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Property Rights and the Historical Development of Texas and Alberta's Oil and Gas Industries: An Institutional Perspective

by

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Abstract

Property rights, as a set of institutions, are often identified as a core component of economic development. Yet, their composition can differ substantially between jurisdictions. This research examines how jurisdictions with different forms of property rights can achieve similar degrees of economic growth and development. This is accomplished by performing a comparative historical study that surveys two cases with different underlying property regimes overseeing the disposition of resource rights for oil and gas. The historical developments of Texas and Alberta's oil and gas industries are therefore examined from an institutional lens, looking at particular periods of time that coincide with important institutional and economic changes. The outcome of the research indicates that with regard to influencing economic development, the underlying form of property rights matter less than the functions of the presiding resource regime.

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List of Abbreviations

AANDC	Aboriginal Affairs and Northern Development Canada
AARD	Alberta Ministry of Agriculture and Rural Development
AEAE	Alberta Enterprise and Advanced Education
AERI	Alberta Energy Research Institute
AIEES	Alberta Innovates – Energy and Environment Solutions
AIIR	Alberta Ministry of International and Intergovernmental Relations
AITF	Alberta Innovates – Technology Futures
ASRD	Alberta Sustainable Resource Development
BBL/D	Barrels per day
BNA	British North America Act
CCEMC	Climate Change and Emissions Management Corporation
CERI	Canadian Energy Research Institute
CO_2	Carbon Dioxide
CUFTA	Canada-U.S. Free Trade Agreement
EIA	Energy Information Agency
FIRA	Federal Investment Review Agency
FIRE	Finance, Insurance and Real Estate
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
HBC	Hudson's Bay Company
IEA	International Energy Agency

IPE	Institutional Political Economy
NAFTA	North American Free Trade Agreement
NEB	National Energy Board
NEP	National Energy Program
NIE	New Institutional Economics
OPEC	Organization of Petroleum Exporting Countries
PAW	Petroleum Administration for War
PNGCB	Petroleum and Natural Gas Conservation Board
RMMFL	Rocky Mountain Mineral Law Foundation
RSC	Royal Society of Canada
SAGD	Steam Assisted Gravity Drainage
SOEs	State-Owned Enterprises
TCEQ	Texas Commission on Environmental Quality
TCUP	Transportation, Communications and Public Utility Services
TGLO	Texas General Land Office
TRC	Texas Railroad Commission
TSHA	Texas State Historical Association
TVCB	Turner Valley Conservation Board

Introduction

For the last decade the World Bank has released annual reports ranking over 185 countries based on the ease of doing business within their jurisdiction. The report measures a number of institutional variables relating to firm performance such as regulatory barriers, protection of property rights and enforcement of contracts (The World Bank 2013). In this year's iteration, Singapore and Hong-Kong rank first and second, respectively. Interestingly, these two locales share some core commonalities championed by the report, particularly with regard to low tax rates and general institutional competence. Yet their underlying differences may be of even more interest. Unlike Hong-Kong which has primarily private industry, State-Owned Enterprises (SOEs) account for over 20 percent of Singapore's Gross Domestic Product (GDP) (Chang 2008). Private property rights are also quite limited with regards to land and, in particular, resource rights; yet, private property rights are frequently identified as a necessary component of economic growth. There is often an implicit acknowledgment of secure private property rights leading towards economic growth. Clearly this is not always the case. If so, under what conditions can alternative property arrangements lead to economic growth? Do property rights even matter? Unsurprisingly, identifying the role of property rights and their relation to economic growth is a common scholarly and policy pursuit. However, the primacy of property rights – and institutions more broadly – to economic change remains a contentious area of debate. Answering the questions above is fundamental for understanding the historical development of various states, as well as providing insight into the institutional arrangements that can help foster economic development in contemporary societies. The purpose of this study is to examine changes in property rights and economic growth and identify their historical roots through comparative analysis. The argument put forth is that the underlying form of property rights is less important than their function for economic development; this means differing property types can achieve similar results from an economic perspective. The method employed makes use of comparative historical analysis for two cases with similar degrees of

growth, yet different underlying natural resource regimes. By examining the growth of the oil and gas sector in Alberta and Texas – with an emphasis on their respective resource regimes and economic changes – the argument above is examined. Moreover, the underlying differences in the disposition of resource rights in the two cases allows us to move away from orthodox conceptions related to the causes of economic growth; thus, enabling the identification of some key institutional and organizational conditions that are necessary and sufficient for economic growth.

Why oil and gas? Energy resources represent interesting cases for examination due to a number of factors. Canadian political and economic history is intertwined with natural resources and, increasingly, energy resource development. Other researchers have focused on this relationship, albeit through an economic historical lens, which did not focus on broader forms of institutional development (Innis 1930; Watkins 1963). Their research helped illustrate the role of resources to economic development in Canada, but rarely touched on the implications towards property rights and other underlying institutions. Furthermore, while the purpose of this research is not aimed at particular policy prescriptions, it ought to provide a greater understanding of the policy environment – in Canada and the United States – and how past choices impact future decisions in resource management. From an empirical perspective, the unique nature of oil is of particular interest. The view of oil as a "strategic asset" and how this impacts the role of the state in its production and distribution remains a ubiquitous question (Rutledge 2006; Walter and Sen 2009). This is discernible in the design and evolution of oil and gas resource regimes through the large degree of differentiation witnessed in their development between jurisdictions. This is especially evident in relation to the role of the state. Some oil producing countries maintain direct state ownership and management through SOEs, such as Norway, Russia and many members of the Organization of the Petroleum Exporting Countries (OPEC). These states do not completely shut out private contributions, however they limit them to varying degrees through either

concessionary and contractual agreements (Bayulgen 2010). Comparatively, in a global sense, Canada and the United States are interesting cases. Despite the differences in their respective natural resource regimes, both have undergone primarily private development throughout their historical evolution, unlike many other producing states that have moved towards greater degrees of state ownership and management. In this respect, the momentum of change observed in Canada and the United States differs substantially from the norm elsewhere. In addition, there have been many cases where resource development – oil in particular – has not led to wider economic and social benefit (Buiter and Purvis 1983; Sachs and Warner 2001; Friedman 2006; Bayulgen 2010). These two jurisdictions provide important lessons as to which features help avoid some of the major pitfalls of non-renewable resource management, and importantly, that the underlying form of ownership need not be the primary influencing factor. As for the inclusion of natural gas, given geological features and legal institutions, both oil and gas production often coincide, so it is common to examine them together (Barton 1993; RMMLF 2001; Blake et. al., 2008; Scott 2008).

The two selected cases have been chosen for a number of important reasons. North American oil and gas production has been a hot topic in recent years. With the increasing exploitation of unconventional resources such as oil sands and shale, production of both oil and gas is on the rise. In Alberta, oil sands production continues to fuel economic growth and overall production continues to rise (Baldwin and Macdonald 2012; Statistics Canada 2011). In Texas, shale oil and gas have brought back to life what was a declining conventional based industry (Hamilton 2013; EIA 2013a). Yet despite these similar contemporary developments, it is also their common historical trajectories that are of interest. Both jurisdictions were early adopters of oil production in their respective states. By 1939, Alberta alone accounted for 97 percent of Canada's oil production (Beach and Irwin 1940). While this share of production varied with time – despite aggregate production increasing – Alberta has consistently been the primary producing province for oil and natural gas in Canada (Baldwin and Macdonald

2012; Statistics Canada 2011). Texas began producing substantial quantities of oil and gas by the turn of the 20th century (Olien and Olien 2002). While it was not the first major producer it quickly became a key producing state in the U.S. and later went on to be the largest U.S. producer (Hamilton 2013; EIA 2013b). Each case has an important history of oil development within their legal jurisdictions but also for the states of which they are a part. Therefore, this chosen level of analysis focuses on two similar cases with similar outcomes yet with considerably dissimilar resource regime starting points. These similarities and differences will be used to show that the type of ownership matters less than the broader institutional function; functions such as conservation, stability or growth.

As has been covered above, property rights are a core component associated with economic growth. In this respect, it is clear that property rights as a set of institutions matter, but to what extent? Is their function more important than their particular makeup? Answering these questions requires examining real world conditions and comparing them across not only jurisdictions but also over time. This study does just that, demonstrating that particular functions of a property rights regime matter more than their particular makeup – private or public – and that this is tied to historical contingency and path dependency. The two cases are examined by comparative historical analysis with a focus on historical institutionalism. This entails breaking the cases down into periods that map their property rights developments and comparing them. While Alberta's regime constitutionally grants the province ownership over natural resources, and in Texas private rights are enshrined, both jurisdictions achieved similar growth trajectories because of functional similarities in the enforcement of resource rights and regulations. The methods of enforcement need not be entirely the same, as the regulatory environment, underlying ownership, and leasing practices differ substantially between these jurisdictions at different times. Most changes to the property regimes that did occur in these cases were incremental and did not disrupt existing momentum. Ultimately, a property rights regime's relative success or failure is less tied to the underlying form as it is to its underlying

functions. In the aforementioned example of Hong-Kong and Singapore the function of the property rights regime is to ensure ease of doing business despite core differences pertaining to public and private ownership. In the two cases under analysis, the same is true though the function of each resource regime, respectively, entailed a focus on stability through conservation with increasing movement towards growth. It is these similarities of function, despite difference in form, that explain the similar trajectory of economic development witnessed in the cases.

Literature Review

What are institutions, and why do they matter? Moreover, if institutions are so important, why have we been unable to design them so as to deliver better economic and social performance? These questions have been posed by a variety of scholars and have yet to be answered with certainty. Even when we see comparisons of institutions which attempt to mark their performance, when examining such claims closely, we see that in many ways they gloss over important differences. How can two jurisdictions ranked so similarly, have such different underlying institutional structures? This was the scenario in our example in the introduction – Singapore and Hong-Kong – but it is also true of the cases presented in this study: Texas and Alberta. These two jurisdictions have fundamentally different underlying property rights regimes presiding over oil and gas development. Alberta's sub-surface minerals are considered sovereign rights (Bradley 1996); the constitutional delineation of powers dictates which level of government controls the disposition of state mineral rights. Texas, on the other hand, has a private regime wherein the majority of sub-surface mineral rights – including oil and gas – are owned directly by the surface title-holder. Despite this difference of form in the underlying property rights regime, both jurisdictions have had similar degrees of economic performance. The research conducted in this thesis attempts to examine the historical development of these two cases, highlighting some of the underlying reasons as to why, in spite of this difference, both have had such similar degrees of growth. Clearly the form of each jurisdiction's property regime is different, but functionally they operate similarly because they meet two important conditions. Necessarily, each has a clear delineation of property and resource rights, regardless of title. Sufficiently, they have both achieved degrees of stability through state regulatory action. These two conditions ensure that participants are well aware of the rules of the game and therefore eliminate high levels of uncertainty which are more important features pertaining to economic growth than a pure focus on the form property takes – with regards to land and resource rights – in any given society. A classification as

private or public is therefore less important than institutional functions that enable consistency and stability in the enforcement of rights.

Property and Resource Regimes as Sets of Institutions

Defining institutions remains an area of contention. Many draw from the influential work of Douglass North (1990) who broadly defines them as:

> Institutions are the humanly devised constraints that structure political, economic and social interaction. They consist of both informal constraints (sanctions, taboos, customs, traditions, and codes of conduct), and formal rules (constitutions, laws, property rights). (97)

While this definition is widely accepted for use in institutional research, a number of scholars have questioned it based on perceived limitations. Some of these limitations are centered on quantification, questioning the ability to falsify research which makes use of this definition (Angeles 2011); or rather, at a more conceptual level, where institutional characteristics need to be examined and not taken for granted (Searle 2005). We also have to be aware that institutions are not organizations as institutions are social constructs whereas organizations are physical constructs (North 1981; Roland 2004). Although these contentions are acknowledged, the definition provided by North (1990) is used for this study. To narrow in on particular institutions – such as those that encompass a property or resource regime – we need to be able to classify institutions under more specific categories. Some academics have done just that by establishing categories that can be used to specify institutional types from broad to narrow classes. At the highest level, institutions can be broken down into four categories: political, economic, legal and social (Roland 2004). We can then go a step further, for example, and classify particular institutions such as a specific legal institution which may be a statute or constitutional ruling. These sub-categories come together – as we shall see – to produce institutional arrangements such as a state's property rights regime or in our particular cases, a natural resource regime.

What is a property rights regime? Before examining conceptions of property further it is important to explain a few key terms by answering this question. At a conceptual level, a property rights regime relates to the lattice-work of institutions and organizations that delineate who owns what, who bears what costs, and who derives the benefits from such ownership in any given space. These are important questions that have been answered in various ways throughout history. In practice this entails examining the political and legal structure of a particular jurisdiction, while accounting for the role of economic institutions – markets – and any relevant social institutions. While this is helpful conceptually, it still remains too broad for the research at hand. To manage this complexity, this research examines natural resource regimes as a sub-set of a state's property rights regime. Similarly, a natural resource regime encompasses the lattice-work of institutions and organizations that delineate ownership and disposition methods related to specific natural resources. One can speak broadly of all natural resources in a given space, or to the relevant institutions and organizations of a particular resource, such as oil. In this respect, the research is presented in a careful way that clarifies these differences.

From a philosophical and normative perspective, many have argued that property is a natural right drawing from the works of Locke (Bradley 1996; Rothbard 1997; Pipes 1999). Others argue it is a social construct and property does not exist in the absence of social interaction (Williams 1977; Bromley 1991; Rose 1994; Benda-Beckmann et. al., 2006). In some respects, both conceptions are correct. On the one hand, possession is a necessary pre-requisite to property (Pipes 1999); yet on the other hand, without social interaction, there is no need to classify something that is possessed as 'their' property. In this regard, property requires not just physical possession but also an 'intelligible right' which incorporates social acknowledgement (Bromley 1991). Acknowledging this social element, it is not difficult to see that property rights are a social construct that do not exist in individual isolation. The story of Robinson Crusoe and his isolated island existence has often been used as an illustration of the absence of property

but not possession (Demsetz 1967). The underlying point is that there is an important social component to property rights and this opens the door for a multiplicity of social, political, legal and economic institutional arrangements related to property rights and property rights regimes.

Drawing from the philosophical perspectives above, many different conceptions have arisen regarding property rights. Broadly speaking, they can be broken down into three general schools: 1) legalistic; 2) economic; and 3) communitarian (Rose 1994). Each of these approaches focuses on different characteristics of property and makes use of different methodological approaches for research. The economic and communitarian approaches are described in the following paragraphs. As for legalistic approaches, they are often more formal methods of analysis applied by scholars of legal studies focused on constitutional or common law factors. For the purposes of this study, the legalistic approach is too limited because it ignores political, economic and social institutional forces. For this reason the legalistic approach is primarily used for jurisprudence purposes relating to constitutional, property or contract law. While this is part of the whole, analyses along these lines are insufficient for examining broad institutional development.

The prevailing view of property in economics is drawn from neo-classicalism. This theory of property rights proposes that such rights develop due to economic circumstances. The focus of this approach is on the formation of property rights with respect to mitigating the role of transaction costs and externalities (Coase 1937, 1960; Demsetz 1967; Umbeck 1977). Supporters also highlight the costs of property rights implementation, related to the inherent expenses associated with their negotiation, implementation and enforcement (Umbeck 1977; Williamson 2002). This approach requires an implicit assumption regarding rational decision making. In this regard, the expectation is that individual actors act to maximize their utility in a particular manner that is synonymous with economic gain (Umbeck 1977). The problem with this is that it

does not account for subjective utility preferences – or rather, the role of institutions in shaping preferences (Chang and Evans 2005). This is an important limitation regarding the institutional examination of property rights because if utility preferences do not fall along clear rationalist lines, predictability becomes infinitely more difficult. Furthermore, it is an approach which views property rights existing in an optimal form which leads to their function of enabling exchange and thus markets to operate effectively. Proponents of this view see a large degree of uniformity in the form and function of property rights with regards to regions with similar levels of economic growth. This conception of property rights as universal in nature ignores the role of historical contingency and the uniqueness observed in institutional formation and development. In this regard, the economic-centric approach is insufficient for unraveling the underlying question of why different property systems appear to be correlated with similar degrees of growth.

Less economic-centric literature often views property from a different perspective. Generally speaking, they view the characteristics of property as derived from communitarian conceptions (Rose 1994; Benda-Beckmann et. al., 2006), which draws heavily on ideas of property as a social construct. In this respect, property rights are acknowledged due to community recognition and do not form based solely on self-interested individuals. This is an important distinction from the economic theory of property discussed above because it helps to explain the degrees of divergence we see in property regimes. Since property is a social construct, it is no surprise that different societies have employed such a variety of property regimes contingent in part on their historical institutional structures. However, acknowledging the social components need not discount the role that transaction costs or externalities may play; rather, such a communitarian conception discounts these as the *sole* formative features of property rights regimes. Limitations of this approach are highlighted by Rose (1994) who explains that often times the communitarian approach is too statist, over emphasizing the role of formal institutions in the development of property

regimes. While formal institutions are a central focus of the research at hand, the role of informal institutions is ever present. Additionally, within this work there is an explicit acknowledgment of stateless and informal forms of property regimes (Umbeck 1977; Geisler 2006; Williamson and Kerekes 2011). While much of the communitarian literature is focused on forms of communal ownership (Ostrom 1990, 2007; Rose 1994; Benda-Beckmann 2006), even private regimes can be viewed under this perspective; wherein, "a regime of individual property is itself a kind of collective property or meta-property; a private property regime holds together only on the basis of common beliefs and understandings" (Rose 1994: 5). This is extremely important as it steps away from a purely theoretical view of property towards a more real-world conception. It also does away with basic public-private dichotomies related to property regimes, showing that in fact any regime is a hybrid of public and private institutions and organizations. Moreover, the role of the state is not constrained solely by the form of property ownership. Primarily private regimes may have similar degrees of state involvement to those of public regimes; be it through regulation or even market interventions that limit property right holders. Ultimately, this view accentuates the social component of property and fits best with the variety of regimes observed over time and across the cases in this study.

Institutions and Economic Growth

How do the institutional features of property discussed above relate to economic growth? Different schools within new-institutionalism have varied views on this very question. The dominant perspective is drawn from New Institutional Economics (NIE) literature and entails a number of embedded assumptions related to economic growth. The less orthodox perspectives are drawn from Institutional Political Economy (IPE) and various forms of historical institutionalism, namely from the disciplines of political science and sociology. The following section examines the basic assumptions related to economic development drawn from these two schools, and explains the expected

relationships observed in this particular research.

Generally speaking, a number of assumptions underlie the perceived causes of economic growth, including institutional arrangements. Another focal point is often rational decision making, alongside a particular institutional structure that – at least theoretically – purports optimal economic growth. The former has undergone considerable challenges over time (Simon 1986; Rose 1994; North 2005; Castellano and Quero 2012), while the latter remains pervasive in much of the supporting literature (Demsetz 1967; Umbeck 1977; North and Weingast 1989; Acemoglu et. al., 2002; Boettke et. al., 2005; Libecap 2007; Morriss 2009; Boettke and Fink 2011). Rational decision making is a central component to both economic and political motivations, hence the common use of public choice theory amongst researchers under the NIE umbrella (North and Weingast 1989). However, the focus on wholly rational decision making led to difficulties when comparing theory to empirical data, a common occurrence in neo-classical economics as a whole. Moreover, the view that institutions are the rational outcome of interacting individuals, assumes that preexisting institutions – those that predate the birth of particular individuals – do not influence their values or beliefs. However, Chang and Evans (2005) rightly point out the 'constitutive' role of institutions, and their impact on defining rationality in a given time and place. Chang goes so far as to state that, “the very notions of self-interest and rationality are defined by history” (Chang 2011: 490). This, in many ways, is not a new argument, as rational choice theory has undergone significant challenges. One particularly strong challenge has come from Herbert Simon (1986) who argued for bounded-rationality which accounts for imperfect information and the role of time limits. Moreover, even with perfect information and unlimited time, rationalist outcomes are not a certainty. North (2005), among others in the NIE school have increasingly accepted the more limited conception of rational decision making (Castellano and Quero 2012).

While movement towards convergence between the two schools has

occurred in relation to individual decision making, NIE still clings to conceptions of an optimal institutional arrangement for economic growth (Demsetz 1967; Umbeck 1977; North and Weingast 1989; Boettke et. al., 2005; Libecap 2007; Morriss 2009; Boettke and Fink 2011). Born in part from North and Weingast's (1989) influential work on the British Industrial Revolution, a particular focus on property rights and contract enforcement are the primary factors. Moreover, this ties in to the purpose of the state according to NIE proponents. The state is delimited to a particular space, and consequently enables optimal economic growth. In this regard, the state is limited to: delineating and enforcing property rights, implicitly private rights; enforcing contracts; and reducing transaction costs (Demsetz 1967; Umbeck 1977; North and Weingast 1989; Acemoglu et. al., 2002; Morriss 2009; Boetkke and Fink 2011; Castellano and Quero 2012). Through these basic functions, the state provides a political and legal institutional setting that enables optimal growth, at least in theory. Others have gone even further and labeled action by the state as "predatory" and confiscatory (Bardhan 2001, 2005). This view sees an even greater necessity for confining the state to a very small space, or in some cases, no space at all (Williamson 2009; Boettke and Fink 2011; Williamson and Kerekes 2011). Moreover, the rigid institutional structure that they argue for draws from a particular *functionalist* perspective. The function of property rights and accompanying legal system, from their perspective, is to allow economic institutions – namely markets – to operate along optimal lines. Yet, this becomes problematic under comparison. Texas and Alberta's resource regimes, and underlying property disposition systems, are different, despite both achieving similar degrees of growth. If one – the Texan model – more closely follows the optimal institutional arrangement for growth, what explains the similar degrees of growth in both cases? This need not be applied solely at a sub-sector level, and others have made similar arguments at the level of the state in relation to economic development more broadly (Chang 2008, 2011). Ultimately, a rigid assumption towards an optimal institutional setting fails empirical testing.

However, that does not mean that NIE proponents totally miss the point. Institutions that provide continuity in property rights delineation and enforcement, for example, are important conditions for economic growth. These conditions help lower participants' perceptions of types of risk, simplifying the decision-making process, which has an appreciable impact on investment and by extension, economic growth (Angeles 2011; Boettke and Fink 2011). In turn, this also influences the degree of technological development and diffusion (Milner 2006; NPC 2007; Frey 2013). This has led to an increasing focus on the study of technological development and diffusion and their impact on economic development (Acemoglu and Robinson 2000, 2006b; Parente and Prescott 2000; Milner 2006; NPC 2007; Frey 2013). This study acknowledges the role of property rights regimes as a set of institutions and organizations that impact technological development and diffusion. However, as we see through the investigation of natural resource regimes, all property rights need not be private to ensure a particular function; additionally, technological development and diffusion depend not only on economic institutions but also on their interaction with political, legal and social institutions and organizations (Milner 2006; NPC 2007). Ultimately, while technology is an important feature, the necessity of a clear delineation of property rights, regardless of form, and their impact on particular functional arrangements are the core components of this research.

Here, lessons derived from proponents of the IPE approach are helpful. For example, the role of the state is dramatically increased in IPE. In this sense, the state is not delimited to a particular space and its supporting institutions and organizations exist in tandem with economic institutions such as markets (Chang 2011; Castellano and Quero 2012). In as much, institutions feed off each other in more dynamic ways than those acknowledged by NIE proponents. The importance to this particular research is that it fits the differences in property regimes while still being able to explain the similarities in growth, not only between places, but in the same place over time. At both conceptual and empirical levels, this approach fits well within the scope of historical institutionalism, and

comparative historical analysis more broadly. There should be no surprise that proponents of IPE have been clamoring for a wider spectrum of methodological approaches to institutional analysis, including such historical approaches (Chang 2011; Castellano and Quero 2012). Furthermore, there are those from other disciplines who have been conducting research projects along the methodological lines of comparative historical analysis (Steinmo et. al., 1992; Berman 1998, 2006; Lecours 2005; Levi 2009).

Methodology

As has been established, the impact of property and resource rights on economic growth is the focal point of this research. Furthermore, the role of historical contingency in shaping these factors has been acknowledged. Comparative historical analysis with the use of periodization is the methodological approach that best suits the case studies that follow. This approach examines particular institutions and organizations relating to Texas and Alberta's natural resource regimes over time with specific periods in mind. Basic measures of institutional, organizational and economic change are observed through this method, and then compared and analyzed. The conceptual discussion above is linked to the use of historical institutionalism in social science research to start this section. Next, the section reaffirms the importance of time and place that justify historical comparative analysis. It is then followed by further justification for the choice of the sub-state units of analysis, and lastly explains the particular focus on natural resources and closes off with a look at the use of periodization.

Historical institutionalism is a methodological approach to research drawn from new-institutionalism (Steinmo et. al., 1991; Lecours 2005). According to Lecours (2005), there are three types of new-institutionalists: rational, historical and sociological. The rationalist perspective typifies the research conducted by many proponents of NIE and is primarily focused on quantitative methodological approaches to institutional analysis. A more qualitatively focused approach, the historical school, has gained considerable momentum in the social sciences over the last several decades and in particular in political science literature (Steinmo et. al., 1991; Berman 1998, 2006; Lecours 2005; Levi 2009). As has been previously discussed, there have been increasing calls for this type of research to be used in concurrence with the quantitative research of the rationalist or NIE type, especially in relation to examining institutional change and economic development (Chang 2011; Castellano and Quero 2012). Given that institutional change and economic development are time dependent and that a wealth of

historical empirical data is often available, at the very least it acts as a complementary qualitative research method. Qualitative analysis might fall short in terms of causal explanations or predictive measures, but it does provide insight into the nuances of institutional change and economic development; additionally, it assists with respect to theory building.

This type of qualitative methodology does, however, suffer from some short-comings. For one, the methods employed are insufficient for making wide-ranging causal claims. In this respect, this thesis is not aimed at uncovering the causal relationships between property and economic development. Yet, given the path-dependent nature of institutions (Steinmo et. al., 1992; Roland 2004; Lecours, 2005; Levi 2009), comparative historical analysis is a method that does provide a roadmap of the correlative nature of property rights regimes and economic change in the cases under examination. Another issue that remains problematic is the near bottomless pit of alternative variables, including: technology (North 1971; Milner 2006; NPC 2007; Frey 2013); political factors including regime type or degrees of federalism (Acemoglu and Robinson 2006a; Bayulgen 2010); and even culture and language (Childs 2005; Erk and Koning 2010). These limitations, however, are not so large as to undermine the purpose of this study. Even quantitative methodologies have had a difficult time assigning proper measurements for addressing each of these variables, and their results are scattered and lack uniformity. These limitations point to the need for wider forms of analysis that can help provide detailed insights and we see increasing claims towards this (Steinmo et. al., 1992; Chang 2011; Castellano and Quero 2012). Qualitative methods are helpful for establishing relationships between factors while being able to side-step the arguably intractable issue of measurement so often encountered in the social sciences. So while this thesis is unable to state with certainty that property rights and their function are the only, or even most, important factors relating to economic change, it does establish how these factors were connected over a distinct period of time in two separate locations. A more holistic approach could include the role of all of the aforementioned factors, but

given the scale and scope of this research, for the purposes of brevity a narrower range is taken. This allows for examining two core components in great detail while not veering off-course and falling into some of the pitfalls associated with qualitative research.

Institutions, organizations and economic change do not occur in a vacuum; rather, these factors alter over time. While some methods may compare two existing institutional structures at a particular time to investigate their effectiveness, if one is interested in change they need to examine and compare such institutions over time. While the classification scheme for investigating institutional change over time is not wholly agreed upon, there are some means available for doing so. Roland (2004), for example, discusses fast- versus slow-moving institutions, highlighting the role of path-dependency, incremental change and how the classification of the institutions in question matters. Others have discussed the role of designed and engineered change (Scott 2008; Angeles 2011). Also, the evolutionary change observed in some institutions has been highlighted as a form of incremental institutional change, particularly with regard to common law (Hayek 1960; Hoffman 1999; Scott 2008). Taken together, these classifications of institutional change provide conceptual and analytical tools for investigating how institutions change over time. These tools are helpful for comparative historical analysis as they are applicable to the institutions and organizations under study. Classifying their form of change and comparing them across cases and between time periods promotes a more robust analysis and provides insight into which factor promoted such change. Ultimately, we still face problems of complexity, but these analytical and conceptual tools provide methods of classification and, more importantly, comparison.

Spatial limitations are also important features related to institutional change and economic development. Particular political, legal and economic jurisdictions exist and institutional arrangements are confined to these spaces. That is why the state remains an important unit of analysis. A number of the

underlying institutions that influence economic development remain under the privy of government control. However, it is important to differentiate which level of government has the greater sway. In the cases presented, sub-federal governments are the primary actors shaping or being shaped by the relevant institutions. So, the province – in Canada – and the state – in the United States – are the primary units of analysis. However, the inter-play between levels of government remains an important component throughout the research. Both countries are federations and the degree of federalism embedded in their institutional structure – especially relating to their property and natural resource regimes – is a common theme throughout. Despite this, the province/state remains the most relevant jurisdictional divider and is therefore the primary unit of analysis for the purposes of this research. However, we need to also incorporate the role of private actors in any analysis. Many non-state actors play equally important roles in the cases under study. Individuals, firms and interest groups are all important organizations that interact with state institutions and organizations throughout the development of Texas and Alberta's oil and gas industries. It is the interplay between all these institutions and organizations that dictates the path of development observed in the cases. By focusing on the state/province as the primary unit of analysis, it is important that these alternative units are still incorporated into the study.

As has been discussed above, property rights – and in particular private property rights as a set of institutions – are commonly used as an explanation for economic development (Demsetz 1967; Umbeck 1977; North and Weingast 1989; Acemoglu et. al., 2002; Boettke et. al., 2005; Libecap 2007; Morriss 2009; Boetkke and Fink 2011). Yet, when we examine the range of property regimes in natural resources we see few that are clearly unobstructed by varying degrees of direct public ownership or at the very least stringent regulatory environments. This brings up the importance of separating theory from practice. Texas, for example, has followed a relatively private development model for oil and gas; however, its offshore oil and gas resources are federally owned and administered

and even on-shore resources have undergone varying degrees of regulatory pressures. This tells us that even in the same case during the same time period, we see co-existing and overlapping resource regimes, let alone over a set of time periods and across cases. In this regard, natural resources are an important and often overlooked source for institutional analysis aimed at further developing the relationships between institutions and economic development. They act as a testing bed wherein a huge variety of resource regimes exist in which we are able to observe their institutional and organizational development alongside their endogenous growth – the resource's output over time – and wider impact on overall economic growth.

Texas and Alberta have fundamentally different forms of ownership regarding oil and gas. Texas is primarily privately owned and operated, wherein the vast majority of Alberta's resources rest firmly under the control of the provincial government; a clear case of private versus public ownership. Despite this underlying difference, both jurisdictions have followed similar growth trajectories in their oil and gas sector and wider economies. Both have also been historically the largest single contributors to their respective country's in oil and gas output (Baldwin and Macdonald 2012; Hamilton 2013; EIA 2013b; Statistics Canada 2011). Considering that they have different resource regimes, but similar degrees of economic growth, we already see the difficulties of the common private property explanation for economic growth. In this respect, natural resources appear to be an important – and sometimes overlooked – area for theory testing.

In many circumstances, natural resource exploitation is capital and technology intensive. However, the degrees of capital and technology required do differ from resource to resource. No resource is as capital intensive as oil, especially as easier to access sources diminish and offshore and unconventional resources replace them (Chastko 2004; Rutledge 2006; Bayulgen 2010). Moreover, natural gas is often a by-product of oil extraction and it is common to

place the two together for analysis (Barton 1993; RMMLF 2001; Blake et. al., 2008; Scott 2008). While there are clear distinctions between the two, the study looks primarily at the oil industry's development over time. This focus will detail the particular importance of institutional arrangements that clearly delineate resource rights and enforce them with continuity over time. Furthermore it helps accentuate that property rights regimes can thrive under a variety of institutional structures; meaning, a private regime aimed at optimality is not the only possible institutional arrangement that promotes stable growth. In fact, as we shall see in the early periods of Texas, private ownership was a factor of instability with regards to industry growth. These examples highlight the time-sensitive nature of any institutional arrangement. At one time period a given regime may produce instability, while at a later date it helps to promote stability. If we are to improve on descriptive analysis and move towards prescriptive suggestions, this is a necessary first step. Lastly, this research acts as an important spring-board towards further studies regarding natural resource regimes and economic development.

Periodization

As has been discussed, every society operates under an institutional framework of some kind. In some cases, this entails informal and ad-hoc arrangements that dictate the rules of the game; while in other cases, formal structures are well defined and appreciated by many participants. Regardless of the structure, social interactions occur within an institutional setting. Moreover, through space, institutional structures differ and they often change with the passing of time. So what particular methods are best used for examining institutions with temporal change in mind? Given that this research examines institutional and economic development over a long period of time, the chosen method of analysis means focusing on institutional change (Lieberman 2001; Lecour 2005). To do so, the timeline is broken down into a stretch of history between periods of major

institutional change. So as opposed to other methods of historical institutionalism such as institutional origin, exogenous shock or rival causes, this method investigates change and its empirical impacts over time (Lieberman 2001). This is measured through historical data that is relevant to the institutions in question. The benefit of this approach is that two different cases – Alberta and Texas – can both be examined without producing arbitrary period divisions that may not fit the unique nature of their institutional and economic development. Rather, the cases can be divided by the features that best define their own path of institutional and economic development. However, given the dynamic nature of institutions, not all minor institutional changes can result in period analysis. Evolutionary change is often incremental and designed changes can also be minor in and of themselves. In this regard, only large institutional change will mark period divisions while smaller observed changes will be examined within a given period. In the end, this method allows for both intra- and inter-case comparisons.

The first case examines the development of the oil and gas industry in Texas. The periods are broken down into four particular blocks, representing major shifts at either a regulatory or market level. They are: (1) The Initial Oil Boom: A Shifting Economy 1894-1930; (2) Texas' Regulatory Development 1930-1970; (3) Supply Shocks and Texas Production 1970-1985; and (4) Contemporary Developments 1985-2013. These periods span the development of Texas' oil and gas industry.

In the second case, Alberta's institutional development relating to its oil and gas property regime is examined. This involves evaluating the key periods of institutional change. The case is divided into three particular time periods, each period shift marking a time of major institutional change: (1) The Formative Years of Alberta's Natural Resource Regime 1930-1970; (2) Supply Shocks and the National Energy Program 1970-1985; and (3) Contemporary Developments 1985-2013. These periods roughly match ones used by others when investigating Alberta's oil and gas sector (Manning 2005; Lucas 2007).

While each period discussed above corresponds with a number of unique historical features, continuity is attained by focusing on important themes. In so doing, this research focuses on institutional development and changes to the resource regime by structuring each period analysis along particular lines. Each period starts by focusing on the basic historical context followed by an examination of oil and gas development during the period and then property rights and resource rights with a specific focus on legislative and regulatory changes and their impact on historical outcomes. Then an examination of the study's overarching themes is presented; function over form, the role of the state and continuity in the enforcement of rights are the primary points of examination. Once each case has undergone this form of analysis a discussion is presented relating to these particular features; re-examining and comparing the periods to ascertain how these relationships have played out over time and across cases.

Case-Study: Texas' Oil and Gas Resource Regime

Introduction

Texas, and the United States more generally, are well known for the protection of private property rights. Moreover, the role of private property rights has often been associated with the United States' rapid industrialization and economic success. Yet how secure have these rights been in the case of oil and gas development? Has the economic growth of Texas' oil and gas sector been a product of its resource regime delineating rights to private actors, or have other factors been important? How consistent has property and resource rights enforcement been, and how much change do we observe in the institutions and organizations that enforce these rights? The answers to these questions provide a background from which we can examine the case of Texas' oil and gas sector and compare it to that of Alberta. By breaking the case down into particular periods and examining these questions, we are able to answer this thesis' underlying question as to the importance of form versus function of property rights in relation to economic growth and development more broadly. As will be shown, Texas has a primarily private property regime, but the role of the state has been rather intrusive and considerable limitations on private rights have been enacted for the express purpose of conservation and stability in the oil and gas industry. It is these functions – that changed over time given the context of a particular period – that best explain the development trajectory of Texas' oil and gas industry.

The existence of oil in Texas, much like Alberta, was recognized from the beginning of colonial times. Members of the De Soto expedition in 1543 made use of, "a pitch like substance found there for repairing the bottoms of the vessels" (Warner 1939: 1). Aboriginals also used the substance found in naturally occurring surface areas of which they later informed European settlers (Warner 1939). These first recorded discoveries differed in substantial ways from the gushers that would bring Texas recognition around the world, but they did provide nascent indicators of the mineral richness that lay under the surface.

While it would be almost 400 years until the resource proved to be commercially viable, the evidence was there from a very early stage. Since then, Texas has developed into the largest producer of oil and gas in the United States. The following case study examines the historical development of Texas' oil and gas sector, the relevant institutions and their changes over time, marking their impact on state wide economic growth. The first section underscores the formal institutional structure related to property rights and natural resource rights in the United States. It is then followed by a period-by-period analysis of the development of Texas oil and gas.

The United States' Formal Institutional Structure

The United States' formal institutional structure relating to natural resource rights is primarily derived from common law, related to property and contract law. Due in part to this legal structure, the majority of resources are owned and operated by private individuals and firms with conflicts being resolved through the courts. However, both federal and state governments do own land – nearly 40 percent of onshore U.S acreage (U.S. Bureau of the Census 2011) – primarily for the purpose of conservation. Offshore lands and resources are also federally administered with the United States having played a large role in the formation of offshore property rights regimes at the international level (Kelly 2008; Kurlanda 2011). Offshore crude oil production accounts for roughly 19 percent of total U.S. output (EIA 2013b); much of which occurs in the Gulf Coast region which borders Texas. While the majority of the recent and historical petroleum production growth has occurred through private development on private land in Texas, state participation ranges from moderate – legal institutions overseeing contract and property law – to strong – direct government resource ownership and administration. This points to the hybrid nature of natural resource regimes and harkens back to Roses' (1994) conception of all property regimes as social and communal; the interesting question being, to what degree? In addition, despite the United States being known conventionally as a strong proponent of private property rights, the constitution's 5th amendment enables government confiscation

through eminent domain and this clause has been used with considerable frequency with regards to oil and gas pipeline infrastructure (Epstein 1985; Bradley 1996; Benson 2008; Niles 2010). Private property rights are therefore secure to a degree, but they are not entirely so. Ultimately, the United States – much like Canada – is a complex arrangement of institutions and organizations, both public and private, which define the underlying property and natural resource regime. The case-study breaks these complexities down by examining the historical development of Texas' natural resource regime over oil and gas alongside its periods of economic growth.

The sub-federal unit in the United States has different responsibilities and powers than its northern neighbour. Unlike Canadian provinces, U.S. states typically do not own mineral and other sub-surface rights, except in particular cases associated with homesteading or conservation legislation (Bauerle 2006). This has enabled a greater degree of direct private ownership in the country's oil and gas sector. Needless to say, most of Texas' early history was marked by private ventures and the private selling or leasing of land. Despite this, both the federal and state governments did, and still do, own significant portions of land (TGLO 2010; U.S. Bureau of the Census 2011). The case of Texas, however, is somewhat unique. Texas was the only state in the union to have joined by annexation treaty. Through this treaty, and in the aftermath of the U.S.-Mexican War, Texas was granted full ownership over its unassigned land. In 1876 this amounted to more than 76,000,000 acres, equaling over one-third of Texas' total landmass (TGLO 2010); though in the years since, most this land has been sold or traded to private interests (Eckhardt 2011). Some sub-surface mineral rights were retained, in particular on public school lands which were used to support a public university system (TGLO 2010). Apart from the original thirteen colonies, Texas was the only state to retain rights to its public land (Eckhardt 2011). While it retained mineral rights over these lands when it first joined the union, in the aftermath of the civil war, new state constitutions subsequently revoked these rights. This revocation, along with selling the majority of public lands, meant that

a primarily private oil and gas industry was to be the norm in Texas. However, differing degrees of public involvement occurred at different periods of the industry's development.

Federal constitutional law also grants the state considerable leeway over shaping their respective resource regime through the activity of conservation, regardless of public or private title (Engdahl 1978). Federal oversight too has become increasingly active through environmental regulation and broad energy policy which in some cases takes precedence over state rules (Bromley 1991; Haas 1994; EIA 2013c). This regulatory course was related to the growing importance of the oil and gas sector on both a state and national stage. The development of new extraction technologies further complicated matters as offshore resources became accessible. This brought new dynamics into the property debate and created not just public-private conflict but also political conflict between states and the federal government (Kelly 2008). The following case study traces the historical development of Texas' resource regime over oil and gas, marking the subtle and large-scale changes while describing how they affected the wider state economy. It does so with the underlying purpose of showing that the function of the resource regime was more important than its form in defining the direction of economic development in Texas since the commercialization of oil and gas.

Historical Context

Texas underwent a number of governance transitions prior to commercialization of oil and gas in 1894, each affecting the underlying property and resource regime. Each transition marked a shift in the governance structure that oversaw the property regime. New institutions and organizations replaced those that came before. The shift between Spanish rule, Mexican rule, self-rule as the Republic of Texas and lastly, joining the United States through treaty, represent these governance transitions. While remnants of the previous institutional and organizational structures prevailed through each transition, ultimately the property

regime transformed substantially. The following section examines the core components of each regime and how they impacted the regime that followed. Doing so helps to set-up the context of Texas' property and resource regime at the turn of the 20th century alongside the commercialization of oil and gas, including the transformation – both economically and socially – that this entailed.

Spain initially laid claim to the territory now encompassing Texas in 1517, though direct attempts at colonization did not occur until the late 17th century (TGLO 2010). Despite the size of Spain's claim at the time, growth was slow. Land could only be attained through the Spanish crown and documentation for only 60 land grants awarded during Spain's 130 year tenure controlling title claims remain (TGLO 2010). Land was considered private if awarded by the king, though this meant that the vast majority of individuals – especially immigrants from Mexico and the United States – had no potential to attain land until 1819. The slow pace of colonization and the strict disposition of land meant that population growth was slow despite evidence of considerable mineral riches (Warner 1939; Chipman and Joseph 2010). However, informally, land rights could be attained by "squatting" which entailed making productive use of the land for 10 years or more; additionally, some local administrators did provide land to settlers though the scale remained relatively small (TGLO 2010). The modern state of Texas bears little resemblance to its period of Spanish rule apart from a few key features. Institutionally, Texas adopted a common-law legal system though it has retained some Spanish legal practices including community and public property (Chipman and Joseph 2010). While the majority of public land was sold off in the 19th century, there remain some pockets of public land which tie back to institutions enacted during Spanish rule.

After having attained independence from Spain in 1821, Mexico achieved jurisdiction over what is now Texas. Mexico enacted new legislation to encourage colonization of Texas, though disposition rules mimicked Spanish laws in many ways (TGLO 2010). Importantly, what set the new approach apart was that

Mexican administrators were more open to provide title to a broader spectrum of potential settlers. Moreover, slavery was condemned by Mexican administrators:

> And the 1823 Colonization Law forbid the sale or purchase of slaves in Texas and specified that children of slaves born in Mexico would be free at fourteen years of age, but it did not prohibit settlers from bringing slaves with them. By allowing these early settlers to bring their slaves, Mexico opened a door to slavery in Texas that it was never able to close, even when it tried. (TGLO 2010: 5)

Importantly, this oversight provided the emergent Republic of Texas with a property regime that counted slaves as mere possessions. From an institutional perspective this is an important point because it speaks to the range property has taken in the region. People have been considered, from a formal institutional point of view, as commodities and one's private property and therefore owners retained particular legal rights. Such practices would only end after the U.S. civil war, and even then, informal institutions persisted that discriminated based on racial and historical differences.

During Mexico's rule immigration grew at a considerable rate, however, American settlers began to outnumber Mexican settlers at a ratio of ten-to-one, prompting the Mexican government to institute new rules prohibiting further American settlement (TGLO 2010). By 1835 the situation became untenable and fragments of the state revolted and overthrew Mexican rule. Similar institutional remnants to those of Spanish rule continued over through Texas' independence. The most notable to our study is the retention of public land and, "Perhaps most importantly for the future of Texas, the practice of selling public land to raise state revenue was firmly established during this period" (TGLO 2010: 9). While the institution of public property was developed under Spanish rule, the practice of selling it off to attain state revenue became a defining feature of Mexican rule.

Self-rule as the Republic of Texas began in 1835. As the new country lacked financial resources, land was the primary resource available to political leaders. Therefore, land was used to reward military service as well as provide

direct revenue to the state through land sales; a practice that became increasingly institutionalized. Drawing from a new constitution established in 1836 as well as other emerging laws regarding settlement, the Texas government sought to increase population as a means of promoting economic development and attaining greater state revenues (TGLO 2010). These attempts were rather successful whereas population growth attributed to the land grant system showed large gains. Population increased over four-fold from 38,000 to 130,000 by 1844 (TGLO 2010). The transition that occurred during this period was a shift from a small class of private land-owners who held huge swathes of land to one of a larger population of small tract owners. Interestingly this demographic shift altered the entire composition of the state. Ultimately, due to pressure from Mexican encroachment and increasing financial debts, Texas sought to join the U.S. in 1844.

In 1845, Texas became a state of the U.S. whereby, "Texas was annexed by the United States in 1845 by a joint resolution of Congress, Texas retained both its debts and its public lands. Texas was the only state, other than the original 13 colonies, to enter the Union controlling its public lands" (TGLO 2010: 15). During this transition, all previous land grants were deemed retroactively permissible. Although, as Texas retained its debts, it continued to make use of land sales as a primary source of revenue generation and debt repayment. As the Mexican war ended in 1848 the resultant Treaty of Guadalupe Hidalgo provided huge territories to Texas, with which the state bargained with the federal government; exchanging the majority of the territory for federal bonds, enabling the state to repay its debts while still retaining almost 100 million acres of new land (TGLO 2010). The Texas government continued to provide land grants over the next several decades to increase population and incentivize infrastructural development, particularly to the railroad industry. In the aftermath of the civil war, the Texas government enacted two new constitutions in 1869 and 1876. These constitutions differed in what they deemed permissible land transfers from public to private ownership. Ultimately, the 1876 constitution enabled the

continued sell off of public land and this continued unabated until the majority of public land had been sold to private interests (Eckhardt 2011).

All these governance transitions speak to both institutional change and path-dependency. While the core governing institutions – political and legal structures – altered between forms of rule, some key institutional features remained. The use of particular legislation and rules for encouraging settlement saw some change but retained considerable consistency between regimes. Additionally, the legacy of public land sales as a key revenue source remained throughout the regime changes, resulting in minimal public land holdings for modern day Texas, despite having had the largest quantity of public land of any U.S. state. Importantly, these events pre-date the commercialization of oil and gas in the state, leading to the vast majority of industry development having occurred on private property. The institutions established before the period of commercialization had an impact on the starting point of the industry. However, as we shall see, despite this shift in the form of ownership of land and mineral resources prior to commercialization of oil and gas in the state, it was the functions of the emerging resource regime that explain its development trajectory.

Period 1 - The Initial Oil Boom: A Shifting Economy (1894-1930)

Texas underwent significant changes with the discovery and commercialization of oil as the state transitioned away from an agriculture based economy toward a resource based, and increasingly industrialized economy. During this period of rapid growth, oil exploration and production acted as the underlying economic driver. Other states had by this time already established growing oil industries and entrepreneurs in Texas would draw on their knowledge to help build the nascent local industry. However, overt outside control was often hindered by political and legal means, in great part due to distrust of northern capitalists (Olien and Olien 2002; Childs 2005). Protectionist measures were taken through the courts which limited the degree to which outside corporations could move in to the emerging market's oil and gas industry. The Texas constitution played an important role in limiting trusts and monopoly encroachment into the Texan market. Moreover, vertical integration was extremely limited at this early stage of development, primarily as a means of impeding outside intrusion by established northern companies like Standard Oil (Olien and Olien 2002). Property rights over oil and gas deposits were important as well, but so too were rights over transportation networks, including pipeline and rail infrastructure. Property rights were also used as an argument for undermining initial attempts at regulating the oil and gas industry. Though as is shown, the economic impacts of early exploration and production techniques resulted in considerable volatility and led participants – private and public alike – to seek regulation in the oil and gas sector. These emerging laws and regulatory practices had an impact on the degree to which property and resource rights holders could make use of their holdings. In this respect, there was an important shift in the function of the resource regime; going from a hands-off growth approach to an increasingly interventionist state aimed at stability through conservation.

Oil and Gas Development

The discovery and development of two primary fields occurred during the initial part of this period: Corsicana in 1894 and later, Spindletop in 1901. With the relative commercial successes of Corsicana and Spindletop, the market composition and spin-off infrastructural effects began to occur in Texas. The Corsicana discovery was proof of the economic credibility of oil production in Texas. At its peak, in 1900, it produced 839,000 barrels of oil (Olien 2013). The most important feature of the field was that its moderate success promoted greater exploratory efforts around the state. This momentum continued and resulted in the discovery of prolific gushers at Spindletop, outside of Beaumont in 1901, some of which shot up to a hundred feet in the air (Wooster and Sanders 2013). The first successful well, Lucas-1, went on to produce over 75,000 barrels per day (bbl/d), an impressive quantity at the time (Olien 2013). The field as a whole helped dwarf previous production quantities whereas, "Texas oil production was 836,039 barrels in 1900. In 1902, Spindletop alone produced more than 17 million barrels, or 94 percent of the state's production. As a result of the glut, oil prices dropped to an all-time low of 3 cents a barrel, while water in some boom towns sold for 5 cents a cup" (Ramos 2000: 30). The glut, and the accompanying bust, would be common field traits during the early part of the industry's development. Rapid decline was another common field characteristic and Spindletop's peak of 17 million barrels quickly declined with the field producing only 3.65 million barrels two years later in 1904 (Wooster and Sanders 2013). The decline at Spindletop meant that total state production was down to approximately 9 million barrels by 1910 despite alternative discoveries (Hamilton 2013). It would be decades before production levels matched and surpassed those attained during the Spindletop boom.

The second half of this period saw oil and gas production continue apace, rising slowly at first and then much more rapidly in the lead up to 1930 and the eventual discovery of the East Texas field. This was in part due to new assorted field discoveries, alongside technological changes that enabled deeper and more

effective extractive techniques (Gould 1976). The early half of this period saw continuing discoveries around the Gulf Coast region only later spreading outwards throughout Texas (Olien 2013). A number of these new fields would go on to be significant contributors to oil output in Texas. Despite the rapid decline of most fields – in great part associated with overproduction and well-spacing – aggregate production continued to rise throughout the latter part of this period. Discoveries around the Gulf Region, and others spreading deeper into Northern Texas, helped promote output growth. Demand for oil was also increasing as manufacturers and transportation vehicles began converting to oil use. The results of these dynamics produced an increase in output from approximately 9 million barrels in 1910 to 25.7 million barrels in 1928 (Hamilton 2013). However, it would take the discovery of the East Texas field to surpass the peaks achieved during the early 20th century.

Property Rights and the Role of the State

Property rights law regarding sub-surface minerals was borrowed from the experience of dealing with water rights, other minerals and even wild animals (Scott 2008; Low 2009). In this instance, the Rule of Capture was the underlying legal precedent used in early Texas oil and gas production. This legal rule dictated that the first actor to access and extract a sub-surface resource had the right to claim it as a commodity and sell it. Moreover, this legal concept brought with it an implied convention – the offset-drilling-rule – that lessees had to act in a speedy and reasonable manner in the circumstance that adjacent rights holders were drilling (Bradley 1996). This put legal pressure on leaseholders to produce as rapidly as possible or otherwise face litigation from unhappy property owners. Complicating matters was the fact that underground oil reservoirs were fluid and did not correlate neatly with surface land divisions. Adjacent land owners, and leaseholders, therefore attempted to drain the reservoirs as quickly as possible so as to capture the resources for themselves. Considerable over-production was a direct result, alongside a number of spin-off effects (Olien and Olien 2002; Childs 2005; Scott 2008). These effects were broken down by early observers as

economic waste and *physical waste*, each denoting their own set of costs to producers, landowners, market participants and people living near production sites. By drawing from institutions of the pre-existing resource regimes that were ill-suited to the dynamics of oil and gas, the established function of the early resource regime presiding over oil and gas in Texas was one that promoted waste through unbridled growth. Waste and overproduction became common features of oil production in the state and led to calls from various participants for a functional change to the resource regime; alterations that would require a greater state presence and a move away from the hands-off approach that dominated the first period of commercialization of oil and gas in Texas

In this respect, legislators did not remain silent during this period. Even prior to Spindletop, many of the lessons of Corsicana were heeded by the state legislature. In 1899 the first Texas legislation on oil and gas passed. The legislative statute - House Bill No. 542 - was passed on February 14, 1899 and became law on March 29, 1899. It set forth regulations that:

> Required operators to case off upper oil- or water-bearing formations before drilling into oil pay; prohibited abandoning wells without plugging them with rock, earth, or cement; provided penalties for an operator or owner who did an inadequate plugging job; prohibited gas (but not oil) producers from letting gas flow without use for more than ten days; and restricted flaring gas in the field. (Olien and Olien 2002: 9)

However, without a monitoring and enforcement organization, these regulations proved immaterial. The economic and physical waste produced at Spindletop and subsequent Gulf Coast fields, despite these regulations, were further evidence of this. It was an important step, however, in that it showed that legislators and producers alike recognized some of the emerging issues related to the industry's development. After-all, this was a new industry in the state and drawing lessons from other states was a difficult task as they were themselves in a similar position. Several of these early regulations would be the basis for future rules that were enforced in oil and gas production and distribution in Texas. Here we see

movement towards a new set of functions for the resource regime. However, the lack of credible enforcement mechanisms – namely a regulatory organization with sufficient powers – meant that these actions were insufficient for altering behavior in the emerging industry.

Alongside early regulatory activities that would lead to changes in Texas' resource regime, other important constitutional and legal events were occurring. The Texas gushers became national news, as no previous find had so captured the imagination of the country. This was both a help and a hindrance to those establishing themselves in the industry. On the one hand, it brought necessary out-of-state capital and knowledge that were in short-supply locally. On the other hand, it brought with it the intrusion of the new industry by established northern capitalists and firms, namely Standard Oil. At the time, in Texas, there was a cultural aversion to outsiders, especially northern capitalists (Olien and Olien 2002). This aversion manifested itself through the enforcement of the state's constitution in relation to Standard's perceived monopoly practices. Interestingly, U.S. constitutional law provides states with the right to regulate natural resources with regards to conservation, with the exception of regulatory measures that inhibit inter-state commerce (Engdhal 1978). However, since the protectionist measures took the guise of anti-monopoly, and did not occur through conservation legislative or regulatory activity, they held up in the courts; first through state courts and later at the national level through Supreme Court decisions (Bradley 1996; Childs 2005). These would not be the only anti-monopoly charges levied at Standard and the company would eventually break-up due to legal pressures (Bradley 1996). Importantly, these early actions taken by the Texas government had a long-term impact. Limiting high degrees of vertical integration meant that interests' intra-industry were split between types of participants. Greater competitive pressures and differing interests based on a firm's role in the industry meant that – for the most part – there was no particular policy approach that satisfied all industry participants. It also meant that no one interest group had the power to dictate state policy.

By the late-1910s it was increasingly apparent that the initial rules established in 1899 were insufficient for managing the costly boom and bust cycles occurring throughout the state. Consequently, a number of key events happened between 1917 and 1919 that restructured the resource regime. New legislative statutes were enacted, first with regards to pipeline regulations, and second with regards to direct oil and gas production (Bradley 1996; Childs 2005; Niles 2010). These two changes aimed to provide a state organization with the regulatory authority to oversee oil and gas production and distribution. Due to its experience dealing with common-carriers in the rail industry, the Texas Railroad Commission (TRC) was chosen to oversee oil and gas transportation based on the 1917 legislation (Bradley 1996; Childs 2005; Niles 2010). Moreover, this legislation made the same classification of pipeline infrastructure as common-carriers, bringing considerable legal precedents as to their just use. Common-carrier classification entailed nondiscrimination and equal treatment – costs – for transporting well-head oil to refineries or markets. Additionally, the 1917 statute enabled pro-rationing which dictated that a particular amount per-well was to be transported at equal costs. These two features provided the TRC with substantial regulatory powers, transforming the role of the state with regards to the existing resource regime.

In 1919, the TRC was granted even greater authority when the state legislature passed the *Oil and Gas Conservation Act* (1919) which:

> Outlined in more detail the TRC's duties in controlling waste in the oil fields. The TRC was to promote efficient oil-drilling practices through the enforcement of rules that the commissioners would promulgate. The law required operators to file with the TRC production reports, which the regulators would use to monitor the waste of gas and the production levels of crude. The petroleum companies would pay the costs of regulation through the collection of the tax on crude production provided for in the 1917 pipeline act. (Childs 2005: 155)

This was a large statutory and regulatory change for a number of reasons. For one, it established the TRC as the regulatory agency presiding over oil production as well as transportation, providing the range of authority required if pro-rationing

was to be implemented. By this time the TRC had been provided the formal rule making and judicial authority to regulate the industry, but it would take time to build legitimacy with operators in the field (Childs 2005).

Property rights infringements became more common during this period. Regulatory momentum gathered rather quickly and had considerable implications for property and resource rights holders. On the one hand, regulations affected what could and could not be done on private land, limiting rights holders in several ways. For one, regulations regarding well-spacing meant that activity pursued on private property became limited and created disincentives for small-tract leasing. While this was beneficial to the longevity of reservoirs, it did objectively limit private actions. In this respect, from a legal point of view:

> If the restriction on the use of private property is authorized by statute in an exercise of police power, and if the restriction constitutes a reasonable means to reach a permissible end, the restriction is valid, even though serious loss occurs to the owner of property. Although a restriction on the use of private property is not invalid merely because of serious loss, even confiscation, will occur, nevertheless, when the state imposes the restriction - such as taking away the right of self-help of oil operators by placing limitations on the number of wells that may be drilled, on where they may be located, and on how much they can produce - the state must protect property rights if there is any reasonable way to do so. Stated differently, the means adopted by the state to accomplish a permissible end must not be arbitrary or unreasonable. (Hardwicke 1952: 105)

Regulation of this type that clearly infringed property and resource holders rights was justified under waste-prevention measures which is evident in the aforementioned legislative and constitutional laws. The introduction of correlative rights – primarily as a counter to the Rule of Capture (Low 2009) – also fell within this justification scheme and further constrained private activity by enabling the state to enforce pro-rationing schemes at both production and transportation stages. The amalgamation of these legislative and common-law concepts underwrote the growth in the role of the state and limits to private right holders. Moreover, it altered the function of the resource regime, pushing it towards stability through conservation measures.

Property rights were also undermined by the use of eminent domain to promote infrastructural development. Unlike the above, eminent domain was not justified by conservation and waste-prevention, but rather, was drawn from federal and state constitutional law. In the particular case of pipelines, through the 1917 and 1919 statutes, the state sanctioned eminent domain for land-use (Niles 2010). In Texas, eminent domain was primarily used to seize land or more commonly, allow for an easement – a right of way over private property – for private firms. As long as these firms were classified as common-carriers under established statutes they were able to make use of the Texas constitution's section 14, article 1 (Niles 2010). The underlying legal concept at play in cases of eminent domain has been public-use which remains rather loosely defined in Texas and was originally used during the railroad boom (Niles 2010). The use of eminent domain is a clear violation of property rights. Owners of land are coerced into settling for 'fair market-value' for their land, or easement rights. Moreover, the state makes use of police power in favour of private firms that are built for profitability without any obligation of promoting the public good. Regulations and laws can attempt to converge public-good with firm profitability, but it is commonly an unhappy union. Here we encounter the odd reality of property rights enforcement in Texas – common in many jurisdictions around the world – where arguments for the public-good can, and are, used for infrastructure development through property rights infringements. However, in the case of Texas, it was primarily to the benefit of private firms at the cost of private landowners rights.

Taken together, this period marks both the commercialization and formalization of Texas' oil and gas resource regime. In its earliest stage, the Rule of Capture incentivized rapid unfettered growth which resulted in extreme boom and busts. The state responded to this by promoting conservation – particularly of physical waste – and slowly adopted the necessary legislative, common-law and regulatory institutions and organizations to deal with the mounting costs of growth. This meant shifting the pre-existing function of the state's broader

resource regime from one focused primarily on growth to one that included conservation, and by extension stability, as primary features. This is a key turning point in the development of Texas' oil and gas industry. The role of the state and the degree to which property rights can be infringed are all based on actions taken during this time period.

Economic Development

Wide spread economic growth was a by-product of rapid oil development. Cities and towns around potential fields became inundated with people and capital. Population around Spindletop, for example, doubled between 1900 and 1910 (Olien and Olien 2002). Port-Arthur – a central refining and shipping hub near Spindletop – a town of less than 1,000 people at the turn of the century, had over 9,000 inhabitants by 1910 (TSHA 2013). These boom-towns suffered from considerable volatility. Inflation was rampant as already limited resources became scarcer. Food and lodgings were often difficult to attain. Land speculation drove prices very high, very fast. Land that had been considered nearly worthless was driven as high as $100,000 per acre within the first 3-months of the Spindletop discovery (Olien and Olien 2002). The infrastructural deficit was present not only with regards to oil industry needs, but also for the rapid demographic shifts occurring around emerging fields. Inadequate housing, schools and healthcare establishments were a negative by-product of the rapid growth. However, despite these costs, the emergent oil industry was fueling the state's industrial growth. Downstream activity helped to create trade hubs, particularly in Houston which became the largest port in the U.S. in 1909 (Olien and Olien 2002). The abundance of oil also had auxiliary effects on energy intensive businesses, primarily, "railroads, brickyards, ice factories, slaughterhouses, cottonseed oil mills and breweries" (Olien and Olien 2002: 59). As more of these industries converted from wood and coal to oil, the potential for competitive advantages emerged through cheaper energy inputs. Local manufactures catering to the industry's needs for well and refinery equipment also helped promote economic growth. State revenue was strengthened through tax receipts related to oil and gas

activity, amounting to $5.9 million in 1929 (Ramos 2000; Olien 2013). General economic growth and public finances both benefited from the oil industry even under conditions of increasing state intervention.

Period Wrap-up

Private rights were the underlying form of ownership for the Texas oil industry, but increasingly, unimpeded private sector control was viewed as harmful. Both with regards to economic volatility accompanied by large booms and busts, as well as with regards to high degrees of physical waste highlighting the need for some level of conservation. Thus, strictly private and unimpeded development quickly showed itself to be a limited approach, one that fostered large-scale physical and economic waste. This was not lost on participants, and functional changes to the resource regime took place. For one, the formalization of the underlying institutions began, rules were enacted through statutes that limited resource and property rights for the express purpose of conservation with an implicit purpose towards stabilization; both of price and growth. These regulations included well-spacing and capping rules, flaring limitations and even went so far as to propose production allowables. Restrictions on private rights holders alongside direct state intervention in markets were pivotal functional changes to the resource regime that would have a lasting impact on the development of Texas' oil and gas industry.

Period 2 - Texas' Regulatory Development (1930-1970)

In 1930 the East Texas field was discovered. It proved to be the largest oil field in U.S. history by volume (Smith 2013). As we have seen through the analysis of the previous period, new regulations were in place with the express purpose of curtailing physical and economic waste; however, due to organizational resource constraints they were still insufficient for dealing with the flush of production that occurred with the rapid development of the East Texas field. Due in great part to the size and high quality of the field, which initially led to overproduction and its negative side-effects, the emergent regulatory structure strengthened during this period. The events in East Texas became so uncontrolled, that martial force was put in place twice to coerce a halt in production. Even with the enactment of stronger pro-rationing regulations for limiting output, 'hot oil' – oil produced above production quotas – became an ever increasing issue. As the Great Depression ended, Texas oil and gas production continued to rise and offshore resources – owned and administered by the federal government as opposed to the state – pushed production levels to new heights. These developments had a substantive impact on the function of the existing resource regime. It brought greater inter-governmental conflict over resource rights with regard to which level of government ought to be the benefactor of new offshore oil and gas plays. However, the underlying functional changes to the resource regime continued to meet the demands of various interests around the state. Primarily, stability through conservation – preventing physical waste – was the formal focus of the state during this period.

Oil and Gas Development

The discovery of the East Texas field was a game changer for the Texas oil and gas industry. Prior to its uncovering, Texas ranked behind other major producing states including California and Oklahoma in U.S. production (Hamilton 2013). After-which Texas propelled itself to the top rank in oil output in the nation. The field has remained the largest in U.S. history by volume, having had

approximately 30,300 wells drilled within its 140,000 acre area, measuring over 5.2 billion barrels of produced oil (Smith 2013). The fields first year of development occurred in sparse areas of the huge acreage which spanned five counties. However, when one of the early wells showed the capability of producing 22,000 bbl/d, the rush was on for land and mineral leases (Smith 2013). By the next year, a similar development to that of Spindletop occurred, wherein small-tract leases were sold and wells began to prop up rapidly with little care for spacing. The flush of new supply from the East Texas field had a profound impact on price. Just prior to the field's discovery, crude was selling at average spot prices of over $1.00 per barrel. Prices dropped a staggering 90 percent to a mere $0.10 per barrel. (Bradley 1996) This was, in-part, due to the field producing three times as much as the legal amount under the TRC's pro-rationing system. These circumstances led Governor Ross Sterling, on August 17th 1931, to mobilize 1,200 Texas National Guardsmen and declare martial law with the express purpose of shutting down production in the East Texas field (Bradley 1996; Ramos 2000). The shutdown helped to prop up the price of oil, pushing it upwards to $0.64 (Bradley 1996). Federal courts later intervened in February, 1932 holding Governor Sterling's actions as illegal marking an end of martial law (Prindle 1981, 1984). Ultimately, pro-rationing continued to be an uphill battle in East Texas for the next several years.

The rapid increase in production associated with the East Texas field enabled oil output of 1.1 million bbl/d by 1933 (Hamilton 2013). Further growth would continue throughout the period, reaching 2.1 million bbl/d by 1945, 2.9 million bbl/d by 1955, and closing off the period at 3.4 million bbl/d in 1970 (Hamilton 2013). Consistent growth occurred in a number of locations throughout the state. The East Texas field, however, played a large role throughout the period. Offshore developments did take place by the mid-1950s, but any promising locations over ten miles off the coast fell under federal jurisdiction and is therefore counted separately from state production figures. This period marks

the heyday of Texas oil production. The state continually increased output, taking center stage nationally and globally as an oil producing powerhouse.

Property Rights and the Role of the State

Oil extraction was already an important part of Texas' economy by 1930; however, with the discovery of the East Texas field, it became the central component. Production increased rapidly and lawmakers and regulators scrambled to deal with the economic and social costs of flush production. Production ramped up so rapidly that the TRC moved in to enact pro-rationing as the field's first seven months were unregulated and resulted in a flush of production. On April 1931 the order for pro-rationing was placed and it was revised twice and went into effect on the 1st of May (Bradley 1996). It resulted in a wave of litigation against the TRC, with upwards of 2000 participants (Nordhauser 1979). The district court ruled against the TRC in this instance. The courts did so arguing that the TRC's pro-rationing system prohibited economic waste in an illegal manner counter to the laws established in a 1929 statute. The ruling countered a previous ruling, forcing the Texas legislature to pass the *Anti-Market Demand Act* (1931) which strictly forbade state regulators at the TRC from limiting market demand and thus, enacting production quotas. However, in November 1932, the legislature was forced to reverse its decision due to the mounting costs of unbridled development at the field (Prindle 1981, 1984). They did so by passing the *Market Demand Act* (1932) which provided the TRC with the statutory authority to enact production allowables. Yet, the uncertainty created by these actions damaged the legitimacy of the TRC and made it all the more difficult for them to enforce pro-rationing in the East Texas field.

An important side-effect of pro-rationing attempts was the selling of 'hot-oil'. The ease of production, and the excessive size and high quality of the East Texas field, intensified the field's problems. Over-production, much like the earlier Spindletop field, was one such problem; although, this time, it ran into regulatory obstacles. These regulatory obstacles created a space for illegality with

respect to producing oil above and beyond the allowable threshold established by the TRC. “Enforcement of assigned allowables by the TRC was difficult and necessarily lax. A Drilling spree, fostered in part by allowable assignments per well, spawned thousands of new wells, the policing of which was far beyond the limited staff and budget of the commission” (Bradley 1996: 639). Resource limitations such as these plagued the TRC and 'hot oil' – oil produced in excess of established quotas – fluctuated wildly through 1931-1935 (Bradley 1996). A combination of state and federal enforcement would eventually halt this practice, but not without considerable costs. Even in the aftermath of martial law, state regulation was seen as insufficient for dealing with the issue which exceeded the state's jurisdiction in some cases because of interstate midstream activity. Moreover, mounting injunctions by injured parties – producers in the field – were an additional barrier and cost to state enforcement (Hardwicke 1937). Hot oil was such an issue at its peak, mid-1933, that it destabilized not only regional markets but the national market for oil. Due to these factors, federal intervention was lobbied, primarily by the majors. These companies were hit hard by flush production and crude oil's subsequent price collapse, with “Twenty-nine companies, which had enjoyed profits of $497 million in 1929 and $271 million in 1930, suffered losses of $74 million in 1931” (Bradley 1996: 637). New federal laws regarding interstate transportation of petroleum products were enacted and both state and federal regulators exerted mounting pressure on hot oil market participants (Bradley 1996). Some private sector support, alongside these new state and federal initiatives, finally brought the illegal activity to a minimum by 1935. However, the haphazard implementation of wildly fluctuating production quotas, and the initially weak enforcement costs – mild fines and no threat of incarceration – were considered regulatory failures even by many supporters of conservation measures (Zimmerman 1976; Bradley 1996). Only after enforcement mechanisms that were seen as extensive enough to halt the illegal behaviour – costlier fines and up to 10 years in prison in some cases – did illegal production slow to manageable levels (Bradley 1996). Of significance, the role of the federal government in oil and gas regulation increased during this period and this held

importance for future events, in particular regarding future war-time planning, offshore developments and their response to the supply shocks of the 1970s.

Property rights infringements continued along similar lines to those observed in the previous period. Regulations limited what could and could not be done on leased or owned properties, especially through greater endeavors at enforcement. Moreover, pro-rationing was one such rule that was implemented with greater focus during this period. Pro-rationing limited the degree to which producers could extract and transport oil – which according to the Rule of Capture – was their property once out of the ground. So not only were land and mineral rights curtailed, but implicitly, so too were commodity rights once the crude product was physically ready for extraction. This period included growth of regulatory oversight which constrained property and resource rights, but also state activity leading to direct market interventions. These market interventions were supported by some market participants, while others were quite hostile towards them. Revising the historical literature, there does not seem to be an easy binary division between majors and independents or upstream and midstream interests. Rather, what side of the argument one fell on seemed to be a product of one's particular circumstance and opportunity to benefit – or accrue the costs – of various regulations and their accompanying market interventions. In addition, eminent domain continued to be used as a method of securing land, right-of-way and easement as needed for pipeline infrastructure (Niles 2010). Ultimately, property and resource rights associated with the oil and gas industry incrementally experienced less freedom with regards to exclusivity, quality of title and even transferability; though, many of these limitations were small or moderate adjustments from the rules governing these rights established and enforced during the previous period. Moreover, the role of the state expanded to meet the requirements of its established constitutional and statutory authority to conserve oil and gas with the implicit purpose of ensuring stable growth in the industry.

World War II also introduced considerable institutional restructuring. After the declaration of war, the Petroleum Administration for War (PAW) was

created by executive order (Bradley 1996). This federal organization was tasked with price regulation, output subsidization aimed at boosting national production, and the regulation of materials; all of which had an impact on Texas' regime. Price regulations included a price ceiling by 1942 which prevented particular field operators from charging above chosen thresholds (Bradley 1996). Since prices were controlled, marginal wells began suffering losses. In response, the PAW initiated a subsidization program to mitigate those financial losses and maintain production at marginal sites (Bradley 1996). Synthetic fuel subsidies were also enacted where, "The Synthetic Liquid Fuels Act allocated $30 million to the Bureau of Mines to construct and operate demonstration plants for turning coal, shale, or other products into crude oil" (Bradley 1996: 239). Lastly, rationing of materials required for oil and gas exploration and production was put in place as an attempt to ensure that necessary materials were accessible to industry participants. While these policies were rolled back in the aftermath of World War II, they highlight the degree to which the federal government can control resources under wartime measures. While these were exceptional circumstances, institutionally, the federal government retains considerable powers over resource management during wartime. Moreover, these pushes for greater federal resource control would continue forward; first through the conflict over offshore resources, and later with federal responses to the oil shocks of the 1970s.

Another area of property rights conflict emerged during this period, this time between the state and federal government. The geographic location of Texas meant that considerable oil and gas resources were available off its shores. As new technologies developed and scientific expertise in geology improved, oil and gas that had once been out of reach became accessible. In 1945, during the final days of World War II, President Truman unilaterally proclaimed offshore resources owned and administered by the federal government (Kelly 2008). Two years later, the Supreme Court ruled in the federal government's favour, classifying all offshore territory ten miles off a state's coast as federal jurisdiction (Kelly 2008). Previous years had seen some offshore developments in Texas,

however federal jurisdiction prevented developments further offshore. However, despite this inter-governmental conflict over property rights, Texas has still produced oil in its ten mile offshore zone (TRC 2013).

Oil and gas development during this period increased steadily despite the institutional instability of the early years. The state, through the TRC, had a difficult time enacting its first pro-rationing orders, resulting in martial law and the proliferation of 'hot' oil. However, as these issues subsided – due to cooperation between the federal and state government, alongside a group of private operators – a function of conservation and by extension stability returned. After the mid-1930s, production in Texas continued to grow steadily all the way to 1970 with the TRC regulating production allowables, enforcing conservation regulations and advocating for voluntary unitization – developing fields cooperatively so as to ensure the highest ultimate recovery rate possible (Weaver 1986; Childs 2005). By the latter part of the period, however, there was a shift towards a function of growth. Production allowables were increased upwards, nearly allowing for full production capacity by 1970 (Weaver 1986). The shifting function of the resource regime was the result of steady growth throughout the period in conjunction with rising demand both nationally and globally (Chastko 2004). While issues pertaining to conservation provided the legal impetus for the role of the state, stability and often price stability were the underlying function of the regime. As these issues appeared constant throughout the latter part of this period, a focus on growth began to gain ground among relevant industry participants.

Economic Development

The economic situation during this period was complicated by exogenous shocks; primarily, the market crash of 1929 and the onset of the Great Depression. Despite this, aggregate oil production continued to rise during this early part of the period. Production data, however, provides a picture that suggests considerable volatility – upwards of 10 million barrels – in yearly output during

the 1930s. Given the often changing production quotas and declines in other fields, this should not come as a surprise. With regards to the Great Depression, Texas was not spared, despite some early predictions stating otherwise (Isaac 1978). A microcosm of the larger impact on Texas, Beaumont – the area near Spindletop and other gulf region fields – that had enjoyed huge growth between 1900 and 1930, suffered major economic set-backs.

> Business declined, a large number of people were unemployed, local relief agencies could not cope with the demand for help, private and public projects were abandoned, and tax delinquency almost forced the municipal government into bankruptcy. These problems had their origin in what happened somewhere else and they had no local cure. (Isaac 1978: 30)

This story was common in urban centers around the state. The rural population did not fare much better. Even the giant East Texas field was insufficient for curing the economic malaise that had developed in the financial core of the country. Moreover, the instability and overproduction of the field created its own speculative and financial havoc. External economic shock put a rapid halt on statewide growth and it would take both the New Deal and WWII to reinvigorate the state's economy. The post-war period saw a boom both in the state's oil and gas industry as well as its broader economy. Growth continued with relative consistency between 1945 and 1970. The growth of both the oil and gas industry, and more broadly the state economy, provided a relatively calm period prior to the supply shocks that occurred in the 1970s.

Period Wrap-up

A function of stability and conservation in Texas' oil and gas resource regime was further entrenched during this period. However, as we saw, pro-rationing quotas were often inconsistent during the initial rush of production at the East Texas field, and in that way further promoted the sale of hot oil. The state legislature too was at times inconsistent, putting forth a bill prohibiting pro-rationing only to repeal it a year later. These inconsistencies were in great part resultant from court

decisions that in one case approved of state activity, only to renounce it at a later date. The result was over-production, the accompanying physical and economic waste, alongside the proliferation of hot oil. These factors further exaggerated the boom and bust regional effects of early Texan oil production which caused considerable financial and social havoc, especially coupled with the impact of the Great Depression. These inconsistencies mark the teething period of institutional development. Once overcame, stability through conservation became the overriding function of the resource regime until the end of this period. While a function of conservation and stability was initiated with the legislative and regulatory changes of the previous period, it was the experience in East Texas and the stable growth that followed the bust that cemented conservation and stability as the primary features of the resource regime up until the 1970s.

Period 3 - Supply Shocks and Texas Production (1970-1985)

During the early 1970s, events in the Middle East culminated in the run up of global oil prices, providing Texas oil producers with greater impetus to increase production, despite clear geological declines in many major fields. In this case, exogenous shocks forced a change to the incentive structure of the existing resource regime. The underlying function of the regime that had rested on stability moved towards a greater focus on growth as the period's volatile price swings – both up and down – tested Texas' institutional and organizational capacity in new ways. Moreover, the impact of the supply shocks meant that the federal government became more interested in the oil and gas industry, entailing a greater institutional presence within Texas' oil and gas resource regimes. The impact of volatility in global prices, emerging federal policies and changing production dynamics in the state are examined in this section through an institutional lens with a particular focus on the functional changes to the existing resource regime.

Oil and Gas Development

By the latter 1970s, Texas oil production was on the decline (Hamilton 2013; EIA 2013a). Texas hit its peak production in 1972 with output of 3.5 million bbl/d (Hamilton 2013). However, oil production is highly dependent on price as price is the primary variable for considering whether a resource is accounted for as a reserve – an economically feasible production unit. As price rises, more costly resources shift towards reserves which often enables firms to generate larger investment inflows as their energy account balance improves. These features help to explain the push to maintain high output during times of high prices despite clear signs of geological depletion. Prices jumped in the early 1970s from below $5.00 per barrel to over $35.00 per barrel by 1985 (Hamilton 2011). The run up in prices, and their subsequent collapse in 1986, help to explain institutional changes that occurred during this period. Attempts at growing oil and gas production entailed higher rig counts which is represented by 35 percent increase in 1973-74

followed by a 26 percent increase in 1975 (Olien 2013). Despite such increases to exploration and new production, overall state output continued to decline after 1972 (Hamilton 2013). The increase in activity led to substantial gains in state revenue; by 1983 28 percent of state tax revenue was attained through oil and gas taxes (Olien 2013). However, by 1985 production had declined to 2.4 million bbl/d and the state was hit by a major economic recession. After which, oil and gas production continued to decline until a recent resurgence. Driven primarily by high global prices, but also through the novel use of extractive methods and emerging technologies, output has been rapidly increasing; although, even so, existing output is below the 1972 peak.

Property Rights and the Role of the State

Changing global dynamics in the oil and gas industry had an important impact on Texas' resource regime. The TRC enabled considerably higher degrees of production – even up to 100 percent production rates – in many major producing areas (Weaver 1986; Olien 2013). Issues of conservation made way for growth even at the expense of stability. Additionally, the threat of oil shortages prompted a larger federal response. Federal institutions and organizations increasingly pushed into what was traditionally Texas' jurisdiction. These two features define the changing resource regime in Texas during the period. The former relates to shifts in the property rights regime by removing some of the impediments to growth such as lower production allowables; whereas the latter relates to the role of the state and the sometimes conflicting nature of inter-governmental oversight and federalism.

Conservation had dominated Texas' natural resource regime over oil and gas since the costs of unbridled expansions were understood as far back as the turn of the 20th century. Preventing overt physical waste was the underlying legal and constitutional principle that enabled the degree of property rights infringements that underpinned many laws and regulations in the state. However,

by the 1970s the run-up of oil prices created too favourable a circumstance for producers and the state alike. Producers could attain larger margins through rising prices and the state benefitted from greater tax revenues. These factors influenced decisions to enable larger production allowables and ultimately shift the function of the resource regime towards growth. However, geological limitations were themselves an important limit to growth. Prices meant that revenues and industry activity was on the rise but overall output declined after 1972 (Hamilton 2013). At first the decline was slow – in great part due to the aforementioned activity – but by the 1980s declines began to accelerate. The functional shift towards growth may have delayed the impact of declines, but clearly when dealing with non-renewable resources, growth alone is insufficient for managing depletion. In fact, an overt focus on growth can sometimes delay declines but accelerate depletion of the overall resource base (Hook et. al., 2009). While the Texas government removed institutional impediments to growth and shifted the state's resource regime's function towards growth as opposed to stability, geological realities and federal policies had a more powerful counter effect.

With oil supply shocks in 1973 and 1978 causing prices to jump considerably, the federal government became more assertive in energy policy. This newfound assertiveness meant overlapping state functions and expanding federal influence; particularly through the initiation of new institutions. One such institutional change came in the immediate aftermath of the 1973 oil embargo. The *Emergency Petroleum Allocation Act* (1973) sought to classify types of oil and create a two-tiered pricing system for domestic oil (EIA 2013c). The new rules also instituted limits on exports so as to promote greater domestic use of domestic resources. Some results of this legislation were production declines and a rapid increase in oil imports (EIA 2013c). This was because "old" oil which made up the majority of U.S. production was locked at a significantly lower price than global indices. However, in Texas, this prompted producers towards exploration with hopes of attaining access to "new" oil which was unconstrained by the federal legislation and traded unobstructed at market values (Olien 2013).

Here we see conflicting functional approaches by the state and federal government. The state sought to promote growth over stability by enabling greater degrees of production whereas the federal government explicitly approached the issue of global price volatility from the perspective domestic price stability. The federal government therefore attempted to stabilize price through legislative rules that established price ceilings on the majority of U.S. production. While they also hoped to spur further production, the new institutions had the opposite effect. The unintended consequence in Texas was the exploratory rush; however, the rush was unable to overcome the reality of geological limits.

The new federal rules had an interesting impact on property rights. The classification of oil as either "old" or "new" created a divide between existing title holders and potential sites for exploration and production. Unsurprisingly, the rules incentivized new production over old and this increased the value of unexplored locations. New lease values increased while old production sites stagnated despite the TRC increasing allowables in most areas to 100 percent (Weaver 1986; Olien 2013). In this circumstance, the institutional classification of "old" or "new" brought on by federal legislation had a direct impact on property holders and the value of their titles. While the new rules did not directly limit the characteristics of ownership of title holders, they indirectly affected value and price. In a way, this was a discriminatory approach that favoured certain participants while altering the incentive structure of the resource regime. What followed was increased oil imports, slowed production across the country and more limited exports which impacted many firms' bottom lines; these were unintended consequences, counter to the aim of federal policy makers (EIA 2013c). These alterations were not in-line with expectations of federal policy makers and in some cases ran counter to their actual aim.

In the aftermath of the 1978 oil shortages, further federal reach occurred. New federal legislation established new rules alongside changes to the tax regime that increased the costs of exploration (Olien 2013). Subsequently, exploration

began to decline and geological depletion set in more rapidly (Hamilton 2013). As it became clear that federal policies were causing considerable unintended consequences, by 1981 they began to scale back price policies. In 1981, the federal government removed price allocation mechanisms, allowing oil prices to be decided on the open-market without direct federal government controls (EIA 2013c). As prices increased for Texas producers so too did profits and state revenues. The step back by the federal government allowed the Texas resource regime's focus on growth to win out. However, it remained a short lived victory as geological limits and global prices undermined the rather high profits and revenues of the early 1980s. Declines in production continued onward during the early 1980s and only accelerated later in the decade (Hamilton 2013). Additionally, prices continued to creep lower until 1985 and dropped rapidly in 1986 (EIA 2013d). The impact of these two factors led to considerable financial and economic havoc in Texas resulting in countless industry bankruptcies and a rather sharp state-wide economic recession (Olien 2013).

Ultimately, this period marks a tug-of-war between federal and state policies and global prices. The former represents a debate over the proper function of an oil and gas resource regime; in this case, whether the focus ought to be price stability or growth. On the other hand, the latter was complicated by a complex set of geopolitical and domestic variables which culminated first in high comparative global prices only to settle back down at very low prices by 1986. These features define the institutional arrangements we observe throughout the period and help to explain the growth and then decline of the industry and more broadly, Texas' economy.

Economic Development

Economic growth in Texas was highly reliant on the oil and gas industry during this period. Employment, GDP and state revenue all peaked alongside oil and gas industry growth in 1981, indicating the central role of the industry with regards to

state-wide economic growth. Direct employment in oil and gas extraction accounted for over 6 percent of the workforce in 1981 (Brown and Yucel 2005). Up to 17.16 percent of total state revenue was derived from taxes and federal transfers directly tied to the industry (Olien 2013). The highest share of Texas GDP – roughly 20 percent – was also due to oil and gas development by 1981 (Brown and Yucel 2005). However, this overt reliance on the oil and gas industry for state-wide economic growth became more of a hindrance than a benefit. Prices declined rather rapidly in the mid-1980s and the impact on the oil and gas industry caused ripple effects through the entire state economy. The lack of diversity in the economy meant that the bust following the boom was that much more pronounced. Economic declines originating in the oil and gas industry due to both geological depletion and falling global prices resulted in a costly recession in Texas. The impact of these factors led to a rapid reconfiguration in the composition of Texas' economy. The oil and gas industry went on to provide only 10 percent of overall economic output, roughly half of what it had in 1981 (Brown and Yucel 2005). While this caused considerable economic hardship, in the long run it did promote the diversification of Texas' economy, enabling it to better cope with the volatility in the global oil and gas industry.

Period Wrap-up

External geopolitical events and struggles between the federal and state government to define the underlying function of the presiding resource regime best define this period. Whether the function was price stability or growth oriented became the central component of institutional arrangements at the time. The federal government created new institutions – primarily through legislation – which aimed at providing price stability through direct price setting mechanisms. On the other hand, Texas sought to promote a function of growth through increasing production quotas, in some cases removing them entirely. The federal approach set off a number of unintended consequences which in great part undermined their primary goals of price stability due to the uncertainty it created

within the industry. However, the Texas government's approach towards growth had its own consequences wherein growth at the time led to a larger bust in its aftermath. Ultimately, by the end of this period the underlying function of the resource regime was still in question, both price stability and growth had shown their limitations, particularly in an era of resource depletion.

Period 4 - Contemporary Developments (1985-2012)

The story of Texas oil and gas production since 1985 is primarily one of gradual decline. However, declines in output have recently been overcome by the increasing production of unconventional shale oil and gas in the state. This resurgence has brought its own problems and the state has once again expanded its scope in an attempt to resolve them. Moreover, the federal government has continued to expand its interests with regards to environmental, trade and general energy policy. Conflict over property rights continue to occur alongside the evolving role of the state. The following period examines these institutional changes to the resource regime in the context of decline followed by the recent ramp up in production.

Oil and Gas Development

At the beginning of this period, in 1986, Texas was producing approximately 2.4 million bbl/d of crude oil; significantly less than its 1972 peak (Hamilton 2013; EIA 2013a). However, production still had a long way to go before hitting its lowest level since the 1930s. In 2005, Texas produced just over 1 million bbl/d of crude (Hamilton 2013; EIA 2013a). While Texas still remained an important contributor of total U.S. petroleum production, its production profile seemed to be in terminal decline. Stagnating prices did not help the situation, as they moved between $15.00 and $30.00 until 2004 when prices began to rise more rapidly (EIA 2013d). Even in the early years of the price run up from 2004 until 2008, production in Texas continued to stagnate as geological limitations prevented new production. In recent years, however, Texas has reversed its declining production profile by exploiting its abundance of unconventional shale oil resources. By doing so, production has climbed to an average of 1.82 million bbl/d of crude oil in 2012, and so far 2013 is on pace to have even higher output (EIA 2013a). High prices are an important factor here, especially when dealing with more costly unconventional production methods. Prices today remain above $100.00 per

barrel for both primary global price indices (EIA 2013d). High prices, new techniques and technologies and the institutional setting have enabled Texas to re-grow its extractive oil and gas industry despite the geological declines of its conventional resources.

Property Rights and the Role of the State

During the declining phase of production, the property and resource regime could do little to curb loss of output. Running into issues of geological depletion is a physical reality when dealing with non-renewable resources. Conservation and stability can help promote the resources use over a longer period of time, but the millennia required to replenish used stocks of crude oil extend far beyond our use cycle. This, however, does not undermine the benefits of conservation regulations, which in many cases were drawn up by technical experts and helped prolong the lives of particular fields. By this time, the fundamental functions of the resource regime were well defined. Property rights were clearly delineated and leasers and lessees alike understood in what ways their rights were constrained – be it well-spacing, flaring limitations or proper capping procedures. However, this does not mean that conflicts were absent. New technologies and techniques used for shale oil and gas bring new technical troubles. Easement for pipeline construction remains an ever present issue concerning property rights in the state. Moreover, the re-emergence of large-scale extraction due to the exploitation of shale resources has brought property rights back into the limelight. This is particularly true with regard to issues of split-estates – the separation of property title between the surface and the sub-surface (Rattikin 2008). These issues also speak to the role of the state as an adjudicator of conflicts that cannot be resolved voluntarily between parties. All these issues, alongside increasing output, have re-ignited a policy debate pertaining to the function of the state's resource regime; be it conservation and stability, or rather, focused on growth.

Re-arranging the resource regime towards a function of growth faced

considerable limitations in the previous period. For one, the federal government undermined growth with an overt focus on price stability. Additionally, geological depletion meant growth of the industry appeared to have hit its limit and decline was inevitable. In the aftermath of the 1986 price collapse, the Texas government recognized this reality and returned towards a function of stability – in the face of depletion – hoping to maintain what production it could as well as maintaining the state's central role in refining crude oil. The slow and steady decline in production is one indicator of this shift. However, in recent years, the rapid build-up of production occurring in the Eagle Ford and Barnett shale plays has brought back to the fore the question of function. Ought the state pursue a function of rapid growth or retain stability?

Moreover, shale oil and gas extraction require different techniques than those used to produce conventional crude. Hydraulic fracturing – the primary method of extraction – requires large quantities of water and this has altered the resource regime, providing additional organizations with jurisdictional powers (Sumi 2010; Kurlander 2013). The Texas Commission on Environmental Quality (TCEQ) has attained regulatory powers over the use of surface water, an extremely important role given the inputs required by shale producers (Kulander 2013). Interestingly, the role of the state expanded once again to match changing dynamics in the industry; however, in this case it was for the express purpose of conservation and stability of another key resource, water. So while the role of the TRC has not changed much, the overall resource regime has adjusted to meet the demands of the industry and the state more broadly. Water use has become more heavily regulated due to its centrality to new production techniques as it already holds large importance for other natural, personal, agricultural and industrial uses in the state. Moreover, we are in the midst of a pivotal point in the historical development of Texas' resource regime, where the debate over conservation and stability, or growth, once again butts heads.

Issues pertaining to property rights infringements are still present in Texas.

One notable example relates to the construction of the Keystone XL pipeline by TransCanada Corporation. Since the vast majority of land is privately owned in Texas, pipeline construction requires either easement or right of way over large swathes of privately owned territory. While in many cases, voluntary agreements can be reached between pipeline companies and private landowners, this is not always the case. The construction of the Keystone XL highlights this issue as there are four pending cases of landowners attempting to block the pipeline's path (Calkins 2013). Conflict over property rights regarding pipeline construction has been a common feature of Texas' resource regime as we have already seen (Niles 2010). With the country's largest refining capabilities alongside growth in local production due to shale oil, these issues are likely to re-emerge and require substantial state resources. Meanwhile, if history is an indicator, it is likely that these private rights will be infringed if the federal government approves the project (Niles 2010; Calkins 2013). Interestingly, such infringements on private property owners occur for the benefit of primarily private interests. The classification as common-carriers enables the state to enforce coercive practices on private rights holders for the broad purpose of the public good. Meanwhile, the majority of the benefits stream to private pipeline companies and their shareholders. Once again, this highlights that limitations to property rights are not neatly divided by private or public ownership. Even in contemporary Texas, a place where conventional wisdom applauds their primarily private property regime, property owners face coercive action on behalf of private firms by the state. Ultimately, this is due to the function of the established property and resource regime, regardless of its underlying form.

The role of the state has changed substantively during this period. The TRC still retains the aforementioned responsibilities pertaining to oil and gas production and transportation in the state, and the courts still adjudicate unresolved conflicts such as those described above. However, there have been some changes. As previously mentioned, the new dynamics of shale production have brought large scale water-use in to the forefront of contemporary oil and gas

development. Consequently, the Texas government has provided considerable new regulatory powers to the TCEQ. Additionally, the federal government continues to play an increasingly assertive role through environmental legislation and wide-ranging energy legislation such as the *Energy Policy Act* (1992) and the subsequent *Energy Policy Act* (2005), both of which alter the tax regime and incentive structure for oil and gas development (EIA 2013c). These alterations lower the tax burden, aim for efficiency improvements and produce funding for basic research. The ultimate purpose of these federal policies is to decrease demand through efficiency gains, increase production through new technologies and impose less stringent tax requirements for domestic producers. These federal policies mark a significant change from their approach of price stability during the previous period. Moreover, these rules aim to incentivize both conservation and stability through efficiency improvements and basic research towards substitute energy sources, while also promoting growth of the oil and gas industry – primarily through tax easement. Given the still prevalent deficit in domestic supply over demand for crude oil in the U.S., such a policy makes sense for the country as a whole. It also demonstrates that conservation and growth are not entirely mutually exclusive from a policy standpoint, even though in many cases they may seem so.

Taken as a whole, this period represents an interesting period of transition. Prior to 2008, Texas' oil and gas industry – especially exploration and extraction – was in what appeared to be terminal decline. Since then, production has rapidly increased with expectations towards even larger gains (Maugeri 2012; EIA 2013e). However, the new dynamics associated with emerging production techniques has brought changes to the resource regime. The state has once again expanded its regulatory reach by incorporating further organizational oversight to water-use, a key input for shale oil and gas production. More importantly, the rapid growth in output has brought a familiar policy debate back to the fore, whether the function of the resource regime ought to be based on conservation and stability or growth. Moving forward, decisions made regarding the regime's

function will play a central role in Texas' development trajectory.

Economic Development

Economic growth remained relatively stable throughout the majority of this period, despite declines in oil and gas production. These declines resulted in the diversification of Texas' economy, whereby oil and gas production, distribution, refining and marketing make up a smaller share of the whole:

> As output in the Texas mining industry shrank, output in other Texas industries continued to grow after the mid-1980s. Texas saw output gains in manufacturing, construction, agriculture and the service-producing sectors – wholesale and retail trade; transportation, communications and public utility services (TCUP); services; finance, insurance and real estate (FIRE); and government. (Brown and Yucel 2005: 35)

The degree of diversification is a direct result of declines in conventional production. Interestingly, the government sector grew even though the proportion of state revenues derived from oil and gas shrunk considerably. However, in recent years, volatility and economic uncertainty have returned. Unlike the period of moderate but stable growth between the late-1980s to the mid-2000s, the Great Recession that began in 2008 led to high levels of unemployment and economic contraction; unemployment figures rose from under 5 percent to over 8 percent alongside a GDP contraction of 2.28 percent (BLS 2013; BEA 2013). However, in recent years, we can observe a reversal in the data. Growth in Texas has resumed, in part fueled by 10 percent year over year growth of its oil and gas sector (BEA 2013). Moreover, unemployment has fallen in between its highs and lows of the period resting at the 6 percent range (BLS 2013). Texas's comparative success in the aftermath of the Great Recession – from a growth perspective – is in great part due to the rapid increase in unconventional oil and gas production in the state.

Period Wrap-up

Declines followed by industry expansion best define the contemporary development of Texas' oil and gas industry. What appeared to be the slow but steady dissolution of production in the state has reversed rather dramatically through the exploitation of unconventional shale oil and gas. While the oil and gas industry in Texas had remained strong with regards to refining and marketing, the resurgence in exploration and production is having a great impact on the state. Ultimately, the question of function relating to the state's resource regime is returning to center stage. Will Texas pursue a primarily growth focused approach, or rather, as they have historically, will stability and conservation continue to play important roles? It is issues like those pertaining to water use and the environmental costs of hydraulic fracturing that are shaping contemporary debates over the underlying functions of Texas' resource regime. The outcome of these debates will provide us with a glimpse into future development of the state's oil and gas industry.

Texas Case Study Conclusion

While the form of property rights – private ownership – has remained consistent throughout Texas oil and gas industry's development, the function of the resource regime has changed over time. During the initial phase of commercialization, the industry's development was marked by a hands-off approach dictated through court rulings, affirming the Rule of Capture as the basis for development. Consequently, overproduction and volatility followed with a common boom and bust cycle around the state as new resources were found and exploited. Working within the existing constitutional and legislative setting, state lawmakers sought to curb accumulating waste by focusing on conservation, and by extension, stability. This was the pivotal functional change in Texas' resource regime as it moved away from a hands-off approach and redefined the role of the state. The state was no longer solely an adjudicator, but an active participant in the industry. Regulations were not limited to waste prevention measures that limited property rights – such as well spacing or casing rules – but included direct market interventions through pro-rationing. Moreover, easement and right of way rulings meant that surface property rights were sometimes in jeopardy when pipeline companies expanded their lines. These activities, and the greater reach of the state, occurred despite the underlying form of ownership. Moreover, through wartime and external supply shocks, the federal government has become more assertive in the oil and gas industry. Direct regulatory rights are under the purview of the state of Texas; however, the federal government has consistently navigated the constitutional and legislative environment with purpose towards its own goals. At the time of the supply shocks of the 1970s, this meant trying to adjust the function of the overarching resource regime to focus on price stability. Needless to say, one is unable to adequately explain the development of Texas' oil and gas industry without accounting for the role of the federal government in attempting to define the function of the regime especially when it was at odds with the Texas government.

When taken at face value, the story of Texas' oil and gas industry appears

to confirm conventional wisdom regarding property rights. The state is dominated by private property rights, has undergone relatively successful development – comparatively speaking – and maintains low taxes. Highlighting just these features, however, presents a false image of the historical development of the oil and gas industry in Texas. As we have seen, the state has consistently had a hand in production of oil and gas since the earliest attempts at conservation based regulation in 1899. While it took time and effort to enforce emerging rules, the role of the state has been considerably more invasive than a face value examination might suggest. Moreover, despite the form of private ownership underpinning resources in the state, property rights infringements do and continue to happen. Simply taking the form of property as a given and assuming it inherently entails more or less protection of one's ownership rights is a theoretical, not empirical, endeavor. This case simply re-affirms the need to do in-depth historical studies based on empirical evidence so as to separate theory from practice, and fact from fiction. Ultimately, the strengths or weaknesses of property rights, the role of the state and their impact on broader economic development are dictated not by the underlying form of a property rights regime, but rather by its functions.

Case Study: Alberta's Oil and Gas Property Regime

Introduction

Alberta's oil and gas regime has undergone considerable change over the span of its development. It has gone from an informal and uncertain private property regime, to a federally controlled regime, culminating in provincial administration which itself has faced sizable alterations over its tenure. Throughout this process, the characteristics of ownership of resource rights have changed substantially, reflecting the institutional and organizational changes from period to period. The following case study examines these developments, mapping the changes through a descriptive and analytical investigation of particular periods during Alberta's institutional development regarding resource rights. By examining the historical context, investigating changes over time relating to property and resource rights and identifying key themes, an in-depth case-study is presented. Through this institutional lens the role of property is examined, showing that its form – public or private – matters less than the function of the overarching property regime. The role of the state ties into this as regardless of the form of the property system, the state plays a key role; the underlying question is to what extent does the state intervene? Lastly, the role of continuity in the enforcement of the rights regime is highlighted. Taken together these issues provide insight into the role of institutions – namely property – in economic development.

Canada's Formal Institutional Structure

It is important to distinguish the political units in Canada and how they relate to the institutional structure that governs natural resource use. Canada's federalist structure contains four levels of government: federal; provincial; territorial; and municipal. Canada's system is rather de-centralized with constitutional powers divided between federal and provincial governments. Section 91 and 92 of the *Constitution Act* (1867) – previously known as the British North America Act

(BNA) – delineates the powers held by the federal and provincial governments respectively. Importantly, the establishment of municipal governments is just one of the many responsibilities held by provincial governments in Canada, as are territories which are one constitutional responsibility of the federal government. In this respect, the powers of municipal and territorial governments are highly constrained by existing constitutional and statutory legal considerations. Due to this, in most cases, municipalities are inconsequential or subsidiary actors when it comes to resource rights regimes – though exceptions do occur. Territorial crown land is controlled by the federal government in a similar manner to provincial control over municipalities. The Canadian constitution has undergone at least two important changes since its inception in 1867. The first relates to the transfer of federal control of resource rights to Alberta, Saskatchewan and Manitoba in 1930. While these jurisdictions had been admitted as provinces of Canada at earlier dates, they gave up resource rights – ownership and control – to the federal government as part of the price of admission. After considerable negotiations, the rights to Crown land were attained by the three prairie provinces in 1930 through a constitutional change – the *Constitution Act* (1930) – permitted by the British Crown. Since the BNA had no amending formula, British acquiescence was a requirement for constitutional change at the time. This was remedied in 1982 with the second major change through the *Constitution Act* (1982) which provided amending formulae alongside the charter of rights and freedoms.

The Canadian constitution provides constitutional authority for direct resource ownership to its provincial governments through Section 109 of the *Constitution Act* (1867). Moreover, Section 92A of the *Constitution Act* (1867) provides the province with primary control over resource administration, stating:

> (1) In each province, the legislature may exclusively make laws in relation to:
> (a) exploration for non-renewable natural resource sin the province;
> (b) development, conservation and management of non-renewable natural resources and forestry resources in the province, including laws in relation to the rate of primary production there from;
> (c) development, conservation and management of sites and facilities in

the province for the generation and production of electrical energy.

This institutional structure enables considerable differentiation between provinces. These differences show themselves in the management of extractive industries. It is on display when we account for the overall mix of supply of various energy outputs between Canadian provinces (Brunnen et. al., 2011). More importantly, these differences province-to-province help to illustrate the diversity we observe in the historical development and contemporary make-up of Canadian resource regimes. However, despite ownership and primary control resting in the hands of the province, the federal government still has its own constitutional authority regarding resource management. Sections 92A (2) and (3) provide the federal government with considerable legislative leeway with respect to resource control. As is shown throughout the case, this has resulted in considerable inter-governmental conflict over resource control.

Three primary categories help to explain the institutional structure of Alberta's oil and gas regime: lease and permit renewals; royalties; and compliance with laws. Under these three categories rest the fundamental areas of governance relating to oil and gas development on public land in Alberta. Importantly, over 81 percent of mineral rights are in the hands of the province so the rules established regarding these three categories apply the vast majority of oil and gas development in Alberta (Alberta Energy 2009a). Renewals relate not only to the length of a given permit or lease, but also stipulate the degree to which actual efforts at exploration and production of oil or gas are required during their tenure, as well as establishing rules regarding reclamation. Royalties are the rate at which the government can charge private operators above and beyond the fixed costs of application and maintenance fees. Lastly, compliance with laws underscores a broad category in which environmental, tax and any such regulatory or legislative mechanisms can apply to resource management. Taken together, these three aspects of governance provide the government with considerable policy sovereignty relating to resource management.

Ultimately, the formal institutional makeup of Canadian resource regimes is quite simple: the province decides. However, as we see in the case of Alberta, reality is never so simple. In the earliest years of westward expansion and the initiation of Alberta as a province of Canada in 1905, resource control remained in the hands of the Canadian federal government. It took many years of discontent and political fighting for Alberta – and the other Prairie Provinces – to retain the rights to their own natural resources; a right that had been enjoyed in the East since confederation. Yet even after the transfer of power, again and again we see the emergence of conflict between levels of government play out. Sometimes this occurs in broad sweeping measures such as Trudeau's National Energy Program (NEP); other times it occurs in smaller degrees of encroachment, as through federal licenses for product exportation. This is examined throughout this case study as one important dimension of the overall development of Alberta's property rights regime overseeing oil and gas. The chosen format of analysis entails a periodization of time periods related to these developments. This allows for intra-case comparisons as well as the case-to-case comparison that will follow, with a particular focus on the form and function of property rights, the role of the state and continuity in the enforcement of resource rights vis-à-vis economic growth.

Historical Context

Canada's formal institutional regime over natural resources was established at confederation. The *Constitution Act* (1867) asserts provincial ownership over natural resources within their jurisdiction. However, formal institutions alone rarely tell the whole story. With westward expansion, the formal institutions established at confederation were shown to be fallible. Until 1930, well after the addition of the Prairie Provinces – Manitoba and then Saskatchewan and Alberta – the ownership and control of their natural resources rested under federal authority. The early story of natural resource regimes in Alberta is one of developing the necessary internal institutions and wrestling control from the federal government. This is a representation of the sometimes limited nature of formal institutions; on

the one hand they outline the rules of the game, yet on the other we see that these rules can be ignored, bent or changed to favour different actors. In this case, the federal government received considerable financial benefit by holding on to the resource rights of the newly established Prairie Provinces (Spry and McCardle 1993; Janigan 2012). It was only in 1930, well after Alberta had joined Canada as a province in 1905, that they finally acquired control over their own resources through federal legislative acquiescence. As a starting place, it is worth examining the institutional makeup of the property rights regime in Alberta, and how it has changed within the jurisdiction. Therefore, this section of the case study will examine the historical context of confederation and early natural resource regimes including those federally administered ones that presided in Alberta until the province gained control over its own resources.

The initial era of European colonization westward in Canada occurred under the institutional rule-set established by the British Crown's Royal Charter establishing the Hudson's Bay Company's (HBC) possession of Rupert's Land – what is now Western Canada. The land was held by the Hudson's Bay Company which retained the rights to occupy and dispose of any land within its awarded jurisdiction (Spry and McCardle 1993). However, the ad-hoc nature of the HBC's administration led to the absence of clear disposition rules alongside minimal infrastructure, limiting the appeal of settlement and the exploitation of resources (Richtik 1975; Libecap 2007). The HBC was, however, committed to the fur trade (Innis 1930; Friesen 1998) while mineral extraction and oil and gas development were rarely considered.

In 1871, having secured Rupert's Land, the Canadian government sought to transform it to a more hospitable and profitable locale; yet, such a transformation would entail a great cost. The explicit cost had been paid to the HBC, amounting to £300,000 and the right to a defined amount of Crown land, "the HBC had been granted blocks of land around each of its existing posts, to a total not more than 50,000 acres, and one-twentieth of the land settled in an area

bounded by the United States border on the south, the North Saskatchewan River on the north, the Rocky Mountains on the west and Lake Winnipeg and the Lake of the Woods on the east" (Spry and McCardle 1993: 2). This amounted to 7 million acres of land that remained in the possession of the HBC, and importantly, this included both surface and subsurface rights (Blake et. al., 2008). The new land acquired by the federal government was classified as the North-West territories – which included present day Alberta. There also remained the implicit costs of administration and infrastructure development. These costs required a revenue base, and due to the limitations of personal taxation on an economically undeveloped area, it required one that was primarily driven by resource development. During the early stage of Canadian federal administration there was a deficiency in the understanding of the pre-existing institutions in the territories by far removed federal managers. Due to the need of resource revenues for development, understanding existing property regimes and establishing new institutions was paramount so as to promote their use. In this sense, early administrators were tasked with the difficult undertaking of integrating existing rules and norms to an emerging management system for both property and resource rights (Janigan 2012). The government began by creating a new property regime which would create greater certainty while promoting population growth and resource development. Ultimately, Western Canada's initial property and resource regimes were being formalized at this time.

In many cases, the static nature of property divisions conflicted with existing settlement patterns. While provisions were in place to accommodate some existing settlers, this ultimately resulted in the displacement of many Metis and Aboriginal communities (Friesen 1998; Janigan 2012). However, 1.4 million acres were earmarked for the Metis through the *Manitoba Act* (1870) (Spry and McCardle 1993). Also at the time, three treaties were signed between the Federal government and aboriginal groups within what is now the province of Alberta (AANDC 2013). The treaties – treaty 6, 7 and 8 – provided lump sum payments to signatories alongside designating reserves, enabling hunting and fishing rights

in unsettled locations, and establishing the right to consult on certain land use issues. The latter issue, the right to consult, has remained an area of dispute regarding oil and gas industry development in Alberta; especially after it was reinforced at the constitutional level through judicial interpretation of Section 35 of the *Constitution Act* (1982). Conflict over land-title and the accompanying property rights have therefore remained important issues, sometimes with a particular emphasis on sub-surface rights (Weber 2004). These early infractions on Metis and Aboriginal claims over property and resources would remain an area of contention even to this day.

As for resource rights, the Canadian government saw them as an opportunity for revenue generation which would in great part fund the construction of the trans-Canadian railway – and important link between the East and West – while also promoting general economic development in the west. Through the purchase of Rupert's Land and subsequent legislation ensuring statutory control, legally the federal government secured the rights over natural resources (Barton 1993; Chastko 2004; Blake et. al., 2008). The economical use of resources thus required a detailed analysis of potential reserves wherein, "Eager to assess the region's potential resources, the Dominion government instructed the Geological Survey to collect samples, make maps, and report on the mineral wealth of the newly acquired territories" (Chastko 2004: 2). The Department of Interior too was tasked with similar objectives (Spry and McCardle 1993). Leases – primarily for timber rights but also mineral rights – were sold through the Department of Interior an organ of the federal government which took over for the Dominion Land Branch. Immediately following the formalization of property districts, areas rich with known mineral sources were set aside. For example, an area around Lethbridge was excluded from settlement rights established in the *Dominion Lands Act* (1872) and grants were provided to enable mining (den Otter 1982; Johnston 1983). Additionally, land suitable for timber production was labeled as woodlots and timber licenses were provided through the Department of Interior (Spry and McCardle 1993). Land was also sanctioned

off for ranching, potential water power sites and townships (Richtik 1975; Spry and McCardle 1993). By 1887, land that was provided to homesteaders only provided surface rights while all subsurface rights remained privy to the federal government (Blake et. al., 2008). The emerging property and resource rights regime derived legitimacy from federal legislation, particularly the *Dominion Land Act* (1872), as well as existing practices from Eastern Canada and the United States (Richtik 1975; Libecap 2007). The regime was set up in a specific way so as to provide a surplus of revenue to the federal government for infrastructure investment – chiefly for railroad construction through land grant bonds and lease agreements – while also providing a subsidy to the emerging provinces and territories; wherein Alberta's first budget amounted to $2.5 million, of which roughly half came from the federal subsidy (Manning 2005). However, as population growth occurred rapidly after 1880, the subsidy provided by the federal government decreased on a per-capita basis and left local administrators and political organizations without adequate fiscal resources (Janigan 2012).

Alberta attained provincial admission into Canada on September 1st, 1905 through the *Alberta Act* (1905). While resource control was discussed as an important issue, a variety of other responsibilities out-weighed it and so it was abandoned by local political negotiators. Establishing the organizational competence for provincial rule was the number one priority, and at this point in time, that meant remaining subsidized by the federal government at the expense of resource control. Provincial resource control was abandoned due to the strength of the federal position in conjunction with inter-provincial disagreement. Eastern provinces still felt that they had paid for the Western lands and thus believed the benefits of resource control – revenue attained by the federal government and doled out to them – was well within their own rights (Janigan 2012). Fueled by these underlying issues, the lead up to 1930 represented the culmination of inter-governmental conflict over resource control. While the federal government retained control, its perceived misuse of resources – including oil and gas – and the increasing divide between resource revenues and federal subsidies, led to

further discontent within the Prairie Provinces. The result was a powerful political push for establishing provincial rule over resources that were within their geographic jurisdiction.

In 1930 Alberta attained constitutional rights to manage natural resources within its provincial borders. Along with these new responsibilities came another fundamental shift in the institutional framework relating to natural resource management. This governance shift coincides with the increasing commercialization of oil and gas production in Alberta. The following sections examine the key periods of Alberta's oil and gas development from an institutional perspective. The aforementioned historical information helps us to understand the province's newfound position in 1930. Oil and gas development, as well as a basic resource rights regime, had already been in place prior to 1930; however, the governance change that occurred placed far greater responsibility – and power – in the provincial government to influence the development of the oil and gas industry alongside broader economic growth. The role of the state changed considerably with this transition. However, the underlying property form – public ownership – remained. Meanwhile the function of the resource regime trended towards establishing stability in an ever-changing industry and global environment.

Period 1: The Formative Years of Alberta's Natural Resource Regime (1930-1970)

In Alberta, from 1930 onward, property rights of natural resources took a particular form. Private property rights and public property rights existed side-by-side. With the transfer of Crown land from the federal government to the Alberta government in 1930, over 81 percent of subsurface rights in the province fell under provincial control (Alberta Energy 2013). While the quantity of land under government control did not change much between federal and provincial rule, the role of the state alongside the enforcement of rules and regulations, and development more generally, did alter substantially. Moreover, oil and gas production continued to increase during this period and with the discovery of massive oil reserves at Leduc in 1947, the province's overall development trajectory changed significantly. The following section examines these changes from an institutional lens, investigating the changing functions of the resource regime alongside the development of Alberta's oil and gas industry.

Oil and Gas development

Commercial success of oil and gas production began as early as the mid-1910s in Alberta; although, it would not be until the 1930s that commercial production amounted to an important part of the broader provincial economy. In 1930, Alberta was producing just over 1 million barrels of oil annually, though this number rose consistently to over 7 million barrels just prior to the discovery of massive oil reserves at Leduc in 1947 (Beach and Irwin 1940; Quirin 1999). While this quantity was rather small in comparison to large producers south of the border, it still amounted to approximately 97 percent of total Canadian production at the time (Beach and Irwin 1940). After the Leduc discovery production increased exponentially, reaching 337 million barrels – some 923,000 bbl/d – by 1970 (Quirin 1999). Importantly, this period saw the transition of Alberta from an agriculturally dependent province facing bankruptcy to a rapidly growing

economy fueled in great part by the oil and gas industry.

Production during the early part of this period was primarily centered in the Turner Valley which had yielded the first successful commercial production wells earlier in the century (Beach and Irwin 1940). By 1947, oil was discovered in abundance at Leduc, just south of Edmonton, which became the primary producing area in the province (Breen 1993). The marketability of Leduc's output increased significantly as domestic consumption steadily rose alongside exports to the United States (Chastko 2004). Lacking marketability for more costly oil sands output had been a constraint on the development of Alberta's Athabasca region up until the 1960s. As well, conventional producers successfully lobbied the provincial government to protect their interests, particularly through the use of production quotas (Breen 1993; Chastko 2004). With domestic and export markets growing, however, a window opened for commercial production in the oil sands. While this period saw only small quantities produced – some 27,300 bbl/d by 1969 – the basic structure of open-pit mining operations were established (Chastko 2004). The first successful attempts at commercialization of bituminous crude therefore occurred during the latter part of this period. Ultimately, the rapid growth of oil production in Alberta marked this period, which led to significant changes to the property and resource regime, the role of the state and provincial development more broadly.

Property Rights and the Role of the State

Property rights in Alberta had been undergoing significant changes through transitions from regime to regime. As has been discussed, a number of regimes had presided over the area with differing rules and enforcement organizations. By 1930 much of this change and discontinuity had been put to rest with the provincial government attaining ownership and primary control over Crown land within its jurisdiction. Yet, what changes did this entail? How much did these changes impact the rights of existing property holders in the province; particularly

lessees of land or mineral rights? Did these changes create uncertainty, and if so how may this have impacted the development of the province? Certainly, some conflict did arise out of the governance shift, in particular with relation to pre-existing leases established under federal rule. The result of these conflicts would shape the enforcement of property rights, with a particular emphasis on resource rights and the role of conservation in the province of Alberta.

The institutional structure pertaining to property rights over land and minerals changed alongside the transfer of resource rights from the federal government to the Alberta government. The governance change altered the existing framework establishing ownership and rights claims that had overseen resource disposition in the province's location since the 1870s. Here we have a case of institutional change where the underlying legal structure supporting ownership changed. Changes such as these alter existing relationships between individuals, firms and the state. The Alberta government was at first hesitant to make large scale changes to the regulatory structure, but some key alterations did take place that impacted property and resource rights. The most notable of these regarded leasing rights that the federal government had provided to firms during its tenure. These rights were deemed permissible retroactively despite the governance shift. However, at the time of transition, there were only minimal regulations relating to oil and gas production. Leasing standards had already been established that required lessees to follow some guidelines that impacted their rights – such as the need for ensuring productive output during the tenure of the lease or else face revocation – and many of these remained in effect upon transition.

Attempts at conservation, however, were beginning to take root and these efforts meant reshaping existing property and resource rights and thus, the institutional framework overseeing and incentivizing oil and gas development. Importantly, the question as to whether new rules would impact existing rights holders became a central component of the emerging regime (Lucas 2007).

Conservation efforts through statutory, regulatory or common-law mechanisms inherently involve restrictions on property rights; restricting owners or lessees with regard to the characteristics of their property rights (Scott 2008). In practice this meant restrictions on well-spacing, enforcing production quotas, properly capping-off abandoned wells, and limiting flaring of natural gas; and many existing rights holders were reticent to accept such limitations. Most of these rules were absent at the beginning of this period only to be enacted as time went on and production increased, only further stressing the question as to whether they ought to be retroactively applied. As new rules were enacted, they were underscored by the institutional foundation that supported them; new statutes, legal rulings and regulatory initiatives which all tied into the increasingly visible role of the state in the enforcement of the province's property and resource regime. Under the guise of conservation – not unlike the process observed in Texas and other U.S. states – the role of the state expanded to meet the needs of the emerging oil and gas industry and provincial economic development more broadly. Though, unlike its U.S. counterparts, the starting point differed considerably, whereas underlying property rights were those of sovereign rights as opposed to private rights.

As commercial production continued to increase familiar issues with oil and gas development followed. The payment of royalties and excessive natural gas flaring were the first to meet public debate in the early 1930s. Production in the province was, at the time, centered in Turner Valley and this was where the issues came to the fore. Firms that had entered into leases, under the federal government's administration, were increasingly pressured by the expanding role of the province. Firms operating in the area had been subsidized by the federal government, receiving 67.5 cents per barrel of oil; working out to roughly $12.75 per barrel in 2008 dollars (Finch 2008). The payment of this subsidy was in-line with the federal government's push – alongside British insistence – to increase exploration and production of oil in the early 20th century (Breen 1981). However, as the Alberta government took over administrative duties, one of their first actions was to introduce a 5 percent fixed royalty on any oil and gas produced in

the province (Finch 2008). Not only did firms that had been in operation prior to the resource transfers now have to pay the province, they lost access to the federal subsidy. During this period, the Alberta government continued to raise royalties while also introducing more complex rate options which took the degree of development of a given production site or the quality of oil outputs into account (Alberta Energy 2009b, 2010, 2013). Royalties would continue to be a pivotal issue in the industry's development and was an area of differentiation between private and public property regimes more generally. Royalties are still paid on oil and gas production under private regimes, but they are paid to the property owner who is a private landowner. Functionally, such differences do not necessarily amount to much as the same outcomes can be achieved through taxation. Here, the form of the underlying property ownership type influences the institutional path towards government revenue generation – taxation as opposed to royalties and taxation – but both can result in similar degrees of incoming government revenue. Ultimately, it is the function of the institutions of a given resource regime that dictate the degree of government revenue generation. While royalties provide a secondary revenue stream, similar outcomes can be achieved through direct taxation. Royalties derived from sovereign ownership do, however, provide some additional policy maneuverability for the state.

The second expansion of the Alberta government's activity in the oil and gas industry aimed at curbing wasteful natural gas flaring. Flaring at the Turner Valley had become a significant wasteful procedure by the early 1930s. Natural gas wasted to produce a barrel of oil accounted for a loss of $10 of gas to produce just $1.20 of oil (Finch 2008). Lawmakers and industry participants were well aware of the wasteful practice and were increasingly conscious of the geological costs related to declining reservoir pressure, and ultimately, lower field-life petroleum output. These circumstances led the Alberta government to enact the *Turner Valley Gas Conservation Act* (1932) although not without considerable protests from several interests; particularly, the majors operating in the area along with associated business interests in Calgary (Breen 1993). The Turner Valley

Conservation Board (TVCB) established through the aforementioned legislation attempted to limit natural gas flaring in the region through monitoring and enforcement of production allowables; but, local firms claimed that their pre-existing agreements with the federal government exempted them from such rules (Breen 1993; Lucas 2007). As the Alberta government attempted to enforce new rules existing leaseholders were resistant. Spooner Oils, a firm operating in the Turner Valley, challenged the legal authority of the Alberta government (Breen 1993; Lucas 2007). The case, *Spooner Oils v. Turner Valley Conservation Board,* went on to the Supreme Court of Canada, which:

> Reversed the Alberta Courts, concluding that the Turner Valley Gas Conservation Board's prorating order, issued under the Alberta Turner Valley Natural Gas Conservation Act, was invalid because it "affect[ed] or alter[ed]" the terms of the Spooner lease, contrary to Article 2 of the Natural Resource Transfer Agreement, as confirmed by the British North America Act, 1930. However, the Supreme Court of Canada judges did not address the Alberta Appellate Division's conclusion that the Act as a whole was within the constitutional authority of the Alberta legislature. (Lucas 2007: 231)

This was a pivotal moment in the early construction of Alberta's natural resource regime overseeing oil and gas development. While the first attempt by the province to enforce pro-rationing failed as the courts ruled against the Alberta government, the ruling – alongside subsequent Alberta Supreme Court and Supreme Court of Canada decisions – did reinforce the constitutional authority of the Alberta government to regulate the oil and gas industry. Despite the failure of the first regulatory push, from an institutional standpoint, these rulings ensured that the right to establish and enforce regulations over the oil and gas industry rested legally and constitutionally in the hands of the Alberta government.

Rulings such as these also highlight the important role legal institutions play in shaping property rights and resource rights regimes. Legal rulings by these important state organizations have binding effects on existing rules, in many cases altering their application and in turn, how they affect resource rights holders. In some cases they reaffirm rights holders, strengthening one or more of the

characteristics of their rights, while in other cases they do the opposite and limit rights. Interestingly, this particular ruling did both. On the one hand it re-affirmed Spooner Oil's right to produce the quantities of oil, regardless of wasted natural gas, that it deemed best for the firm's interests, at least in the short term. On the other hand, the decision was broad enough that it supported the underlying legal position that the Alberta government had a constitutional right to limit activity in the oil and gas industry through statutory and regulatory means for the purpose of conservation; in particular, preventing physical waste. A scenario such as this also speaks to the evolutionary component of broader institutional change (Hayek 1960; Hoffman 1999; Scott 2008). Legal rulings are not designed forms of institutional change, rather they are often ad-hoc in the sense that they respond to particular cases as they arise. As discussed above, the decisions clearly alter the existing institutional framework, particularly the characteristics of ownership of rights holders, but in a different way than would new legislation or regulatory measures. The latter are designed specifically to alter incentives one way or the other, while the former is primarily concerned with interpreting the broader institutional framework when conflict between competing interests arises that cannot be voluntarily remedied. These are important points of divergence wherein some institutions develop along more evolutionary trajectories, while others are primarily designed with particular purposes in mind. However, neither change in isolation and oftentimes they have a dynamic relationship with one another. In this particular circumstance, new legislation and regulatory initiatives sparked a conflict that ended up in the courts, altering the existing institutional framework.

These initial attempts at state intervention failed, but they paved the way for future endeavors. Not long after, on April 8th 1938, the Alberta government established the Petroleum and Natural Gas Conservation Board (PNGCB) through the *Oil and Gas Conservation Act* (Breen 1993; Finch 2008; Alberta Energy 2013). In many ways this board was modeled after the TRC which was the regulatory organization overseeing oil production and transportation in Texas. Its first commissioner, Bill Knode, was picked precisely due to his experience in

Texas which was one of a number of U.S. states that led the way on early oil and gas regulation (Breen 1993). The PNGCB was the primary regulatory organization with regards to the oil and gas industry in Alberta. As natural resource regimes include a lattice-work of institutions and organizations, this was one such key organization. Moreover, many regulatory organizations – including the PNGCB and the TRC – are granted considerable leeway with regards to enacting regulatory measures due to their accumulated technical expertise. These measures alter the existing institutional framework, as these new rules are themselves new institutions being added to the mix. The PNGCB's creation had a profound institutional impact on the resource regime in Alberta. In this respect, it is important to understand the role the PNGCB played in altering the institutional framework overseeing resource disposition and use in Alberta.

Independent regulatory organizations such as the PNGCB are often vested with considerable power. These powers entail rule-making and enforcement mechanisms – usually legislative and judicial functions respectively – that can force those that fall under their jurisdiction to comply or face penalty. Coercive authority is an important part of their overall role, but organizational competence and credibility are also requirements for well-functioning regulatory regimes. The early period of the PNGCB's development was in great part focused on building credibility from rather reticent operators in the province (Breen 1993). The PNGCB was vested with considerable coercive powers, but without some forms of voluntary compliance by participants in the oil and gas industry, it would have faced an uphill battle. While there were those who were adverse to any forms of conservation in the province's industry, most were willing to support conservation, though often disagreeing on the best approach (Breen 1993). The issue of conservation would, however, be put to the test in 1947 with the onset of Alberta's oil boom.

When oil was struck in Leduc in 1947, it brought with it an inflow of foreign capital and the accompanying boom in productive output. By 1949,

production was outstripping regional demand and the government pursued two complementary options: pro-rationing to try to bring the market in to balance, and finding ways to access more distant markets thus expanding the marketability of Alberta's oil. The option of pro-rationing fell directly on the PNGCB and was a rather forceful form of market intervention. Expanding market access was a secondary objective which would help stabilize growth in the industry and provide both the Alberta and federal governments with greater revenue through export licensing and higher oil prices. As the PNGCB enforced well allowables, firms competed with one and other to adjust their own per-well quotas. Accordingly, "the Board's essential role would be that of refereeing to ensure equity among resource owners, co-ordinated development, and good production practices in the public interest" (Breen 1993: 248). In the immediate aftermath of the Leduc discovery, new regulatory institutions were enacted. The PNGCB issued well-spacing and casing rules and the government handled the influx of lease applications (Breen 1993). A number of new bills were also enacted in the late 1940s that further shaped the institutional regime presiding over the oil and gas industry in Alberta.

The institutional emergence of new rules and enforcement mechanisms – including the PNGCB – was the dominant theme of this period. A relatively unregulated institutional structure, apart from existing leasing standards, moved towards a highly regulated system which included direct market interventions. The role of the state, thereby, increased rather dramatically. The Alberta government initiated leases, the judicial system arbitrated over major disputes, and the PNGCB oversaw day-to-day regulatory initiatives. Here we observe greater governmental reach in conjunction with rather stable growth while the primary constraints on further expansion were external factors such as market access. As North American oil and gas transportation infrastructure improved, alongside domestic demand growth, many of these constraints began to wane. Despite considerable state intervention and the underlying public ownership of the vast majority of oil and gas resources in the province, growth was occurring

steadily both in the industry and broader economy.

Economic Development

Economic development in the province was rather volatile during this period. It ranged from governmental bankruptcy to becoming one of the more well off provinces in terms of per-capita wealth. The beginning of this period coincides with the direct after-shocks of the market crash in 1929 and the on-set of the Great Depression. These events hit Alberta hard, which at the time, was still primarily dependent on agriculture for provincial economic strength. Income derived from agriculture alone accounted for roughly half of the province's total income well in to the 1930s (Ascah 1999). Provincial incomes were cut in half from losses related to agriculture production, falling from a peak of $300 million to approximately $150 million (Ascah 1999). Unemployment was as high as 20 percent at the height of the depression, and on April 1st 1936, Alberta became "Canada's first, and only, province to default on a principal debt payment" (Ascah 1999: 53). Economic and financial difficulty was the norm at the time, however in Alberta it is clear that despite the increasing momentum in the oil and gas indsutry, the province still ended up being one of the hardest hit in Canada by the Great Depression. These exceptional internal and external shocks may have slowed industry growth alongside shrinking provincial GDP, but they would face reversal in the post-war years.

During the 1940s economic recovery began to take root. Moreover, Alberta's economy began to diversify. The oil and gas sector continued its growth alongside the province's GDP. Though, as addressed earlier, oil and gas output was only slowly growing until the discovery of oil at Leduc in 1947. This was Alberta's game-changing event, much like the East Texas field in Texas. Early successes at Leduc brought increasing amounts of investment dollars (Breen 1993), and the accompanying spill-over effects for the provincial economy. The 1950s and 1960s saw similar degrees of increasing growth in conjunction with

rapid rises in oil and gas output (Quirin 1999). Once having overcome the negative impact of the Great Depression and provincial bankruptcy, the province's economic development began an upward trajectory fueled primarily by the oil and gas industry's expansion.

Period Wrap-up

This period marks a number of important historical turning points for Alberta. For one, it encompasses the transition of resource ownership from the federal government to the Alberta government, together with all the accompanying institutional changes. Secondly, it marks the commercial eruption of the province's oil and gas industry. While some commercial successes did pre-date the period under analysis, the majority of real commercial expansion occurred during this time-frame. Moreover, the institutional changes brought with these events had a profound effect on the resource regime overseeing oil and gas development. The province became increasingly assertive in conservation and stability regulatory measures, ensuring a function of stability in the resource regime. Important court rulings ensured constitutional – and by extension statutory – authority rested firmly in the hands of the Alberta government. A royalty and tax regime was established to preside over oil and gas production. The province's primary enforcement agency with regards to oil and gas regulations, the PNGCB, was created and immediately thrust into a rather hands-on regulatory approach to the industry including attempts at direct market-intervention through pro-rationing schemes. The institutional and organizational framework – the overall natural resource regime – underwent its formative development during this period and oversaw the industry's early development, along with broader economic growth in Alberta. Furthermore, 1940-1970 saw rather calm inter-governmental relations, low degrees of uncertainty and volatility, and increasing provincial growth. It would be exogenous shocks initiated half-way across the world during the 1970s that would disrupt this momentum and create substantial uncertainty about the industry, and Alberta's, economic future.

Period 2: Supply Shocks and the National Energy Program (1970-1985)

Whereas inter-governmental relations had remained relatively calm during the previous period, the oil shocks of the 1970s and the federal government's response re-ignited views of western alienation and produced uncertainty that resulted in a reshuffling of Alberta's oil and gas industry. Both federal and provincial policies created considerable political and economic uncertainties which only further compounded the difficulties facing the industry. These forces are examined through an institutional lens to better understand how the external supply shock, and inter-governmental politicking, impacted Alberta's resource regime presiding over oil and gas. Moreover, these events created discontinuity and uncertainty, which affected the institutional reformation associated with the National Energy Program (NEP); further highlighting how changing functions of the property regime alters outcomes even when its underlying form stays stable.

Oil and Gas development

Volatility in the world price of oil was one of the most notable features of this period. The onset of the 1970s saw world prices below $5.00 per barrel, which would rise over six times to $35.75 by 1980 only to fall back to just over $11.00 by 1986 (Chastko 2004; EIA 2013d). Canada, as a net producer by this time – producing in excess of national consumption – was not as deeply impacted by the world price swing as importing nations, but even so saw five-fold price increases from $3.80 to $15.58 (Chastko 2004). This amounted to a price differential of less than a dollar to over $20.00 by 1980 (Chastko 2004). Meanwhile production in Alberta moved between 1.3 to 1.9 million bbl/d during this period; having reached peak conventional production in 1973 at just over 1.9 million bbl/d (Chastko 2004). Even the onset of high oil prices would not be able to propel conventional production forward as geological limits began to affect output totals. Most Canadian production still rested in Alberta and as conventional stocks began to decline, more costly heavy western crude and – for the first time – Alberta's oil

sands began to play an increasingly important role in the total mix.

These price swings in conjunction with the institutional and organizational changes described below created a difficult environment for oil and gas producers. Investment outflows totaled approximately $11.5 billion associated with the NEP and operating oil rigs declined from 550 to 120 by 1982 after the initiation of the NEP (Emery 2006). Broad inflation and the new tax regime also impacted a number of projects, particularly in the nascent oil sands, where project costs were doubling and in some cases tripling; although some projects were placed on hold for primarily political reasons (Chastko 2004). Moreover, despite not reaching allowable daily production at the Sun Oil facility, production remained above 40,000 bbl/d throughout the 1970s (Chastko 2004). Another oil sands operator, Syncrude, lobbied to increase production quotas from 80,000 bbl/d to 125,000 bbl/d in 1971 because "the company noted that consumer demand finally caught up with supplies, ending the twenty-two years of surplus in North American production" (Chastko 2004: 138). Additionally, with declines in conventional production beginning in several notable jurisdictions, the added output was argued as necessary for offsetting such losses. So while uncertainty was impacting the broader industry, oil sands operations continued to take root during this period. All in all, oil industry activity declined substantially during the period due to the institutional changes that resulted from the external supply shock.

Property Rights and the Role of the State

The function of the presiding resource rights regime underwent significant changes during this period. The supply shocks emanating from geopolitical events in the Middle East had a profound global effect. Volatility in the price of oil hit Canada, disproportionately impacting Eastern Canadians who primarily paid global prices (Chastko 2004). The federal government, tasked with ensuring the public good for the entirety of the country viewed this growing imbalance as too

costly for too many Canadians. They sought – often unilaterally – to rectify the mounting burden of high fuel costs by reshaping the function of the existing natural resource regime in Alberta. With hopes of stabilizing the price of oil across the country, the federal government sought to institute the NEP which would: set price for all Canadian provinces below world prices based on Canadian production and distribution, introduce new taxes on oil production and distribution, restrict exports and increase Canadian ownership of firms in the oil and gas industry (Granatstein and Bothwell 1990; Bow 2009). Doing so meant a considerable re-shaping of the existing institutional framework especially with regards to the function of the presiding resource regime. In Alberta, many viewed the plan as federal overstep given the constitutional authority vested in the province to oversee resource development. This put the province and the federal government at odds, adding a large degree of political uncertainty alongside already mounting economic instability.

Another part of the political uncertainty was centered on property rights. The initiation of a price setting agenda followed by the creation of a nationalized oil company, Petro-Canada, in 1973 and 1975 respectively, had far ranging consequences for firms operating in the industry. Pro-rationing was already one method at stabilizing price by determining production amounts, but the establishment of a federal pricing policy provided a second level of government with institutional and organizational capabilities for influencing price. Moreover, with the creation of Petro-Canada, there was also the issue of fair and stable leasing procedures. Whereby ensuring a secure quality of title – especially within the oil industry which often requires high upfront capital costs – helps to promote investment. With the emergence of a state owned competitor, lease holders feared that they would have a competitive disadvantage. These two changes foreshadowed the establishment of the NEP which went further to address the core issues of price stability across the country as well as ensuring greater degrees of Canadian ownership of firms operating in the oil and gas industry. However, these functional changes compounded rising uncertainty, and created

discontinuity and inter-governmental conflict. They also highlighted the degree to which the federal government could have an impact on the control of provincially owned resources.

The actions by the federal government associated with the NEP illustrate once again the institutional dynamics of federalism and the role of the state. While governmental responsibilities are often outlined constitutionally, different external events – especially more forceful shocks to existing arrangements – can lead to attempts at rapid change. This type of rapid change is often marked by instability and uncertainty which can be observed through incentive and behavioural changes to participants. In this case, the federal reach into Alberta's jurisdiction created not just political discontent but market reactions as well. Investment dollars left and the Alberta government halted a number of projects in the oil sands (Chastko 2004; Emery 2006). Instability occurred due to the federal government's policies which altered the existing functions of the property regime; namely, stability through conservation in conventional production. Moreover, these actions also speak to the role of the state. While it has already been established that the state can and does play an important stabilizing force – at least with respect to the oil and gas industry's development – this is not a strict rule. In this case, state action at the federal level had a destabilizing effect. Importantly, this highlights the difficult balance in attaining stability through state intervention. If state action is sometimes beneficial, but in other circumstances harmful: how do we know the effective amount? That is a difficult question, particularly from a policy perspective but it is in part answered by looking back. In our case, the last period highlighted the regulatory role played by the state which helped stabilize the industry through conservation measures. Having learned lessons from other jurisdictions – particularly early movers in the U.S. – as well through its own early struggles, the Alberta government successfully enacted a number of regulatory institutions and organizations that curbed wasteful practices in the oil and gas industry. However, the purpose of federal intervention through the NEP was far more intrusive than earlier provincial approaches. The federal government

sought to displace Alberta's power over Canadian prices – re-asserting a stronger federal presence in energy production and distribution – while also aiming for the 'Canadianization' of the oil and gas industry which was upwards of 70 percent foreign owned by 1980 (Sinclair 2011). These two policy objectives – functionally – put the federal government at odds with both the province and major industry participants.

Unilateral actions taken by the federal government during the NEP also highlight another interesting institutional dynamic: inter-state relations. Attempts to ensure greater Canadian ownership of the oil and gas industry brought with them a number of institutional changes that differentiated between state actors. Since the majority of foreign ownership of firms operating in Alberta rested in American hands, the discriminatory approach disproportionately impacted American interests (Bow 2009). These actions therefore led to negative reactions south of the border, not just through capital flight from private investors but also through U.S. government policy. The so called "special-relationship" between the two countries was drastically undermined by this conflict which expanded further than just the oil and gas industry (Bow 2009). Much of this was not new by the 1980s and the NEP, as the actions of the federal government during the 1970s foreshadowed the changing relationship. Worry over foreign ownership had prompted the federal government to create the Foreign Investment and Review Agency (FIRA) in 1974 and was followed by Petro-Canada's formation a year later. The enactment of the NEP only further intensified inter-state conflict due to its greater reach in crowding out American ownership, taxing a greater share of primarily American firms' profits and restricting exports. These actions aggravated the relationship between the two states and resulted in, "diplomatic protests, a challenge under the General Agreement on Tariffs and Trade (GATT), and, ultimately, threats of diplomatic and economic retaliation" (Bow 2009: 103). From an institutional vantage point, we see that institutional change reaches further than the jurisdictional boundaries of a given area. Actions pursued by the Canadian federal government impacted U.S. interests which led to a response that

altered the two countries' relationship. By trying to re-assert federal control over oil and gas development, the subsequent functional changes to the institutional structure – particularly changes aimed at attaining greater Canadian firm ownership – led to a de-stabilization of relations between the two countries.

The province too was not an easy partner for industry to work with during this volatile time. Prior to the establishment of the NEP in 1980 the Alberta government sought to re-structure the royalty regime alongside bureaucratic overhaul while also responding to the price spikes of the 1970s. In 1971 the Progressive Conservative Party unseated the reigning Social Credit party which had been in power since 1935 (Chastko 2004). Political change brought with it considerable turnover in the civil service, creating new networks between industry and government personnel. These organizational changes were also followed by the Alberta government enacting a flat rate change to the royalty structure, increasing it to 23 percent of gross production (Marsh 2011). The change in government therefore brought with it substantial organizational and institutional change. Political change can act as a catalyst for organizational and institutional change and the lack of such political change during the greater part of the previous period in Alberta had been a stabilizing institutional force. The organizational and institutional changes enacted with the governmental change created short-term instability though it was the actions of the federal government and the volatile global environment affecting oil prices that truly forced large-scale change in the industry. Nevertheless, the modifications to the existing regime created animosity between major industry participants and the provincial government. Subsequent events, however, would align the two against the federal government.

Property rights and the role of the state underpinned many of the actions pursued by the federal government under the auspices of the NEP. The process of 'Canadianization' meant discriminating between property holders. Those firms which were not classified as Canadian faced less certainty over the quality of their

title with regards to leases as well as their capital goods. Fear of excess taxation and even outright expropriation drove considerable capital flight – not just in terms of investment dollars but also equipment (Chastko 2004; Emery 2006). A large part of what the federal government was trying to achieve was institutionally rooted in re-arranging the existing property regime presiding over oil and gas to favour particular interests. These interests were in conflict with the majority of existing industry participants who were primarily foreign owned but also the province of Alberta which benefited economically from investment inflows and production exports. The role of property rights is central here as discriminatory actions were imbedded in nationality and therefore rights were more or less secure based on this factor. By redefining the property rights regime along these lines – when the majority of existing ownership was set at odds with the new rules – the federal government sent an important signal; one that partly undermined the role of the province and had an adverse effect from an economic perspective. This signal was marred by uncertainty and discontinuity; uncertainty over the quality of title of claims, and discontinuity with regards to the enforcement of the pre-existing resource regime. The latter had been stabilized during the previous period only to be destabilized by federal actions during this period. The province had been the primary designer of the overarching property regime presiding over oil and gas, however, with these actions the federal government was attempting to re-configure the relationship.

Despite these attempts at a rather forceful functional change to the property rights regime presiding over oil and gas in Alberta, external events undermined much of the federal government's goals. By 1985 the price of oil had fallen considerably, undermining the primary purpose of the federal initiative – affordability and price stability for fuel. A subsequent change in government in 1984 from Pierre Trudeau's Liberals to Brian Mulroney's Progressive Conservatives further cemented the demise of the NEP. So while inter-governmental conflict – both sub-national and state-to-state – marked this period, it was in great part market factors revolving around price that returned the bulk of

institutional powers to the province of Alberta.

Economic Development

The oil shocks and their subsequent impact on the global economy created a period of economic instability. Primarily, rapid increases in the price of oil led to broader inflation and economic recession. From the perspective of industry interests in Alberta, the rise in prices was not necessarily a negative. Rising prices meant larger profit margins for firms – after accounting for increased production costs associated with inflation – but also increased government take through royalties and taxes. Additionally, it meant marginal plays that were more costly, such as early oil sands operations, became more attractive investments. For the most part, these factors held true through the 1970s. However, the actions of the federal government in wake of the NEP undermined these developments and stymied production increases. Early oil sands projects were caught in the cross-fire of inter-governmental negotiations, alongside mounting inflation which ballooned their start-up costs (Chastko 2004). Overall, economic deficiencies marked this period across Canada, and while Alberta was in a better position than most to mitigate some of the mounting costs, it still suffered considerable economic contraction and high unemployment in the early 1980s (Anielski 2002). Functional changes to the institutional regime, coupled with economic uncertainty brought on by external supply shocks, made this period a volatile time.

Period Wrap-Up

Discontinuity and successive uncertainty was a staple of this period. Volatility in global markets, political change and institutional change all converged to create the perfect storm. As major oil producers in the Middle-East cut back production during the 1970s, prices continued to rise, sparking fears of shortages worldwide. While Alberta was in a position to benefit from high prices as a major producing jurisdiction, subsequent federal policies undermined their position and drove

capital flight and wider industry instability. Moreover, political change in the province further exasperated mounting uncertainty as the new Progressive Conservatives were less inclined to enable the industry to the same extent as the previous ruling party (Chastko 2004). All of these factors together help to explain the economic instability facing Alberta, and Canada more generally, during this period. Disentangling which factor had the greatest negative impact is no easy task. However, the institutional insights derived from this period relate to the role of federalism, inter-state relations and the important underlying function of property rights. Each of these played a part in the institutional and organizational changes observed throughout this period.

Period 3: Contemporary Developments (1985-2012)

The final period under analysis represents another time of transition. In the aftermath of the NEP and the collapse of the global price of oil in 1986, Alberta's industry suffered considerable financial loss. In wake of this loss, the industry re-asserted itself and slowly moved towards its present day state which is primarily driven by unconventional oil sands production. As conventional production peaked in the mid-1970s, synthetic crude increasingly picked up the slack. Yet, oil sands operations are of a giant scale, requiring huge capital expenditure, and the low world prices after 1985 put many oil sands projects on hold. As prices continued to creep upwards by the turn of the century, however, and technological improvements cut costs at the margins, firms found plenty of opportunity for profit and growth. Changes in state-to-state relations also impacted the functions of the resource regime. The initiation of free-trade agreements, first the Canada-U.S. Free-Trade Agreement (CUFTA), followed by the North American Free-Trade Agreement (NAFTA), altered existing institutional arrangements. More than ever before, oil and gas markets were continental in scope and breaking away from the nationalist focus undertaken during the NEP. In the end, this period is best defined by the emergence of continental oil and gas markets and the increasing shift towards synthetic production in Alberta both of which pushed the function of the resource regime towards a focus on growth.

Oil and Gas Development

At the outset of this period Alberta was producing some 1.5 million bbl/d a decline from peaks attained in the mid-1970s (Statistics Canada 2011). Part of this decline was associated with the aftermath of the NEP as well as global oil prices which crashed to lows of $11.13 in July of 1986 (EIA 2013d). However, the peak of light conventional production had also occurred in the 1970s. While production would climb from 1.5 million bbl/d in 1986 to over 2.4 million bbl/d by 2012, the majority of the increase came from unconventional oil produced in Alberta's oil

sands (Statistics Canada 2011). Moreover, there are expectations among some that production in the region can continue to increase considerably higher (NEB 2013a). Despite this change from reliance on conventional light crudes, to unconventional bituminous crude, Alberta now produces more oil than it ever has. Prices since the mid-2000s have helped, often sitting well above $100 per barrel. Yet, a move towards an institutional function of growth, and the particular role played by the state are also important underlying factors.

Property Rights and the Role of the State

Conventional production defined Alberta's oil and gas industry well into the 1990s. However, as conventional production faced increasing decline, there became an intensifying focus on the massive unconventional stocks of resources located in Alberta. As we have seen in previous periods, the institutional – and by extension regulatory – framework presiding over oil and gas in Alberta was primarily tailored to conventional forms of production; much of the regulatory and tax regime was set-up in favour of conventional oil and gas production. Since the process for producing synthetic crude differed so much from conventional production, to promote its exploitation required fundamental alterations to the existing framework. Some particular incentives for oil sands production had been in effect since as early as the 1960s, but conventional interests still held the balance of power up until the mid- to late-1990s (Chastko 2004). In some ways, this is another important turning point in Alberta's oil and gas industry's development. The powerful interests of conventional producers began to wane as those of unconventional producers began to rise. However, this shift was also underpinned by changes to the role of the state.

The function of the resource regime remained centered in stability during the early part of this period. However, the increasing declines of conventional production brought its own form of uncertainty. Even up to 2004, cheaper and easier to access conventional reserves were depleting and synthetic crude was still

economically prohibitive in comparison. Some of the economic difficulties were associated with the royalty and regulatory regimes, but primarily they were the result of relatively low global oil prices. While the former were under the purview of the Alberta government, the latter rested on a complex set of uncertain variables most of which fell outside of Alberta's jurisdiction. One step the Alberta government did take was to shrink government and open the province to be more favourable from a business perspective. These attempts included balancing the budget while simultaneously decreasing corporate taxes (Chastko 2004). There was an understanding in both the provincial and federal government that the regulatory and tax regime considered at the height of the NEP was too stringent on unconventional producers and was therefore an impediment to a necessary area of potential oil production; this was necessary, if the province and Canada were to curb mounting oil imports. In this sense, the debate over function was settling. Arguments for greater Canadian presence in production were set-aside for growth and drawing in investment, resulting in greater productive output. While stability was the approach in the immediate aftermath of the 1986 price collapse, the function of the property and resource regime was quickly moving towards growth; accounting for new geological and geopolitical realities including depleting conventional resources, and the growth of free-trade and globalization which increasingly pushed regional oil prices towards parity with global indices.

Depletion of conventional resources in Alberta meant that the oil sands were increasingly seen as the next area of growth. Depletion in Alberta was not a unique global phenomenon as other regions were undergoing similar degrees of resource depletion, including the United States (Hamilton 2013). However, many of the other jurisdictions facing decline did not have the abundance of unconventional reserves located in Alberta's oil sands. However, exploiting them meant both a shifting set of functions of the resource regime as well as favourable global dynamics. The latter occurred with increasing global demand and by the mid-2000s with high prices. The former, on the other hand, took time and incremental changes over the last several decades. In part this meant ensuring that

regulatory barriers were tailored to the greater risks and higher costs associated with oil sands production. This took root by the mid-1990s with the introduction of the *Oil Sands Royalty Regulation* (1997), a set of royalty changes that established generic terms for any projects undertaken in Alberta's oil sands. Such a change promoted development by decreasing financial risks and providing new projects with greater cash flow until portions of their start-up capital had been repaid (Alberta Energy 2010). However, as dynamics change, often so do the underlying institutions. By the latter 2000s, the price of oil had risen to well over $100 per barrel and many oil sands projects which were deemed unprofitable became highly productive. Under the circumstance, even with industry reticence, the Alberta government once again altered the royalty regime. Since prices continued to stay high, the government opted for a sliding scale that adjusted in tandem with global oil prices (Alberta Energy 2010). These changes continue to show the conflict between functions of stability, revenue generation and growth. As the primary administrator of the resources, the provincial government sought to ensure a greater share of the pie in wake of high prices at the cost of some stability. However, due to role of the federal government as a fiscal participant – through the levy of a corporate income tax – overall firm tax and royalty transfers have not increased in wake of the 2009 institutional change (Plourde 2010). While the provincial resource regime did slightly alter the function of growth in favour of revenue generation, subsequent federal policies mitigated these changes and continue to promote a broad resource regime function of growth.

Free-trade was one inter-state institutional arrangement that was gaining ground in North America. The establishment of the CUFTA – followed by the NAFTA – represented this shift in Canada. Furthermore, the NAFTA contains particular provisions associated with energy production – namely the proportionality clause – that were pursued by Canadian negotiators who hoped to avoid the destructive impact of export restrictions on bi-national relations witnessed during the NEP (Pratt 2001). The implementation of these new institutions meant that certain forms of conservation regulation would violate the

treaty; particularly, decreasing production allowables under a particular threshold except in exceptional circumstances. Free-trade agreements and other such bi- or multi-lateral treaties affect the existing institutional framework and highlight the interesting role played by the state. On the one hand, the state initiates negotiations and implements agreements. While on the other hand, the state becomes constricted by the implementation of the agreements by vesting particular powers – traditionally held by the state – in third party adjudicators. In this case, the Alberta government lost some regulatory maneuverability due to federal policy. However, industry interests in Alberta were cognizant of the benefits as the NAFTA ensured market access in to the U.S., Canada and Alberta's largest trading partner. Lacking market access had been one of the primary constraining factors on the industry up until the oil shocks tossed business as usual on its head and so locking up market access was seen by many industry participants as a major success. Depleting conventional reserves meant that alternative sources would be required if Alberta wanted to maintain large export volumes to its southern neighbour.

Even while the role of the state – both provincial and federal governments – became more constrained through free-trade agreements and globalization more generally, the Alberta government continued to play an important role. Part of the focus on commercialization of the oil sands rests on turning basic research into commercially viable technologies that reduce costs for unconventional producers. This process has had a documented history of public-private cooperation dating back to the days of Dr. Karl Clark's discovery of a hot water separation process in 1926 that is still the fundamental basis for many oil sands extraction processes (Chastko 2004; Alberta Energy 2013). The spirit of government funded basic research remains an important part of the contemporary resource regime. Further research conducted by the now defunct Alberta Energy Research Institute (AERI) in the 1990s provided technologies that underpin Steam Assisted Gravity Drainage (SAGD) methods for in situ oil sands production, the fastest growing source of new oil sands output (AIEES 2013). Moreover, the Alberta government

continues to subsidize basic research pertaining to oil sands production with a significant portion of $75 million a year, most of which goes to public universities with some private industry led projects (AITF 2010, 2011). Considerably larger sums have been used in recent years to test the commercial potential of carbon capture and storage, alongside substantial federal contributions (CCEMC 2010, 2011; NRCan 2012). While carbon capture technologies are only indirectly tied to oil production, much of their push in the province has been aimed at curbing carbon dioxide (CO_2) emissions with hopes of expanding markets which are reticent to accept oil sands production, such as the European Union (AIIR 2013). What we see is a rather hands on approach to public-private research cooperation funded primarily by the provincial government. The role of the state in promoting basic research is practically a given in Alberta's unconventional oil industry (Brunnen et. al., 2011; CCEMC 2012). Apart from the state's noticeable role in leasing and regulatory matters pertaining to resource-use, here we see a secondary role played by the state with regards to basic research. Incremental improvements from this research, in large part funded by the state, have played an important role in the successful commercialization of unconventional resources. The institutions and organizations – which are primarily public – that support this degree of technological development are important, and sometimes overlooked, components of the province's resource regime.

Ultimately, this period saw a return to relative continuity followed by a move towards a function of growth in the property and resource regime relating to oil and gas. The instability in price was muted for much of the period until the run up of prices in the mid-2000s. Conventional oil production continued to decline, but advancements in technological processes associated with unconventional production and the run up of prices since 2004 meant oil sands production more than made up for the declines. By attempting to incentivize investment and unconventional production, from an institutional perspective, growth became the dominant function of the resource regime. Some discontinuity has occurred, such as the 2009 royalty adjustments made by the Alberta government highlight;

though, these alterations to the resource regime have not altered its underlying function of production growth excluding geological limitations.

Economic Development

This period covers a considerable span of economic development. The early portion occurred during the aftermath of the recession of the early 1980s. Recovery took root and GDP growth was rather consistent up until the Great Recession which began in 2008 (AEAE 2012). The oil and gas industry helped maintain growth during the time, acting as a key point of growth in the latter 2000s. GDP growth has been nearly double what it would have been without the oil and gas industry in Alberta (Alberta Energy 2010). In this respect, the significance of the oil and gas industry on Alberta's overall growth has been substantial. Growth is not just the investment dollars and government revenue attained by the Alberta government, but also entails the spin-off effects which include considerable economic benefits (CERI 2010). Due to these factors, Alberta has had the highest GDP growth in Canada alongside the lowest levels of unemployment (Statistics Canada 2013a, 2013b). While inflation is slightly higher – a common trait of oil and gas led growth – it is not significantly so compared to other Canadian provinces (Statistics Canada 2011). Ultimately, the oil and gas industry and wider economic growth have occurred in tandem in Alberta during this period.

Period Wrap-up

Most of the fundamental functions of the property and resource regime presiding over oil and gas in Alberta were established well before this period. The oil shocks and the NEP sought to alter the established functions only to fall short. This period marks a shift to a function of growth of the resource regime. However, geological limitations forced a transition from conventional resources to unconventional resources. Despite this, changes to global dynamics of supply

and demand alongside the growth function of the resource regime have enabled Alberta to grow both the industry and the province from an economic perspective. Regulatory and royalty changes have created some areas of conflict between industry participants but not enough so to halt forward momentum. Ultimately, this period represents movement towards a function of growth. Whether an overt focus on growth remains, or functions of conservation and stability return, will define the type of development we observe in the province moving forward.

Alberta Case Study: Conclusion

The development of Alberta's oil and gas industry provides us with insight into a number of institutional factors. For one, it highlights that the underlying form of resource ownership – public in this case – is not an insurmountable feature of economic development. Public ownership of the resources did little to halt development or provide greater impetus for regulatory measures than in the case of Texas. In fact, much of the regulatory trajectory was borrowed from experiences in Texas and other major producing states in the United States (Breen 1993). Rather, it was changing functions of the property and resource regime that had the greater impact on development at any given time. During the first period under analysis, the function of the institutional framework was just being established. The regime's functions were built to ensure stability through differing forms of conservation. This meant curbing excessive physical and economic waste through measures such as pro-rationing, flaring limits, well-capping, well-spacing requirements and instituting a particular royalty and tax regime; all of which required varying degrees of state intervention. Functionally, these features limited waste, promoted relative price stability and provided the Alberta government with considerable revenue. This period brought steady growth in production and revenues. It was the changes brought on by federal policies in the 1970s and 1980s that destabilized the existing arrangement. In particular, the NEP attempted to overhaul the functions of the existing resource regime through overt attempts at increasing Canadian ownership of oil and gas firms and lowering prices for Canadians outside major producing markets (Granatstein and Bothwell 1990). These actions, and the counter-actions taken in Alberta, produced considerable political uncertainty in an already economically unstable environment. While this resulted in a contraction in the industry – along with associated capital flight and production declines – business as usual returned by the 1990s as the NEP was dismantled and world oil prices declined and then steadied. It was the changing function of the resource regime – combined with external shock – that produced the instability observed during the 1970-1985

period. The final period under analysis marks a shift in the resource regime's function towards growth but also a transition towards a regime that enables greater degrees of more expensive unconventional production. Such changes entail some changing functions of the regime, especially with regards to regulations, royalties and taxes. Here, the difference in geological traits associated with the type of oil produced matters and affects the changing structure of the resource regime. However, global dynamics are also at play, wherein rising prices helped to prompt the government towards re-designing the existing royalty regime in a way that scales with price fluctuations.

Changing functions of Alberta's oil and gas resource regime, such as those described above, explain its development trajectory. The fact that the underlying form of ownership was public had little consequence on how the industry actually developed; rather, it was the various functions of the institutions presiding over oil and gas development. These include the legislative, regulatory and legal institutions and organizations that came together, defining the rules of the game for oil and gas development in the province of Alberta. Moreover, these same functions promoted broader economic growth through ensuring some degrees of stability in oil and gas development which by its very nature is a volatile industry. While Alberta was marked by the same ups and downs in the business cycle as other jurisdictions in Canada and elsewhere, its comparative levels of growth were impressive and correlate with growth in its oil and gas industry. Resource development and economic growth are inherently tied together and it is the functions of the resource regimes – not their underlying form of ownership – that delineates the costs and benefits to society regarding their development.

Discussion

The examination of these two cases provides us with insight into a number of relevant topics. For one, they highlight the role of the state regardless of the underlying type of ownership attributed to resource rights. Secondly, they touch upon issues of continuity and discontinuity associated with property and resource regimes, and institutions more broadly. Third, they identify how the role of the state along with continuity and discontinuity – with regards to institutional change – are related to economic development. Lastly, they provide insight into the existing policy environment, while also providing attention to ways that policy adjustments going forward can benefit from looking back. In this regard, their outcomes help to identify areas of complementary research. This section discusses all of these issues from a comparative and institutional perspective, highlighting the key lessons derived from the cases and drawing from other notable examples to provide some consideration for moving forward.

The Role of the State

Despite the underlying difference in the property ownership types observed in the two cases – sovereign and private – we see the role of the state expand in a similar fashion. This speaks to the issue of form versus function with respect to the construction of property rights regimes. Neither state nor private ownership guarantees by its nature stronger rights for individuals and firms. The commonalities in the institutional development of Alberta and Texas speak directly to this point. Many of the rules established in Alberta were drawn from experience in the U.S. and Texas in particular (Breen 1993). Moreover, some of the influential individuals who helped shape the institutional and organizational framework in Texas – including oft cited legal specialist Robert Hardwicke – held prominent roles in Alberta's own institutional and organizational development (Breen 1993). Unsurprisingly, rules were not just similar in some regards, but even identical in some cases; as an example, with respect to the particular spacing

required between wells. So while both jurisdictions examined in the case studies start from entirely different property forms, their institutional development – the rules of the game and their accompanying regulatory organizations – are markedly similar. This tells us something about the similar trajectory of economic development observed in the two cases. The role of the state, institutionally speaking, was a central component to stabilization in their respective oil and gas industries' development. By extension, the role of the state was central to broader economic development.

This ties back in to the discussion presented in the literature review. Scholars that promote property rights as inherently more efficient due to their form – particularly private or public – are unable to adequately explain the role of the state in real world examples. Conveniently, they view a state delimited to all but the most basic legal functions as ideal (Boettke and Fink 2011). While this may allow for more simplistic models of efficiency, it clearly does not fit the narrative presented through both case studies. Both jurisdictions had differing ownership types, yet both had similar institutional trends which entailed a wide-range of state intervention. Some interventions were less intrusive on rights holders, while others entailed rather large-scale market interventions that impacted how much oil and gas private firms could produce at any given time. The story of the oil and gas industry in Alberta and Texas is not one of form, but rather one of function. What was the function of their respective property and natural resource regimes? Certainly it was, in part, to ensure a degree of profitability for the firms engaged in production, transportation, refining and marketing but it also was a conduit for general economic development. Ensuring that development of oil and gas production had a broadly positive influence on wealth generation meant safeguarding stability through conservation and this required a strong state presence. Ultimately, the role of the state cannot be pigeon holed in to a small space when discussing development; be it in the cases studied here or when examining development more generally. Moreover, it is less important to discuss the form of property rights presiding over land and minerals

than it is to understand the dynamic relationship between their broader institutional functions and economic growth.

Other jurisdictions act as further evidence of this. Norway, for example, maintains sovereign ownership of its resources and is often considered a model of successful oil and gas development (Bayulgen 2010; Ryggvik 2010). Venezuela too has vast reserves of oil and gas under sovereign ownership but it is currently characterized by declining output and production inefficiencies (EIA 2012). Here, again, it has less to do with the form – of which both have public property regimes – and more about the function of established institutions presiding over the disposition of resource rights and the rules governing resource use. The functions of Norway's resource regime ensure high degrees of stability. Private actors may not have expansive property rights, but stability allows them to make calculated decisions regarding investments. This fosters a strong public-private cooperative environment, regardless of rather stringent limitations on certain types of private property rights. Venezuela, on the other hand, is marked by instability, instability attributed to both political and economic factors. From an institutional perspective, instability can be partly attributed to functional features of the resource regime. An overt focus on revenue generation for the purpose of government fiscal spending is one such feature that can cause instability. Siphoning too much revenue from an industry that is capital intensive can cause problems with regards to technological development and exploration; key features for maintaining and increasing future production. Moreover, high levels of revenue transfers can also lead to potential issues of organizational inefficiencies. While, Norway too has retained substantial revenue from its oil and gas industry, compared to Venezuela, Norway's primary focus on stability has ensured greater consistency during its industry's development. However, stability extends beyond the property or resource regime. It includes a myriad of broader institutions and organizations. In this respect, instability can be a result of broader political, economic or social conditions. While some of the differences that explain the divergent outcomes between Norway and Venezuela are attributed to functions of

the resource regime; others should also be taken into account when examining broader state stability and its impact on resource development.

While the majority of global oil and gas reserves rest under sovereign ownership, the relative success of the U.S. and Texas in particular, is often focused on the form of property ownership. However, the focus should be on the institutional framework that governs the disposition of resources rights and resource use. Here lessons are learned from our two cases, but also from others elsewhere, such as the Norwegian experience. Again, the more important feature is not the form of property rights over resources, but rather the institutional arrangement that governs resource use. Attributes like regulatory best practices can be very helpful and much of this can be ascertained though comprehensive historical case studies like those conducted in this study. In fact, we see it in the cases themselves that known practices that had yielded varying degrees of success in Texas had been later transported to Alberta. The sharing of ideas towards constructing an effective regulatory regime was important here. Other functional features attributed to conservation and by extension stability are also quite important. Regulations would not have been initiated had constitutional and statutory authority not been affirmed by pivotal legal rulings. In this respect, there has to be complementary institutional features between key state participants. If the state is to act in an effective manner, constitutional, legislative, legal and regulatory functions have to be constructed – or in some cases evolve – in complementary ways. This is no easy task and cannot always be replicated. As we saw in the cases, some designed state actions – such as price stability during the supply shocks of the 1970s – can have adverse effects. Moreover, common law institutional change is heavily influenced by incremental evolutions which are difficult to predict (Hayek 1960; Scott 2008). It is important to keep in mind that path-dependency impacts institutional development. By being mindful of the existing institutional setting, and recognizing that there is no simple one-size-fits all approach to effective institutional development, better decisions can be made regarding the design and implementation of new institutions that alter the existing

incentive structure.

Taken together, this study provides insight into how the state matters. Through delineating ownership over resources, arbitrating conflicts as they arise, and regulating their use, the state provides procedures that increase or decrease stability. By increasing stability, participants become accustomed to the rules governing resource use and are better able to allocate their own resources. Stability is, however, not attained through a single method. It is context dependent, particularly with regards to pre-existing institutions. In this regard, the form of resource ownership is often path-dependent. Additionally, as we saw throughout the cases, exogenous shocks do generate instability. State responses either mitigate some of the costs of externally induced instability, or make them worse. This is another area where we see how the state matters. Responding to changes originating outside of the established institutional framework is a key area of state action that often results in new institutional or organizational developments. For example, when Texas's initial oil boom began because of emerging technologies, the state responded by creating statutory foundations for resource conservation with the express purpose of curbing physical and economic waste. Responses such as this highlight how the state plays an important reactionary role. Ultimately, how does the state matter? The state matters because its actions lead to the effective or ineffective use of natural resources.

Continuity and Stability of Property Rights

There also remains the issue of continuity in the enforcement of rights. This too ties in to the discussion above about function over form and the role of the state. In the two case studies, similar institutional trajectories are observed despite the underlying difference in the property rights type presiding over land and minerals. One area of continuity in each case is this very same underlying property type. Neither jurisdiction attempted to switch from one property form to the other to attain the desired results of stable growth. Rather, each worked within the existing

institutional structure pertaining to property rights over resources to achieve similar outcomes. This may help us better understand institutional development elsewhere. Often times, large scale changes – so called shock therapy – creates discontinuity and uncertainty for participants (Osipian 2012). The poor track record of the Washington Consensus is another example where a narrow approach which is meant to create less uncertainty and stimulate growth can have the opposite effect (Krogstad 2007). Unsurprisingly, many of the reforms associated with this approach entail a primary focus on the form of property rights affecting the function of the property regime, as opposed to tailoring functions to existing forms. While institutions and organizations are dynamic and in many ways always changing, there can be benefits to ensuring some forms of continuity. Moreover, privatization does not inherently reduce uncertainty and associated forms of political or economic risk. We can see this through the Alberta case which maintained a degree of continuity through preserving sovereign ownership while still being able to establish stability and relatively wide-spread wealth generation. It is also evident when investigating the impact of rapid and unfettered privatization in Russia after the transition away from communist rule (Bayulgen 2010; Osipian 2012). This also speaks to the role of historical contingency and path-dependency in institutional development. While many of the underlying institutions changed in Alberta – statutory foundations for rules, regulation enforcement and common-law interpretations – we still observe the static role of sovereign ownership in the province. Privatizing all land and mineral rights was and remains an option; however, similar outcomes were achieved to those in Texas without having to radically alter the existing property regime. The existing form of property was sufficient for enabling the kind of growth desired by political leaders and society more broadly.

Ensuring a strong degree of stability in quality of title is another important element, especially in the oil and gas industry. With such high upfront capital expenditures, ensuring quality of title means ensuring return on investment over the life of any given project. In Texas, quality of title was provided primarily

through the common-law system overseeing property and contract law. While this afforded a large degree of certainty with regards to most rights claims, there were some exceptions. Easement and right-of-way associated with pipeline expansion remains an issue with regards to exclusivity and quality of title on private property. At this time, there are four pending cases in Texas associated with the state enforcing easement on landowners for the purpose of constructing the Keystone XL pipeline which would transfer synthetic crude from Alberta's oil sands to refineries on the Gulf Coast (Calkins 2013). In Alberta since most land in the province is Crown land, pipeline infrastructure within the province passes with less conflict than in Texas. In cases where pipelines pass through private or native land, there are bureaucratic and legal procedures that do, at times, limit exclusivity or quality of title rights (AARD 2009). Like Texas, there are constitutional and statutory bases for limiting private rights in favour of the construction of energy transportation infrastructure. Here we see an area of discontinuity in private rights enforcement, where certain rights are granted greater importance than others. While economic growth often benefits from the increased transportation of resources, it sometimes comes at the expense of curtailing the rights of private land owners. Interestingly, this runs counter to conceptions of strengthening private property rights as way of inducing economic growth. If private property rights were fully secure, pipeline companies would have to garner direct owner consent or else find another route – slowing resource trade and by extension economic growth.

With respect to ensuring quality of title over resource rights which are leased by the state, much of this was accomplished through the particular structure of leasing methods and subsequent court decisions. The courts viewed leases provided by the Alberta government as contractual, like that of a landlord and tenant, along with the common-law attachments associated with contract enforcement (Lucas 2007). This approach, reaffirmed through a number of court decisions, ensured a high degree of stability with regards to the resource rights claims of private actors. However, we have to be careful to attribute Alberta's

relative success to this mimicking of private rights. Some have suggested that it is this concessionary approach that enables high degrees of growth (Bayulgen 2010). Contractual agreements, the other common approach in the oil and gas industry, are therefore considered too unstable to ensure strong quality of title which thereby inhibits investment. Yet, some states have successfully employed the contractual approach instead of a concessionary method while still capturing large degrees of investment and industry expansion (Bayulgen 2010). Again, it is important not to get caught up in form and rather focus on function. If the function of a lease system is stability and relative continuity in enforcement, then it is more likely to succeed regardless of whether it is contractually or concessionary based.

Institutions and Economic Development

All of this ties in to the relationship between institutions and economic development more broadly. Too often researchers become mired in a debate about form and ideal outcomes. Drawing from the cases, it appears that neither form provided inherent advantages, or achieved ideals, with regards to industry growth and broader economic development. The dominant private property system in Texas underwent considerable difficulties during its early stage of development, in great part due to the dynamics of the oil and gas industry. Costly boom and busts created uneven spurts of growth and both physical and economic waste were abundant. Alberta too suffered from similar forms of waste wherein the flaring of natural gas wasted huge reserves of resources. These cases tell us that the overt focus on form blinds us to the underlying issue of the functional purpose of institutions. Economic development is a complex multi-variable process that is importantly anchored, at least in part, to historical institutions and their accompanying organizations. While these cases are not wholly conclusive in this regard, they do highlight the role of historical contingency. Constitutional and common-law institutional changes are often slow and incremental processes. However, this need not be an impediment to development, even in

underdeveloped – institutionally speaking – regions. As the cases demonstrate, tailoring institutional changes and even wholly new institutions to an existing framework is a better approach than full out reconfiguration. As Roland (2004) says, "Institutions generally form a system in the sense that each institution in the system is complemented by others, achieving a certain systemic consistency" (113). He rightly highlights the often tenuous connections between incremental institutional change and overall stability. Tying in to economic development, this means that institutional change – be it from a designed approach or more organic forms of institutional evolution – requires some underlying forms of continuity. Rapid or radical changes often produce negative results.

The cases also provide insight into the role of the state with regards to economic development. In both cases, the state acted as an important stabilizing force over the long-term development of their respective oil and gas industries. However, in some cases, the state did create periods of instability. The NEP, for example, created uncertainty through inter-governmental conflict that had a substantial negative impact on industry investment and growth. Despite these particular situations, examined at a high level covering the entirety of the cases, the state played more of a positive than negative role. With regards to economic development more broadly, it is important to recognize this role. While political regime type, degrees of corruption and other offenses may play negative roles in other cases of economic development, we should be aware of the bi-directional relationship between development and governmental competence. Chang (2008, 2011) has focused on this, highlighting shifts in organizational behavior during periods of economic development in a wide-range of historical cases. Moreover, Chang and Evans' (2005) work speaks to the 'constitutive role' of institutions which further illustrates that institutional changes of the economic system can go hand in hand with changes to governmental competence. So while a state may be considered underdeveloped with attendant governmental inefficiencies, that alone should not undermine the important role of the state in economic development. It does however indicate that some institutional changes – functionally speaking –

should be of greater focus than others. However, using these inefficiencies as excuses for delimiting the state and following an institutional path for development that ignores important functions that the state can provide is a mistake.

Current Policy Analysis

The analysis of Texas and Alberta also provides us with some insight as to the forward momentum and direction of their respective resource regimes. Interestingly, both jurisdictions have undergone a revival in their oil and gas industries through the growth of unconventional oil and gas production. However, both resource types have different dynamics which highlight the importance of the quality and quantity of unconventional reserves. Even conventional oil has countless gradations of quality, each impacting the going price and mix of fuels derived from refinement. The same occurs with respect to unconventional shale oil and oil sands, which are often lower in price due to their lower quality. The lower quality of these resources means that they are often heavy – more viscous – and sour – higher composition of sulfur – which are two primary measures of petroleum quality (RMMLF 2001; Hughes 2013). Additionally, they both require considerably more energy inputs for every unit of energy output than conventional production (Cleveland and O'Connor 2011; Brandt et. al., 2013). These limitations have been overcome in both jurisdictions in great part due to high global oil prices. Technological change has also played a role, especially at the margins, but many of the techniques being used today are not particularly new, though they are at times being used in novel ways (NPC 2007; Sumi 2010). This is predominantly true with the use of hydraulic fracturing and horizontal drilling which are processes used to extract shale oil and gas. Regardless of the diminished quality of the resources in comparison to the conventional ones that had propelled the industry forward in the past, high prices continue to influence increasing production.

Here, perhaps, differences in Alberta's regime and geological realities provide a greater opportunity for stability. The oil sands have been in operation for over 50 years now and incremental improvements in the process of extraction and refining have led to lower actual costs (Chastko 2004; NEB 2006, 2013b). While it has been argued that the landlocked geography of Alberta is a limiting factor in expanding the industry, the industry still continues to grow. The industry in Alberta actually faces other difficulties with respect to labour shortages and environmental concerns. Moreover, the claim that the industry is losing billions of dollars per year due to these transportation constraints has been shown to be mischaracterized (Allan 2013). While such constraints may inhibit some investment, it is not undercutting the existing profitability of firms operating in the region. Another important feature of the oil sands has to do with the production profile of fields in the area. Overall field decline has a long and gradual decline rate compared to oil shale, averaging between 1-2 percent per year; though there are differences between mining and in situ operations (NEB 2006, 2013b). Unlike the boom associated with shale production, there is a substantial quantity of data pertaining to decline rates in the oil sands. This data presents a picture of a resource base that has a relatively long lifespan (NEB 2006, 2013b) – at least within the industry – and therefore can be exploited profitably over particular fields' life-cycles. Development in the oil sands is also one of the most capital extensive forms of oil extraction in the world, and unsurprisingly the Alberta government has shared considerable risks during the region's development (Chastko 2004). Huge machines and costly upgrading plants are often required before even transporting the bituminous crude to refineries. Extremely large tracts of land are also required for open-pit mining and upgrading. Unsurprisingly, the extreme capital expenditure required means that the area's development is dominated by the majors with independents playing a subsidiary role. While the unfettered expansion of the region is limited by government policy, demographic, environmental and transportation constraints, the geological features are rather stable. Apart from normative questions pertaining to the social and environmental costs of expansion, it appears that

objectively speaking, steady exploitation of the resource base is possible for the mid-term without destructive amounts of depletion. Here the institutional structure of Alberta is both a help and constraint towards further growth. The government controls leasing procedures but also land-use in and around the region (ASRD 1997). The expansion of key population centers, particularly Fort McMurray, is therefore contingent on provincial land-use decisions that are implicitly related to the resource regime. Decisions pertaining to these issues impact the incentive structure for maintaining existing output or drawing in new investment. Ultimately, the supplementary hand the Alberta government has in land-use above and beyond its Texas counterpart does provide additional policy maneuverability, comparatively speaking.

Moreover, the core institutions established during the development of Alberta's oil and gas industry are only now shifting in function to deal with the oil sands. Many of the laws and regulations pertained to conventional producers are less effective for overseeing oil sands production. We have seen some movement in an attempt to remedy this with changes to the royalty regime. However, aside from some functions pertaining to revenue generation, the general institutional structure continues to focus on growth. Expanding market access is, once again, a large focus for the provincial government (AIIR 2013). Particular regulatory institutions aimed at providing oversight for the oil sands have been slow-moving. Reclamation of used land, impacts on local environments and public health, concerns relating to water-use, and air pollution are all areas of concern with regards to oil sands production (RSC 2010). Moreover, new technologies are often used and their potential impact is not always immediately understood. These issues are magnified by a functional approach of growth perpetuated by the resource regime. By enabling rapid growth and transferring many negative externalities to public spaces, larger costs will accrue over the long-term than if conservation and stability were more central functions of the resource regime. Regardless, it is not the underlying form of property that is defining the current trajectory of oil sands development, but rather the functions of the broader

resource regime.

Texas lawmakers may be best served by examining their own history rather than comparing Texas with Alberta's unconventional production. Shale oil has a completely different geological profile than the oil sands of Alberta. Moreover, while shale resources have been known for over 50 years, their commercial exploitation is rather new (Chastko 2004; Cleveland and O'Connor 2011). Since they have only really been exploited on a large scale for the last 5 to 10 years, data on their production profiles are more limited. However, early data analyses seem to indicate a number of troubling trends, including rapid first year decline rates of 50-70 percent per well with a wider range of overall field declines between 30-60 percent (Hughes 2013). This degree of decline means wells can go from profitable to unprofitable very quickly. As the better locations for wells are exploited first, the decline rates alongside increasingly marginal well placement coincide to produce a decline in average well productivity. This means that more and more wells are required per year, not just to increase output, but even to simply maintain it. While the data is far from conclusive, these trends do not appear as promising as some recent reports suggest (Maugeri 2012; IEA 2012; EIA 2013e). Meanwhile, the same boom dynamics associated with early Texas developments are occurring. Shale oil and gas development, unlike oil sands exploitation, occurs on a well by well basis through the use of hydraulic fracturing. This means small tracts of land are all that are required with comparatively low capital expenditures and up until recently, independent firms pre-dominated production of shale oil (Helman 2013). The same land-grab and produce as fast as possible mentality is occurring as that witnessed during Texas' heyday with many of the accompanying features. Moreover, other parallels are present. While geological and petroleum engineering knowledge has made tremendous gains over the last century, the data pertaining to shale plays remains limited and analysts have far ranging predictions over the scale and scope of development going forward (Milhench and Baghdjian 2012). The degree of uncertainty with regards to these resources is arguably similar to those observed

during the early attempts at conservation regulation in Texas.

These developments are putting a heavy strain on Texas' resource regime. Already, issues related to water-use have resulted in state organizations attaining greater regulatory authority (Kurlander 2013). While institutional changes such as these may curb some new production – in this case due to input constraints related to water needed for hydraulic fracturing – far larger institutional changes need to occur to alter the state's current trajectory. While other regulatory initiatives have been put forth with the purpose of providing greater oversight over new production methods (Galbraith 2011; Kurlander 2013), the underlying function still seems settled on growth. Under the circumstances, relatively rapid growth will likely follow. However, Texas' history of booms and busts may simply be repeating itself one more time. Given the aforementioned data pertaining to shale oil and gas, a primary focus on growth could result in more rapid depletion over particular fields' life-cycles. In this respect lawmakers in Texas might benefit from revisiting their past. After-all, Texas experienced a long period of stable industry and state growth when institutional functions promoted stability through conservation. Focusing on growth, on the other hand, led to more pronounced busts and more rapid resource depletion. Though, in an era of U.S. oil deficits – consuming more than it produces – the idea of conservation through pro-rationing and greater regulatory intervention is likely an untenable position. Moreover, despite the parallels between Texas' previous oil booms and its current situation, the institutions and organizations that oversaw oil and gas production were tailored to conventional resources and may not be effective at managing the emerging costs of new unconventional production.

Conclusion

What of the broader lessons regarding property rights, institutions more broadly, and economic development? For one, it is important to recognize the unique nature of oil. No other resource is as guarded by the state at a global level. The view of oil as a "strategic asset" is ubiquitous as no viable substitutes can adequately replace its role in today's international economic paradigm (Rutledge 2006). Due to this, we must be careful in taking the lessons learned in these two cases and applying them elsewhere; be it other resource types or towards economic development more broadly. That being said, there are parallels between the institutional developments observed in the cases and research conducted by other scholars. Chang (2008, 2011) extensively examined broad forms of economic development recognizing a central role for the state alongside the primacy of stability in property rights as opposed to a sole focus on their form. These cases act as tests of this observation, reinforcing the stabilizing, incentivizing, and sometimes enabling force that the state often plays in development. In Texas and Alberta, it is not a normative question as to whether the state ought to be involved, but rather an objective reality that the state is involved. One area of interest of this research lies in having examined to what extent the state involved itself and whether such activity was a broadly positive or negative force. Moreover, the conclusion is that the state's role was more positive than negative, it is therefore important to identify what types of actions added to stability and economic development. As we see elsewhere, overt state control and activity can lead to negative outcomes. These outcomes range the spectrum from loss of civil liberties to economic stagnation and decline. With respect to oil, we need look no further than petro-states and how that form of development entails considerable costs for many of the people living there (Friedman 2006). So while it is easy to look at the two cases and say the state matters, it is extremely important to understand to what extent and looking back at each jurisdiction's historical developments helps us to do so.

Unraveling the role of the state in the particular development of Texas and Alberta's respective oil and gas industries was one part of this research; but further complementary research can be done elsewhere. More can be done to examine institutional development from a historical lens. Had we not done so and simply taken the Texas case at face-value, it would have looked much like the traditional analyses of an "ideal" institutional structure with regards to economic development. Texas' resources are privately owned, it has an established and stable legal system, and tax rates are relatively low. These features appear in-line with much of the theoretical work on institutions and property so it is of little wonder that many researchers see Texas as a successful case supporting their theoretical views. Yet, when conducting an in-depth historical analysis, many of these factors are shown to be a small part of the whole story. Texas may have private ownership of resources, but the state still pursued forms of direct intervention such as pro-rationing limiting production and private activity. Its court system is well established but its interpretation of the dynamics of oil and gas at the onset of commercialization led to the use of the Rule of Capture which incentivized waste and overproduction. Additionally, well-spacing and eminent domain litigations are still legal hurdles that take up substantial court and state resources while continuing to limit the rights of particular property holders. Taxes may be low on individuals and corporations, but they have been used on the oil industry as a key revenue stream for the state since the early days of production. As all this is taken together, we see that the historical record does not neatly match with conventional wisdom. Texas and Alberta are not the free-wheeling capitalist jurisdictions that they are often portrayed as. Rather, their governments have played central roles in regulating, but more importantly stabilizing, their oil and gas industries. They have done so through the stewardship of their respective property and resource rights regimes despite differences in their underlying forms of ownership.

The same mischaracterization occurs if we take the Hong-Kong and Singapore examples touched on in the introduction at face-value. For these

reasons, this type of comparative historical analysis is helpful for stepping away from theory and conjecture while using empirical historical data to understand what really happened; accounting for the role of existing, changing and emerging institutions. While a historical approach is primarily backwards looking, it does provide insights into future developments, enabling us to build better predictive models that account for details that are often overlooked. In this regard, it is a complementary form of research to more forward thinking approaches. More research such as that conducted in this thesis can help us to understand what degree of state intervention and cooperation is necessary to stimulate stable and long lasting economic development. Moreover, this research highlights that the functions of a resource regime are more important than its underlying form of property ownership – public or private – with respect to economic performance over time.

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