Dynamic Bargaining and the Prospects for Learning in the Petroleum Industry: The Case of Kazakhstan

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Abstract
This article examines the bargaining interface between petroleum-rich developing countries and large multinational corporations, with an application to the case of Kazakhstan, formerly a Soviet Republic. In the *analytic narrative* tradition, this article combines a case study with an extensive form game, applying Theodore Moran's dynamic bargaining theory, which posits that, over time and through repeated interaction, developing countries do better for themselves, incrementally improving their outcomes through bargaining and strategic interaction, thereby advancing along a learning curve. The application of this theory is systematized through the utilization of game theory; an extensive game modeled on strategic, iterated bargaining behavior between the two actors is introduced. This dynamic game allows for the recalculation of strategies based on the players' revealed moves, allowing for the concept of learning while doing. The game is then applied to Kazakhstan's particular situation. The application of Moran's theory through the use of a generalizable game provides a method for resource-rich developing countries—particularly those in the nascent stages of developing these industries—to systematize the negotiation process and accelerate their ascent on a bargaining learning curve.

Keywords
natural resources, dynamic bargaining, game theory, learning curve, petroleum, Kazakhstan, negotiation

Introduction

In academic studies of the interface between large multinational corporations (MNCs) and the developing countries that are the target of their investments, scholars have noted that, over time and through repeated interaction, the developing countries tend to do better for themselves. In other words, the developing countries progress along a learning curve and incrementally improve their outcomes through bargaining and strategic interaction: this is the essence of Theodore Moran's dynamic bargaining model. This article investigates whether the dynamic bargaining model can be systematically

applied, and therefore instructive, to resource-rich developing countries that are in the early stages of extractive industry development, countries such as the former Soviet states. It proposes a new methodology for systematic application by introducing an extensive form game modeled on strategic bargaining behavior. The article then gives evidence from a case study of the country of Kazakhstan and applies the game to Kazakhstan's specific situation.

Background and Dynamic Bargaining Theory

Over the past 40 years, much has been written regarding developing countries' economic experiences in the area of non-renewable resource extraction. This scholarly interest coincides with an exponential increase of both investments in and development of these industries, and often focuses either upon the exploitative relationship between foreign-based MNCs and developing countries or on the phenomenon known as the *resource curse*: a skewed economy in which the state allows a single industry to dominate, to the detriment of all others.

Beginning in the 1970s, a small number of researchers took on this subject with an eye to understanding how resource-rich developing countries could do better for themselves within the context of their relationship with MNCs (Moran 1974; Smith and Wells 1975; Vernon 1971). Building upon their work, this article focuses its analysis on the bargaining interface between these two parties, giving particular attention to Kazakhstan's experience.

Since unexploited resources are generally found in underdeveloped areas, extractive corporations do business with developing countries, which, in turn, depend upon the corporations for technological expertise and capital. Because developing country legal systems generally are not sophisticated enough to address all potential issues and areas relevant to an emerging oil industry, the developing state most often negotiates a specific contract directly with each MNC, one intended to cover all aspects of their agreement.

The two actors enter into these negotiations with markedly different backgrounds, particularly at the outset. The MNC begins in a position of monopoly control over technological capabilities to develop the potential deposit. It also possesses a great deal of business and negotiation experience, both in general and as specifically related to the oil industry. The developing country, on the other hand, possesses little bargaining experience, and begins the negotiation process with an inexact knowledge of this industry. Further, the state is inexperienced in numerous areas of business—legal, financial, and environmental, to name a few—that are relevant to the development of an oil industry.

Given the David-and-Goliath scenario described above, it was rather surprising when in the early 1970s, the following observation emerged in academic circles: in examining the historical record of MNCs' and developing countries' interaction, scholars found that, over time, agreements between the two actors tended to be made on terms more and more favorable to the developing country (Mikesell 1971; Moran 1974; Smith and Wells 1975; Stoever 1981).

In his country study of the Chilean copper industry, Theodore Moran (1974) formulated a testable hypothesis to explain this phenomenon. This theory came to be known as the *dynamic bargaining model.* Moran posits that there exists a learning curve for developing countries: over time, the countries gain experience in bargaining and doing business—learning by doing—and utilize this experience to become better negotiators. Through bargaining and strategic interaction, the developing countries incrementally improve their outcomes; they form contracts more favorable to their side—a notion he calls "ascending the bargaining learning curve." As these states gain experience and confidence through bargaining and doing business with MNCs, they will also take steps to ensure that their indigenous populations gradually develop the skills (monitoring, operating and supervising) necessary to reduce dependence on the corporations.

Though developing countries initially may have little to no experience with contract negotiations and inadequate or nonexistent laws regarding these contracts or the future industry being created, "Successful ventures... provide an incentive for the host country to develop skills and expertise appropriate to the industry. Beginning with elementary attempts to tighten the bargaining process, the country starts to move up a learning curve that leads from monitoring industry behavior to replicating complicated corporate functions" (Moran 1974:1).

Moran's theory builds on the *Obsolescing Bargain Model* developed by Raymond Vernon (1971), which states that as soon as a bargain is struck, and the corporation makes its initial investments, the bargaining positions of the two parties begin to change. The promise of investment is no longer a bargaining chip for the corporation, and it finds itself with sunk costs. It has incentives to stay in the country—to avoid losing these sunk costs and to bring the project to fruition—in order to reap the financial rewards it envisioned in its profit projections. As soon as the risks associated with the initial investment have disappeared and the corporation begins to realize a profit, which in the case of petroleum is often a windfall, the host country begins to question the distribution of benefits from the original contract. In retrospect, such agreements "invariably have the appearance... of the strong [company] cheating

the weak [country]" (Moran 1974:160). As a result, the developing countries call for renegotiations of the original terms of the contract.

Up to the mid-1970s, scholars of concession arrangements traditionally viewed these contracts as a one-time bargain, reflecting a single set of negotiations between the two parties, in which one party "wins" and the other "loses." Smith and Wells (1975) and Moran (1974) argued that this notion was out of step with reality, given the numerous renegotiations and even expropriations witnessed in the world oil industry during the 1960s. Furthermore, the stark win/loss scenario employed within static analysis was also not a reflection of reality. It portrayed bargains as zero-sum games. In fact, contract negotiations offer the opportunity for both sides to realize a mutuality of interests, in the form of non-zero sum games, where bargaining is the method to determine the division of the fixed set of rewards—or of the collective "pie"—between the two sides. Thus both players may benefit.

Smith and Wells thus contributed to the scholarly understanding of the bargaining process by stressing its dynamic nature (1975). They pointed out that the existing static bargaining models overlooked changes that occurred both within the industry and within the host country, and how these changes shift the strength of bargaining positions for each party over time, which is ultimately reflected in the changing nature of the contracts. They issued a call for future researchers to take into account the economic, social, and political forces at work in the host country, the interests of the MNC and its position in the global industry, and the dynamics occurring within the industry itself when analyzing contract negotiations (1975). Smith and Wells lamented that game theory, at the time, did not offer a non-static model that satisfied their desire for a more dynamic view. However, they utilize the underlying rationalization for employing game theory as an important justification for a dynamic approach to the bargaining process, arguing that each side must thoroughly understand the bargaining interests and positions of the other party. Each actor must perform a thorough analysis of not only its opponent but also of itself to understand fully the situation at hand, as well as where each party's bargaining strengths lie, and what therefore can be negotiated. It is this same necessity of specifying all assumptions and stating everything known about each player that underlies game theory's contribution to understanding the situation at hand.

In the introductory chapter of his case study, a compilation of mineral-rich Latin American and Middle Eastern countries, Raymond Mikesell (1971) provides a comprehensive preliminary review of the range of economic, political, and social areas potentially affected by mineral development and the host country/MNC relationship. However, when he attempts to measure these

effects on the host country, Mikesell utilizes exclusively numerical economic data. Not surprisingly, perhaps, he meets with some of the same challenges that the developing countries themselves faced. To give one salient example, he finds a significant differential between posted prices and realized prices for mineral exports (Mikesell 1971), which complicates computations. He also laments the paucity of data in many instances.

Even so, Bruce McKern (1993) reports that most of the studies undertaken to measure the costs and benefits for both parties in the resource-development interface employ numerical economic data to estimate the proportion of revenues retained by the host country relative to the total sales value of the natural resource. This article rejects the notion that limited economic data can accurately gauge the effects of a phenomenon with far-reaching political, social, and economic implications. Pure economic or numerical data cannot reflect or measure the importance of such diverse and complex issues as environmental concerns, technology transfer, indigenous employment demands, or the promise of future investment for the host country. It is not sufficient simply to calculate whether state revenues have increased as a result of oil industry contracts; this measures but one small aspect of contract negotiations—whether the state can bargain for a higher profit tax rate, for example—which may be the result of purely exogenous variables, such as the skyrocketing price of oil. It hardly would be conclusive to call such negotiations "evidence of learning." Only a bigger-picture analysis can allow us to conclude that a developing country has learned and has done better for itself over time or, as we have defined this concept, whether it has advanced in its overall level of skills and the capacity to deal with all aspects of its oil industry, as well as demonstrated the ability to negotiate for more of the collective pie with the MNCs. For such an analysis, economic data alone is not sufficient; a broader historical, social, and political context must be established.

Curiously, both Mikesell (1971) and Moran (1974) rejected the use of game theory, despite their acknowledgment of the benefits that its application could bring, benefits based on the very same arguments for its use put forth by Morrow (1994) two decades later. According to Morrow, formally writing down one's argument forces the modeler to expose all stated and unstated assumptions and to see the situation more realistically from all points of view, not just from one's own. Mikesell (1971), however, laments the fact that "Bargaining would be far less complex and the outcome more readily predictable if each party could estimate confidently the intentions and the relative bargaining strength of his opponent" (p. 44). But this present article argues that these are precisely the benefits we can expect by systematically employing the tools of rational choice and game theory, given the more

complete understanding of the entire bargaining scenario brought about through the appropriate use of game theory methodology. The formalizing of this methodology forces the informed, rational actors to take into consideration the bigger picture, including each actor's motivation and strategies and the potential consequences of his or her actions or decisions.

This article argues *for* the use of game theory on the same grounds that both scholars, Mikesell and Moran, rejected it. An elaborate, dynamic, and descriptive model of the changing balance of power between foreign investors and a host government *is* useful as a framework for analyzing the actual course of relations, and as a standard against which to measure the actual performance of the host country. It is only fair, however, to point out again that both scholars' rejection of game theory was likely affected by a zeitgeist tilted against the methodology. This study not only takes advantage of the recent renewal of interest and developments in this methodology, but also of the broader range of its application for the social sciences in general. This includes the acknowledgements of its benefits as a descriptive tool, and not exclusively a mathematical one.

On a related note, McKern (1993) points out that over time, host countries have shifted their bargaining priorities away from a focus solely on fiscal benefits and toward a more complex schedule of desiderata designed to capture direct and indirect benefits. The application of a more descriptive or extensive form game thus fits more appropriately in this case, for a reduced mathematical form of the methodology can overlook the broader range of the actors' concerns, which can include political and social considerations in addition to the more simply mathematically measurable financial issues.

Logically, the need for a methodology that allows for more complexity follows from the fact that negotiations between the developing countries and MNCs have become more multifarious (McKern 1993). Over the years, host countries have moved from an initial position of viewing MNC royalty payments as a "windfall reward" to becoming competent negotiators bargaining over taxation, ownership, and management measures, as well as over environmental, employment, infrastructure, future investment, technology transfer, and local economy concerns, among others (Moran 1974). Some of these issues are more difficult to measure quantitatively than others. This is where a descriptive methodology becomes important, highlighting the continued need to rely upon the case study, a point on which all of the scholars mentioned above would agree, for they all have employed it in their research.

And yet, it is important not simply to stop at the case study level. Many scholars make the assertion that qualitative and quantitative methods complement one another and ultimately must be combined (Odell 2001). This article

provides a starting point for a systematic, game theoretic analysis of the MNC-developing country's bargaining interface, one that may be applied across multiple case studies, thereby combining the qualitative with the quantitative.

As noted above, in the 1970s, scholars of this subject lamented the fact that game theory, at the time, did not offer a non-static, non-zero-sum model that satisfied their desire for a more dynamic view, taking into account the economic, social, and political forces at work in the host country, the interests of the MNC and its position in the global industry, and the dynamics occurring within the industry itself when analyzing contract negotiations. This assertion is in line with James Morrow's (1994:2) claim that, during the 1960s and 1970s, the performance of game theory lagged behind its early promise, and as a result, "Many became convinced that game theory was inadequate to answer most central questions in the social sciences" (p. 2).

Over the ensuing thirty-five years, however, considerable advances have been made in game theory methodology and application, particularly in the areas of non-cooperative, dynamic, and iterated games, which are specifically applicable to bargaining theory. Morrow goes on to argue that, now more than ever, game theory provides a tool for all social scientists; formal developments have pushed the methodology in ways not even imagined during its initial development, and it *should* be used to address substantive issues that have arisen in the field in the intervening years (Morrow 1994:3, emphasis added). This article follows in the *Analytic Narrative* tradition, combining the case study method with an extensive form game, to examine the choices of individuals involved in strategic, interdependent decision-making (Bates et al. 1998).

Let us return, however, to Moran's theory. As stated above, negotiations between the host country and the oil corporation are no longer viewed as a one-time occurrence. Logically, the developing country seeks to strengthen its bargaining position. It does this in various ways, over time, by taking strategic initiatives. These may include learning more about the oil industry in general and learning what its cohorts have been able to achieve around the world. A state enterprise may also be established by the developing country in the attempt to monitor, supervise, manage, and eventually operate some or all of its own industry. It may create programs to train indigenous workers in the above areas. The state can also negotiate that a proportion of the workforce employed by the MNCs be citizens of the country, that certain products purchased by the corporations be locally produced, and that the equipment that must be imported by the MNC becomes the property of the state upon its arrival. Further, the state may negotiate for an increased level of equity in the contract itself, or for a share of the final product.

This is not meant to be an exhaustive list of negotiable items; each country must decide what will work best for its individual development path. Yet each of these issues represents a component of learning on the part of the developing country. Each concession that the state successfully negotiates chips away at the monopoly of information and control that the MNC originally possessed, and cumulatively they shift the relative strength of bargaining toward the host country (Moran 1974).

A major critique leveled against Moran's theory is that it fails to take into account the fact that MNCs also face a learning curve. Indeed they do, and by treating the MNC as an exogenous variable in the bargaining interface, the model treats it as a constant, while the state is allowed to change, improve, and learn. Though the original intent of this study was to include an analysis giving equal consideration to the MNC's bargaining experience, this intent eventually proved to be beyond its scope, as the description of negotiations would have been twice as complicated and lengthy, and its focus on developing countries would have been sacrificed.

Nor does this analysis comprise a comprehensive list of all the potential players that could affect the bargaining scenario. There are, in fact, many actors with the potential to influence the contractual decision-making process: the multinational's home country, other MNCs with an interest in the outcome, the developing country's state oil enterprise, and non-governmental organizations or other interest groups. For the purposes of simplification and feasibility, this article has narrowed the number of actors examined to two; adding more would have been beyond the scope of this inquiry and would have made the games extremely complicated.

We thus characterize contract negotiations between the MNC and the developing country as strategic interactions between two actors bargaining to find a mutually acceptable arrangement, even while each attempts to maximize its own share of the pie. Such a generalizable situation may be analyzed through the methodology of game theory, the subject to which we now turn.

Game Theory and Bayesian Equilibrium Analysis

By applying the methodology of game theory to the analysis of this bargaining interface, this article responds to a call issued by various scholars for increased use of game theory to study and understand multinational corporations (Caves 1996; Graham 1998). Edward Graham calls it "surprising—and even dismaying—that so little effort has been made to rethinking MNC behavior in light of new [game] theory" (1998:67).

Yet, because game theory analyzes all potential strategies for each of the actors involved—to the extent that this is possible, given that omniscience is not—the opportunity also exists for developing countries to gain significant insight into their own behavior and strategies, into what will make them more efficient bargainers. In other words, if we are able to identify a bargaining learning curve for developing countries, it may be possible for a country to progress along this curve at an accelerated rate (or make it steeper) if it better understands competitive strategies associated with the bargaining process.

When contracts are negotiated between the MNC and the LDC, the interface conforms to the central tenets of game theory. The bargaining between the actors may be considered strategic interaction. This feature of the negotiation dynamic means that the actual bargaining position of each actor at each decision point is a function of the perceived strategic preferences of the other player (Dixit and Skeath 1999). The perceptions of each actor's own strategic preferences, as well as those of the other actors, are modified through a learning process. This learning process, or the updating of beliefs and strategies in response to the other actor's moves, may be illustrated through a concept called *Bayesian equilibrium analysis*.

The game modeled in this article is an example of international bargaining. According to Morrow (1994), such games should not be viewed in the same way as a game of chance or a game against nature with given, fixed probabilities. Instead, the negotiation process is more accurately characterized as strategic decision-making for each actor under conditions of uncertainty regarding the behavior of his or her counterpart, who, in turn, is trying to estimate the other's likely behavior. Each actor makes a probability assessment of his or her counterpart's possible responses shaped by perceptions of the other actor's preferences. In this way, the probabilities are not given or fixed—they are subjective and subject to revision.

The game is presented in the extensive form, and at each decision node, the player is faced with two choices. Additionally, each actor is seen as a unified entity. These assumptions are clearly a simplification of reality, but this is not to be seen as a weakness or liability of this methodology. On the contrary, game theory's strength lies not in its ability to accurately describe a complicated situation, but rather in its ability to generalize a strategic interaction and to be able to apply it to other similar situations in order to tell us what behavior we should expect as a consequence of the generalized theories (Morrow 1994).

The strategizing and recalculating process for actors within the constructs of a bargaining game may be described as follows: each actor identifies the various negotiating outcomes available; these are ranked to establish the actor's preference ordering. Each player then formulates a probability assessment of

the opponent's perceived preferences and uses this assessment to predict the opponent's most likely bargaining strategies.

A player's perceptions may be based upon previous interactions with, or the historic reputation of, the opposing player. However, if there has been no previous interaction between the actors, or if one actor is new to the industry or bargaining scenario, there may be much room for error in the calculation of probabilities due to misperceptions or lack of experience. Given this possibility, it is important to be able to recalculate strategies and probabilities once the actor better understands the game and his or her opponent. In other words, an actor's moves in the game reveal his or her preferences. The opponent may then readjust, or reassess, his or her strategy based on a refined perception of the opposing player's preferences. It is this possibility for readjustment of beliefs in response to observed events that characterizes Bayesian equilibrium analysis, and that allows for the concept of learning during the bargaining process.

In the bargaining scenario at hand, a collaborative effort can increase the size of the pie to be divided, and thus the absolute returns to each party. Moran's concept of a learning curve may be illustrated as in Figure 1.

Because game theory attempts to analyze all possible strategies for each of the actors involved, the possibility exists for developing countries to gain significant insight into their own behavior and strategies, into what will make them more efficient bargainers. If a developing country habitually applies a rigorous methodology to the mapping out of its strategic interactions, it may be possible to proceed more quickly along its learning curve, or along a steeper curve, as illustrated by Moran's subsequent graph (figure 2).

The game presented in this article relies more heavily upon logic than on complex mathematics. The choice to present the game in extensive form was made to increase its applicability across countries. The purpose of the game is to provide a methodological framework for the systematic analysis of the negotiation process, within the context of Moran's learning curve concept. In this way, the article examines Moran's assertion that developing countries learn by doing, while positing that game theory offers a method by which developing countries can systematize and better understand the bargaining *process and thus learn* even more quickly how to be efficient bargainers—or to ascend the learning curve at an accelerated rate. As a result, the game may be applied to additional *studies of countries* to systematize analyses of bargaining between *the governments of* developing *countries* and multinational corporations.

Figure 1   Moran's Learning Curve Illustrating Total Returns to the Foreign Investor and the Host Country (*Source*: Moran 1974:162)
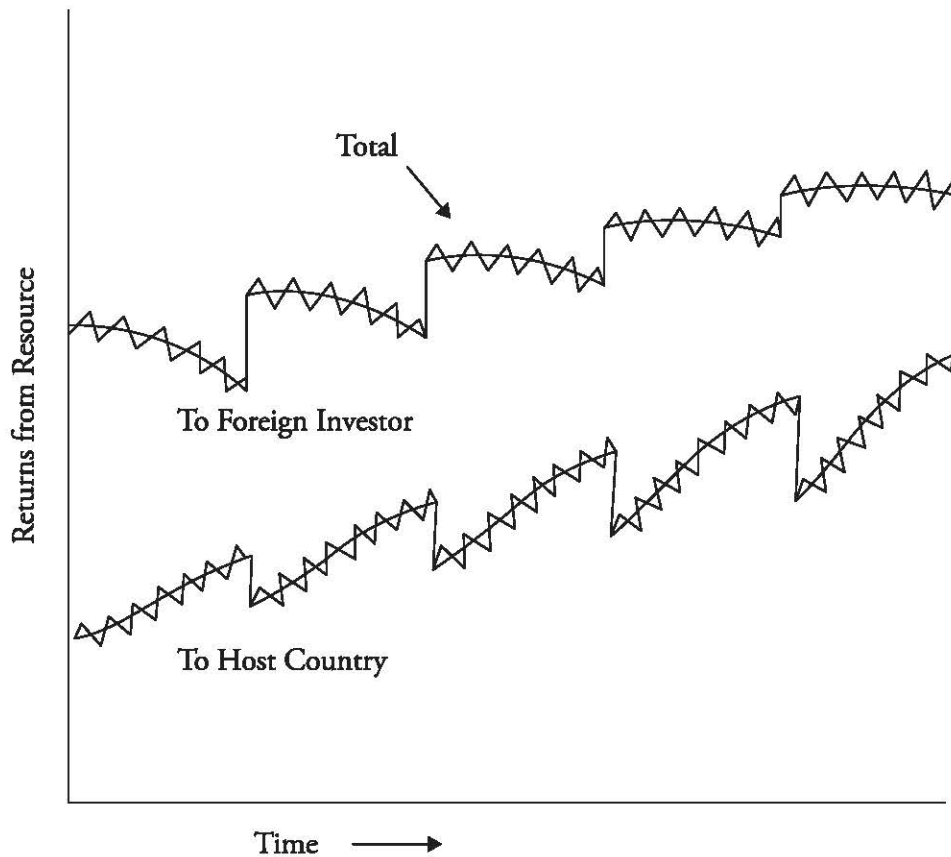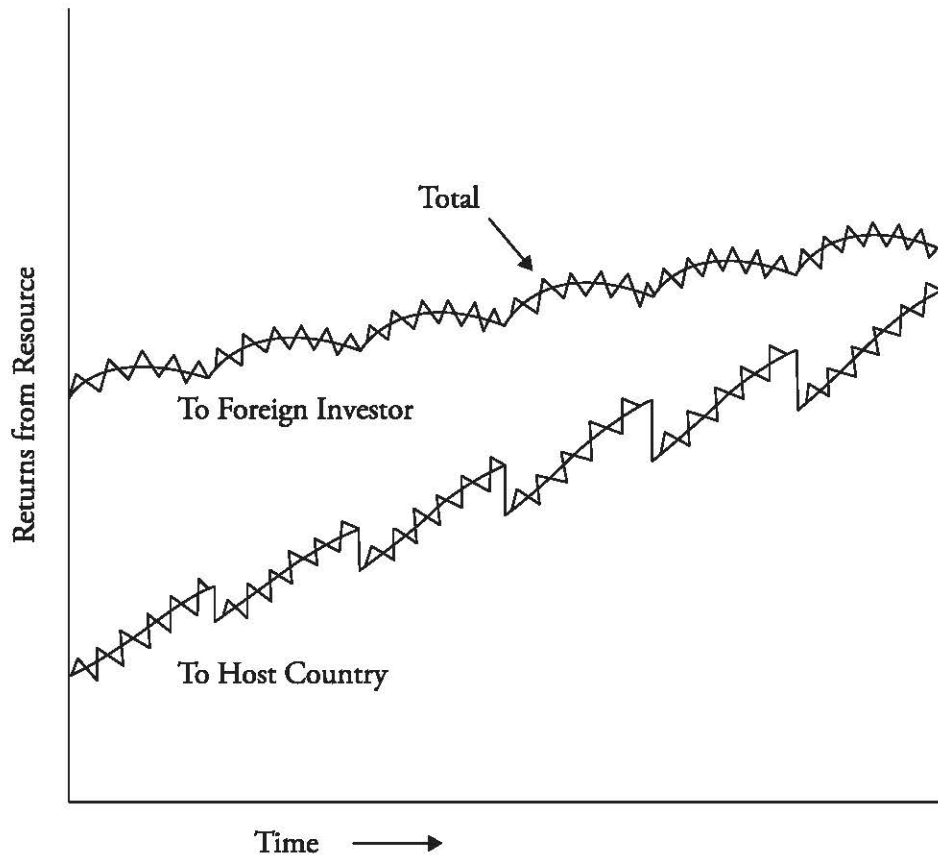

Note: since returns are a function of final market prices, the curves will not be smooth.

The Game

This article's game is an extensive-form, two-player, non-cooperative game based on a model of bargaining under incomplete information. As Morrow argues, "Extensive forms allow a more detailed analysis of the strategic interaction between two players than strategic forms do" (1994:121).

We assume, for the sake of simplicity, a world consisting of two actors: the MNC and the developing country (or state). We further assume that the developing country has little to no experience in bargaining, while the MNC's experience is extensive. In addition to bargaining experience, the MNC possesses intricate technical, logistical, business, and legal knowledge of all aspects of the oil industry. The developing country, on the other hand, does not possess such knowledge or experience.

**Figure 2   Moran's Accelerated Learning Curve (*Source*: Moran
1974:167)**

Note: since returns are a function of final market prices,
the curves will not be smooth.

We also assume that the government wants to remain in power. Further theorizing on this point is problematic, because the government may act to enrich itself or it may act to increase the citizens' welfare by distributing the added wealth—gained from bargaining—throughout the country.

The corporation, it is generally assumed, acts to maximize the company's value to its shareholders. In this case, it searches for oilfields where it can best employ its technological advantages and negotiates contracts to develop (and/or refine, transport, and sell) oil from this location. We also assume that the corporation in question has the technological capabilities to develop the oil in the country and that it has previous experience in negotiating contracts with states.

There are political as well as economic concerns for each actor. While the government wants to stay in power politically, it has the potential to benefit economically from bargaining with the corporation that motivates the undertaking; economic success generally translates to continued political power. At the same time, the corporation wants to negotiate the best contract for itself, economically speaking, and yet also desires political stability of rule within the state where its operations will be located. This is necessary in order for the state to avoid disruptions related to political uprisings and to assure continued operations and the enforcement of laws.

In the case at hand, the state has a locational advantage: the oil is located within its borders. The MNC must negotiate with the state in order to develop the oil. On the other hand, the MNC has its own distinct advantages, the most salient of which are technological. The state cannot develop its oil on its own, or it would presumably do so. It therefore needs the technological expertise of the MNC.

We have also assumed that the MNC has the advantage of bargaining experience. It has bargained with numerous countries before and understands, better than the developing country, key concepts crucial to its industry, such as transfer pricing and profit-sharing agreements. It is well informed about standard business practices around the world, and about concessions obtained regarding other oil concerns. It also has a clearer understanding of the prospects for developing the oil, since it can carry out its own feasibility studies and exploration reports. Further, it employs a cadre of experts in many fields—engineers, lawyers, negotiators, and so forth—which the state likely does not have at the initial stage.

Additionally, the portrayal of each actor as unitary is a simplification. For example, Chevron is actually but one member of the TengizChevroil consortium to develop the Tengiz field. Even so, it is considered the consortium's manager, holding 50% of its value, and Chevron itself is the single largest contributor to Kazakhstan's GDP.

The choice of this model is based loosely on negotiations and any subsequent renegotiations between Kazakhstan and Chevron. The author must rely upon available public records and reports, and is not privy to exact knowledge of what transpired during the negotiation process, nor of some specific details of the outcomes, as these are kept confidential. This is one reason that such "real world" interactions, such as bribes or signing bonuses, are not included in the model—though they may take place, and, if each side is aware of them, they may be able to incorporate them into their bargaining calculations. However, this researcher was not privy to such interactions, so they do not appear in the following negotiation description.

In this game, we assume a situation where a developing state (S) and an extractive energy multinational company (MNC) have realized that by applying the technological advantages of the MNC to the locational advantages of the State and, forming a contract for a project to develop the oil in question, they can generate an added value (V) of 100. If the parties negotiate an agreement, they will need to determine how to divide the project's added value (V) of 100 between them. An illustration of the game appears in figure 3.

The assumption of incomplete information is crucial for the model and is represented by private information for each actor regarding certain payoffs. The MNC possesses private information about its own *sunk costs*, and the State has private information regarding how it values its reputation costs. Information is revealed by the moves of the two players.

Each square, or node, represents a choice for one of the actors. There are two branches from each choice node; these indicate the choices available to the actor. The choice of any circle, if taken, represents an end to the game. The outcomes for each player are indicated as values in parentheses at each circle. The first value represents the outcome, or payoff, for the MNC, because it is denoted Player 1 in this game, and the second value indicates the payoff for the State, Player 2.

In the above game, the MNC makes the first move, in which it must decide whether to enter into a contract with the state and therefore to invest or not in developing the oil fields in question. In order to determine its best move,

Figure 3　The MNC/Developing State Bargaining Game
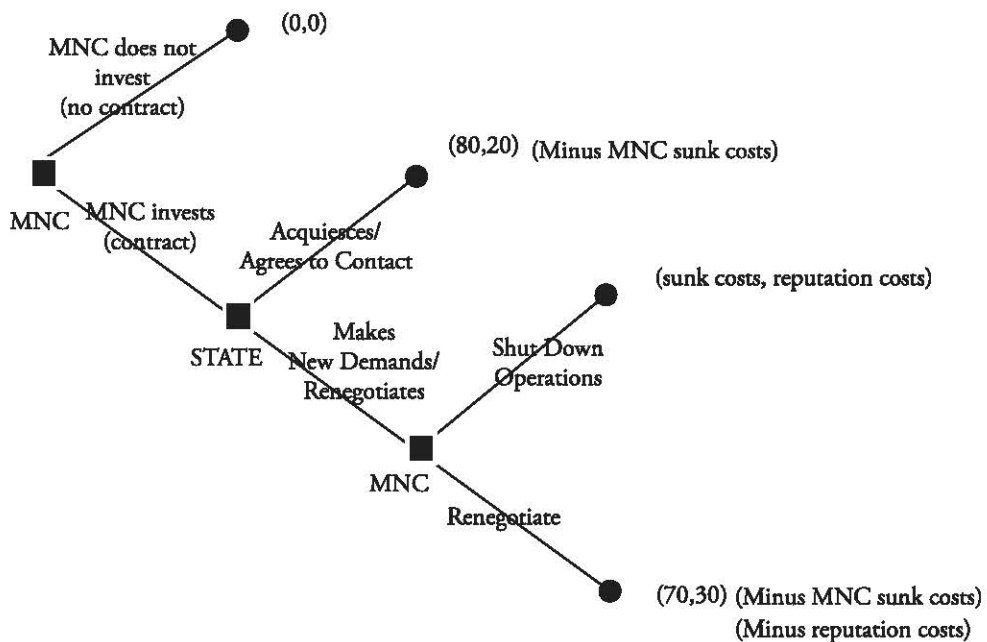
the MNC takes into consideration everything it knows about all stages of the game, including its best moves as potential responses to the best moves of the other player, and the probabilities with which it believes the other player will act upon those moves. In order to calculate all of the possible outcomes and decide on its best strategy, the player will utilize the concept of *backward induction*, that is, choosing its best move at each terminal node and working its way backward to determine which preceding moves are optimal by using the projections of moves later in the game tree (Morrow 1994). This solution concept, developed for extensive form games, provides a way to solve games with limited information. A player forms conjectures about the uncertainties it faces in the game. It revises these conjectures as it learns about the game from the moves of the other players. This is where the possibility for learning, or updating beliefs, emerges.

If the MNC initially chooses not to invest, there is no contract. Each side receives nothing (0,0) because the industry is not developed; this node's payoffs are simple to calculate since it is a terminal node with no other play possibilities. If it chooses to invest and agrees to form a contract with the State, it must look to all future possibilities for moves and calculate its potential payoffs, given what it believes the State will do.

We begin our backward induction at the final node's payoffs. If the MNC initially invests and the State chooses to renegotiate the contract, the MNC can either shut down operations or agree to renegotiate. If it decides to shut down operations in protest, the payoffs are as follows: the MNC sacrifices the sunk costs associated with the initial investment, and the State suffers the reputation costs associated with reneging on a contract. The value of each of these payoffs is private information known only to the side experiencing the cost. While the MNC knows its own valuation of the sunk costs, it can only speculate on how important the other player—the State—values its own reputation for upholding contracts, or how much it believes it would stand to lose in the future with new bargaining partners and a reputation for reneging, for example, by violating a previously agreed-upon contract.

If the MNC were to decide to engage the state in renegotiations, the payoffs from V=100 would be 70 to the MNC and 30 to the State, with the caveat that the MNC still must subtract its sunk costs (private information) from this payoff.

Finally, taking the terminal node where the MNC has invested and the State agrees to the contract, the payoffs from the initial added value (V) of 100 are divided as follows: 80 to the MNC and 20 to the State. We must again add that the MNC subtracts its sunk costs from this payoff of 80.

Player 2, the State, will employ the same method of backward induction to analyze its own best move, given whether it believes the MNC will invest and

make a contract and whether the MNC will shut down operations or agree to renegotiate. It possesses the same common knowledge about the game and all the payoffs as the MNC does; neither knows the other's private information.

In order to calculate whether the MNC would choose to invest, we will assume that it knows that its sunk costs are equal to -10, and it assumes that the State would bear a reputation cost of -30 if it were to renegotiate a contract. It wants to make a credible threat of shutting down its operations if the State insists upon renegotiation, even though it does not actually want this outcome, because shutting down operations brings about the MNC's worst outcome of the game (-10). It may tell the State outright that if it attempts to renegotiate, the MNC would definitely shut down operations, and further advise the State of the reputational dangers for renegotiators. The actual outcome values remain private information, however, and the state will need to determine its own values, given its own private information.

Let us calculate whether the MNC will make the initial investment and agree to a contract. It is faced with a certain outcome of 0 if it does not invest. Though it wants the State to believe it would shut down operations if faced with renegotiations, the MNC calculates that it would receive a much better payoff of 70 if it renegotiates and -10 if it shuts down operations. Rationally, the MNC would opt to renegotiate and get the better payoff. Therefore, it knows its payoffs, if it invests, are either 80 if the State agrees to the contract, or 70 if the state renegotiates. In either case, the payoff is greater than 0 if the MNC did not invest, so it will opt to invest, and given that its outcome is greater with no renegotiations, it will attempt to convince the State that it would shut down operations rather than renegotiate—in other words, it will attempt a "credible threat."

Now we turn to the State for the next move. First, let us assume that the State believes the MNC's sunk costs to be equal to -10, and its own reputation costs to be a positive value of 10, because it believes that, if it can renegotiate with the MNC, it will earn a reputation as a tough negotiator and will therefore be able to negotiate more successfully with other MNCs in the future. If the State finds the MNC's threat that it would shut down operations credible, it might estimate with 9/10 probability that the MNC would shut down operations and 1/10 probability that the MNC would agree to the renegotiations. We can then calculate its expected payoff value for renegotiating: $(9/10)*(10) + (1/10)*(30) = 12$. It is more likely to stay with the "sure thing" payoff of 20 that it would receive for acquiescing or agreeing to the contract in the first place.

Say, however, that a relevant event that had occurred wherein the State was able to successfully make a demand of the MNC, not necessarily to renegoti-

ate a contract, but to reduce a certain pollutant, for example, without the MNC shutting down operations. An almost identical game tree could be used to illustrate the above situation. Having thus learned from its success in a similar situation, the State would be able to recalculate its belief of the MNC's threat, or its expectations of whether the MNC would shut down operations, given that it conceded to the State's demands on a relevant issue.

Given this updating of beliefs, let us go back to the game illustrated above, and assume that the State recalculates the probability of the MNC shutting down to be just 1/5 and the probability of the MNC agreeing to renegotiate to be 4/5. We can now recalculate that instead of going for its "sure thing" acquiescing payoff of 20, it would opt for an expected payoff value from renegotiating of $(1/5)*(10) + (4/5)*(30) = 26$. It would thus initiate a renegotiation and ultimately receive a payoff of 30, while the MNC would receive the renegotiated payoff of 70. By adjusting its beliefs and recalculating its probabilities and expected payoffs, the State adjusts its move and ultimately receives a higher payoff. It has advanced on the learning curve, and receives a larger proportion of the pie.

Case Study: Kazakhstan

After 55 years as a Soviet Republic, Kazakhstan attained sovereign status in 1991, when it seceded from the disintegrating Soviet Union. Finding itself a nation extremely rich with oil deposits but technologically unable to develop them, it opened its fields to foreign investment.

In the years following independence, Kazakhstan attempted to move as quickly as possible away from a centrally planned economy. It initiated a massive campaign to privatize virtually all of its industries and embarked on what has been termed the "Sale of the Century." This included an "extraordinary sale of most of its large resource extraction enterprises, formerly run by the Soviet state, to mostly foreign companies over the relatively short period from roughly 1994 to 1997" (Peck 2003:2).

Over the years, and with the benefit of hindsight, analysts have widely critiqued Kazakhstan's handling of its fire sale, alleging that many of its potentially lucrative enterprises were given to foreigners at rock-bottom prices (Brill Olcott 2002; Peck 2004). The government was also criticized for exempting foreign investors from taxes, clearing their purchased enterprises of all former debts, offering them reduced transport tariffs, and the like (Esentugelov 1997). Though Kazakhstan's privatization efforts have been disparaged, so have those of all the former Soviet States, as they each attempted, by varying degrees and with varying levels of success, to leap from centrally planned economic

systems to market economies. The one thing all these states had in common was that they embarked on this journey to capitalism "without a map" (Schleifer and Treisman 2000).

As is the case for virtually all petroleum-rich developing countries, Kazakhstan viewed the development of its oil sector as the lynchpin to the state's overall economic growth. This industry produces quick, large, and often long-term financial returns; even if the petroleum itself is not produced or profitable for years, signing bonuses and start-up capital investments begin the financial flows almost as immediately as the ink dries on the contracts.

Thus, from its independence, Kazakhstan has focused much of its economic energies on making contracts with foreign firms to develop this key sector. As of 2002, the result has been that approximately half of all foreign-direct investment into Kazakhstan has flowed to the petroleum sector, and this figure is likely to have increased during the interim years. However, even though Peck (2004) reports that there was widespread governmental agreement on the need to privatize the oil industry, "rarely was there agreement on how to secure that investment and yet retain control of the sector" (p. 144).

At independence, Kazakhstan was able to manage its own refineries, pipelines, and exports; in this respect it was ahead of many other developing countries. However, the majority of petroleum refined in Kazakhstan during its days as a republic had been sent from the Soviet Union. This was a vestige of the centrally planned Soviet economy—an irony of which was that many of Kazakhstan's own massive oil fields were left undeveloped, to the new nation's benefit. Yet, as stated above, it was unable to develop these fields independently.

Upon the dissolution of the USSR, Russia stopped exporting its oil to Kazakhstan for refining. As a result, the country's refinery supply, as well as its exports, dwindled. Not surprisingly, great hope was placed on the ability of foreign investors to bring the country back on line as an oil-producing and oil-exporting nation. However, during the late 1990s, privatization efforts in the oil industry were often put on hold by political infighting between the President, Nursultan Nazarbayev, and the various prime ministers who have served since Kazakh independence. In fact, Kazakhstan's first two prime ministers were dismissed amid allegations of corruption connected to the oil industry (Peck 2004).

Though Kazakhstan is geographically expansive and is the world's ninth largest country, its oil deposits are concentrated in the western half of the state, with most located near or below the Caspian Sea. This article focuses on the development agreements surrounding that region's largest oil field, Tengiz, which alone accounts for more than a quarter of the country's total oil production.

The few scholars who specialize in studying Kazakhstan lament the lack of information regarding many areas of the Kazakh economy and its privatization agreements; this dearth of data also applies to the oil industry (Brill Olcott 2002; Peck 2004). In the Tengiz joint venture, however, Chevron is the principal negotiator and manager. As a U.S. corporation, Chevron is required by its home country's laws to disclose legal and financial data. Because of this, there is more information on the Tengiz oil field agreement than on any other Kazakh/MNC contract.

Located on the northeastern shore of the Caspian Sea, the Tengiz oil field was discovered in 1979, while Kazakhstan was still under Soviet rule. Development of this important underground field proved difficult even for the technologically experienced Soviets; it is the deepest high-pressure deposit in the world, with oil that emerges from the ground scalding hot, at a very high pressure and laden with poisonous hydrogen sulfide, which must be removed from the oil. Chevron, however, believed it possessed the technology to develop this oil and entered into negotiations with Moscow in 1990 to do so.

After the dissolution of the Soviet Union, Chevron continued negotiations with the newly sovereign state of Kazakhstan, as the oil field was now located within Kazakh borders. These negotiations were among the first undertaken by Kazakhstan with a foreign firm. They commenced almost upon the state's independence and concluded in 1993—which is notable, because it means this contract not only preceded the passage of the country's first Law on Oil and Gas (in 1995), but also predated the "Sale of the Century," widely acknowledged to have begun in 1994. Moreover, despite that massive economic privatization campaign, it was not until 1996 that any further oil industry sales or contracts were concluded. Thus, it is not difficult to make the argument that Kazakhstan initiated its negotiations with Chevron without a map.

In contrast to the nascent existence and economic inexperience embodied by Kazakhstan, the Chevron Corporation was founded in 1879—then called the Pacific Coast Oil Company—and by the mid-1990s had major operations on six continents. It currently ranks as the fourth largest oil concern in the world, and the sixth largest global corporation overall (*Fortune* 2008).

The particular instances to which the game above refers involve the renegotiating of the original contract initiated by Kazakhstan in November of 2002—nearly a decade after the contract initially had been signed. The circumstances surrounding Kazakhstan's desire for renegotiations closely resembled those in Raymond Vernon's Obsolescing Bargain Model: the agreement had been made, the investments were sunk, the oil was beginning to turn a profit for the corporation, and the state started to feel that the distribution of benefits were too much in favor of the MNC. The country called for renegotiations.

In fact, Kazakhstan already had made relevant, but not contractual, demands of the oil corporation on three different occasions before calling for the renegotiations. First, it had successfully levied a $5.8 million fine on Chevron for excessive air pollution in 1997. The state also obtained a concession from Chevron in 2001 that mandated more responsible disposal of the oil's sulfur by-product (Peck 2004). Another propitious encounter involved securing the company's agreement to finance the relocation of an entire village that was suffering ill environmental effects from Chevron's processing plant. The success of these interactions—all evidence of learning, according to Moran's theory—increased the government's confidence in its ability to negotiate for further concessions from the company, this time contractual ones. In the terminology of game theory, *the interactions* caused Kazakhstan to recalculate both its reputation costs as well as the perceived likelihood that Chevron would agree to both the renegotiations and to concessions.

In *such an event,* the renegotiations in question were not a simple affair, and likely did not progress as Kazakhstan had predicted. The renegotiations involved the financing arrangements for major gas processing and recycling projects designed to reduce pollution as well as for projects designed to increase production at the TengizChevroil venture. Looking back at the game, it may seem surprising that Chevron would shut down its operations in protest of the renegotiations. Yet, initially, it did. This can be explained, however, as the result of Chevron's following through on its threat, and being taken by surprise that Kazakhstan indeed demanded renegotiations. After recalculating its costs, expected value, and strategic play, and given the strategy revealed by the State's move, Chevron reversed its decision after just two months. TengizChevroil's operations were resumed in January of 2003, with Chevron agreeing to some revisions in the contractual terms.

This game illustrates one instance of the state's bargaining with an MNC. In order to establish a stronger case for progression along a learning curve, more evidence of Kazakhstan's benefiting from increased strategic interactions is preferable. Moran's case study of Chile graphed the state's increasing share of copper profits over time; the results closely mirrored his predictions (see Figure 1). As an alternate method for demonstrating Kazakhstan's progression along Moran's learning curve, this article instead provides evidence of what Moran considers learning: "developing negotiating, operating, and supervisory skills." Additionally, this method is arguably more comprehensive, since it illustrates a developing country's gains that are not exclusively financial in nature.

Evidence of Kazakhstan's Progression on the Learning Curve

This section provides additional evidence of Kazakhstan's progression on Moran's learning curve, with concrete examples from further legislative initiatives, environmental protection and enforcement, renegotiations, and the ensuring of local employment on the part of Kazakhstan, which have taken place since the initial renegotiations described in the case study above.

Although in 1991, at the commencement of the original TengizChevroil negotiations, Kazakhstan had no legislation regarding oil and gas, it has since passed a number of laws to regulate the industry. In 2003, the country introduced tougher rules for oil investors. On November 29, 2003, the *Law on Changes to the Tax Code* was adopted. Kazakhstan also adopted a new land code on June 20, 2003, and a customs code on April 5, 2003 (*Petroleum Economist* 2003). In the same year, the state tax committee revoked two overly generous VAT exemptions granted to the Agip-led consortium developing the Kashagan field (*Rigzone* 2003). In November, 2007, in the midst of heated renegotiations over the Kashagan oil fields, Kazakhstan's Parliament passed a law allowing the government to abrogate an oil contract if it failed to live up to its economic promise (Kramer 2008). In May 2008, a new oil-export duty came into force, which was designed to increase the tax burden on oil and mineral producers, and at the same time streamline the complex taxation system (although existing contracts and big foreign projects were to be exempt). The government justified this law by asserting that the oil deals struck in the 1990s were too generous to foreign investors (*Petroleum Economist* 2007). Further increases in oil taxes are expected to be included in a subsequent revision of the tax code to take place in the fall of 2008 (*Petroleum Economist* 2008b).

Specifically regarding the environment, additional signals of learning through successful strategic interactions include the government's ability to compel Chevron to dispose of the sulfuric by-product from the Tengiz field in a more environmentally secure manner, as mentioned above. Despite progress in this area, the government was still unsatisfied with Chevron's actions, and in October 2007, fined Chevron again, this time for $609 million, for improperly stockpiling and storing the sulfur by-products from 2003-2006 (Roberts et al. 2007). Another important instance of Kazakhstan successfully making demands of MNCs was the 2000 TengizChevroil consortium commitment to spend $2 billion creating additional oil-cleaning facilities and pumping natural gas back into the oil reservoir instead of continuing to flare it, which causes considerable air pollution (Peck 2004). As of July 1, 2006, Kazakhstan outlawed all such gas flaring within its borders, and continues to monitor and fine offenders (*Petroleum Economist* 2008a).

Kazakhstan has also learned through its experiences that any call for renegotiations presents a risk: it faced a severe backlash in 2003 following renegotiations with Chevron. Foreign corporations and governments alike expressed both frustration and concern that future contracts would not be honored. They pressured the Kazakh government not to renegotiate contracts, to the point that, in October 2003, Kazakh President Nazarbayev stated, "Kazakhstan will not revise present oil contracts signed with foreign investors but it will choose those investors who will propose a greater Kazakh involvement in developing new fields" (*Interfax-Kazakhstan* 2003).

In addition to addressing foreign investor concerns, this announcement indicated a new policy for Kazakhstan, one of mandating that foreign corporations employ a certain percentage of both Kazakh employees and contractors in their operations. This demonstrates Moran's concept of developing operating skills and industry-specific technological skills. As evidence of the policy's success, at the TengizChevroil workplace, 50% of the workforce was Kazakhstani in 1993. By 2001 that percentage had reached 70% (Adamson 2001). Also, the number of Kazakhstani contractors and suppliers employed by this consortium is increasing, and in 2000, a Kazakh drilling company was awarded a contract for the first time (Peck 2004).

Perhaps no single event gives clearer evidence of progress according to Moran's concept of learning—developing negotiating, operating, and supervisory skills—than the establishment of Kazakhstan's National Oil Company, KazMunaiGaz, in 2002, by Nurlan Balgimbayev, who was the Prime Minister at the time. At its outset, this new company was given a mandate to control no less than 50% of the ownership shares in future oil projects to be developed with foreign companies. In 2004-2005, Parliament made this mandate into a law (Campaner and Yenikeyeff 2008). Since 2002, Kazakhstan has made great strides in ensuring its active role in the energy sector through the activities of its National Oil Company.

Kazakhstan has also managed to force renegotiations with other oil consortium members since the initial renegotiation with Chevron. The most notable such instance concerns the Kashagan oil fields, which, like the Tengiz fields, are also located beneath the Caspian Sea. Kashagan and Tengiz together account for nearly half of the country's proven oil reserves (Campaner and Yenikeyeff 2008). There are many similarities between the situations at Kashagan and Tengiz, which include the sulfuric nature of the oil and the complications associated with extracting it; the degree of risk to the natural environment in close proximity to the oil; and the government's call for the renegotiation of production-sharing contracts.

The consortium charged with developing the Kashagan fields was formed in 1997, with Italian Oil Company (ENI) chosen as project operator by consor-

tium partners in 2001, and oil production slated to begin in 2005. However, when ENI doubled its budget estimates for the project and pushed back predictions for the start of oil production to 2010 (current predictions are for 2013), the Kazakh government took action. First, it fined the consortium $300 million for project overruns and environmental problems in 2005 (Roberts et al. 2007). Next, it pressured ENI by halting work at the oil field for three months on environmental grounds (*Reuters* 2007), while simultaneously initiating criminal proceedings against ENI's executives for alleged tax evasion regarding the importation of oil-related equipment (Campaner and Yenikeyeff 2008). Subsequently, in January/February 2008, it called for renegotiation of the entire Production Sharing Agreement. The outcome of these negotiations included the concession that ENI would eventually lose its role as operator of the project, and that KazMunaiGaz would double its stake in the field, becoming an equal partner with other consortium members (Exxon-Mobil, Shell, Total and ENI), each with a 16.81% stake in the field (Conoco and Inpex hold the remaining shares). In a sign that negotiations are ongoing phenomena, in late September of 2008, Shell and KazMunaiGaz announced that their companies would form a joint venture to lead operations at the Kashagan field, following the commencement of commercial operations in 2013 (Rayborn 2008). At the same time, Kazakhstan's Energy Minister announced that in the new operation model, no less than 264 KazMunaiGaz (Kazakh) employees will work at the project "at a very high level."

The game introduced above may be applied in the same way to these negotiations, with a similar outcome: evidence of bargaining gains on the part of the developing country's government. In fact, all of the situations above describe strategic interactions between Kazakhstan and MNCs, wherein strategies for action were calculated and counter-strategies considered and Kazakhstan came out having done better for itself. Each of these situations, in other words, may be thought of as a game, and may be analyzed in such a fashion. In this way, Kazakhstan can better understand its strategic possibilities, rationally plan its moves, and benefit by advancing along its "learning curve" for strategic interaction.

Conclusion

This article applied Theodore Moran's dynamic bargaining theory—that developing countries do better for themselves over time, as their experience with bargaining and doing business grows—to the specific case of Kazakhstan. It showed that game theory, and specifically Bayesian Equilibrium Analysis, can be a useful methodology for states to employ in this development interface, as it forces each player to take into consideration not just its own position, but

all the possible strategies and moves of its opponent, before making its own strategic move. Once a move has been made, and a preference revealed, the player can adjust its beliefs, recalculate the expected probabilities and values, and better plan its next move.

A further argument for the use of such modeling of strategic interaction, particularly for developing countries, is that formal modeling forces a thorough analysis of the situation at hand. This modeling, as a result, obligates the player to state its knowledge, assumptions, and beliefs in entirety, as well as its knowledge, beliefs, and assumptions about the other player at every potential stage of the game. Doing so may expose unstated assumptions, reveal a gap in the knowledge about the game or about the other player, or even lead to the realization of alternate moves or superior strategies. A complete knowledge of the game allows a player to act rationally in a consistent manner and, as in the game described above, to readjust beliefs as events change and eventually discover a way to do better for itself.

If a developing country systematically applies a rigorous methodology to analyze its strategic interactions, it may be possible to proceed more quickly along its learning curve, or along a steeper curve. It is this possibility for developing countries to accelerate their own rate of learning, through use of formal game modeling, that this article has attempted to illustrate. In this way, it may be possible for other newly sovereign states, such as other resource-rich former Soviet states or for new entrants to the world extractive resource market, to gain more, and do so more quickly, from their strategic interactions with extractive MNCs.

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