

## BOOK REVIEWS

*Ownership and Control of Oil: Explaining Policy Choices across Producing Countries*, by BIANCA SARBU. (Routledge, Taylor Francis, 2014) 204 pages, hardcover, \$165.00. ISBN-10: 0415725992, ISBN-13: 978-0415725996.

This book examines the different policies that have been employed by oil producing countries in their oil upstream sector. It identifies the factors that influence government decisions about how much control to exercise over the oil industry, paying particular attention to the role of the NOC (National Oil Companies).

The book starts with a chronology of the ownership and control of the oil upstream industry. The first chapter provides important information and the historical context of the development of the oil upstream sector. It discusses the development of the IOC (International Oil Companies) and NOC and it sets the themes that will be repeated throughout the book. The author nicely identifies the research gap and the research question and clearly positions the book in the literature. The road map at the end of the chapter is also very useful and well structured.

The second chapter focuses on upstream sector policy in the oil industry. The author starts by discussing the different policy-making processes, depending on the political systems under which the oil sector operates. The book provides a very interesting distinction between the policy-making process in parliamentary and congressional systems versus the centralised political systems. Furthermore, the author exposes the complexity of the sector's political economy with operational decision-making on top of policy-making in the context of three different models, namely the corporatized, the pure budget and the hybrid. In addition, there is a discussion of the Norwegian model, which separates further the decision-making into policy-making, strategy-making, operational decision-making and monitoring and regulation. In the second part of this chapter, the author expands on upstream sector policy, focusing on the distinction between ownership and control. In this section, the author discusses how the economic performance of the sector may change depending on who exercises the control (i.e. state versus private). This particular section provides a one-sided view, though, as it expands on the disadvantages of the NOCs, while the potential disadvantages of the IOCs are not explored. Furthermore, there is no discussion on the economic upsides when control and ownership belongs to the state. Overall, this second part of the chapter presents the cliché that the state is an inefficient agent as opposed to a private sectors that "thrives." I would like to see a more objective approach to this matter. Finally, the explanation of the upstream sector's policy tools is very useful.

Chapter 3 introduces the key focus of the paper. It provides an extensive review of the drivers and drives in oil sector policy making and decisions on the degree of control that the state is exercising. The author distinguishes between three broad categories, namely the technical, economic and institutional issues. Using these three categories, she develops an analytical framework (see Figure 3.1) and five hypotheses, which are then examined empirically in chapters 4 and 5. These five hypotheses are related to the complexity of the geological conditions, technical capabilities, oil prices, reliance on oil, and executive constraints on the level of state control over the oil upstream sector. The main issue in this chapter is the development of the first two hypotheses, as they are not well justified. It is not clear why we should expect that more complex geological conditions and lower technical capabilities of NOCs would lead to more control by the IOCs.

Chapters 4 and 5 include the empirical research of the book. The author employed a mixed method methodology, where in Chapter 4 provides the quantitative analysis and in Chapter 5 the qualitative.

In Chapter 4 the author has developed a very well detailed econometric model to test the five hypotheses developed in Chapter 3. The author well justifies the choice of the variables, explaining any disadvantages that some proxies may have. The results suggest that the higher com-

plexity of geological conditions leads the oil-producing countries to relax their control over the upstream sector. Furthermore, it is maintained that the reliance on oil, as measured by oil rents as a % of GDP or oil exports, shows some positive and significant effects on the level of state control. Nevertheless, this does not hold for all specifications. Thus, the author claims that the particular hypothesis is partially supported. On the contrary, the author finds strong evidence to suggest that the executive constraints have a significantly positive impact on state control over the upstream sector. Even though the analysis of these hypotheses is well developed, there are two more results that are counter-intuitive.

The first is related to the technical capabilities, which is captured via two proxies, namely, the school enrolment or GDP per capita. The findings show that in the majority of the specifications the effect is negative and significant. This contradicts the author's argument, as this was developed in Chapter 3, that lower technical capabilities lead to less state control on the upstream sector. Given this contradiction, the author should spend more time to explain this finding.

The second issue is related to the effects of oil prices on the level of state control. According to the theory, the previous literature and the author's hypothesis, these effects should be significant and positive. The author, though, finds evidence that the effects of oil prices are negative and significant in almost all specifications. Once again, the author should allocate more space to explain this counter-intuitive finding.

The aim of Chapter 5 is to collect primary data through interviews, focusing on two case studies (Saudi Arabia and Abu Dhabi) in order to compare the findings of the qualitative study with those of the quantitative analysis presented in Chapter 4. There are 33 interviews in total from experts in the oil industry. In this particular context, "experts" were considered those people with possession of relevant knowledge about the specific subject. The structure of the interviews is well-thought out and they assist the comparison with the quantitative study, as well as to provide more in-depth analysis in certain issues.

The results from the interviews partially confirm those of the statistical analysis. More specifically, Chapter 5 shows that the complexity of the geological conditions can indeed lead to a reduction of state control over the upstream sector. Furthermore, the interviews show that oil reliance can also positively influence the level of state control, although not to the same degree for the two countries. Finally, the author maintains that executive constraints may play an important role on the level of state control over the upstream sector. Such a conclusion however, is not straight forward as the decision for the level of state control is also impacted by oil revenues, technical capabilities, as well as the different national historical paths of the two countries.

By contrast, the interviews reveal that lower technical capabilities reduce the level of state control, which contradicts the results from the quantitative analysis. Furthermore, the interviews did not reveal any impact of oil prices on the level of state control. The analysis of these two contradictory results is quite in depth and informative.

The last chapter provides a very nice summary of Chapters' 4 and 5 findings and based on these findings, the author revises the analytical framework that was initially exhibited in Chapter 3. Interestingly enough, the author has removed the impact of oil prices from the framework. Nevertheless, this required further justification given that the statistical analysis showed a clear negative and significant effect. The author finally reiterates the study's contributions and limitations.

Overall, this is a very useful book for those interested in the oil upstream sector, although, the author tries to incorporate too much information in just 204 pages.

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*Economics of Unconventional Shale Gas Development: Case Studies and Impacts*, edited by WILLIAM E. HEFLEY and YONGSHENG WANG. (Springer International Publishing Switzerland 2015). 294 pages. ISBN 978-3-319-11498-9

Policymakers maintain that the dramatic transformation in the U.S. shale industry ranks as the most significant energy innovation so far this century. Indeed, the economics and related impacts of unconventional shale gas development have the potential to cause a paradigm shift in the fueling of North America's energy future. Increased drilling in the Marcellus and Utica shales in the Mid-Atlantic region and promising oil and gas plays in the Niobrara shale formation have made the U.S. a net producer of natural gas and contributed to local economic gains.

This important book is the first volume to focus solely on the economics and related financial impacts of unconventional shale gas development in the United States. The editors are William E. Hefley at the University of Pittsburgh and Yongsheng Wang, at Washington and Jefferson College. While focusing mainly on the Marcellus and Utica Shales in the Mid-Atlantic region, the purpose of the book is to review, synthesize and discuss the development of the U.S. shale energy industry using a wide range of research from multiple levels of analysis, i.e. single wells to entire states and additional insights from other regions, in order to provide a broader view of these issues. It addresses, in particular, the impact of increased exploitation of natural gas reserves on local communities, states, and sectors, and the environmental concerns from an economic perspective. The analyses and proposals put forward by the authors should be considered constructive inputs to fill the research gap on this pressing issue.

The nine contributions to this volume, plus an introductory chapter by the editors, investigate a variety of case studies and engage several related aspects of technological advances in horizontal drilling and hydraulic fracturing (or "fracking"). Collectively, they offer valuable insights into how political discourse, rather than technical or technological advantage drives shale gas development at the state level and the attendant changes in the U.S. energy portfolio.

The volume is organized into four main areas, namely: [1] case studies (Chapters 1–5); [2] state-centered impacts (Chapters 6–7); [3] sectors (Chapter 8); and [4] the supply chain (Chapter 9). I will follow the same classification, but without necessarily reviewing and commenting on each case study or individual analysis.

Chapter 1 on the cost of bringing a single well to production, "Direct Economic Impact of the Value Chain of a Marcellus Shale Gas Well", is written by William E. Hefley and Shaun M. Seydor, both at the University of Pittsburgh. It examines the direct economic impact of shale gas exploration from a single well perspective, using a Marcellus Shale well located in Southwestern Pennsylvania as a case study. The authors quantify the "business" factors of a single Marcellus Shale well value chain, from preparation to production, to be in excess of seven million dollars. They note, however, that the central costs in development are: site preparation and reclamation, mobilization of equipment and materials, power generation throughout the process, and steel and steel derivatives. Therefore new regulations, or changes to the existing laws and policies on natural gas extraction are required, and could have a future impact on the drilling costs and operations of Marcellus Shale wells.

Hefley and Seydor propose two preliminary steps to be considered when analysing the total cost of drilling a gas well: (i) mineral leasing and acquisition and (ii) permitting. In particular, these steps are critical to the establishment of a well and can contribute significantly to the overall costs. Changes in regulatory costs, compliance costs, inflationary pressures, or changes in materials and/or labor costs will impact the direct economic costs and the production value chain of companies, thus changing the direct economic impact of a Marcellus Shale well. The authors also advocate an explicit account for direct economic costs to address concerns that labor movement in the Marcellus region may not match the underlying assumptions of a net economic benefit from gas drilling implicit in certain studies from other gas producing states.

Chapter 2 on the Marcellus Shale play, “Analysis of the Shale Gas Economy in Washington County, Pennsylvania” is written by Yongsheng Wang and Diana Stares, both at Washington and Jefferson College, while the positive effects of Marcellus Shale on employment, wages, and local business activity study in (Chapter 4), “Marcellus Shale and the Commonwealth of Pennsylvania”, is undertaken by Timothy W. Kelsey and Kirsten Hardy, both with the Pennsylvania State University. Chapter 3 on Pennsylvania’s top five drilling counties, “The Shale Gas Economy in the Northeast Pennsylvania Counties”, is also authored by Hardy and Kelsey. The chapter on the top five drilling counties in Pennsylvania is the shortest of the four Marcellus plays chapters and may also be the most comprehensive in quantifying the local economic impacts of Marcellus Shale development at the county-level. The study focuses on six counties of Pennsylvania’s Northern Tier, including Bradford, Lycoming, Sullivan, Susquehanna, Tioga, and Wyoming counties and points to their generally struggling rural economies in need of community revitalization. They observe that unlike other areas of the state with a history of gas and coal development, the Northern Tier (with the exception of parts of Sullivan County) did not have existing infrastructure to support the shale industry.

The study shows that much of the enthusiasm about Marcellus Shale has been its promise of greater indirect and induced economic benefits because “dollars spent locally are more likely to stay local and recirculate in the community.” Take for example tax collections between the fiscal year 2007–2008 and 2011–2012. The Northern Tier counties experienced an average 24.7% increase in sales tax collections during this period compared to the statewide average of 4.8% decrease at the county level. Yet, despite the level of increased drilling activity within the first 7 years of shale development in the region (2005 through 2007), it is unclear how much of the economic impact from Marcellus Shale development is actually occurring in the counties, or stays within the counties where drilling is occurring.

Chapter 5 on shale development in Texas, “Eagle Ford and the State of Texas”, is authored by Thomas Tunstall from the Institute for Economic Development at the University of Texas at San Antonio. Its emphasis is on the wide ranging effects of the South Texas Eagle Ford Shale formation, the largest single oil and shale gas development in the world measured by overall capital expenditures. The author discusses key possible approaches to mitigating potential impacts as a result of the shale oil and gas boom. The five approaches include (i) decrease production rates to lessen the “crowding out effects” to other industries (p. 124), (ii) diversification to other industries, (iii) revenue sterilization, (iv) creation of stabilization funds to neutralize the impact of large revenue windfall inflow, and (v) government investment policy to encourage economic diversification and infrastructure development. Chapter 6 on “Communities Experiencing Shale Gas Development”, has eleven authors; Kathryn J. Brasier, Lisa Davis, Leland Glenna, Timothy W. Kelsey, Diane K. McLaughlin, Kai Schafft, Kristin Babbie, Catharine Biddle, Anne DeLessio-Parson, Danielle Rhubarb, and Mark Suchyta, all from the Pennsylvania State University. This chapter continues the discussion of the previous chapter by assessing how social indicators, including education, crime, housing, healthcare, and residents’ perceptions of their communities have changed as a result of Marcellus Shale development.

The last part on different areas of state-centered shale gas development focuses on variations in regulatory response to shale gas in different states. In Chapter 7, Iliia Murtazashvili, University of Pittsburgh, writes on “Origins and Consequences of State-Level Variation in Shale Regulation: The Cases of Pennsylvania and New York.” The author characterizes differences in regulatory responses in shale gas development, in particular, the extent to which features of politics, geography, changes in relative prices, and institutions explain variations in shale policies at the state level. He argues: “Explaining the extent to which rules reflect efficiency considerations requires a theory of institutional change, although establishing which mechanisms drive the process of institutional change is often difficult” (p. 181). The chapter concludes with a bold forward-looking observation. While the shale policy in Pennsylvania appears to be economically “efficient” because

it was conceptualized to promote wealth creation and remedy economic externalities, the same cannot be said of other states. In New York, the response to shale policy appears “inefficient” because it is political consideration, rather than economic ones, that has prevented shale production in the state.

Alan Krupnick, Zhongmin Wang, and Yushuang Wang, all from Resources for the Future, have authored Chapter 8, on “Sector Effects of Shale Gas Development”. The chapter assesses the impacts of the shale gas revolution in the U.S. economy on the sectors of manufacturing, electricity generation, and transportation. The emphasis is on the profound effects of the natural gas revolution on the electric power and manufacturing sectors of the economy, as well as growing effects on the transportation sector through rising penetration of LNG in the heavy-duty truck market. The conclusion, Chapter 9, written by Clifford A. Lipscomb, Sarah J. Kilpatrick, Yongsheng Wang and William E. Hefley, on “Achieving Balance Between Economic, Sociodemographic, Environmental, and Regulatory Concerns: A Shale Gas Perspective,” explains that the benefits of shale gas development related to jobs and revenues must be balanced against potential costs related to environmental, litigation, property value, and financing.

The book provides a much more extensive description of economics of unconventional shale gas development in the United States than touched upon in this brief review. While the book is mainly descriptive, relying heavily on case studies, the analytical foundation for the policy proposals and recommendations for the impacts of shale development put forward can help explain factors that have converged to spur the shale boom in the United States. Technological innovations (e.g. hydraulic fracturing and microseismic fracture mapping), high natural gas prices in the 2000s, favorable geological formations and market structure, private land and mineral rights ownership, and an extensive network of natural gas pipelines and infrastructure explain the remarkable shale boom in the U.S. Unavoidably, there is some overlap and repetition of information about the politics of shale development, and the resulting economic, environmental, and regulatory concerns, but not unduly so. How the industry resolves these issues will depend on the degree to which these issues are perceived as pertinent to the industry.

The ability to cost-effectively develop vast, dispersed deposits of shale energy in the United States will continue to transform the supply and price outlooks in the energy markets affecting the choice of fuel options and potential economic and environmental benefits, domestically and abroad. The derived benefits of the growth of shale oil and gas have been a significant transformation in the electric power generation due to enhanced competitiveness of natural gas-fired power plants, especially with respect to coal. This transformation has resulted in the displacement of the most inefficient coal power plants from the base load and a significant increased use of gas in the power sector. The actual market regulatory framework for shale oil and gas in the U.S. nevertheless remains uncertain and this poses technology, policy, macroeconomic, and institutional risks to the industry, and this book is a valuable contribution to finding solutions to these concerns.

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***The Economics and Uncertainties of Nuclear Power***, by FRANÇOIS LÉVÊQUE (Cambridge: Cambridge University Press 2015) Hardbound, 341 pages, ISBN 978-1-107-08728-6

This book presents a thorough discussion of the cost uncertainties and externalities associated with nuclear power generation. However, a better title in English might have been *The Political Economy of Nuclear Power in the Light of Uncertainty*, as the book suggests on page 3.

The book introduces concepts from economics, but does not provide an 'economic analysis' of nuclear power or the nuclear power industry, as the Anglo-American reader might expect. The focus is more on nuclear power policy and regulation than on a complete quantification of costs and uncertainties.

While Part I (1) adds up the expected present value of the costs of nuclear power, (2) speculates as to the origin of the "curse of rising costs," and (3) compares these costs with alternative forms of generation, the book concludes Part I with "Setting aside any consideration of possible accidents, it would be an economically risky choice for an operator to invest in building new nuclear power plants or for a state to facilitate such projects." (p. 78)

Part II covers the probability of nuclear power plant accidents (see International Atomic Energy Agency's, IAEA's, International Nuclear and Radiological Event Scale, INES, defining the severity of nuclear accidents). Chapter 4 starts with a review of the publicly available studies of the probability of a nuclear power plant accident in Europe in light of the accidents at Three Mile Island in the United States in 1979 (INES Level 5), at Chernobyl in the Ukraine (then the Soviet Union) in 1986 (INES Level 7), and at Fukushima Daiichi in Japan in 2011 (INES Level 7). In contrast to these studies, Chapter 5 introduces the reader to the economic analysis of risk aversion, including the complexities of asymmetric value functions taking into account "The distorting effect of the Fukushima Daiichi disaster [which] is likely to be a durable feature, particularly as we receive regular reminders." (p. 117)

These two chapters provide an introduction to Chapter 6, "The magic of Bayesian analysis," arguably the most important contribution of the book to this literature. Chapter 6 shows how the results of Probabilistic Risk Analysis (PRA) of a potential accident (calculated for each nuclear reactor since PRA was proposed in the 'Rasmussen Report,' WASH-1400, 1975) can be updated with the few observations on nuclear reactor core fuel melts with Bayes' rule (fuel core melts would be rated at INES Level 4 and above, of which there have been eleven accidents in 14,400 reactor years, p. 128). The book shows that by updating the PRA estimates with observed events leads to a more reasoned approach to risk analysis than either the 'rational experts' or the 'irrational public,' "with both parties accusing the other of rank stupidity" (p. 135). The chapter ends by concluding (1) if regulatory agencies use PRA without Bayesian updating and (2) if the propensity to invest in nuclear safety is not brought under control, then "many expensive new protective measures will accumulate, without necessarily having any effect." (p. 137)

This naturally leads into a discussion of safety regulation in Part III. This is done by comparing three cases: (1) safety regulation in the United States under the US Nuclear Regulatory Commission and with the Price-Anderson Act defining US electric utility liability should a nuclear power plant accident occur; (2) France under the *Autorité de Sûreté Nucléaire* (and related European Union authorities and regulations) with the Paris Convention on Nuclear Third-Party Liability; and (3) Japan at the time of the Fukushima-Daiichi accident under the Nuclear Industrial Safety Agency with Japanese liability law and, since November 2014, with the "Convention on Supplementary Compensation for Nuclear Damage."

Chapter 7 explores the question of whether there is a need for nuclear industry safety regulation given the liability regimes, and concludes that due to failures in the insurance market, the only liability regime that could replace safety regulation would be one with "unlimited liability, capped financial obligations and pooling of risk." (p. 155)

Chapter 8 discusses the tenants of the basic rules of nuclear regulation, starting with "Nuclear safety is primarily a matter for engineers. . . To design and safely operate these technological monsters requires theoretical and practical knowledge of which engineers have a better grasp than managers or administrators." (p. 157) The chapter then evaluates the Japanese regulatory system at the time of the Fukushima-Daiichi disaster: "In a word, the regulator must be independent, competent, transparent and powerful. These four characteristics have in the past all been cruelly lacking in Japan's Nuclear Industrial Safety Agency." (p. 160). Unfortunately, the book does not

offer policy suggestions on how to move from ‘there’ (the “nuclear village,” p. 171) to ‘here’ (one with more independence, competency, transparency, and authority) as in the U.S. or France, which are compared and contrasted in Chapter 9.

Part IV moves from the national to the international. It discusses the Euratom Treaty and the contradiction between non-proliferation and trade in nuclear technology. The Nuclear Suppliers Group (NSG) monitors trade and while the IAEA both monitors nuclear weapons proliferation and provides assistance to non-nuclear countries to develop ‘peaceful atomic’ technologies under the Non-Proliferation Treaty, NPT. The Euratom Treaty is dismissed, but “it has not been entirely useless.” (p. 256) On the other hand, “The IAEA and the NPT have greatly contributed to disseminating [nuclear research reactors] all over the world. In this respect the deal set out by Atoms for Peace was an illusion.” (p. 269). Also, the NSG limits trade between member countries and non-member countries. However, “it is not simply the expression of the hegemonic position of a small number of nuclear weapon states, determined to prevent others from obtaining these weapons. I am convinced by this idea, but in defending it we would stray too far from the field of Oeconomics. What matters is that the NSG displays the characteristics of a cartel of states” (p. 289) to reduce “a collective ill” (i.e., nuclear weapons proliferation). Therefore, one can conclude that no international organization can adequately monitor the proliferation of nuclear technology.

In the conclusion, after summarizing the important points of the book, the author states, “It should be apparent that the author is in favor of new nuclear and its growth, on condition that costs are contained, risks controlled and safety regulation properly implemented, and that international governance on safety and security is stronger and more effective.” (p. 300) This conclusion reflects the post-Fukushima-Daiichi malaise in France while Areva with and without EDF struggles to complete the Generation III+ nuclear reactors in China, Finland, and France, and the current government attempts to reduce French reliance on nuclear power by half within a decade. Readers in countries with successful nuclear power programs might not share this pessimism as climate change, and nuclear power’s role in reducing climate change, becomes increasingly apparent.

While a great introduction to the costs and uncertainties associated with nuclear power, the tone of the book is confusing. As stated in the book’s proposal for publication in English, the primary intended audiences are graduate students, professionals, and scientists in various fields dealing with energy (not necessarily nuclear energy). However, they might find the following sentence a bit odd: “At this scale, the error and distribution parameters – with barbaric names such as standard deviation, mode, variance or kurtosis – are generally entered.” (p. 90). (Note, however, that the word ‘kurtosis’ was taken directly from a cradle of civilization, Greece.) The term “barbaric” seems to contradict the discussion in Chapter 6, “Unlike [Stephen Jay] Gould [Gerd Gigerenzer] upholds the idea that the human mind evolved, while integrating Bayesian algorithms.” (p. 123) Therefore, one might be led to conclude that barbarians acted with Bayesian updating and were capable of discussing the characteristic moments of probability functions.

Finally, while I might disagree with some of the facts that the book presents, it fills an important niche in educating the public and decision makers on how to think rationally about the costs, benefits, and risks of nuclear power.

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***Regulation of the Upstream Petroleum Sector, A Comparative Study of Licensing and Concession Systems***, edited by TINA HUNTER (Edward Elgar, 2015) Hardback, 432 pages, ISBN 978 1 78347 010 5.

*Regulation of the Upstream Petroleum Sector, A Comparative Study of Licensing and Concession Systems* which is edited by Dr. Tina Hunter and co-authored by other several contrib-

utors is a timely and most relevant work concerning an area of the upstream petroleum industry which is complex and intricate in nature. Petroleum sector is often strategic and crucial, upon which a country (its government, its political system, its elites and commerce) depends so exclusively on. Therefore, regulating such a vital sector is always of a particular challenge for most nations. To ensure the optimum growth and development of the sector, different countries opt for different legal models and instruments which bear varied responsibilities as well as liabilities. The two main universal legal structures adopted in the sector include the concessionary systems and the contractual systems. Notably the concessionary system is almost exclusively utilized by developed nations who take advantage of their well-developed legal structures and institutions. While the contractual system, is almost exclusively adopted by developing nations who can benefit from the flexible nature of negotiating, by experimenting with different systems that would eventually develop their emerging petroleum legal systems. This book therefore inches towards a greater understanding of the licensing and concessionary legal framework and how licenses are granted both in a developed and developing province of the upstream petroleum sector.

In general petroleum industry, and in particular the upstream subsector, transcends boundaries either through investments from developed to developing countries or through the internationalization of national laws. This book begins with an analysis of the universality of petroleum regulation in the upstream subsector, which involves internationalization of national laws specifically known as *Lex Petrolea* (a specialized transnational law) in the petroleum industry. *Lex Petrolea* derives its sources from internationalization of business practice, usages and customs of the industry. Notably, natural resources are predominantly in developing countries with limited resources (financial, infrastructural and technical know-how), whose governments are handicapped to bear the enormous risks of exploration, therefore depends on arrangements with International Oil Companies (“IOCs”) to bear the risk. While, on a continuous basis these countries systematically regulate and impose national laws and domestic principles as inherent fundamental norms to be followed when pursuing any contractual petroleum operations in a given country. These laws today are guided by industry’s best practices that are applied globally, hence, creating the effect of internationalization of petroleum law. Internationalization of petroleum laws, however, places an enormous task on the industry to define its scope as *Lex Petrolea*, in order to attempt to implement the concept as a mature doctrine that merits to be treated as an autonomous branch of law. The chapter soon identifies the hurdle in developing this doctrine as the lack of universal definition, scope, jurisprudential basis and content of *Lex Petrolea* irrespective of the sources, content and nature.

This chapter further identifies that even though regulatory aspects of the upstream petroleum sector are not subject to treaty law. The industry, however, identifies with the growing process of internationalization of domestic principles of conducting business in the sector. This is reflected in the internationalization and globalization of oil markets, onshore and offshore explorations and global application of principles and norms as discussed in various jurisdiction within the book. Creating a transnational element of petroleum law. Chapter two of this section, carefully begins to explore the structures between the contractual forms of acquiring a license from the concessionary systems by highlighting the differences in formulation of structures. Notably in the licensing and concessionary systems the state regulates terms and conditions through a fixed legislation, while under the contractual arrangement there’s room for negotiating in a contract (production sharing contract “PSA” as an example) certain conditions that are not pre-fixed by regulation. This chapter further provides an in depth view of licensing and concession systems by discussing a multitude of legal issues to include, ownership and allocation of petroleum resources, in particular this section tackles the process of awarding licences. The chapter offers a valuable discussion to both a learner as well as an expert reader an array of systems applied in the award of a licence; these include bidding or discretionary allocation of licences. It further discusses the bidding system to encapsulate two methods, either by cash (cash bonus or special royalty) which involves the amount of money a company is willing to pay for the property right, or work program bid which involves the amount



of exploration work a company is willing to undertake if allocated the license. In relation to the bid process the chapter outlines possible pros and cons of either an investor or a host government opting for either system. For example in terms of a cash bid a company opting for such system needs to be aware of the viable petroleum reserves in order to calculate considerable risk in the bid. Discretionary bid on the other hand, shows the level of state participation, used as a political tool which enables a government to lay out certain legal criteria expected of an investor.

Part II of the book provides a detailed regulatory analysis of mature petroleum provinces which include: Australia, United Kingdom, Norway, United States, and Canada respectively. All these jurisdictions have robust regulatory regimes for the petroleum industry and this section presents a comparative analysis of these robust regimes by addressing the myriad principal statutes, subsidiary legislations, and institutions governing offshore petroleum activities. The discussion is undertaken in two aspects, one, from an international perspective such as the relevance of the United Nations Law of the Sea (UNCLOS) which grants the sovereignty over natural resources in the territorial waters. Two, from a national perspective which grants sovereignty rights over resources in general and the right to regulate the resources which include, the main statutes, other subsidiary laws and institutions governing the oil and gas sectors of the respective countries. These laws cover an array of legal issues but of particular interests are ownership and access to petroleum resources. This section highlights the form of developing a field by developed mature provinces; a commonly used form is the formal process of awarding a license. Arguably it is said to be a competitive system which encourages suitable investors. For instance, in the US the common system of accessing the petroleum license is through bidding, the form of a bid is said to be the cash bonus. In the US today, the cash bonus is also used as leverage in securing and protecting the environment of the outer continental shelf. Australia presents various systems for granting licences, the most commonly used is the bidding system. Prior to 1993 the bid system incorporated was the cash bonus, however from 1993-2014 the system incorporated has been the work program bid. In Canada work program bid is the criterion used for allocation of licenses. While In UK and Norway the means of accessing a license is through the discretionary allocation of licence on the basis of a committed work program established either by the company or by the state.

Part III of the book analyzes developing petroleum provinces in the context of Brazil, Nigeria, Russia, and Japan. This section contains a detailed comparative analysis of the normative framework that governs offshore exploration in these respective countries. Like the developed provinces, these developing provinces also have robust regulatory framework, to which multitude legal issues are tackled to provide a greater understanding of the regulatory frameworks. This section covers an array of issues, for instance, the relevance of international law and in particular the United Nations Law of the Sea (UNCLOS) which deals with several issues like Continental shelf, Exclusive Economic zone and sovereignty of natural resources. But of a particular interest to this review are the various forms of allocating licenses as incorporated by these respective countries. For instance, in Russia, subsoil blocks are awarded without any competitive tenders both through cash auction, while other commercial activities undertaken under a license are awarded through competitive tenders and auctions. In Japan the system incorporated is that of a 'first come first served' basis on account that the applicant fulfils the main obligations required. In Nigeria, only until recently did the country adopt the open bidding system to include the cash bid, which is similar to that of the USA. This somehow symbolizes the degree transparency levels of the governmental awarding body within the sector. Further, Nigeria introduced the allocation of Marginal fields to indigenous oil companies, which stem out from the Oil Mining Lease (OML) held by an 'IOC'. In Brazil the system is intricate with a labyrinth set of regulations to include enormous signature bonuses, minimum work program that is established by the authority and attainment of local content provision as provided in the regulations.

The significant similarity between the developing nations as highlighted in this section is the local content requirement to incorporate Joint Ventures. In Brazil, Japan and Nigeria prior to

attaining a license a company is expected to form a joint venture with a local entity subject to bidding. Analogous to the bid in Nigeria, companies are required to enter into joint ventures with Nigerian –owned companies which would harness the development of local content. In clarity bidders are expected to showcase to what extent their work will be undertaken by these so called Local Content Vehicles. In Japanese Civil Code joint ventures are not mandatory and therefore companies can derogate from it.

Finally the book in Part IV presents legal issues in petroleum regulation, through a comparative study on access to petroleum in developed and developing licensing and concessions systems. This section provides the similarities between developed and developing provinces to include, attainment of the three basic criteria financial, technical and legal competence prior to awarding a license, while differences to include levels of government control over petroleum activities. This chapter further reminds the reader of the existing separate categories of the licensing and concession systems. The long established ‘North American’ model which is incorporated by the American and Canadian jurisdiction from the ‘North Sea’ model which is predominantly used by Norway and the UK. The ultimate differences are the degree of government control and of course the manner in awarding petroleum agreements. The North American model as referenced and well-argued has limited government involvement with a bid system of either cash or work program in which companies are given autonomy and control over the resources. To the North Sea model the typifying concept is the high level of state intervention through discretionary allocation of license.

Internationalization of petroleum industry practices is well articulated in this section through the use of a bid system. In Nigeria and Russia which very recently mirrored the cash bid system from the US, of course with slight or major differences especially in term of levels and degree of state intervention. Canada and Australia have incorporated the work program bid, while the UK and Norway have the North Sea model. Japan is the only country evaluated in this book to have a standalone policy of first come first served basis.

This book therefore aims to analytically review a wide range and a good coverage of pertinent legal issues from an international perspective as well as national understanding of the existing regulatory frameworks. Most importantly this book provides a good proliferation of the doctrine of *Lex Petrolea*. The authors’ provision of information is definitely well founded and well-articulated. This book will be an essential entry point for general audience with an interest in petroleum transactions, but more importantly it will be crucial for students, academics, and legal practitioners in the petroleum industry.

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