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14. ABSTRACT Prospecting for New IR Theory: Auctions and Strategic Interaction International relations theory is much more explanatory in retrospect than predictive in prospect. Persistent contradictions in international relations challenge rational analysis. As James Fearon posits War's Inefficiency Puzzle, "The central puzzle about war, and also the main reason we study it, is that wars are costly but nonetheless recur." Explanations in the current body of theory seem incomplete. A breakthrough will require expanding analysis beyond inward self-study to the outward study of strategic interaction and the interaction mechanisms between cognitive competitors. In prospecting for this new international relations theory, the economics of competitive interaction in auctions may provide a window into strategic interaction more broadly. This paper departs from the last great innovation in applied economics, Prospect Theory, to propose the study of auction interactions as a mechanism to more predictive international relations theory.					
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THE UNITED STATES NAVAL WAR COLLEGE

Prospecting for New IR Theory: Auctions and Strategic Interaction



February 12, 2018

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Economics as Naval Science

Congress established the Office of Naval Research (ONR) in 1946, to “encourage scientific research in... naval power, and... national security...”¹ The “specialized and imaginative research”² envisioned by Congress earned its first Nobel Prize in 1952. Impressively, that six-year span remains the longest period without ONR-sponsored research earning Nobel distinction.

Of the 63 laureates recognized for ONR-research to date, Chemistry dominates with 26 prize winners. Physics is second with 23, Medicine third with nine.³ These hard sciences are an obvious fit for the Department of Navy’s interest. Less intuitively, ONR research has also earned five Nobel Prizes in Economics.⁴

Nobels were first awarded in 1901, but the Economics prize wasn’t established until 1969. Consequently, only 49 have been awarded.⁵ In that context, ONR’s five prizes are even more remarkable—more than ten percent of the awards *ever* conferred have recognized U.S. Navy-sponsored achievements.

ONR-sponsored research by Daniel Kahneman, John Nash, Jr., Gerard Debreu, Herbert Simon and Kenneth Arrow is the foundation for both mathematical and behavioral economics, pioneering advanced game theory, and expanded understanding of individual and organizational decision-making. Prospect Theory, Mixed-Strategy Nash Equilibria, Bounded Rationality,

¹ Public Law 588, 69th Congress of the United States at the Second Session, August 1, 1946, p.1, available at <https://www.onr.navy.mil/About-ONR/History> accessed January 18, 2018.

² *Ibid.*

³ Office of Naval Research, “All ONR-Sponsored Nobel Laureates,” available at <https://www.onr.navy.mil/en/About-ONR/History/Nobels> accessed January 18, 2018

⁴ Office of Naval Research.

⁵ Nobel Media AB, “The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel,” available at https://www.nobelprize.org/nobel_prizes/economic-sciences/ accessed January 18, 2018.

Satisficing and the Theory of Value represent just a handful of the foundational concepts discovered in ONR-sponsored research.⁶ The body of work continues to find application in national security decision making and organizational management in strategic, operational and tactical settings. Economics is naval science.

Searching for Innovation

The science is far from exhausted, though. In many respects, research to date can be considered targeted self-study. Much of the work focuses inwardly on the cognitive process of the individual confronting challenges of scarcity, uncertainty and risk. Researchers articulate these processes with increasing specificity. The understanding of individual decision-making is being creatively applied across disciplines, including international relations. While *incremental progress* continues on the foundation laid by economists like the ONR laureates, an *innovative breakthrough* in international relations theory remains elusive. Opportunity remains for a pioneering interdisciplinary application of economics to improve national security strategy and decision making.

Current international relations theory conforms to Kahneman's aphorism, "The idea that the future is unpredictable is undermined every day by the ease with which the past is explained."⁷

⁶ The work of these five ONR-sponsored Nobel Laureate economists exceeds the scope and purpose of this paper. An interested reader can begin further research with: Amos Tversky and Daniel Kahneman, "Judgement Under Uncertainty: Heuristics and Biases," *Science*, Vol. 185, 1974. Amos Tversky and Daniel Kahneman, "Prospect Theory: An Analysis of Decision Under Risk," *Econometrica*, Vol. 47, No. 2 (March 1, 1979), 263-291. John Nash, Jr, "Equilibrium points in n-person games," *Proceedings of Proceedings of the National Academy of Sciences of the United States of America*, Vol. 36, No. 1, communicated by S. Lefschetz, November 16, 1949, p.48-49. Gerard Debreu, *Theory Of Value: An Axiomatic Analysis Of Economic Equilibrium*. Yale University Press, New Haven and London, 1959. Herbert A. Simon, *Administrative Behavior: A Study of Decision-Making Processes in Administrative Organization*. Macmillan, New York, 1947. Kenneth J. Arrow, "General Economic Equilibrium: Purpose, Analytic Techniques, Collective Choice," *The American Economic Review*, Vol. 64, No. 3 (June 1974), p.253-272.

⁷ Daniel Kahneman, *Thinking, Fast and Slow*. Farrar, Straus and Giroux, New York, NY, 2012, p.218.

Predictive insight is rare. Theory is much more explanatory in retrospect than predictive in prospect. Persistent contradictions—weak states resisting bargaining to their own peril, for example⁸—challenge rational analysis. As James Fearon posits War’s Inefficiency Puzzle, “The central puzzle about war, and also the main reason we study it, is that wars are costly but nonetheless recur.”⁹ Explanations in the current body of theory seem incomplete.

Innovative thought on this puzzle may require a new approach within applied economics. A breakthrough will require expanding analysis beyond inward self-study. The next untapped lode of theoretic gold for international relations and national security application will be in the outward study of interaction itself—not individual cognitive processes, but the interaction mechanisms between cognitive competitors.

In prospecting for this new international relations theory, the economics of competitive interaction in auctions may provide a window into strategic interaction more broadly. In evaluating this proposal, the last great innovation in applied economics, Prospect Theory, is a fitting point of departure.

Prospect Theory: Looking Inward

In the spring of 1969, Daniel Kahneman invited Amos Tversky to address a seminar he was teaching in Psychology at the Hebrew University of Jerusalem.¹⁰ He presented a view of ongoing University of Michigan research on intuitive statistics. The resulting exchange between Tversky and Kahneman famously ignited a fuse of intellectual dynamite between the two. It catalyzed an

⁸ See for example: Phil Haun, *Coercion, Survival and War: Why Weak States Resist the United States*. Stanford University Press, Stanford, CA, 2015.

⁹ James D. Fearon, “Rationalist Explanations for War,” *International Organization*, Vol. 49 Iss. 3 (Summer 1995), p.379.

¹⁰ Kahneman, p.5.

enduring relationship credited with creating the science of behavioral economics. Challenging normative models of utility first articulated by Bernoulli in 1738.¹¹ on how people *ought to make decisions*, they led an emerging cadre of psychologists, political scientists and economists that began tugging on the strings of the Gordian knot of how people *actually make decisions* in the face of uncertainty and risk.

At its core, Tversky and Kahneman's Prospect Theory critically observed the interplay of judgement and decision-making and found that human beings deviate from idealized economic models of rational expectations in common and, importantly, predictable ways. Fundamentally, decision-makers first establish a propensity for risk upon which to evaluate a given decision. The decision-maker frames the situation in a domain of gains or a domain of losses then adopts a risk-averse or a risk-seeking posture, respectively. Within this risk frame, three categories of cognitive heuristics—representativeness (*how well what is observed actually represents the unknown*), availability (*how the ease of observation, or ease of recall, effects what is believed*), and adjustment/anchoring (*how previous observations effect interpretations of subsequent observations*)—then conspire to produce predictable biases of judgement and decision that depart from the perfect rationality anticipated by normative value and utility models.¹²

Tversky and Kahneman lit the fuse and the explosion reverberated far and wide. Prospect Theory is everywhere. A search of the U.S. Naval War College collection for “Prospect Theory” produces 315,049 articles, conference proceedings and books published on the subject.¹³

¹¹ Rose McDermott, *Risk-Taking In International Politics: Prospect Theory in American Foreign Policy*. University of Michigan Press, Ann Arbor, MI, 1998. p.15-16.

¹² For detailed discussion of Prospect Theory, see Tversky and Kahneman, “Judgement Under Uncertainty: Heuristics and Biases,” and “Prospect Theory: An Analysis of Decision Under Risk,” Daniel Kahneman, *Thinking, Fast and Slow*, and Rose McDermott, p.1-44.

¹³ Search results of U.S. Naval War College Henry E. Eccles Library collection using Summon Serials Solutions search for “Prospect Theory” parameters limited by [Scholarly & Peer-Review]. Results include: 289,173 Journal Articles, 22,749 Book Reviews, 2,085 Conference Proceedings, 5 Books/eBooks. Accessed January 18, 2018. <http://usnwc.summon.serialssolutions.com>

Comparatively, a search for “naval power” at the Naval War College draws only 92,611 returns.¹⁴—less than one third the interest.

Applying Cognitive Bias

Expanding on Prospect Theory, researchers continue to identify cognitive biases with predictive power. That knowledge is being employed across disciplines either to take best advantage of those susceptible to error—to *leverage bias*—or to prevent systematic errors in decision making—to *avoid bias*. The most popular example may be *Moneyball*, the 2003 book by Michael Lewis made into a movie starring Brad Pitt in 2011. The book tells the true story of the Oakland A’s adopting a metrics-based approach to sports management in order to defeat the error-prone heuristic judgements of traditional baseball scouts.¹⁵

Professional baseball is but one example of the emergence of behavioral economics, applied with great effect across disciplines. International relations and national security is no exception. Heuristic biases are critically important to decision-making and reveal decisive cognitive process influences on participants in international relations. Employing both individual and national/organizational levels of analysis, particularly from a rational actor analytic perspective, the descriptive value of understanding cognitive heuristics and their impact on participants in the international relations environment is compelling.

Almost by definition, though, Prospect Theory focuses inwardly on the individual participants of interaction. Further consideration of *Moneyball*, and the subsequent growth of sports

¹⁴ Search results of U.S. Naval War College Henry E. Eccles Library collection using Summon Serials Solutions search for “naval power” parameters limited by [Scholarly & Peer-Review]. Results include: 76,148 Journal Articles, 14,952 Book Reviews, 1,333 Magazine Articles, 178 Trade Publication Articles, and 1 Books/eBook. Accessed February 6, 2018. <http://usnwc.summon.serialssolutions.com>

¹⁵ Michael Lewis, *Moneyball: the art of winning an unfair game*. W. W. Norton, New York, 2002.

analytics, is a good illustration. The judgement challenge confronting baseball management in the face of uncertain future performance of players is addressed to improve hiring risk decisions for the team. The risk decision ultimately, though, is reduced to a game of chance. Analytics are used to catalog discrete metrics that defeat the heuristic susceptibility to easily-noticed factors that do not, in fact, offer any actual prediction of future performance—like player appearance. Finding and relying on better representative data, especially data overlooked by competing managers, improves incrementally, but predictably, the individual risk decisions of filling a team roster. Data provides a competitive advantage. Over time, iterations of repeated baseball games and repeated game situations (like at-bats, fielding balls, etc.) extract better future performance. Put to a simple analogy, sports analytics strive to better calculate the actual fairness of the coin to better inform repeated iterations of bets on the flip of that coin. That advantage diminishes when competing managers adopt the same data-driven approach and improve their own *inward* process—when the information advantage is eroded because competitors also improve their own understanding of the fairness of the coin, as it were.

Applying Risk-Framing

Beyond cognitive biases, international relations scholars like Rose McDermott have applied the important risk-framing mechanism of Prospect Theory to international relations. Studying members of the Carter administration, she applies an individual level of analysis through cognitive and palace politics analytic approaches. McDermott explains how and why influencers within the administration, and ultimately the President, adopted the risk-seeking, ill-fated, Iranian hostage rescue attempt. She goes through a similar analysis of other decisions by Carter adjudicating visa-entry for the Shah of Iran. The same lens is applied to the Eisenhower

administration during the U2 shoot-down and the Suez Crisis to illustrate how shifting gain and loss frame perspectives across administrations might explain both risk-seeking and risk-averse decisions.¹⁶

There is value in the vignettes and the detailed discussion of influencers within each administration. McDermott's analysis epitomizes how Prospect Theory looks *inward* at the participants in the interaction to find evidence of motivation, perspective and bias, but reduces the *external* interaction to a probabilistic discreet event—a coin flip, if you will. The actions of Iranian dissidents or the Ayatollah, have no place in the analysis. The hostage rescue operation is a coin, tossed in the air with some chance of success and the Carter administration makes a bet on that toss according to their risk-frame and subject to cognitive biases.

The same can be said of other scholarly applications of Prospect Theory to military decisions, including analysis of the risk-seeking decision by Athens to launch the Sicilian expedition amidst the Peloponnesian War, or shifting risk frames in French decisions from risk-averse to risk-seeking at Dien Bien Phu.¹⁷ In each case, Prospect Theory and the heuristic biases articulated by behavioral economists provide insight to *inward-looking* analysis, but the theory sheds little light *externally* to illuminate the interaction *between* participants.

Internal analysis has its own value and eliminates complicating variables by simplifying interactions to a game of chance. Simplification is a valuable modeling technique to isolate and better understand influencers and variables. As the maxim widely attributed to Albert Einstein

¹⁶ Rose McDermott, p.45-164.

¹⁷ Gabriel White, "Prospect Theory and the Problem of Strategy: Lessons from Sicily and Dien Bien Phu," The Strategy Bridge, November 3, 2017, accessed January 18, 2018, available at <https://thestrategybridge.org/the-bridge/2017/11/3/prospect-theory-and-the-problem-of-strategy-lessons-from-sicily-and-dien-bien-phu> See also a detailed analysis of tactical heuristic analysis in Blair S. Williams, "Heuristics and Biases in Military Decision Making," *Military Review*, September-October 2010, p.40-52.

reminds us, though, “A theory should be as simple as possible, but not simpler.”¹⁸ If we want to achieve an innovation in theory that can provide better predictive insight, it is time to seek a more complicated *model of interaction*.

On the Block: Why Auctions?

Contrast a game of chance to a game of strategy. A game of chance requires risk decisions by the participant, but the outcome depends ultimately on a probabilistic event. The outcome in a game of strategy, though, depends on the decisions of the other participants. A game of strategy is defined by interaction—by relationships. For his part, the co-author of Prospect Theory, Amos Tversky, enjoyed saying, “People are not so complicated. *Relationships* between people are complicated.”¹⁹

Prospect Theory and behavioral economics expand our understanding of people. To better understand Tversky’s “complicated relationships,” researchers must study competitive strategic interaction.

Value and Price Discovery: Auctions as the Model of Strategic Interaction

Clausewitz may have been the first theorist to apply economic terms to security interaction. Early in *On War*, he sketches an outline for a model framing the purpose and scope of effort by a state in conflict: “Since war is not an act of senseless passion but it is controlled by its political object, the *value* of this object must determine the sacrifices to be made for it in magnitude and also in duration. Once the *expenditure* of effort *exceeds the value* of the political object, the

¹⁸ Michael H. Rothkopf, “Decision Analysis: The Right Tool for Auctions,” *Decision Analysis*, Vol. 4, No. 3 (September 2007), p.171.

¹⁹ Cass R. Sunstein and Richard Thaler, “The Two Friends Who Changed How We Think About How We Think,” *The New Yorker*, December 7, 2016, p.5.

object must be renounced and peace must follow.”²⁰ In his foundational discussion of the “paradoxical trinity”²¹ balancing passion, chance and reason between the people, the military and the government, Clausewitz assigns the valuation function: “the political aims are the business of the government alone.”²² It may be convincingly argued that it is not the government alone that determines the value of the political object, but rather a consensus negotiated amongst the paradoxical trinity, particularly in a modern representative democracy. Still, this Clausewitz framework has stood the test of time and resonates through international relations and security studies even now, two centuries later.

Layering the Clausewitz trinity model, the concept of the value of the political object and advances in behavioral economics in the last half century, an interesting integrated framework for future international relations theory and scholarship emerges. States compete for contested political objects. The expenditure of effort committed to this competition is based on *internal* valuations of the political object, negotiated through some mechanism of consensus. Grounded by the perspective of their individual valuations, then, states interact *externally* in a non-cooperative game of incomplete information to discover, through a variety of signaling and ultimately firm bidding mechanisms to *discover the price* of the political object. What is the mechanism for price discovery of the political object?

Auctions—non-cooperative games of incomplete information—provide just such an interactive mechanism. Advanced research into auction theory and competitive bidding modeling may provide the breakthrough to leverage further developments in applied economics to improve national security decision making.

²⁰ Carl von Clausewitz (edited and translated by Michael Howard and Peter Paret), *On War*. Princeton University Press, Princeton, NJ, 1976, p.92. Note: Emphasis added to highlight economic terms.

²¹ *Ibid.*, p.89.

²² *Ibid.*

No Sale?

Some may argue that auctions are a poor analogy for state interaction. Auctions require agreed upon rules and rely on a fair third party auctioneer to govern the process. Bidding is conducted in dollars, or some currency—unambiguous increments of reliable exchange undergird transactions. Buyers and sellers are willing participants, able to withdraw from the market, or avoid it altogether, at their pleasure. Critics would argue the order and structure inherent in auctions is incongruous with the widely-accepted assertion that “Anarchy is the fundamental fact of international relations.”²³ In fact, if the available economic mechanisms of value transfer are (1) fixed prices, (2) auctions, and (3) bargaining, international relations interaction is much more analogous to bargaining. International relations is more a flea market than an auction—every exchange is a unique anarchical transaction. In fact, the bargaining construct is used extensively across the body of extant theory.²⁴

Consideration of the simplifications and assumptions necessary to apply an auction analogy to international relations is important, but does not defeat the utility of the auction model to study strategic interaction of states. Consider, for example, prevailing international norms, like the Chemical Weapons or Geneva Conventions, and intergovernmental organizations, like the United Nations, as proxies for the auctioneer. Rather than dollar denominations, bidding may be viewed in terms of the commonly accepted framework of the escalation ladder and in the context of Clausewitz’s notion of expenditure of effort measured in magnitude and duration. Even the

²³ Robert J. Art and Robert Jervis, *International Politics: Anarchy, Force, Political Economy, and Decision-Making* (Second Edition). Little, Brown and Company, Boston, 1985, p.7.

²⁴ Prominent examples include, but are in no way limited to: Thomas Schelling, *The strategy of conflict*. Harvard University Press, Cambridge, MA, 1960. George W. Downs and David M. Rocke, *Tacit bargaining, arms races, and arms control*. University of Michigan Press, Ann Arbor, MI, 1990. John Nash, Jr., “The bargaining problem,” *Econometrica*, Vol. 18 No. 2 (April 1950), pp.155-162. Ariel Rubenstein, “Perfect equilibrium in a bargaining model,” *Econometrica*, Vol. 50 No. 1 (January 1982), pp.97-109.

decision to participate or withdraw from auctions may be seen as analogous to certain international relations choices of accommodation, confrontation or avoidance. Briefly, consider Chamberlain at Munich, Kennedy and Khrushchev, and American avoidance of the genocide in Rwanda illustrating the freedom of auction participation along this spectrum.

Auction models may not replace bargaining models for all international relation interactions, but it can fill theoretic gaps. It may also provide insight into interaction heuristics more broadly which can then be applied to bargaining, much like cognitive heuristics have been applied across disciplines. Ultimately, the counterargument that auctions are a poor analogy is best rebutted by considering the work of auction theorists and testing applicability to international relations and the security environment.

Testing Applicability: eBay and the Efficacy of Sanctions

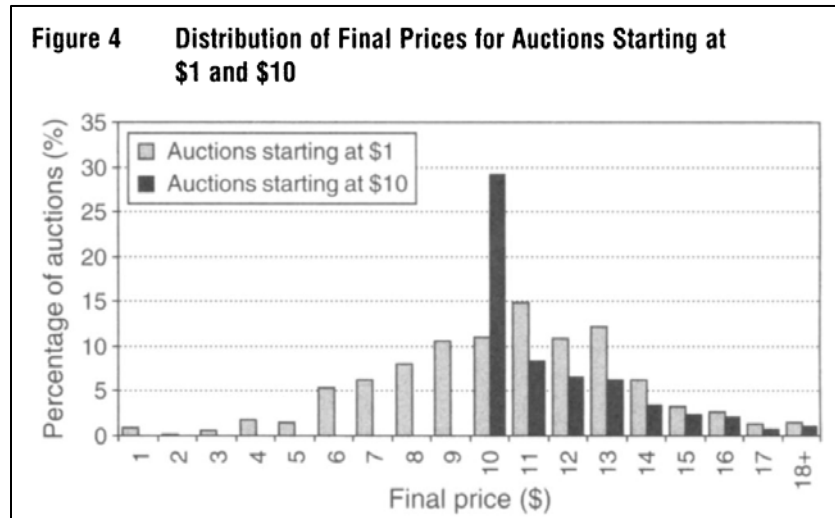
Economists Uri Simonsohn and Dan Ariely studied auction rationality by testing a data set of online auctions on eBay.²⁵ It is noteworthy first to consider the explosion of data available for researchers due to the popularity of online auctions alone. After screening adjustments detailed in their article, the data set comprised 8,333 real-world auctions, by 2,481 different sellers, receiving 37,535 bids.²⁶ Compare this single data set, of a very specific segment of market activity from a single month to what would have been required of Lawrence Friedman to replicate experimentally in the laboratory when he wrote the first academic study of auctions in 1956.²⁷

²⁵ Uri Simonsohn and Dan Ariely, "When Rational Sellers Face Nonrational Buyers: Evidence from Herding on eBay," *Management Science*, Vol. 54, No. 9 (September 2008), pp.1624-1637.

²⁶ *Ibid.*, p.1627.

²⁷ Lawrence Friedman, "A Competitive-Bidding Strategy," *Operations Research*, Vol. 4, No. 1 (February 1956), pp. 104-112.

Simonsohn and Ariely examined how the starting prices of auctions attracts, or “herds” bidders and how that may impact final sales prices. For the same DVD, how would an initial starting price of \$1 compare to an initial starting price of \$10? One figure of the study, included below,²⁸ deserves further consideration here. It illustrates the distribution of final prices for auctions starting at \$1 and \$10:



Of note, the average price for all sales was \$10.29 (rounded in the graph to \$10).

Interestingly, at every final price above the market average, the percentage of \$1 auctions that arrived at that higher final price *exceeds* the percentage that originated from auctions starting at \$10. Of course, there were also more auctions starting at \$1 that settled below the market average as well.

Applying the analogy to international relations, consider the dollar denominations of prices as a substitute for a theoretical escalation ladder. If states are competing with “bids” for a political object, consider \$1 as the opening bid of “Sanctions,” for example. Perhaps \$10 is the equivalent

²⁸ Simonsohn and Ariely, p.1628.

bid of a “Limited Military Strike.” Continue a spectrum of equivalent security bids across the escalation ladder, culminating in “All-Out War” as the highest price of \$18+.

More conventional international relations theorists have studied why sanctions or coercion short of war often fails. Phil Haun, for example, approaches the question from a bargaining model and draws conclusions from a study of U.S. asymmetric interstate crises from 1950-2011.²⁹

Perhaps auction theory instructs us that rather than “failing” in a bargaining/negotiating scenario, what we see in the auction data is that the lower starting bid of “Sanctions” (the \$1 starting bid) may sometimes result in a lower final sale price, but the distribution dictates that, often as not, it results in a *higher* final sales price. In fact, Haun finds that in the 23 asymmetric interstate crises involving the U.S. since WWII, coercion short of war failed in *half* those cases.³⁰ Picture the auction distribution as you consider his results.

Clearly more study is needed to draw reliable inferences, but perhaps the auction data is revealing a heuristic of interaction, not yet understood, that would prescribe a *higher* starting bid (like a “Limited Military Strike”) to more reliably achieve a final resolution cost with less variability. That is, counterintuitively, skipping the lowest rungs on the escalation ladder more reliably resolves conflict at a less variable final cost.

Consider another way to apply this interactive heuristic. If the goal in a specific security interaction is to bring along a coalition of international partners, this mechanism would instead prescribe early low bidding, of sanctions for example, in an effort to “herd” international bidders (i.e. coalition partners) and arrive at the higher ultimate resolution price. If this interactive

²⁹ Phil Haun, *Coercion, Survival and War: Why Weak States Resist the United States*. Stanford University Press, Stanford, CA, 2015, p.173.

³⁰ *Ibid.*, p.6.

heuristic can be better understood, it might offer real explanatory power for a *predictive* behavioral mechanism of commitment escalation—both how it can be employed, and how it can be avoided, depending on the context and desired outcome.

Converging Theories: The Winner's Curse as Cause for War

The Winner's Curse has been examined across a number of auction theory studies and remains "high among the key ideas of auction theory."³¹ The phenomena was first described by three petroleum engineers working for the Atlantic Richfield Company.³² Analyzing financial performance of oil companies that won offshore lease auctions, the engineers concluded that auctions are won by bidders who tend to overestimate the value of the item being auctioned. Auctions tend to be employed, after all, as a price discovery mechanism when the value of the object is unclear. Therefore, if there is a distribution of valuation error among rational bidders, it follows that the highest bidders have committed the greatest overestimation of value for the object being sold.

Daniel Altman, proposed a new international relations theory of false optimism as a cause of war. Seeing a strong parallel to the Winner's Curse, he dubbed his approach "The Strategist's Curse."³³ In many ways, Altman structures an argument which more closely follows the internal focus of behavioral economists than the external interactive focus of auction theorists. Altman explains how cognitive, psychological, bureaucratic and organizational misperceptions may conspire within a rational decision-making process to produce predictably biased decisions

³¹ Rothkopf, p.167.

³² E.C. Capen, R.V. Clapp and W.M. Campbell, "Competitive bidding in high risk situations," *Journal of Petroleum Technology*, Vol. 23 Iss. 6 (June 1971). pp.641-651.

³³ Daniel Altman, "The Strategist's Curse: A Theory of False Optimism as a Cause of War," *Security Studies*, Vol. 24 (2015), pp.284-315.

toward optimism that makes decisions for war more likely. Beyond his psychological arguments, though, his math and methodology will look very familiar to auction theorists.

Daniel Kahneman approached the same basic research question with the direct psychological approach of a behavioral economist. He catalogs the cognitive heuristics that favor conflict over concession.³⁴ It is notable that both approaches arrive at complementary results. There is an interesting crossover between auction theory and Prospect Theory—or interactive and cognitive theory—that may hint at the untapped potential for auction theory to make breakthrough developments in applied economics.

Conclusion

The applicability of auction theory to international relations and security studies is promising. There remains much to learn about the dynamic competitive economics of auctions and how to leverage this learning in international relations.

Consider again the War's Inefficiency Puzzle. Theory to date has bridged the chasm between *ex ante* (before the war) and *ex post* (after the war) rationality by cognitive approaches finding explanations in information advantages, incentives to dissemble, and cognitive biases—or by simply positing non-rational theories of interaction. If the concepts of *ex ante* and *ex post* are exchanged for the economic ideas of *value* and *price*, the focus of study quickly settles on what happens between those two—that is the price discovery function of market interactions.

Auction theory and competitive bidding models are an intriguing place to begin understanding the interactive heuristics at work in these non-cooperative strategic games of incomplete information.

³⁴ Daniel Kahneman and Jonathan Renshon, "Why Hawks Win," *Foreign Policy*, Jan/Feb 2007, pp.34-38.