foreign companies need to find local partners to operate in Malaysia (per Petronas licensing requirement). This is exemplified by the ranking of suppliers by revenues as compiled by MPRC (2022), which are dominated by Malaysian companies, such as MISC, Sapura Energy, and Yinson (occupying the top three places).

International expansion and consolidation.

From Petronas creation in 1974 to the late 2000s, O&G production in Malaysia rose steadily from less than 100,000 barrels of oil equivalent per day, to about 1.8 million in 2008. It has since stabilized around that level. The perception, since early on, that Malaysia's O&G reserves were of limited size and not enough to sustain the industry in the long term has been a critical driver of the internationalization of Petronas.[46] Today, in upstream, Malaysia's NOC is present in over 20 countries with 247 producing fields, in addition to an even larger global footprint in the downstream segment.[47] Only 26 percent of its revenues come from domestic sales, the majority are from exports (41 percent) and direct international operations (33 percent), for a total of RM 375.3 billion in 2022.[48] Furthermore, the limited growth potential of O&G production from Malaysia has given Petronas an additional reason to seek growth opportunities in frontier areas (such as in deep offshore in Suriname) as well as into renewables (through the creation of a subsidiary called Gentari which is investing in solar energy and hydrogen solutions).

Petronas international expansion helped to bring along some home-grown suppliers, many with direct or indirect (through cross-ownership and sovereign funds) links to the Malaysian state. MISC, for instance, is a subsidiary of Petronas with global midstream activities and 107 liquefied natural gas (LNG), petroleum, and products vessels.[49] Brazil and Vietnam are the core focus of its international

[44]Lebdioui (2022).
[45]Petronas (2023a)
[46]Hashim (2004); Lebidiou (2019, 2022).
[47]Petronas (2021).
[48]Petronas (2023b, 5).
[49]MISC (2023).

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expansion through FPSO operation. Similarly, Yinson is another global leader in FSO and FPSO operations with assets deployed in Angola, Brazil, Ghana, Malaysia, and Nigeria. Founded by the Malaysian-Chinese Lim family, it is partially owned by government-linked investment companies (GLICs).[50] Bumi Armada is one more example of a Malaysian company which operates in the same segment, with presence in over 10 countries and is controlled by the investment vehicles of the ethnic Indian Malaysian billionaire Ananda Krishnan, a well-connected businessman who passed away in 2024.[51]

Notwithstanding the growth of internationalized firms from Malaysia, in the government sectoral industrial policy plan, as well as in the specialized local press, there is a recognition that there are too many firms operating in a domestic crowded market, which already suffered from low-margins internationally due to oil price fluctuation.[52] The fine slicing of activities through the SWEC system helped to reduce the barriers of entry to new companies but is increasingly treated as an obstacle to consolidation and growth beyond Malaysia. "We need to reshape the Malaysian oil and gas ecosystem so that the companies that operate here will be more efficient, with the size and economies of scale that will also make them more resilient and competitive globally," called the then Petronas CEO, Wan Zulkiflee Wan Ariffin.[53]

The pressure to reshape the supply sector through consolidation does not mean the abandonment of industrial policy instruments and *bumiputera* assistance. Both industry consolidation and growing *bumiputera* capabilities are key flagship initiatives of the national OGSE industry blueprint.[54] It may, however, change its nature from forced inclusion through the licensing requirements to incentives, such as preferential funding, talent development and R&D grants. Malaysia's ratification on 29 November 2022 of the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), a trade agreement between 11 nations, comes with a clause to phase out Petronas preferential Bumiputera requirements starting five years after the ratification.[55] If followed through, this will remove one key industrial policy instrument from the menu used by Malaysian policymakers to deepen productive linkages in the O&G sector.

As discussed in the previous section, the consensual view on the guiding principles of the developmental paradigm in Malaysia combined with a unique position of Petronas as both regulator and operator, allowed for an LCP evolution that could follow a more *bayesian* path. Petronas officials were given room to constantly update their views on which segments of the supply chain could be competitively occupied by domestic companies while managing the attraction of foreign suppliers. Simultaneously, Malaysian politicians did not have the temptation created by substantial new oil reserves as in Brazil and kept distance from intervening in how Petronas should conduct the implementation of LCP. On the contrary, the gradual decline of oil reserves in Malaysia created incentives for gradually incorporating an outward-looking perspective in the framework of its LCP and for competitive domestic suppliers capable of following Petronas in its internationalization strategy. Along this process, the focus on local production acquired a diminished importance, allowing some *bumiputera* companies to consolidate and form globalized supply chains. The case of Yinson below is representative of this path.

The case of Yinson.

In 2021, according to the Malaysian Investment Development Authority (MIDA), there were 99 registered shipyards undertaking shipbuilding and ship repairing activities, led by the country's largest

[50]GLICs have been another key instrument used by the Malaysian government to influence businesses and achieve socio-political objectives and includes investment and pension and savings funds. GLICs have extensive ownership and control of the Malaysian corporate sector (Gomez et al., 2018), including in O&G either by Petronas directly or institutions like Khazanah and PNB.

[51]Gomez et al. (2018, 48).

[52]EPU (2021); The Edge Malaysia, 15 May 2023. https://theedgemalaysia.com/node/666853.

[53]Petronas (2018, 14).

[54]EPU (2021).

[55]See Malaysia's CTTP "Annex IV – State-Owned Enterprises and Designated Monopolies Non-Conforming Measures". Available at: https://fta.miti.gov.my/miti-fta/resources/Text%20of%20TPPA%20(160516)/Annex_IV._Malaysia_.pdf

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shipbuilding company, Malaysia Marine and Heavy Engineering (MMHE), a state-owned enterprise, belonging to Petronas. As of 2021, tugs, offshore vessels, and dry cargo vessels were the main ship types produced in Malaysia over the last eleven years.[56] However, during this same period, production of seagoing vessels and new orders to Malaysian shipyards underwent a steady decline in terms of CGT. Compared to 2011, completions in 2021 decreased by 79 percent and new orders in 2021 decreased by 96 percent compared to 2020.

Despite constant criticism from the shipbuilding industry in the country, this decline has been the result of a conscious policy decision from Malaysian authorities. Faced with the dominance of shipyards in China, South Korea, and Japan, the Malaysian government and Petronas have repeatedly stated in policy documents that investments in building capacity for complex offshore infrastructures are not something worth pursuing. While focusing on design, engineering, and operational services of large vessels such as FPSOs to oil companies, Malaysian companies could use the myriads of competent shipyards in Southeast Asia to build the needed vessels.

Yinson Holdings Bhd., an investment holding company, is a storage service provider headquartered in Kuala Lumpur and represents well how the Malaysian version of LCP was leveraged to integrate domestic companies into GVCs. The company was founded by Lim Han Weng and Kim Lian Bah in 1983 and currently has about 1,000 employees. Despite being originally, a company owned by ethnic-Chinese, Yinson saw over the years increasing ownership of *bumiputera* state-owned pension funds among their shareholders. By 2023, the Retirement Fund Incorporated (KWAP) and the Employees Provident Fund (KWSP), together, owned about 25 percent of Yinson's shares.

Today, Yinson is engaged in providing offshore support services for the upstream oil and gas sector with a fleet of FPSOs, FSO, and offshore production and offshore support vessels (OSV), tug supply vessels (AHTS), and platform supply vessels (PSVs). Its operations spread across various regions, including Norway, Singapore, Brazil, Ghana, the Netherlands, Nigeria, Angola, Colombia, India, Italy, Malaysia, Vietnam, the United States, the United Kingdom, and Mexico. After a flat period of growth until 2019 with revenues hovering around US$ 250 million, it achieved US$817 million in 2022.

This increase in revenues is due to Yinson venturing into the operation of offshore production vessels. It began in 2011, when it won through a joint venture with PetroVietnam Technical Services Corporation a $737.3 million marine transport contract from a joint venture between oil major PetroVietnam and Malaysia's state oil firm Petronas. The job had previously been awarded to Fred Olsen Production (Norway) for $500 million, but it fell through after financial difficulties at the Norwegian firm.

Another milestone in the company's business trajectory happened in November 2014 when Yinson Holdings' 30%-owned associate company Yinson Energy was awarded three licenses by Petronas qualifying it to tender and participate in upcoming works relating to the categories of the listed licenses for Petronas and other oil companies and/or operators in Malaysia, including a floating offshore facilities license, a mobile offshore facilities license and a naval architecture and marine engineering license. But it was not until 2019 that Yinson had its first FPSO operating in Malaysia, when it took delivery of the Helang FPSO, constructed by Chinese Cosco Shipping (Qidong) Offshore in eastern China's Jiangsu province.

Yinson has five FPSOs in operation around the world, and one FSO. According to Yinson's latest annual report, it is the sixth largest FPSO industry player in the global FPSO league. Today, Yinson's fleet comprises four FPSO vessels, one floating storage and offloading vessel and one mobile offshore production unit with wide geographical presence in West Africa, the United States, Europe, and Southeast Asia.

The company's FPSO division is strongly influenced by Norwegians who came on board when Yinson acquired Fred Olsen Production in 2014. Oslo is the headquarters for its global FPSO operations, Kuala Lumpur is the corporate headquarters, and Singapore is the headquarters for projects. The acquisition of Fred Olsen Production meant Yinson inherited a strong and experienced team, and

[56]Daniel and Lee (2022).

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the company has since grown into a top-tier global FPSO provider, including three large FPSOs under construction for the Brazil market.

Yinson has enhanced its FPSO complementary capabilities with the acquisition 100% of the issued capital of London Marine Group, the sole owner of turret company London Marine Consultants (LMC), a specialist provider of turret mooring systems, an essential and complex technology for FPSOs with a track record of working for Yinson projects Atlanta (Brazil) and Helang (Malaysia) FPSOs and has provided engineering services related to mooring and risers for Yinson's spread moored Anna Nery (Brazil) FPSO. Yinson, as a global top-tier FPSO company, will now join rivals such as SBM Offshore and Modec with an in-house turret mooring capability. Further, LMC's has provided similar expertise in the floating wind, tidal and wave energy sectors.

The most recent Agogo FPSO project in Angola exemplifies Yinson's trust-based collaborative strategy centered on Asia which has become a hallmark practice of the FPSO industry. Yinson entered into an agreement with Azule Energy in early December 2022 to start preliminary activities for the provision, operation, and maintenance of an FPSO for the Agogo Integrated West Hub development project in Angola. Yinson pulled ahead of rivals Bumi Armada (Malaysia) and Saipem (Italy) for the provision of the FPSO.

LCP and GVCs

As mentioned above, GVC dynamics challenges the traditional goal of LCPs given the global dispersion of production activities. The high customization nature of the offshore O&G industry GVC presents unique challenges to the deployment of LCP by oil-producing countries striving to escape the MIT. As this section will show, sectoral national LCP responses are shaped by historical and political contexts. The contemporary offshore O&G industrial dynamics has allowed for the emergence of regional hubs within its GVC resulting from the diverse intra-regional national supply chain segment LCPs.

Brazil's LC policy inward-looking impacts shaped the strategic diversification behavior of potential national engineering companies and suppliers across a multitude of skills and business areas in the offshore services and manufacturing industry. One main limitation of its design was exactly its ambition to capture most of the offshore supply chain with extensive and high levels of local content requirements. For companies with enough capital like Ocyan, they turned mostly into generic service providers without being able to specialize and find their competitiveness across these areas.

Foreign FPSO first-tier suppliers also priced in the LCP requirements in their projects and manufacturing costs and charter day rates, raising the cost of oil production in the country. While Petrobras stipulates 30% local content for FPSOs built for deployment offshore Brazil, meaning that a significant portion of the topside's modules must be constructed within the country, due to various constraints, including capacity limitations and fabrication challenges, Brazil has often opted to send the uncompleted modules to Chinese yards. For example, top-tier FPSO supplier SBM Offshore, lead contractor for the Almirante Tamandare FPSO, designated four yards for construction of the topsides modules: China Merchants Heavy Industry (CMHI) and Penglai Jutal Offshore Engineering Industries (PJOE) in Yantai city, Shandong province, and BrasFELS and EBR in Brazil, subcontracted to build nine modules of which four had been delivered by mid-2023. However, a few months later it was reported that two partially completed modules, 20% and 80% finished, respectively, with one consisting solely of a steel structure, had been shipped from Brazil to PJOE to finish installation of pipes in them. This reveals the pull of GVCs over LCP constraints upon the business strategies of oil companies as well as first-tier suppliers of key production and services equipment.

However, policy regimes are extremely resilient, trumping any learning in LCP and the realities of GVCs. In January 2023, the Workers' Party candidate Luis Inácio Lula da Silva was inaugurated for a third presidential term. Once again, the rebirth of the shipbuilding industry through Petrobras' investments was one of its major campaign promises. A reality check was soon publicly expressed by the new Petrobras' CEO, Jean Paul Prates. In March 2023, he said that the company was willing to help restore the Brazilian shipbuilding industry to its former glory, but that a collective effort and supportive public policies were required to start ordering large equipment locally again. According to his words:

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> "It is not enough for Petrobras to decide that it will no longer place orders for platforms abroad and request proposals from Brazilian shipyards. There must be a competitive condition for that," ... "A complex piece of equipment made entirely in Brazil is not just 30% more expensive than abroad. It costs three, maybe four times more. When there is such a discrepancy, a public policy or a different type of approach is necessary."[57]

At the time, according to Brazil's shipbuilding association Sinaval, contracted projects at local shipyards totaled $1.8 billion back in 2011, a figure that had dropped 94% to around $100 million in 2021. Most of all Brazilian shipyards operated below their capacity or performing mainly vessel repair duties, except for BrasFels, Estaleiro Jurong Aracruz and EBR, which still receive orders to build some topside modules for FPSOs under LC requirements. In mid-2024, Jean-Paul Prates was fired. His unwillingness to contract with uncompetitive domestic suppliers was one of the main reasons for President Lula's dissatisfaction with him. Prates was replaced by Magda Chambriard, a former executive-director of ANP during Dilma's government and one of the main architects of establishing the system for monitoring and enforcing the LCR policy.

Meanwhile, Asian firms acquired and evolved a set of specialized skills and assets that eventually nurtured a highly competitive regional hub for EPCI projects which also greatly contributed to the growth of Malaysian FPSO suppliers and operators.[58] The strengthening and spillovers of the SE Asian hub continues to this day. Offshore Frontier Solutions (OFS), a Modec group company in Singapore, has partnered with Toyo Engineering to establish a global capability center in Bengaluru, India. Toyo Modec OFS India will perform high-quality and efficient front-end engineering and design and detailed engineering and provide procurement support for the topsides of floating production, storage and offloading projects, among its primary business activities supported by a team of more than 450 personnel by 2025. This follows Modec's recent opening of an execution center (OFS Malaysia) in Kuala Lumpur. The goal is to take advantage of the internationalization of Malaysian FPSO operators and build a hub for designing and EPCI management of FPSO projects.

Despite the failure in building a competitive and sustainable shipyard industry in Brazil, the LCP had some positive outcomes. Some marine engineering equipment suppliers, particularly in the subsea segment, invested in productive capacity in Brazil due to the expected demand of equipment required by the exploration of pre-salt fields. These companies have increased investments in Brazil in view of the recovery of the offshore market from the end of the 2010s. Recently, national capital and foreign capital domestic suppliers have continued to participate in the supply chain of foreign-purchased FPSOs under the LC mandates. For instance, the national capital company WEG closed a contract to supply 40 medium voltage electric motors, with powers reaching up to 13,400 kilowatts (kW), and another 100 low voltage equipment and five frequency inverters, compressor and pump drives, to the platform of Equinor's FPSO platform in the pre-salt of the Santos Basin.

These examples, however, should not be seen as a sign of success of the inward-looking LCP implemented between 2003 and 2016. Some of these companies would most likely have invested in Brazil despite any local content requirement, given the size and growth rate of the market and the ever-dominant "produce where you sell" perspective among industrial manufacturing MNCs. In addition, some of the Brazilian suppliers, such as WEG, were already successful and internationalized companies and did not depend on the O&G sector. Another potential counterfactual within Brazil is the case of Embraer. The Brazilian mid-range aircraft producer became an unexpected success mainly because of a strategy that secured a golden share for the government to avoid a foreign take-over in combination with the flexibility to establish its own global supply chain.[59] Unfortunately, the success of Embraer does not seem to inspire Brazilian leaders to update their developmental paradigms.

[57]Upstream, 6 March 2023, https://www.upstreamonline.com/politics/petrobras-eyes-future-orders-at-brazilian-shipyards-but-not-at-any-cost/2-1-1414456

[58]McGregor and Yeung (2022).

[59]Luz and Salles-Filho (2011); Maculan (2013)

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A recent streak of studies tends to emphasize how LC policies should actively incorporate the realities of GVCs to succeed in developing new capabilities in the domestic economy. An OECD (2019) quantitative analysis of two specific local content policies—Brazil's local content requirement in national concession contracts for the oil and gas sector and the long-standing U.S. Jones Act, which mandates that intra-U.S. seaborne trade must use U.S.-built, U.S.-flagged vessels—found "large benefits following the proposed relaxation and hypothetical abolition of the LCRs in the two countries despite initial losses in the target industry." In Brazil's case, the study suggests that recent changes in O&G local content regulation could, over the long term, generate substantial economic gains, potentially offsetting short-term estimated losses of around USD 2.4 billion (–0.1%) in total output. These gains would occur because greater access to foreign markets may reduce prices, boost productivity, and spur new demand, which could stimulate Brazil's total economic output by an additional USD 1.8 billion (+0.06%), resulting in a USD 0.5 billion increase in value added within the sector and USD 0.9 billion for the broader economy. The policy reform could further add up to USD 28 billion in royalties for the government by 2027 (equivalent to USD 2.8 billion per year), while the expectation of thousands of new shipyard positions—due to organic growth of activities—would increase disposable income, fuel private consumption, and thereby raise Brazil's total output and value added over the long run.

Lee et al. (2021) compare the trajectories of the automotive sectors in Malaysia, Thailand, and China with that of Korea, focusing on industrial policy, particularly local content requirements (LCRs) and global value chains (GVCs). They observe that although LCRs commonly increase localization ratios to a certain extent, the subsequent development of automotive industries in each country differs markedly. In their analysis of GVC upgrading, measured by the share of domestic (or foreign) value-added in exports, export orientation through re-exported intermediate imports, and the international competitiveness of intermediate parts (domestic value-added embodied in foreign exports), Malaysia performed the least successfully, behind China (highest in two measures) and Thailand (with strong export orientation). They attribute these different outcomes to local ownership, discipline from market competition, and firm-level efforts and strategies. According to the authors, Malaysia lacks market-competition discipline because of its national automotive monopoly, while Thailand fails to nurture local ownership consistently. China, by contrast, lacks neither a national monopoly nor domination by foreign joint ventures, and instead benefits from a robust base of locally owned firms that fosters high market competition. However, as demonstrated above, Malaysia's O&G LCR policy adapted to different stages of domestic industry capacity and national objectives set by Petronas, combining local ownership with foreign joint ventures under a framework of ongoing monitoring and a balanced, iterative learning process across both the supply chain and the governance structures of the National Transformation Program.[60]

Following earlier GVC studies indicating that participation in global value chains has been central to promoting steady economic growth and upgrading, Murphree and Breznitz (2025) posit that since the 1970s, GVC participation has been crucial for Asian countries seeking to escape the middle-income trap (MIT). Drawing on a case study of the recent development and transformation of the regional city of Dongguan in China, they argue that China's GVC participation has evolved: first, as export-oriented industries shift from attracting large-scale foreign manufacturing investments to becoming locally integrated industrial clusters with co-located foreign invested and domestically owned suppliers, and second, as some Chinese firms emerge as global lead firms by leveraging domestic manufacturing and supplier bases for global competitiveness. They conclude that "the separation of design and definition, component production, assembly, marketing and services among many dedicated firms creates opportunities for regions and individual firms to industrialize and benefit from global demand and knowledge flows even without developing capabilities for the full production chain," and further propose that "small middle-income countries should also participate in GVCs, but with the added benefit of seeking new sources of demand and investment from Chinese MNEs." In the Malaysian context, the O&G LCR framework likewise prompted local firms to seek FPSO (floating production, storage, and offloading) demand outside Asia, obtain critical funding through international markets,

[60]Sabel and Jordan (2015); World Bank (2017).

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and establish joint ventures or undertake corporate acquisitions of European and Japanese FPSO lead suppliers and top-tier suppliers to upgrade their capabilities.

Lastly, Braunschweig (2024) argues that while the number of LCRs has expanded rapidly since 2008, these measures can sometimes impede the development of sustainable GVCs. Although certain LCRs have succeeded in meeting their targets—such as Morocco's wind-power initiatives in fabricating and assembling turbine masts, India's 2013–2017 solar module program that saw 27% annual growth rates in local capacity, and Brazil's reliance on the national development bank BNDES to incentivize localization through low-interest loans—others have been less successful and tend to increase costs, restrict competition, and limit investment in both target and related industries. Their ineffectiveness often stems from overly prescriptive, mandatory local content requirements coupled with misaligned policy measures, as appears to be the case with Brazil's O&G LCR.

Conclusion

Local content requirements are one of the key instruments deployed by governments in resource-rich countries to promote the deepening of productive linkages and industrial upgrading. Those requirements, however, can have significant variation in terms of design, durability, and outcomes. This paper sheds light on the role of policy paradigms in shaping LCPs by studying how it was implemented in the O&G sector in Brazil and Malaysia—upper middle-income countries with a strong presence of national oil companies. In broad terms, Brazil's industrial policy for the sector aimed at maximizing job creation and domestic production, without favoring national ownership and integration in global value chains (GVCs). Malaysia, on the other hand, due to domestic political factors, focused on capital ownership. This led to a more outward-looking, flexible, and globally integrated LCP, with a few Malaysian companies (e.g., MISC, Bumi Armada, Yinson) now becoming significant global providers of offshore services, including for the Brazilian market.

Looking back, DuBois and Primo (2016) remark that a major issue of an aggressive industrial policy regime in emerging markets is the state support of inefficient enterprises. Initiatives aiming to boost the shipyard sector in Brazil did not have either the monitoring capacity to assess the required extensive learning to produce ships for the O&G offshore industry with the required timeliness, quality, and performance characteristics to compete effectively in the global market. Moved by a primarily inward-looking orientation, the Worker's Party administrations used exclusively job creation as the main measure of success for shipyard projects, ignoring any need to achieve global competitiveness.

Brazil's LCP trajectory shift to an opportunistic inward-looking orientation between 2003 and 2016 exposed the political pitfalls of a policy reinterpretation that swims against the market trend. The global shipbuilding industry was going into a decline by the time LCR was revamped in the country. By the end of the 2010s, most of the national capital O&G service and shipbuilding companies that jumped into the LCR bandwagon during this period faced enormous financial difficulties due to the sharp fall in oil prices and massive corruption scandals. All large civil construction groups, involved in multiple enterprises and related shipyards that went bankrupt, shrank considerably, and had to shed assets to survive. Over this period, Petrobras debt increased sevenfold to USD 134 billion led by a trebling of investment between 2005-2013 but without comparable growth in production (less than 10 percent increase) or reserves.

Since then, the LCP showed its resilience as the O&G recovered and reconsolidated during declining oil prices from 2016 and the COVID-19 pandemic. The expansion of foreign operators in the country and Petrobras recovery of its investment capacity were aided by the consolidation of the offshore shipbuilding supply chain in Asia, particularly of firms based in China and Singapore, which was the largest beneficiary of Brazil's surge in FPSO EPCI orders during the past decade. The national shipyards that benefited most from the LCP in this latter period, mainly through small topside construction orders and a few partial topside integration contracts, were mainly those connected to foreign shipbuilding or engineering firms.

The success of Malaysian-owned companies to expand globally suggests a more successful policy than what has been adopted in Brazil. Malaysia's unlikely political stability allowed not only for the

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continuity of a LCR, but above all, the continuing adaptation of the policy to an increasingly competitive global economy. Prime Minister Mahatir's long period in power promoted an important reinterpretation in the country's industrial policy. A strong bumiputera should not only own a substantial part of the domestic economic activity but also be able to compete internationally. Therefore, Malaysia used its full control of Petronas, a business conglomerate that is also the regulator of the oil sector, to promote capable suppliers with *bumiputera* capital while emphasizing their competitiveness. Despite clear practices of cronyism and favoritism, the policy continuity and focus on capital ownership helped to promote domestic players, which now dominate the domestic O&G industry of Malaysia. The local companies have also had more flexibility on where they would manufacture goods used in the industry and take advantage of GVCs—particularly the shipbuilding hub consolidating in Southeast Asia. Moreover, the talent pool spillover attracted foreign firms to establish project management and engineering units in the country, as presented above, turning Kuala Lumpur into an exporter of high-end O&G services fully integrated in the FPSO production and operation GVC.

Nonetheless, Malaysia also faces some enduring competitive challenges and political obstacles to reform. One component of the industrial policy for the oil sector in Malaysia has been the reduction of the entry barriers to the sector by fine-slicing activities through the Standardized Work and Equipment Categories (SWEC) adopted by Petronas. This created a sizable but fragmented supply base heavily dependent on domestic capital expenditures. The more successful companies—the likes of Yinson, MISC, Bumi Armada, and others—have grown by expanding abroad and, recently, moving into renewables, but there are several SMEs that rely on local contracts to survive. In official documents and public statements, policymakers have been emphasizing the importance of consolidating the sector to have few players but with more scale and financial robustness. Consolidation efforts have failed so far. However, three factors point to significant challenges ahead to companies that are focused on domestic contracts in Malaysia. First is the dwindling domestic O&G reserves (unlike Brazil, which however has stagnated recently); second is the energy transition and Petronas embrace of green energy; and third is the ratification by Malaysia of the CPTPP trade agreement. The latter expressively limits (gradually) the use by Petronas of *bumiputera* procurement. Taken together, these factors will reduce the scope of industrial policy instruments in Malaysia's O&G sector. Soon the sector will have to show if it is mature enough to thrive internationally without the domestic support enjoyed so far. Notwithstanding, Petronas 1993 successful Vendor Development Program (VDP), which benefited 171 *bumiputera* businesses, recently underwent an adaptation to address these challenges by adding a new module, VDPx, aimed at scaling-up SME development in collaboration with main contractors and industry enablers, though grooming more SMEs at a faster rate.

The comparison between Brazil and Malaysia shows that policymakers in developing countries cannot ignore the shifting realities of global value chains when considering their LCPs. For example, LCP design ought to address complex services in addition to manufacturing, such as project management and engineering and integrate performance monitoring requirements in industrial policy.[62] The crucial question for political economists interested in developmental challenges is to identify under what conditions policymakers can learn from their mistakes and experiences abroad to adjust their views. Emerging growth-coalitions need to get the right institutions and policies to overcome the middle-income trap. Political stability and a shared consensus about a policy paradigm's broader goal seems to be a necessary condition to achieve a flexible and effective policy. A consensus around an internationally competitive and nationally controlled industry seems to be a fundamental starting point.

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[62]Rodrik and Sabel (2022); Juhász et al. (2024)

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