WHEN TO USE FORCE?

A LAW AND ECONOMICS FRAMEWORK OF ANTICIPATORY SELF-DEFENCE AGAINST ROGUE STATE NUCLEAR ATTACK UNDER INTERNATIONAL LAW

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CONTENTS

Contents ........................................................................................................................................... 1

Authorship Declaration..................................................................................................................... 3

Acronyms and Abbreviations ........................................................................................................... 4

I. Introduction ..................................................................................................................................... 5

II. International Law .......................................................................................................................... 7
   A. Theory and practice of nuclear weapons possession ................................................................. 7
   B. Anticipatory self-defence under International Law ................................................................. 10
      i. Imminence ............................................................................................................................. 12
      ii. Necessity and proportionality ............................................................................................ 12
   C. Post-Charter incidents of anticipatory self-defence ............................................................... 14
      i. Cuban Missile Crisis (1962) ................................................................................................. 14
      ii. Six Day War (1967) ........................................................................................................... 14
      iii. Israeli strike on Iraq’s Osirak nuclear reactor (1981) ..................................................... 15
   D. Evaluation of the doctrine of anticipatory self-defence ......................................................... 16
      i. The problem ......................................................................................................................... 16
      ii. Towards an economic approach ......................................................................................... 18

III. Existing Law and Economics Literature ...................................................................................... 21
   A. Posner & Sykes Model ............................................................................................................. 21
   B. Evaluation of Posner & Sykes Model ....................................................................................... 23

IV. Rationalising Nuclear Aggression: A Public Choice Perspective ................................................. 25
   A. Limitations of International Relations Theory ......................................................................... 25
   B. Definition of a rogue state ....................................................................................................... 26
   C. Public choice approach .......................................................................................................... 27
      i. Rogue democracies .............................................................................................................. 28
      ii. Rogue dictatorships ............................................................................................................ 30
      iii. Comparing democracies and dictatorships ....................................................................... 31
      iv. Failure of deterrence ......................................................................................................... 33
      v. Public choice: a summary .................................................................................................... 33
   D. Application of the theory ......................................................................................................... 34
      i. Iran ........................................................................................................................................ 34

V. Theoretical Model of Optimal Timing of Anticipatory Self-Defence ............................................. 36
   A. Foundations of the Model ......................................................................................................... 36
      i. Expected costs of nuclear aggression .................................................................................. 37
      ii. Costs of anticipatory self-defence ...................................................................................... 40
   B. Optimal timing of anticipatory self-defence ......................................................................... 43
   C. Implications of the Model ......................................................................................................... 44
D. Discussion ................................................................. 47
  i. Victim state’s private and social costs ....................................................... 47
  ii. Attitudes to risk ............................................................................... 48
E. Application of the theory.......................................................... 49
  i. Israeli strike on Iraq’s Osirak nuclear reactor (1981) .................................. 49
  ii. Second Persian Gulf War (2003) ......................................................... 50
  iii. Iran .............................................................................................. 51

VI. Interventions ........................................................................... 52
A. Sanctions and embargoes .......................................................... 52
B. Game theoretic construction ....................................................... 54
  i. Defining the game ........................................................................ 54
  ii. Baseline game payoffs .................................................................. 55
  iii. Baseline game outcome ................................................................ 58
C. Strategic Moves .......................................................................... 59
  i. Threats and promises .................................................................... 60
  ii. Commitments .............................................................................. 62
C. Limitations of strategic moves .................................................. 63
D. Implications ................................................................................. 64
E. Application of the theory .......................................................... 65
  i. Cuban Missile Crisis ....................................................................... 66
  ii. Iran ................................................................................................. 67
  iii. North Korea ................................................................................. 68

VII. Conclusion .............................................................................. 70

Bibliography ............................................................................... 72
  Treaties, Resolutions and Legislation .................................................. 72
  Cases ............................................................................................... 72
  Official Materials ........................................................................... 73
    International Organisations ............................................................. 73
    United Kingdom ........................................................................... 73
    United States .................................................................................. 74
  Books ............................................................................................... 74
  Journal Articles .............................................................................. 76
  Other ............................................................................................... 78
AUTHORSHIP DECLARATION

I hereby declare and confirm that this thesis is entirely the result of my own work except where otherwise indicated. I gratefully acknowledge the supervision and guidance I received from Professor Salzberger. This thesis is not used as part of any other examination and has not yet been published.

Nicholas C Newman

10 August 2009
ACRONYMS AND ABBREVIATIONS

ASEAN: Association of Southeast Asian Nations
GAOR: General Assembly Official Record
IAEA: International Atomic Energy Agency
ICJ: International Court of Justice
NATO: North Atlantic Treaty Organisation
NNWS: Non-Nuclear Weapon State
NPT: Nuclear Non-Proliferation Treaty
NWS: Nuclear Weapon State
SCOR: Security Council Official Record
UN: United Nations
UNGA: United Nations General Assembly
UNSC: United Nations Security Council

δ: discount factor (Posner & Sykes’ model)
A: costs of anticipatory self-defence
B: costs of rogue state nuclear attack
C: cooperate (cooperative action in game theory)
D: defection (defective action in game theory)
g: rate of growth of nuclear threat
K: costs of anticipatory self-defence in period one (Posner & Sykes’ model)
p: probability of rogue state nuclear attack
r: discount rate
\( t^* \): optimal timing of anticipatory self-defence
t: time
U(w): utility function (of wealth)
w: wealth
Y: costs of aggression in period two (Posner & Sykes’ model)
I. INTRODUCTION

Under international law anticipatory self-defence is permitted only in circumstances when an armed attack is imminent. It is argued herein that from an economic perspective this requirement is costly because it prevents pre-emptive use of force in situations where the costs of waiting for an imminent attack are high. A pre-emptive use of force that comes sooner rather than later may reduce the overall costs of war. This is particularly so given the growing threats associated with proliferation of nuclear weapons. Furthermore, the imminence concept is vague when applied to nuclear weapons since it is difficult to detect when an attack is about to occur. It is therefore suggested that the law needs reformulating to emphasise probabilistic rather than just temporal considerations. In this thesis, a new test that deals with the issue of optimal timing of anticipatory self-defence is proposed.

The goal of the thesis is thus to demonstrate a normative Law and Economics framework for assessing optimal anticipatory self-defence against rogue state nuclear attack. This issue is highly relevant because of proliferation issues and potential nuclear aggression surrounding North Korea and Iran. Since the end of the Cold War, the world is no longer a bipolarisation of Warsaw Pact versus NATO nuclear capability. The corresponding policies of “mutually assured destruction” in the face of nuclear aggression are therefore not a primary concern of this thesis.

The framework consists of three parts. Firstly, since it is necessary to make positivist factual judgements about the probability of nuclear attack, a public choice approach is suggested as a means of assessing underlying rogue state preferences for nuclear aggression. Secondly, a normative model of optimal timing of anticipatory self-

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1 The expressions “anticipatory”, “pre-emptive” and “preventive” are used interchangeably throughout.
defence is put forward. The optimal outcome is achieved by comparing the costs of anticipatory self-defence to the expected costs of nuclear aggression. The model also demonstrates an economic justification for the rule of proportionality under international law, which requires that measures taken in self-defence be proportional to the armed attack. Thirdly, the role of strategic and other interventions are considered. It will be shown that the rule of necessity under international law, which requires exhaustion of peaceful means before force is used, is efficient from an economic perspective because interventions short of armed conflict may be able to avert nuclear aggression at less cost. The proposed framework of optimal anticipatory self-defence is an original approach. To the author's knowledge, Law and Economics has barely encroached upon international law regarding use of force.

The primary focus is theoretical, although anticipatory self-defence precedents are used to illustrate applications of the framework. It is not intended that these practical applications are comprehensive factual and analytical assessments. The current state of international law regarding nuclear weapons and anticipatory self-defence is laid down in part II. The only known Law and Economics model of anticipatory self-defence and suggested improvements is contained in part III. The proposed original framework of optimal anticipatory self-defence forms parts IV, V and VI. The conclusion follows in part VII.
II. INTERNATIONAL LAW

The theme of this part is to identify and evaluate under what circumstances armed conflict is lawful for the purposes of anticipatory self-defence against the threat of rogue state nuclear attack according to existing international law doctrine. The focus is on the rules relating to *jus ad bellum* (literally “justice to war”, or justification for war) i.e. whether the decision to go to war is legally permissible. In order to add appropriate context to the evaluation of the rules, issues relating to nuclear weapons possession are considered with the inclusion of specific reference to current international issues of nuclear weapons proliferation.

A. Theory and practice of nuclear weapons possession

Use or threat of use of nuclear weapons is clearly unlawful under international law.\(^2\) Article 2(4) of the UN Charter prohibits,

> “threat or use of force against the territorial integrity or political independence of any state”.\(^3\)

Thus a threat or use of nuclear weapons by a rogue state contrary to Article 2(4) is unlawful. However, a rogue state may signal use of those weapons for the purposes of self-defence.\(^4\) Indeed, the ICJ recognises that effective deterrence necessitates a credible intention to use nuclear weapons.\(^5\) Therefore on one hand a signalled intention to use force contrary to Article 2(4) constitutes an unlawful threat.\(^6\) On the other hand, a state’s readiness to use nuclear weapons may be lawful if the intention is directed toward

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\(^2\) Nuclear weapons are subject to the UN Charter: *Legality of the Threat or Use of Nuclear Weapons, Advisory Opinion* (General List No. 95) [1996] ICJ Reports 226 (hereafter *Advisory Opinion*); see also Cassese, A *International Law* (Oxford: OUP, 2001) p336

\(^3\) Charter of the United Nations (24 October 1945) 1 UNTS XVI

\(^4\) The policy of “mutually assured destruction” during the Cold War illustrates this.

\(^5\) *Advisory Opinion* para 48

\(^6\) Ibid para 47
self-defence and if the measures used otherwise comply with international law.\(^7\) This is important because a rogue state that possesses a nuclear weapons capability is not in breach of use of force rules if its intentions are to use them exclusively for the purposes of self-defence.

States have obligations under the NPT, if signatories. The NPT is based on the three pillars of non-proliferation, disarmament and an inalienable right to peaceful use of nuclear energy. It defines two tiers of states: nuclear weapon states (NWS) which can lawfully possess nuclear weapons and non-nuclear weapon states (NNWS) which are prohibited under Article II from acquiring or manufacturing any nuclear explosive devices. The former group consists of the USA, UK, France, Russia and China whilst the latter consists of all other signatories. All states are signatories except Israel, India, Pakistan, North Korea and the Republic of China (Taiwan). From a rational choice perspective states may have an incentive to enter the NPT for the purposes of signalling their nuclear preferences.\(^8\) Given cooperation over non-proliferation is desirable but uncertainty does not otherwise enable this to be determinable, entering the NPT is a commitment device that alters the payoffs since a non-cooperator would suffer a reputational cost from violation. Hence, in the absence of a state being a signatory to the NPT or subject to a specific Security Council Resolution prohibition, possession of nuclear weapons is not unlawful.

Nevertheless the NPT still presents some quandaries to the international community. There is a “great loophole” that parties can lawfully possess weapons-grade plutonium and uranium as well as nuclear weapon components, thus bringing their

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7 Ultimately the legality of use of nuclear weapons in self-defence is unclear: “the Court cannot conclude definitively whether the threat or use of nuclear weapons would be lawful or unlawful in an extreme circumstance of self-defence, in which the very survival of a State would be at stake”: Advisory Opinion para 105(2)E.

8 Guzman, AT How International Law Works (Oxford: OUP, 2008)
capability to manufacture nuclear weapons to within days.\(^9\) Moreover, there is an argument that IAEA Safeguard Agreements are systematically flawed. Despite being subject to IAEA inspections as a party to and in black-letter compliance with the NPT, Iraq had achieved significant progress with its nuclear weapons programme prior to the 1991 Gulf War. It relied on totally clandestine development using nuclear material not subject to IAEA safeguards. The safeguards were based on the assumption that it was not possible to produce nuclear weapons without diversion of nuclear material otherwise intended for civil purposes. Thus it did not take into account the possibility of a clandestine programme.\(^10\) Whilst there is an Additional Protocol to the NPT that addresses this matter, not all parties have ratified it.\(^11\) The NPT, therefore, is not a fail-proof regime that can guarantee the non-existence of a nuclear threat.

Specifically, the IAEA considered Iran to be in breach of its NPT obligations.\(^12\) The IAEA has demanded transparency so it can make credible assurances about its possible weapons dimension to its nuclear programme.\(^13\) The UN Security Council has passed resolutions demanding cessation of uranium enrichment and compliance with IAEA requirements.\(^14\) Views and estimates on Iran’s intentions and capability vary. One US intelligence estimate concluded it was unknown whether Iran had an intention to

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\(^12\) IAEA Board of Directors, “Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran” (2005) UN Doc GOV/2005/77


develop nuclear weapons.\textsuperscript{15} However, uranium enrichment certainly takes Iran closer to
developing nuclear weapons.

North Korea left the NPT regime in 2003. The Security Council has condemned
North Korea for its nuclear explosions of 2006 and 2009, and requires a halt to its
nuclear weapons programme.\textsuperscript{16} There are implications for Japan and South Korea if the
North develops missiles capable of delivering a nuclear warhead.

Hence in general, there are risks to states of rogue states merely possessing
nuclear weapons. As the ICJ said,

\begin{quote}
\textit{Possession of nuclear weapons may indeed justify an inference of preparedness to use them}.\textsuperscript{17}
\end{quote}

It follows that the concern for the international community is potential rogue state
nuclear attacks. The main source of threat is nuclear weapons proliferation in the
direction of rogue states and the resulting increase in potential for nuclear terrorism.\textsuperscript{18}

\section*{B. Anticipatory self-defence under International Law}

States have a right of self-defence against nuclear attack. Article 51 provides,

\begin{quote}
\textit{Nothing in the present Charter shall impair the inherent right of individual or collective self-
defence if an armed attack occurs against a member of the United Nations...}\textsuperscript{19}
\end{quote}

\begin{footnotesize}
15 National Intelligence Council, \textit{National Intelligence Estimate}, “Iran: Nuclear Intentions and Capabilities”
(accessed 9 August 2009) (hereafter \textit{National Intelligence Estimate})
17 \textit{Advisory Opinion} para 48
(accessed 9 August 2009); Secretary of State for Defence & Secretary of State for Foreign and
Commonwealth Affairs, \textit{The Future of the United Kingdom's Nuclear Deterrent} (London: HMSO, December
2006) Cm 6994; generally Evan, WM “Continuing Dangers of Nuclear War” in WM Evan & VP Nanda
op. cite. pp3-6
19 UN Charter Article 51
\end{footnotesize}
If subject to an armed attack, the Charter is without prejudice to a state’s inherent right of self-defence. The right is inherent owing to the sovereign nature of states and is also a right in customary law.\textsuperscript{20} The triggering condition for lawful self-defence is “armed attack”; in Nicaragua the ICJ relied on the Definition of Aggression\textsuperscript{21} to elucidate upon the meaning of “armed attack”.\textsuperscript{22} Under the Definition of Aggression Article 3(b), use of any weapon by a state against the territorial integrity of another qualifies as an armed attack. Consequently any use of nuclear weapons or nuclear explosive device triggers the right to self-defence.

A supporting foreign power may be imputable for acts of non-state actors under international law. This is important in the context of nuclear weapons because a state that sponsors a group of non-state actors with a nuclear weapons capability may be attributable for their actions. Despite the lack of clarity regarding the precise formulation of the test,\textsuperscript{23} the principle exists that a state can be imputed. A recent application of this issue is the UN Security Council Resolution following the 9/11 terrorist attacks.\textsuperscript{24} Subject to the test of imputability, a state that harbours or otherwise sponsors terrorists who carry out an armed attack can itself be treated as an armed attacker.\textsuperscript{25} Therefore if a state sponsors terrorists with nuclear weapons and they carry

\textsuperscript{20} Case Concerning Military and Paramilitary Activities in and against Nicaragua (Merits) [1986] ICJ Reports 14 (hereafter Nicaragua)
\textsuperscript{21} Definition of Aggression, A/RES/29/3314 (1974)
\textsuperscript{22} Nicaragua para 195
\textsuperscript{23} The ICJ mentions two tests in Nicaragua: firstly a test of “overall control” which requires an agency relationship between the state and non-state actors (para 109), and secondly a more strict “effective control” test which requires direction of non-state actors by the sponsoring state (para 115). The approach taken by the International Criminal Tribunal for the Former Yugoslavia was to apply the overall control test to groups and effective control test to individuals: On the other hand, the effective control test was applied to groups in the Case Concerning the Application of the Convention on the Prevention and Punishment of the Crime of Genocide (Bosnia and Herzegovina v Serbia and Montenegro) (General List 91) (2007) available online at: <http://www.icj-cij.org/docket/files/91/13685.pdf> (accessed 9 August 2009).
\textsuperscript{24} S/RES/1368 (2001) condemning the sponsors of the 9/11 attackers and recognising the right of self-defence
\textsuperscript{25} Franck, TM Recourse to Force (Cambridge: Cambridge University Press, 2002) p54
out an act of terrorism with those devices, the victim state has a right of self-defence against the sponsor.

i. Imminence

The precedent classically cited by states and international law scholars for anticipatory self-defence is the Caroline incident of 1837. US Secretary of State Daniel Webster wrote,

“It will for Her Majesty’s Government to show... a necessity of self-defence, instant, overwhelming, leaving no choice of means and no moment for deliberation.”

Therefore the central requirement of anticipatory self-defence in international law is that the armed attack must be imminent. This implies there is a particular temporal element to the test that needs satisfying in order for anticipatory self-defence to be lawful: the act of aggression has to be very closely proximate in temporal terms. Thus under existing law, a nuclear attack has to be imminent for anticipatory self-defence to be lawful.

ii. Necessity and proportionality

Under customary international law a limit on self-defence is that it has to be necessary and proportional. For an act to be necessary, any measure short of armed force (i.e. diplomatic efforts, economic sanctions, etc) would have to be, or have proven to be, inadequate. Target selection matters in determining whether self-defence is necessary.

Furthermore, it also seems the armed attack might need to be continuing for self-

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26 Webster, D “Letter to Henry Fox, British Minister in Washington” (24 April 1841), in K Bourne and DC Watt (eds) 1 British Documents on Foreign Affairs: Reports and Papers from the Foreign Office Confidential Print (Part I, Series C) (University Publications of America, 1986) 153, 159
27 Case Concerning Oil Platforms (Islamic Republic of Iran v United States of America) [1992] ICJ Reports 763 para 76 (hereafter Oil Platform); Nicaragua para 176; Advisory Opinion para 41
28 Oil Platform: the USA did not complain to Iran
29 Oil Platform: there was no evidence of significant military activity on the platforms
defence to remain lawful: the UK and USA suggested Iran was breaching the necessity requirement during the Iran-Iraq war by refusing to accept the 1987 ceasefire required by the UN Security Council,\textsuperscript{30} despite ejecting Iraq from their territory by mid-1982. For self-defence to be proportional, the amount of force used must be proportional to the armed attack. A use of force in self-defence must conform to the Laws of Armed Conflict (\textit{jus in bello rules}), in particular the principles of humanitarian law.\textsuperscript{31} The general principle\textsuperscript{32} of humanity prohibits superfluous injury and unnecessary suffering.\textsuperscript{33} The proportionality element of the general principle of military necessity and proportionality prohibits use of force in self-defence where incidental loss of life – in other words civilian collateral damage - would be excessive in light of the anticipated military advantage.\textsuperscript{34}

It is important to consider the legal implications of the necessity and proportionality requirements from the perspective of a victim state subject to a nuclear attack by a state in circumstances where the threat is ongoing and diplomacy has failed but the weapons facility is located in a populated area. Subject to the Laws of Armed Conflict, a victim state is entitled to use force against the facility even though collateral damage may be severe.\textsuperscript{35} Under the Geneva Convention Protocol I Article 57, there is a positive duty on states to take feasible precautions in reducing collateral damage.\textsuperscript{36} Accordingly, when choosing from a number of alternatives, the means used should be

\begin{itemize}
  \item \textsuperscript{30} Gray, C “The British Position with Regard to the Gulf Conflict” (1988) 37 ICLQ 420, 427
  \item \textsuperscript{31} Nuclear Weapons para 42
  \item \textsuperscript{32} General principles of law recognised by civilised nations are a source of international law: Statute of the ICJ Article 38(1)(c)
  \item \textsuperscript{33} Customary law: Advisory Opinion
  \item \textsuperscript{34} See Rogers, APV Law on the Battlefield (Manchester: Manchester University Press, 2\textsuperscript{nd} ed., 2004) pp17-23
  \item \textsuperscript{35} Rogers op. cit. p18
  \item \textsuperscript{36} This is arguably a rule of customary law, but the precise scope is disputed
\end{itemize}
the option that achieves the same military outcome with the least amount of collateral damage.

C. Post-Charter incidents of anticipatory self-defence

i. Cuban Missile Crisis (1962)

In 1962, the USA imposed a naval blockade in response to the placement of Soviet nuclear missiles on Cuba. The USA argued their actions did not constitute an Article 51 use of force, instead labelling the measure a “quarantine”. On the one hand the Soviet Union argued the missiles were for defensive purposes. The unsuccessful Bay of Pigs invasion had occurred 18 months earlier, and from their point of view another attempt could not be ruled out. On the other hand the USA saw the deployment of missiles as part of a “policy of aggression” and therefore a threat. The missiles were capable of delivering nuclear warheads to parts of the US mainland. The crisis was resolved peacefully as Premier Khrushchev agreed to withdraw the weapons from Cuba. Legal arguments based on the UN Charter were rarely relied upon - President Kennedy avoided any public mention of “pre-emptive self-defence” against the Soviet Union. Consequently it is difficult to say how the crisis impacted the law or vice-versa.

ii. Six Day War (1967)

In the Six Day War, Israel refrained from using the argument of anticipatory self-defence even though there was no Security Council condemnation and the general view was that

37 Franck op. cit. p99
38 S/PV.1022 (1962) para 71
39 Ibid para 29
the force used may well have been lawful given the threat to state survival. This is perhaps indicative of a view that reliance on an argument of anticipatory self-defence is problematic.

iii. Israeli strike on Iraq's Osirak nuclear reactor (1981)

Israel conducted an airstrike on Iraq’s Osirak nuclear reactor in 1981. It was Israel’s position that Iraq would produce nuclear weapons by 1985; the IAEA inspections were able to be circumvented; and Iraq’s rhetoric that the reactor was “intended… against the Zionist enemy” indicated a genuine intention to use nuclear weapons. Iraq on the contrary submitted that its nuclear facility was exclusively for peaceful purposes. Perhaps its rhetoric was regarded as cheap talk by the international community. In any event, the Security Council condemned Israel and rejected its argument that anticipatory force was used in response to an imminent attack.


Another precedent is the 2003 Second Persian Gulf War. However, one should be cautious over its authority as an anticipatory self-defence precedent since the USA’s claim in this respect was subsidiary to a variety of justifications. Additionally, the UK and Australia completely avoided anticipatory self-defence as a legal basis for the invasion, arguing authorisation was granted by prior Resolutions. The Bush Doctrine included the right to pre-emptive war adding “in particular the requirement that a threat be

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42 Nakdimon, S First Strike (New York: Summit, 1987) p156
43 A/36/610 (1981)
44 S/PV.2281 (1981)
46 S/2003/350; S/2003/352
imminent needs to be revisited”. Whilst this is an indication of a move away from the traditional requirements of anticipatory self-defence, the extent to which the doctrine has had an impact on international law is unclear.

D. Evaluation of the doctrine of anticipatory self-defence

i. The problem

The task for international law is to define an optimal normative rule of lawful anticipatory self-defence. There is a strong case for modifying the imminence requirement. The biggest challenge is addressing the factual nature of the nuclear weapon threat. Technological advances mean a nuclear weapon could potentially be launched with a push of a button. Similarly, terrorists hiding within a civilian population could launch an attack at potentially any moment. Therefore it can be argued that any nuclear threat could be imminent. Accordingly, some commentators argue governments have duties to their citizens to confine the principle of non-intervention. And even if a state could anticipate the timing of a future nuclear attack with certainty, what is the precise legal standard? Under the existing law a victim state does not have to wait until a rogue state actually attacks. However the legal requirement of “imminence” is unclear. Where is the line to be drawn? Some commentators including the UK Government argue that the law is not to be construed in strictly temporal terms and that it should instead be understood to include or wholly

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47 National Security Strategy of the United States of America (2002) 41 ILM 1478
51 Murphy, SM “US adoption of New Doctrine on the Use of Force (2003) American Journal of International Law 203, 204
52 Bowett, DW Self-Defence in International Law (Manchester: Manchester University Press,1958) p185
consist of a probabilistic element. However, to construe “imminence” in purely probabilistic terms, even if desirable, goes against its plain meaning. The exact scope of the imminence requirement is unclear and anticipatory self-defence in general is a controversial issue. The ICJ has avoided making pronouncements on the matter, and there is no provision in the *Definition of Aggression*. There is certainly a need for clarity, and modification is therefore desirable.

Conversely there are a plethora of arguments against modifying the imminence requirement. The law should not grant a free reign to states that perceive a danger from other states. The purpose of the UN is to maintain international peace and security and to this end the Security Council can multilaterally authorise force under Article 42. This argument is rejected on the basis of failures of the collective decision process of the Security Council as a result of strategic voting motivated by political considerations. Permanent Members’ veto rights render the Security Council largely limited in authorising use of force under Article 42. It has only done so for the Korean War and the First Persian Gulf War. Another argument against modifying the imminence requirement for anticipatory self-defence is that relaxation of the rule undermines the norm of non-intervention as enshrined in the UN Charter. At the extreme, this might lead to “*innumerable and fruitless wars*”. However it is contended that Article 51 of the UN Charter does not alter the pre-existing customary international law with respect to a

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55 “*If we live in a barren desert today when it comes to the rules governing pre-emption and prevention*”: Dershowitz, AM *Pre-emption: A Knife that Cuts Both Ways* (New York, 2006) p250
57 UN Charter Article 1(1)
58 S/RES/84 (1950)
59 S/RES/678 (1990)
60 Evans, G *When is it Right to Fight* (2004) 46(3) Survival 66
state’s inherent right to self-defence.\textsuperscript{62} Thus it is not the intention of the Charter to be so restrictive.

\textbf{ii. Towards an economic approach}

It is submitted that most legal and ethical arguments considered above do not strike at the heart of the matter. Evolution of the positive international law relating to self-defence has been overly formalistic, with too much emphasis placed on the outdated purposes of the UN Charter. It should be remembered that the Charter was written in response to the Second World War. Whilst not proposing a complete overhaul of the UN Charter and international law, it is argued the Charter should be interpreted in a context which reflects modern realities of potential nuclear threats from rogue states. Therefore not only are there strong arguments for modifying the imminence requirement, there is a compelling case in light of the modern nuclear threat from rogue states for scrapping it completely.

It is proposed that the normative goal of the UN Charter from a Law and Economics perspective is to minimise costs of conflict. This is in contrast to the purely legal normative goal, that of maintaining international peace and security. In view of the aim to minimise the costs of conflict, preventive war is justified if the costs of waiting are high. This argument is not new. Indeed the principle was expressed by Hugo Grotius as a moral argument under the \textit{Just War} doctrine.\textsuperscript{63} If an attack is inevitable, the overall costs of conflict may be reduced if the victim state pre-emptively attacks sooner rather than later. In the case of an inevitable nuclear attack - either directly or through terrorist sponsorship - by a rogue state, it seems likely that the total costs of conflict will

\textsuperscript{62} Bowett, op. cit.
\textsuperscript{63} \textit{De Jure Belli ac Pacis Libri Tres} (Amsterdam, 2\textsuperscript{nd} ed. 1631)
be reduced if the victim state can pre-emptively destroy the nuclear facilities with precision weaponry and relatively low collateral damage.

Since in practice it is unlikely that a nuclear attack can be measured with 100 percent certainty, what needs to be considered is the probability of attack. It has been pointed out that the imminence test does not distinguish between a 25 or 85 percent probability of attack.\textsuperscript{64} A probabilistic test of anticipatory self-defence has fetched support.\textsuperscript{65} According to probability theory, the expected value of an outcome is given by the probability of the event occurring multiplied by the magnitude. Thus the expected cost of nuclear attack can be calculated by knowing both the probability and magnitude of harm from nuclear attack. Therefore the magnitude of harm is relevant to consider. This is likely to be high in the event of a nuclear attack because of the destructive potential of such weapons.\textsuperscript{66} The imminence requirement, however, falls short owing to the fact it says nothing about probability or magnitude of harm. Probability and magnitude of nuclear attack are crucial considerations but the imminence test does not reflect either.

Hence the foundation of an economic test of anticipatory self-defence with respect to rogue states is to consider the expected costs of nuclear aggression. Yoo suggests a cost-benefit analysis test along these lines, arguing when the threat is growing it is beneficial to pre-emptively attack early using less force with lower collateral damage than would otherwise be used in response to an aggressive attack that actually occurred some time in the future.\textsuperscript{67} Whilst this is likely to increase type I errors (i.e. false positives whereby rogue states are incorrectly identified as aggressors) it reduces type II errors (i.e.

\textsuperscript{64} Yoo, J “Using Force” (2004) 71(3) The University of Chicago Law Review 729, 752-753
\textsuperscript{65} See Lublan op. cit.
\textsuperscript{67} Yoo, op. cit. 757
false negatives whereby rogue states are wrongly identified as being non-aggressors).\textsuperscript{68}

Yoo argues this is beneficial: type I errors are likely to be less costly than type II because it is assumed that overall costs are likely to lower the earlier a war is fought.

\textsuperscript{68} Ibid 759-761
III. EXISTING LAW AND ECONOMICS LITERATURE

In part II it was established that a probabilistic test that takes into account magnitude of harm is desirable for a test of anticipatory self-defence against rogue state nuclear attack from an economic perspective. In this part the model put forward by Posner and Sykes\(^69\) will be presented and assessed. Posner and Sykes’ paper appears to be the only Law and Economics study on self-defence under international law.\(^70\) It will be demonstrated that there are significant shortcomings in their model that need to be addressed.

A. Posner & Sykes Model

Posner and Sykes assert a social value model of the timing of pre-emptive use of force against a threat of rogue state aggression. It is presupposed that rogue states are readily identifiable, and that a subset of such states are aggressive.\(^71\) Furthermore, it is assumed that deterrence is ineffective.\(^72\)

A two-period model is used, assuming that any existence of a threat becomes apparent in the second period. The existence of a threat is dependent on whether the state is an aggressive type or not. Thus the state will reveal whether is it is aggressive or not in the second period. The victim state is characterised as “home” and the rogue state as “foreign”. There is a probability of attack \(p\) which includes any “aggressive


\(^{70}\) p3

\(^{71}\) p5

\(^{72}\) p10
strategy... such as the development of nuclear weapons”. There is a discount factor $\delta$ shared by both nations. There are two types of cost: the cost of pre-emptive self-defence in period one is $K$ and the cost of aggressive attack in period two is $Y$. The cost of conflict in both periods is divided again into two groupings. The cost of pre-emptive attack in period one to home is $K_h$ and to foreign is $K_f$. The cost of attack in period two to home is $Y_h$ and to foreign is $Y_f$.

If foreign does not attack in period two, the costs are zero. If, however, foreign does attack, $Y_f$ will be large because of the costs of damage received as well as the costs of any retaliatory or appeasement measures taken. $Y_f$ is taken to exclude the benefits to foreign of attack. The framework is similar to the economic analysis of criminal law which considers criminal acts as socially undesirable. Therefore gains from aggression are excluded from the social calculus because they are treated as socially undesirable. Thus $Y_f$ should be considered as collateral damage. The expression for socially justifiable pre-emptive self-defence is given by:

$$K_h + K_f < \delta p(Y_h + Y_f)$$

This expression says that where the total social costs of pre-emptive self-defence ($K_h + K_f$) is less than the total discounted costs of the probability of attack in period two ($\delta p(Y_h + Y_f)$), pre-emptive use of force is desirable. Therefore pre-emptive use of force becomes less desirable the higher the discount factor $\delta$ is. It is more attractive the higher the probability of attack in period two $p$ is, and the higher the total costs of conflict in period two ($Y_h + Y_f$) are.

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73 p10
74 p5
Posner and Sykes conclude that pre-emptive war is desirable from an economic perspective “when the costs of waiting for both states [are] high enough”.\textsuperscript{75} It follows that a state should be permitted to use force in self-defence even when the threat is not imminent.\textsuperscript{76}

**B. Evaluation of Posner & Sykes Model**

Posner and Sykes’ model is a useful step towards attaining a satisfactory test of anticipatory self-defence. Its tentative conclusions that imminence should not be a strict requirement and anticipatory self-defence is desirable when the costs of waiting are too high are supported by the literature and self-evidently by an economic approach.

However, when considering the adequacy of the model as a normative test for assessing the timing of anticipatory self-defence against rogue state nuclear attack there are a number of shortcomings. Firstly it is presumed that “rogue states” can be identified. However, what constitutes a rogue state? Some elaboration would be useful. Secondly how can a state determine the probability of attack (the value of $p$)? This is a crucial parameter, since if $p$ is small this might lead to the conclusion that pre-emptive use of force is not desirable compared to situations where, ceteris paribus, $p$ is large. These issues are addressed in part IV.

Thirdly, despite taking into account two or three periods, it is still rather a static model that does not explicitly and clearly reflect the pattern of a growing nuclear threat. To add precision it would be helpful to formulate the relationship between the variables $K$ and $Y$. Moreover, the Posner and Sykes model says nothing about which specific

\textsuperscript{75} p25
\textsuperscript{76} p25
point in time is optimal for pre-emptive self-defence. This is dealt with in the formal model presented in part V.

Fourthly when does “period two” occur? Period two is defined as the time when a rogue state reveals itself as an aggressive or non-aggressive type. A theoretical interpretation of this is certainly needed. However it is not convincing that a victim state could ever be sure a rogue state would reveal its type *ex ante* to aggression. The concern is that the only way a rogue state would reveal its type is by actually committing nuclear aggression (by which time the matter of *anticipatory* self-defence does not apply). Given these problems, this approach is therefore rejected.

Fifthly the framework is criticised because it assumes fixed choices; that is to say there is no room for strategic, non-military interventions that alter decisions. It is suggested that a comprehensive normative framework test of optimal anticipatory self-defence has to take into consideration strategic interventions that may avert more costly conflict. This matter is tackled in part VI.

Sixthly, Posner and Sykes attribute the expression “attack” to mean any aggressive behaviour and include mere acquisition of nuclear weapons in this definition. However, one cannot *necessarily* infer aggressive intention from mere possession. Of course one *may* be able to infer intention from possession on the facts of a particular case, but one cannot conclude with any definite certainty that, as a general rule, possession correlates with intention to use aggressively.\(^7\)

\(^7\) This matter is explored in part IV. One explanation is that states may simply want nuclear weapons for the purposes of lawful self-defence.
IV. RATIONALISING NUCLEAR AGGRESSION: A PUBLIC CHOICE PERSPECTIVE

This part suggests a positivist framework for assessing incentives governments\textsuperscript{78} have for advocating an aggressive nuclear weapons policy. This is achieved by using the public choice tool of Law and Economics. It is important because identifying rogue states with a possible intention to use nuclear weapons aggressively (and therefore by implication unlawfully) is necessary for the model proposed in part V. Probability of nuclear attack is defined as a function of intention, and therefore for a model of optimal anticipatory self-defence against nuclear attack to be applicable, genuine intention to use such weapons must be measured.

A. Limitations of International Relations Theory

According to Von Clausewitz, war is an extension of politics.\textsuperscript{79} Consequently, explaining war as an outcome of international politics is traditionally dealt with in the field of international relations theory. Therefore when seeking explanation for states’ nuclear weapon ambitions it seems international relations theory should be consulted. Indeed there is case for arguing international relations can make a strong contribution to an economic analysis of international law regarding anticipatory self-defence against nuclear attack since it shares the realist and positivist paradigms as well as the rational choice assumptions embraced by Law and Economics. However, international relations is limited because of its overly state-centric assumptions. Neo-realism, the dominant

\textsuperscript{78} The expressions "government" and "politician" are used to denote both dictator and democratic types.

school of thought, explains international outcomes as a product of *interstate* interactions.\(^{80}\)

Thus the weakness of international relations theory is that it has abandoned classical liberalism at the *intra*state level which is able to explain underlying state preferences.\(^ {81}\) Indeed, the outcome of international politics can be regarded as a result of a two-stage process: firstly “state-society relations” which define a state's preferences; and secondly strategic interaction at the international level.\(^ {82}\) Public choice theory deals with the first step by explaining the interaction between rational, utility maximising politicians and state citizens. The second step, interaction between states, is addressed in part VI.

### B. Definition of a rogue state

The concept of a rogue state is a central feature of this paper and consequently needs defining. There are dangers of using the term “rogue state” given its potentially distorting rhetorical uses. According to the previous US National Security Strategy, rogue states,

> “Brutalize their own people and squander their natural resources for the personal gain of the rulers; display no regard for international law…; are determined to acquire weapons of mass destruction; sponsor terrorism around the globe; and reject basic human values…”\(^ {83}\)

The definition for the purposes herein is less dogmatic. The position taken is that a rogue state bears the four characteristics of: (1) significant disregard for international law;

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\(^{82}\) Moravcsik op. cite. 44-45

\(^{83}\) NSSUSA 2002
(2) little safeguarding of fundamental human rights; (3) a determination to acquire nuclear weapons; and (4) a reasonable possibility for sponsorship of international terrorists. Furthermore, a fifth characteristic of a rogue state maybe a dictatorship whose leader squanders resources for personal gain, but this is not to be treated as a necessary condition.

A key point is that a rogue state whilst desiring possession of nuclear weapons does not necessarily desire to use or threaten use of nuclear weapons aggressively. It might be that a rogue state aspires to acquire nuclear weapons for the purposes of signalling their use in self-defence to deter potential attackers in the same way as other nuclear weapon-armed states do. Another reason is that possession of nuclear weapons might be desirable for domestic purposes in a similar way to South Africa which intended its nuclear weapons programme to maintain apartheid. Therefore a rogue state is not to be understood as one that inevitably wishes to use nuclear weapons aggressively, but one that may or may not. To suggest that a rogue state necessarily intends its nuclear weapons programme for aggressive purposes either directly or through terrorist groups would lead to a tautological conclusion that self-defence should be used against all rogue states without question – since in all cases would self-defence (subject to legal limits) be legally permissible.

C. Public choice approach

The issue is to consider why a rogue state might have the intention for nuclear aggression. Understanding the sources of nuclear aggression is a descriptive and positivist process and is crucial for deriving the probability of attack element in the

84 Spector op. cit.
proposed economic model of anticipatory self-defence. It is submitted that public choice theory is a powerful and relevant tool for analysing nuclear weapon decisions at intrastate level.

i. Rogue democracies

From an economic perspective, one of the roles of central government is to provide public goods to its citizens. Military assets are classic examples of public goods, given their characteristics of non-rivalrousness and non-excludability. Hence nuclear weapons and associated policy is interpreted as a public good. If one conceptualises the government-citizen relationship as a principal-agent one, the question arises what are the incentives acting on a rogue state government when providing nuclear weapons for its citizens?

Public choice theory assumes that politicians are motivated by self-interest. It is assumed for present purposes that politicians are rational utility maximisers and have a combination of narrow self-interest and ideological incentives. Narrow self-interest incentives include power, income and prestige through re-election. Ideological incentives might include such things as duty to protect the nation; duty to enhance the nation’s standing within the world order; religious or pseudo-religious beliefs; desire to regain lost territory; or desire to uphold international law.

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86 Olson recognised that ideology does play some role: Olson, M The Logic of Collective Action: Public Goods and the Theory of Groups (Massachusetts: Harvard University Press, 1965) p162

87 One criticism might be application of the rational choice assumption. The argument that rogue state governments are irrational is rejected in Part VI. Essentially, rogue states may have an incentive to appear irrational.
Public choice theory of legislation says that government maximises utility by adapting its programme to suit citizen preferences in order to maximise votes.\(^{88}\) It is assumed this adaptation is confined to the extent which ideological motivation impacts the utility function. Therefore policy is to a degree a product of voter preferences and can thus be predicted to some extent by voter preferences.\(^{89}\) In terms of a policy on war, a democratic rational utility maximising government will foresee war has having a positive or negative affect on voters, and will adapt policy accordingly. Empirical studies provide evidence of the proposition that engaging in war can be the preferences of voters. There is wide-ranging support for the suggestion that the military response initiated by British Prime Minister Mrs Thatcher to the Argentine capture of the Falkland Islands is attributable to a boost in electoral success.\(^{90}\) In the USA, it has been found that in general presidents are more likely to use force if seeking re-election.\(^{91}\) However in circumstances where war is costly (in comparison to any benefits) for citizens, as pointed out by Kant, there will be reluctance to start one.\(^{92}\) It is posited that in a democracy, where citizens perceive that the costs outweigh the benefits of entering a war, they will not support such a policy. In this case, utility maximising governments may not wish to commit to war in situations where such an action would contravene citizen preferences for no war, since this might otherwise lead dissatisfied citizens to shift their votes, which in turn could mean foregoing the benefits of income, power and prestige associated with office.


Applying this line of thought to nuclear weapons and democratic rogue states, a policy of possessing or using nuclear weapons aggressively is chiefly dependent on citizen preferences, depending also on the weighting of ideology in the government’s utility function. Whilst citizens may be in favour of possessing nuclear weapons,\(^93\) it is likely that citizen preferences are collectively against nuclear aggression since the consequences are likely to be foreseeably adverse. Citizens may feel vulnerable to the victim state’s potential military response.

Public choice theory also emphasises the role of special interest groups. Owing to free-rider problems pertaining to large collective action, the supply of legislation favours smaller, more co-ordinated interest groups that organise at relatively lower cost.\(^94\) Assuming the anti-war lobby is more effective than the pro-war lobby, this further explains why democracies are likely to oppose use of nuclear weapons.

**ii. Rogue dictatorships**

Most public choice literature assumes democracy is the prevailing political structure. However, account needs to be taken of dictatorships since rogue states may fit this category. In the absence of elections there is no direct link between citizen preferences and a dictator’s utility. In other words, a dictator’s utility is insulated from its citizens’ preferences because they are not actual or potential voters. Furthermore a dictator uses political repression to stifle criticism, therefore not knowing how much support he has.\(^95\) Thus a dictator retains office regardless of the popularity of his policies with the population. Dictatorship type is important consider. There are two classifications:

totalitarian and tin-pot. Totalitarian dictatorships involve massive intervention into the lives of citizens and significant repression. Their utility functions are likely to consist largely of ideological motivations and therefore are relatively insensitive to the preferences of citizens. On the other hand tin-pot dictators are repressive only to the extent necessary to maintain office and procure its associated benefits such as palaces and Mercedes-Benzes. Therefore their level of repression is lower than totalitarian dictators, and they will implicitly reflect citizen preferences to a larger extent.

Dictatorship, therefore, may imply that a government can get the benefits from war without internalising much of its cost. Accordingly, a rogue state dictator may not face significant constraints from nuclear aggression. This is particularly so for a rogue totalitarian dictator, whose incentive to engage in nuclear aggression maybe more pronounced given the weighting of ideology in his utility function.

### iii. Comparing democracies and dictatorships

As has been shown, there are different incentive effects on democratic and dictatorial leaders. Defeat in war is more costly for democratic leaders than dictators. This is because defeat is costly to society and thus voters will depose a democratic leader who initiates defeat. Even if war does not lead to defeat, democratic governments’ utility may be more sensitive to civilian and military casualties, since citizen preferences may be strongly opposed to these. Therefore antagonistic democracies are far more likely to

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96 Kirkpatrick, J *Dictatorship and Double Standards: Rationalism and Realism in Politics* (New York: Simon and Schuster, 1982)


98 Fearon, JD “Rationalist Explanations for War” (1995) 49(3) International Organisation 375, 379

negotiate rather than fight. On the other hand, a dictator’s utility (particularly a totalitarian) is less sensitive to citizen welfare. It is interesting to note that the 20th century trend of declining unilateral use of force, especially compared to pre-1945, goes hand-in-hand with the pattern towards increased democratisation. It can therefore be concluded that the potential for nuclear aggression is more pronounced from dictatorships than democracies.

The salience of the democracy-dictatorship distinction is only relevant as far as there is correlation between rogue states actually being a dictatorship. Whilst rogue states may be a dictatorship, it is not necessarily the case. What is important is to firstly identify the nation as a rogue state given the characteristics suggested above, and secondly examine the possible factors affecting the utility function of the government. The main determinants from a public choice perspective are citizen and interest group preferences, as well as the ideology of the government. Ultimately, a rational leader wishes to engage in aggressive nuclear war in situations where the gains more than offset the losses in private utility.

There might be a strong case for arguing that reputational costs may constrain a state’s actions. However, there may be limitations to the reputational approach at intrastate government level. Reputational costs are shared between the government and its citizens. Therefore a government does not fully internalise reputational costs, and consequently there may be a tendency towards under-compliance. Moreover, a

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100 Ibidem
102 This is in similar vein to economic analysis of criminal law whereby aggressive war can be considered a crime.
103 See Guzman, op. cit.; Scott, RE & PB Stephan The Limits of Leviathan: Contract Theory and the Enforcement of International Law (Cambridge: Cambridge University Press, 2006)
104 Brewster, R “The Limits of Reputation on Compliance” (2009) 1(2) International Theory 323, 325
government’s time horizons may be shorter than that of its citizens, resulting in even less incentive to maintain reputation. Reputational constraint certainly does not apply to any significant extent with rogue states since it is assumed a priori they – or more accurately their governments - disregard international law. A preference for disregard can be explained on the basis that perhaps for ideological reasons (e.g. rejection of Western values) compliance with international law confers disutility on rogue state governments.

iv. Failure of deterrence

The underlying preference for nuclear aggression may be operating within a general problem of international law: that of lack of enforcement. There is no central authority to enforce unlawful behaviour in international law. One implication is that a potential perpetrator of the crime of aggression cannot necessarily be effectively deterred. This is in contrast to domestic systems under which it is implied in the Law and Economics literature the state does have superior authority necessary to impose optimal sanctions for deterrence. Thus there is a general problem of lack of enforcement which fails to deter aggressors.

v. Public choice: a summary

Contrary to the arguments of many, aggressive nuclear weapon ambition is not the product of irrationality. Quite the opposite: nuclear aggression is a rational response to

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105 Ibid 326
106 The international system is in a “state of anarchy” in international relations parlance.
107 A crime under Rome Statute of the International Criminal Court Article 5
the incentives and lack of incentives operating on rogue state governments. Ultimately the underlying intention to use nuclear weapons is derived from a rogue state government’s utility function. As has been shown, the actual utility a rogue state government gets from using nuclear weapons depends on the weighting and content of government ideology, the structure of government (democratic, or tin-pot or totalitarian dictatorship), citizen preferences and the role of interest groups. Intention, in turn, determines the probability of using nuclear weapons. Probability of using nuclear weapons is a crucial component of the model of anticipatory self-defence considered in part V.

D. Application of the theory

i. Iran

Iran, it is contended, fits the four characteristics of a rogue state listed in part IV.B. When seeking a rationale for possession of nuclear weapons it should be recognised that they may have inherent value in that possession of nuclear weapons symbolises rejection of Western ideals and is a reaction to historical subjugation to the West.\(^{109}\) When assessing the central issue of intention to use nuclear weapons it should be noted that there is tension between Iran as an ordinary sovereign state and as a revolutionary Islamic state.\(^{110}\) This tension is interpreted as transcending to the domestic level; thus there are dualistic citizen preferences. Hence the utility function of its government which consists of narrow self-interest and ideological goals means a utility maximiser has to reconcile the conflict between delivering policy to meet the expectations of both

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\(^{109}\) Moshirzadeh op. cite.

moderates on one hand and revolutionary, anti-Zionist elements on the other whilst addressing its own ideological motivations. Given trepidation over irregularities during the 2009 presidential election,\(^\text{111}\) it seems the Iranian government may be less sensitive to the preferences of its citizens and instead put more weighting on ideological concerns. If ideological utility is satisfied by using nuclear weapons then this can be translated as an intention to use them subject to constraints of narrow self-interest which might be expected to be negatively affected in the face of potential retaliatory measures.

V. THEORETICAL MODEL OF OPTIMAL TIMING OF ANTICIPATORY SELF-DEFENCE

In this part, an original theoretical model of the optimal timing of anticipatory self-defence is proposed. This is a novel approach.

A. Foundations of the Model

The normative goal of use of force law from an economic perspective should be to minimise the total costs of armed conflict. In particular the goal of anticipatory self-defence rules with respect to rogue state nuclear attack is to minimise the total social costs of war. The aim, therefore, is to formulate a rule which keeps the costs of conflict to a minimum.

It is implicitly assumed that the criterion for optimality is based on the total expected utility principle. In other words it is assumed the decision-making strategy of the victim state is not maximin (which aims to maximise the minimum payoff). It is assumed that the normative goal is wealth maximisation. Risk-neutrality is implicitly assumed, which means there is constant marginal utility of wealth and therefore by definition the marginal utility of wealth is not diminishing. Since the utility derived from wealth is equal to the degree of the wealth ($U(w) = w$), this means the normative economic goal of wealth maximisation equates to utility maximisation.

Costs to both the victim state and rogue state are taken into account in order to reflect the total social costs. Additionally it is assumed that a victim state is a democracy – hence citizen preferences are reflected in the decisions made by their governments. It is also assumed that a victim state internalises the social costs of its activities. In contrast to a rogue state, a victim state plays an affirmative role in the international community.
Therefore any cost imposed on the victim state will be internalised by way of international censure and reputational damage.

i. Expected costs of nuclear aggression

One cost to be taken into account is the expected cost of nuclear aggression. As propounded in part IV, the victim state can derive the rogue state’s intention to use nuclear weapons, and this intention engenders the probability of nuclear aggression. Ultimately the assessment is likely to be made under conditions of uncertainty. The victim state knows, ceteris paribus, that the rogue state has two actions: either attack or not attack. It cannot be sure which action the rogue state will take, but can infer a probability of nuclear attack of some particular value. It is assumed for the model that the probability \( p \) is a constant and does not change. Exogenous factors such as revolution or strategic interventions on behalf of other states may change \( p \) but for present purposes this is assumed not to be the case.\(^{112}\)

The other element of expected costs of nuclear aggression is the damage caused. This is expressed as a cost, denoted \( B \). \( B \) consists of two costs: the cost to the victim state of a nuclear attack \( B_v \) and costs to the victim state of any retaliatory measures taken in self-defence to prevent future attacks \( B_r \). Costs to the victim state of a nuclear attack \( B_v \) includes the costs of lives lost, damage to buildings and infrastructure, environmental harm, etc. Additionally \( B_v \) includes costs to the victim state of any retaliatory measures taken in self-defence to prevent future attack. Costs to the rogue state of aggressive nuclear attack \( B_r \) consist of retaliatory measures taken by the victim state. Thus \( B = B_v + B_r \). \( B \) is itself dependent on three factors. The first factor is the rate of growth of the

\(^{112}\) Strategic interventions are dealt with in part VI.
damage $g$. It is assumed that the cost of damage from nuclear aggression increases throughout time because of developments in missile delivery systems and higher yield warheads or explosive devices. The second factor that affects $B$ is a discount rate $r$. It is assumed that the victim state discounts the costs of future nuclear aggression i.e. €1 of nuclear damage is preferred in the future rather than now. Moreover, it is assumed that the growth rate of damage is larger than the discount rate ($g > r$) such that a nuclear attack is preferred now rather than in the future. Thus the third factor that $B$ is dependent on is time $t$. As $t$ increases so does $B$. The cost of nuclear attack $B$ can therefore be expressed as a function of the growth rate $g$, the discount rate $r$ and time $t$. Therefore $B(g,r,t)$. Hence, the expected cost of nuclear aggression is expressed as:

$$ pB(g,r,t) \quad \text{where } p, g \text{ and } r \text{ are constants; and } g > r. $$

In graphical form, the expected costs of nuclear aggression are:

Graph 1: Cost of nuclear aggression plotted against time
Graph 1 shows the relationship between time and the expected costs of nuclear aggression. As time progresses, the costs of nuclear aggression grows. In the period $t < t_n$, the expected cost is relatively low because the rogue state’s nuclear technology is unsophisticated and the discount rate keeps the future costs low. This reflects the situation when some low yield devices (“dirty bombs”) can be detonated, and the inventory of weapons-grade nuclear substance is low. In the period $t > t_n$, the expected costs of rogue state nuclear aggression rise quickly. This reflects the situation when warheads have become more powerful and have a higher yield; there are larger amounts of weapons grade nuclear material and warheads; nuclear facilities have advanced with technology; and the corresponding costs of victim state retaliation have risen accordingly. It can be assumed that rogue states or terrorist agents aim for the highest value damage targets (e.g. city centres) and therefore as delivery systems become more accurate throughout time, the expected damage increases. As the expected costs of damage accelerate, the (constant) discount rate plays a proportionately less significant role. Graph 1 reflects the situation where the relationship between $B$ and $t$ is exponential i.e. the growth in nuclear threat is exponential.\footnote{That a nuclear threat increases exponentially is a reasonable assumption to make: United Nations Office for Disarmament Affairs, “Third Session of the Preparatory Committee for the 2010 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons: General Debate Statement” (2009) available online at: <http://www.un.org/disarmament/WMD/Nuclear/NPT2010Prepcom/PrepCom2009/statements/2009/05May2009/05May2009AMSpeaker-14-Austria.pdf> (accessed 9 August 2009) p3}

It was explained in part IV how $p$ is obtained. The costs of nuclear aggression $B$ can be obtained through a number of methods. Announcements by the rogue state, IAEA inspections, intelligence estimates and other means such as seismological detection of underground nuclear explosions might be useful in calculating $B$. These sources might also be useful in calculating or observing the growth rate $g$ and its
relationship to \( B \). The discount rate \( r \) can be obtained by following pre-existing government guidelines on discounting.\(^{114}\) Hence the precise shape of the expected nuclear aggression cost curve may differ from the one illustrated in Graph 1. This is dependant on the values of, and relationship between, the variables.

**ii. Costs of anticipatory self-defence**

The expected costs of nuclear aggression are not the only costs to be taken into account. The costs of anticipatory self-defence should also be considered. These costs are taken to be those associated with the method that inflicts the least costs whilst being effective at eliminating the nuclear threat. For example, if either an aerial bombing campaign or a ground invasion removes a rogue state’s nuclear weapon capability but the former achieves this at the lower cost, the costs of the former are relevant since a rational state will opt for the method which entails the lowest costs.

The costs of anticipatory self-defence \( A \) are divided into two components: costs to the victim state \( A_C \) and costs to the rogue state \( A_R \). Thus \( A = A_C + A_R \). Costs to the victim state \( A_C \) include domestic political costs, external reputational costs (in the form of both opportunity costs of failing to exhaust non-military means to resolve the situation and costs of any failure to internalise the costs to the rogue state) and costs of military casualties and losses associated with anticipatory self-defence. Reputational costs, in turn are made up of two components: firstly the opportunity cost of failing to attempt a peaceful resolution; and secondly costs to the rogue state \( A_R \) which essentially consist of incidental damage, excessive loss of military personnel, and loss of nuclear infrastructure dedicated to peaceful, civil purposes. If a nuclear facility is dual-purpose...

\(^{114}\) E.g. see the US Office of Management and Budget, Circular Number A-94; available online at: <http://www.whitehouse.gov/omb/rewrite/circulars/a094/a094.html#8> (accessed 30 July 2009)
in that it serves a role of providing civilian power in addition to its role of manufacturing nuclear weapons, the cost calculation should include the cost of losing lawful civilian nuclear capability but exclude the cost of losing nuclear weapons. Aggressive use of nuclear weapons is socially undesirable – there is no benefit to society which mitigates its costs. This is in similar vein to economic analysis of criminal law, which assumes criminal acts are socially undesirable and therefore gains from such acts are excluded.

The costs of anticipatory self-defence $A$ are itself dependent on two factors. Firstly, it is subject to a discount rate $r$. The further action is taken into the future, the more the discount rate $r$ impacts $A$. Ceteris paribus from a social point of view, owing to $r$, anticipatory self-defence in the future is preferred to action now, since it is less costly in the future. Consequently, $A$ is also dependant on time $t$. Hence the cost of anticipatory self-defence is expressed as:

$$A(r,t) \quad \text{where } r \text{ is constant.}$$

In graphical form the costs of anticipatory self-defence is represented as:

Graph 2: Cost of anticipatory self-defence plotted against time
Graph 2 demonstrates the relationship between time and the costs of anticipatory self-defence. It is assumed that as time increases, the cost of anticipatory self-defence decreases. Costs for the victim state $A_v$ are likely to fall overtime. Attacking too prematurely with respect to the relatively small early threat may be deemed unacceptable by domestic citizens and foreign governments, especially if there is a belief that non-military means such as diplomacy or economic sanctions might succeed in eliminating the threat of nuclear aggression. Thus domestic political and external reputational costs suffered by the victim state are correlated to the opportunity costs of not attempting to find peaceful solutions. However political and reputational costs will fall as the threat increases and it becomes more apparent that non-military means are failing. The international community may increasingly recognise the acceptability of a pre-emptive strike against the rogue state. As time increases, the growing intelligence picture is more likely to give accurate estimates of a rogue state’s defence capabilities, which therefore allows better planning to reduce own military casualties. The discount rate $r$ also implies that future costs of anticipatory self-defence are falling relative to today. Therefore $r$ is another cause of falling costs of anticipatory self-defence. The costs for the rogue state $A_r$ fall for the similar reasons. The increasing accuracy of missiles and other weapons, as well as growing intelligence which pinpoints the exact locations of nuclear weapons facilities reduces civilian casualties.

Thus $A(r,t)$ is likely to be reducing over time. However, it might be that an increasing stockpile of nuclear weapons destroyed by anticipatory self-defence causes significant incidental damage which in turn causes $A(r,t)$ to rise. Thus there might be a tail rising upwards on the $A(r,t)$ function, but it is assumed that it will generally be downwards sloping.
B. Optimal timing of anticipatory self-defence

As was established by Posner and Sykes, anticipatory self-defence is efficient from an economic perspective where the costs are lower than the discounted costs of probability of attack. The question remains when is the optimal timing of use of force in anticipatory self-defence?

Optimal timing of anticipatory self-defence is obtained by comparing the costs of anticipatory self-defence and the expected costs of nuclear aggression. This is intuitively meaningful because when seeking a rule of optimal anticipatory self-defence, the cost of action taken in self-defence cannot be considered alone. There has to be some reference to the degree of threat. In other words, anticipatory self-defence and the underlying threat have to be compared.

Thus it is useful to assemble the two cost functions on one graph:

Graph 3: expected costs of nuclear aggression curve and cost of anticipatory self-defence curve plotted against time
In terms of timing, anticipatory self-defence is optimal at the time at which the costs of conflict are minimised. This point is \( t^* \). If \( t < t^* \) (e.g. \( t_i \)), the costs of anticipatory self-defence are larger than the costs of nuclear attack. Indeed, it is better to risk absorbing the nuclear attack than it is to pre-emptively strike. If \( t > t^* \) (e.g. \( t_j \)) whilst the costs of anticipatory self-defence are continuing to fall the expected costs of nuclear aggression becomes higher than the cost of nuclear aggression. It is no longer socially efficient to wait, since the potential damage caused by nuclear aggression and the response by the victim state will outweigh the costs of anticipatory self-defence.

Consequently, the optimal timing of self-defence against nuclear attack is obtained by finding \( t \) where the \( pB(g,r,t) \) and \( A(r,t) \) functions meet. This is where,

\[
pB(g,r,t) = A(r,t)
\]

Hence, \( t^* \) is obtained by solving this equation for \( t \).

**C. Implications of the Model**

Ceteris paribus, the optimal timing of anticipatory self-defence is at \( t^* \). At this point, the costs of anticipatory self-defence are at their lowest before the expected costs of nuclear attack become relatively higher. After \( t^* \), the costs of waiting become high, so it is best to attack at \( t^* \). Before \( t^* \), political and reputational costs are higher since the threat of nuclear attack is quite small and collateral damage can be reduced through intelligence gathering and the development of more accurate weapon systems. An implication of this is that probability and magnitude of nuclear aggression are vital considerations in a test of optimal anticipatory self-defence because the expected cost of nuclear aggression cannot be determined without these factors. Thus probability and magnitude of harm should certainly be incorporated to the international law regarding anticipatory self-defence against rogue state nuclear aggression.
Crucially, the model says nothing about the imminence of attack. If one defines imminence as the probability of attack being “virtually 100 percent”\textsuperscript{115} which is what is required in the \textit{Caroline} incident, then a threat of nuclear aggression occurring with a probability $p$ of less than 100 percent can never legally justify anticipatory self-defence. However, efficiency in the form of wealth maximisation requires that anticipatory self-defence be launched at time $t^*$, even if $p$ might not be anywhere approaching 100 percent. According to the model, anticipatory self-defence is efficient regardless of whether a nuclear attack is imminent. Therefore one policy conclusion is that the imminence requirement – as understood in temporal terms – should be abolished in an optimal rule of anticipatory self-defence.

The legal standard for anticipatory self-defence should be where the costs of anticipatory self-defence are lower than or equal to the expected costs of nuclear aggression. That is, anticipatory self-defence should be permitted under international law when $t \geq t^*$. A rational, utility maximising victim state that internalises the full social costs will minimise social costs, and since expected costs of nuclear aggression rise significantly after $t^*$, the optimal timing of anticipatory self-defence is at $t^*$. It does not pay to wait since the social costs of nuclear aggression rise above the costs of anticipatory self-defence after $t^*$.

Another important point to note is the relationship between what the model says about the optimal timing of anticipatory self-defence and the current international law requirement of proportionality. In short, the force used in self-defence must be proportional to the threat of armed attack. In terms of the model, the degree of force used is measured as costs to the rogue and victim states of anticipatory self-defence (i.e.

\textsuperscript{115} Yoo, op. cite. 751
as \( A(r,t) \) and the threat of armed attack is measured as the expected costs of nuclear aggression (i.e. as \( pB(g,r,t) \)). Thus, applying the terms used in the model to the existing international law requirement, \( A(r,t) \) must be proportional to \( pB(g,r,t) \) i.e. \( A(r,t) \sim pB(g,r,t) \).

Under the assumptions invoked by the model, the optimal timing of anticipatory self-defence occurs when the costs of anticipatory self-defence equal the expected costs of nuclear aggression. Thus there is support for the proportionality requirement, and consequently there is normative foundation for the proportionality requirement from a Law and Economics perspective. In spite of this, according to the model, the proportionality requirement can be refined as not only requiring that the use of force be proportional but the anticipatory use of force be equal to the expected nuclear aggression. Therefore from an economic perspective, one step further than proportionality is required for optimality: equivalence.

More broadly, the implications for the UN charter need assessing. The normative goal of international law under the UN Charter is to maintain international peace and security. From an economic perspective, this should be revised in favour of requiring that the total costs of conflict be minimised. Can with UN Charter tolerate the policy recommendations as asserted by the model, or is a fresh approach to use of force with respect to rogue states under international law needed? It is suggested that a modified interpretation of the Charter is sufficient. By shifting the interpretation away from the current purposive understanding of the Charter, it is able to reflect the economic approach put forward. Indeed, there is explicit legal basis for an economic approach under the Charter’s preamble, which states use of armed force is to be limited.
except when “in the common interest”\textsuperscript{116}. The phrase “common interest” construed in economic terms might mean a situation where total social costs are minimised. Thus one economic meaning of the Charter’s preamble is that armed force is restricted except where total social costs are minimised. Therefore a radical shake-up of the framework of international law regarding use of force is unnecessary.

**D. Discussion**

**i. Victim state’s private and social costs**

The focus of the model is a normative proposition. The optimal timing of anticipatory self-defence against nuclear attack is at $t^*$. The legal standard for anticipatory self-defence from an economic perspective is at or after $t^*$, but a rational victim state who internalises the total cost of anticipatory self-defence $A$ is induced to perform anticipatory self-defence at $t^*$ itself, since the expected costs of nuclear attack rise after $t^*$. This is assumed in the model, but some further explanation is warranted.

Thus the relevant question is whether or not self-defence until $t^*$ can be restrained. This is a positivist issue. A state will refrain from socially sub-optimal premature anticipatory self-defence if both the private and external costs of anticipatory self-defence are internalised. This condition is fulfilled where the victim state’s calculus includes the costs to itself and the costs to the rogue state i.e. $A = A_x + A_v$ and this is presumed to be the case in the model. Therefore a victim state has an incentive to wait until $t^*$ in order to minimise total social costs. Reputation for complying with international law is a mechanism that may force a victim state to internalise these external (rogue state) costs. One form of reputation has already been described: that of

\textsuperscript{116} UN Charter Preamble
failure to convince the international community that peaceful attempts to dissolve the threat have been exhausted. The argument for the second form is that simply because the legal standard is set at $t^*$, a victim state might suffer reputational cost if it attacks earlier. The legal standard already reflects such costs to the rogue state as collateral damage, therefore breach of this standard implies heavier costs to the rogue state (in terms of civilian casualties, etc) if other states impose reputation costs. The threat of suffering reputational costs in effect substitutes for external costs $A_V$ and thus the external costs are represented as reputational costs to the victim state. One method of making reputational costs tangible is by sanctioning of other states, which involves “imposition of material costs for the purposes of inducing compliance”. Furthermore, ratification of international law by victim states results in additional domestic costs to executives acting contrary to the law. Hence it is realistic to assume that a victim state may take into account the relevant costs of conflict for the rogue state in so far as reputation is an effective mechanism which induces internalisation of these costs. If it is assumed that reputation internalises the exact external cost then the legal standard of $t^*$ is obtained.

**ii. Attitudes to risk**

The model assumes the normative goal is wealth maximisation, which is the same as utility maximisation assuming risk neutrality. However, if the first-best goal of Law and Economics is regarded as utility maximisation and risk attitudes are such that they are

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118 Lipson, C Reliable Partners: How Democracies have made a Separate Peace (Princeton: Princeton University Press, 2005)
119 Therefore one policy conclusion is that the international community should work towards imposing external costs by strengthening the effect of reputational costs on victim states. This involves the staking of reputation to the wider international community, since a wider sanctioning effect is more effective at imposing costs on the victim state: Michihiro, K “Social Norms and Community Enforcement” (1992) 59 Review of Economic Studies 63
not neutral, the optimal timing of attack will differ. It is likely that states are risk-averse when it comes to nuclear threats. In other words, it is likely victim states are prepared to pay a certainty equivalent to overcome uncertainty associated with nuclear aggression from rogue states. Thus for a utility maximising approach, the model needs to incorporate a utility function (beyond that of a risk-neutral utility function). The benefit of including a risk-averse utility function is that it would reflect risk-averse attitudes which are likely to persist.

E. Application of the theory

As an illustration of the theory presented, it will be used to analyse past and current international situations. The application of the theory also demonstrates its validity.

i. Israeli strike on Iraq’s Osirak nuclear reactor (1981)

Graph 4: expected costs of Iraqi nuclear aggression curve and costs of Israeli anticipatory self-defence curve plotted against time
Graph 4 illustrated the situation. It was Israel’s position that Iraq would develop nuclear weapons by 1985. Israel estimated a genuine intention of Iraq using nuclear weapons, thus in terms of the model $p$ is high. Anticipatory self-defence occurred in 1981. Approaching 1985 the amount of nuclear material would begin to pose some danger to Israel given the magnitude of harm from a nuclear dirty bombs and the high probability of attack. The socially optimal timing of self-defence is shortly before 1985, at the point when the expected costs of nuclear aggression equals the costs of anticipatory self-defence.

Why was the Israeli strike before the socially optimal timing? This is likely because their private, not the social, optimal timing for anticipatory self-defence dictated that it was rational to attack in 1981. It is suggested that the strike was premature owing to the fact they did not internalise the external cost (costs to Iraq) of anticipatory self-defence. This could be for two reasons. Firstly, Israel may have failed to predict reputational costs. Secondly, Israel may have known that reputational costs would not be effective: whilst the international community condemned Israel’s strike perhaps the condemnation was foreseeably little more than cheap talk involving no material imposition of reputational costs.


Assuming the Second Persian Gulf War was fought on the basis of anticipatory self-defence, coalition governments erroneously believe they were fighting at $t^*$. With a belief that Saddam Hussein could launch weapons of mass destruction within 45 minutes, there was evidently an over-exaggeration of the costs of Iraqi aggression.

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120 E.g. UK Parliamentary debate: Hansard, HC vol 390 col 2 (24 September 2002)
given no such weapons were found. Consequently coalition forces actually engaged in anticipatory self-defence prior to $t^*$ and as such endured reputational costs. Indeed, the USA and UK are largely perceived to have damaged their reputations as a result of the invasion.\(^{121}\)

**iii. Iran**

Intelligence estimates predict Iran may develop nuclear weapons sometime in the not-so-distant future.\(^{122}\) Thus the expected costs of nuclear aggression may soon rise significantly. It also seems that in order to effectively neutralise the nuclear threat during at least the medium run, research and development as well as manufacturing facilities and personnel relating to nuclear, missile and support industries would be targeted by an air bombing campaign.\(^{123}\) It is also alleged that conventional missiles followed by tactical nuclear bunker busters might be used against deep underground targets.\(^{124}\) Therefore the costs of anticipatory self-defence would be high given the incidental damage of these actions. Hence at present the optimal timing of anticipatory self-defence has not been reached. The situation is $t_{\text{present}} < t^*$, and it is not optimal to attack now. However, the situation is moving towards $t^*$ if Iran genuinely intends to develop nuclear weapons.

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122 National Intelligence Estimate


VI. INTERVENTIONS

The model of optimal timing of anticipatory self-defence presented in part V asserts that ceteris paribus the optimal timing of attack is when the costs of anticipatory self-defence equal the expected costs of rogue state nuclear aggression. Thus there is some normative foundation for the proportionality requirement of international law from an economic perspective. However, in all cases, everything else may not remain equal i.e. the ceteris paribus condition may not hold. This is because the rogue state’s probability of attack \( p \) or the costs of nuclear aggression \( B \) may be responsive to strategic interventions by the victim state. The goal of this part is to demonstrate how interventions might defuse the situation and persuade the rogue state to relinquish its aggressive nuclear ambitions. This is successfully fulfilled if the rogue state can be induced to cease development (i.e. possession) of nuclear weapons.

A. Sanctions and embargoes

A crude means of altering the rogue state government’s payoff is by way of sanctions and embargoes. A rogue government which opts to develop nuclear weapons has an implicit demand schedule for them. This demand is met by its nuclear industry’s supply. If the victim state can accomplish effective embargos upon the rogue state by preventing necessary nuclear materials and hardware from entering their territory, this will have the effect of dramatically increasing the nuclear industry’s input costs for supplying nuclear weapons (e.g. it has to substitute for new alternative technologies which may take decades to complete). The supply curve will shift to the left, above and beyond the demand function, meaning the quantity of nuclear weapons supplied in the medium-run
will be zero since the amount of money needed to produce the nuclear weapons is beyond the means of the rogue state.

Effective sanctions and embargoes will lead the payoffs to the rogue state of perusing nuclear weapons development being prohibitively negative. Therefore ceasing nuclear weapons production will be unavoidable. However this depends on sanctions actually being effective. The effectiveness of sanctions will be compromised if the rogue state possesses the necessary domestic resources instead of relying on imports. The sanctions therefore might be aimed at alternative industries, but in this case the government may not internalise the full burden of the sanctions. This is particularly the case if the state is a dictatorship, since the dictator has little incentive to sacrifice his own utility in favour of his citizens. Moreover, economic sanctions are less likely to be effective if a large
number of states are required to enforce them. This is because there are coordination costs and control problems with large numbers.\textsuperscript{125}

\section*{B. Game theoretic construction}

A key point to realise is the interdependence of state interactions at the international level. Thus strategic reasoning is relevant. In turn, game theory is useful because it is a normative and descriptive theory of rational decision-making in situations of interdependent decisions where choices of both or all players determine the outcome.\textsuperscript{126}

\subsection*{i. Defining the game}

Fundamental to international law is the principle of sovereign equality;\textsuperscript{127} meaning international law is between, rather than above, states.\textsuperscript{128} Therefore there is a lack of central authority and, subject to reputation, an inability to bind agreements. As such, the game is treated as non-cooperative. It is assumed that it is a one-shot game that occurs during \( t < t^* \) according to the model. That is, there is one round of play which occurs before the time at which it is optimal to engage in anticipatory self-defence. Thus the decision to engage in anticipatory self-defence might be taken outside the game – in which case the decision ensues after the conclusion of the game. However, if the outcome of the game is itself anticipatory self-defence, this prevents the same event reoccurring after the game.

\begin{itemize}
\item \textsuperscript{126} Schelling, T \textit{Choice and Consequence} (Cambridge, MA: Harvard University Press, 1984) p213
\item \textsuperscript{127} UN Charter Article 2(1)
\end{itemize}
The players of the game are the governments of the victim state and rogue state. The victim state has two actions: either to “concede” (cooperate) or “disallow the nuclear threat” (defect). The former action essentially means to do nothing during the game (though not necessarily after the game). The latter implies engagement in an active policy of seeking a cessation of nuclear weapons development which ultimately means preparedness to use any means necessary to stop possession of nuclear weapons. The rogue state also has two actions: either to “cease nuclear weapons programme” (cooperate) or “develop nuclear weapons” (defect). The former action is defined as not only stopping its nuclear weapons programme, but actively disarming and subjecting itself to full cooperation with IAEA weapons inspectors so they can verify with confidence cessation of a weapons programme. The latter action means to continue to develop nuclear weapons, thereby posing an expected cost of nuclear aggression on the victim state. It is to be noted the players have complete information – since both players know all the possible payoffs. However, there is imperfect information since the moves are taken simultaneously and neither player knows with certainty what moves the opponent will take.

**ii. Baseline game payoffs**

The payoffs for the baseline game need assessing. Since the game is being played before the optimal timing of anticipatory self-defence \( t^* \), by definition the expected costs of nuclear aggression (\( pB(g,r,t) \)) are less than the costs of anticipatory self-defence (\( A(r,t) \)). Thus the worst possible outcome is pre-emptive war, and accordingly payoffs to both players are the worst. Assume the quantity of the payoff is -€10billion each, that is (-10,-10). The victim state government, accountable to its people and susceptible to
reputational costs and harm to its military suffers the costs of (premature) anticipatory self-defence. A rogue state government suffers equally because it loses its nuclear weapons capability and suffers a military defeat at the hands of an enemy. This is the situation where there is mutual defection (DD).

A second possible outcome is where there is no anticipatory self-defence, but an expected cost of nuclear aggression (including retaliation). In this situation, the victim state government bears a negative payoff, but because the nuclear programme is in its early days, the expected costs of nuclear aggression are lower than the costs of self-defence. On the other hand, from the point of view of the rogue state government it gains a positive payoff since they are fulfilling their goals of possessing nuclear weapons. Accordingly of argument assume the payoffs are (-5, 2) respectively. This is the situation where the rogue state unilaterally defects (CD).

A third possible outcome is that the rogue state ceases its nuclear weapon programme with the victim state’s policy of disallowing the nuclear threat. In this situation, the rogue state is forced to back down, and thus suffers humiliation at the hands of its adversary. On the other hand, the victim state government gets a positive payoff in the form of a propaganda victory. Assume the payoffs to the victim and rogue state are (2,-5) respectively. This is the situation where the rogue state unilaterally cooperates (DC).

A fourth possible outcome is a compromise: an arrangement where both sides give concessions, which has a higher payoff than war and humiliation but a lower payoff than victory. Payoffs of (0,0) fit this situation.

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129 This payoff is not counted in the Part V Model since the benefit of nuclear aggression is socially undesirable
These payoffs are summarised in a normal form game:

<table>
<thead>
<tr>
<th>Victim state government</th>
<th>Concede</th>
<th>Disallow nuclear threat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rogue state government</td>
<td>Cease nuclear weapons programme</td>
<td>(0,0)</td>
</tr>
<tr>
<td></td>
<td>Develop nuclear weapons</td>
<td>(2,-5)</td>
</tr>
</tbody>
</table>

Game 1(a): Baseline Chicken game (payoffs in €billions)

For each player, unilateral defection (DC) is preferred to mutual cooperation (CC), which is preferred to unilateral cooperation (CD), which is preferred to unilateral defection (DD). In other words the preference ordering is DC>CC>CD>DD.\(^{130}\) Consequently this is a Chicken game.\(^{131}\) The rogue state threatening development of nuclear weapons and the victim state threatening to disallow such development is akin to two drivers speeding towards each other in a straight line. For each driver, the best individual outcome is to remain on course whilst the opponent swerves (DC), thus allowing victory whilst calling the opponent “a chicken”. The second-best outcome is for both to swerve (CC): neither claims victory nor can call the other chicken. The third-best outcome is to swerve whilst the opponent does not (CD), in which case the driver is branded a chicken whilst the opponent the victor. The worst possible outcome is a collision where they both suffer serious injury (DD). Indeed, a chicken game is often analogous to military crises or confrontations in international relations.\(^{132}\) The whole essence of such a game is “that of a contest in which each party is trying to prevail over the

\(^{130}\) The cardinal values used in the baseline game are for illustrative purposes. What matters is that each player has this preference ordering. It is also assumed that the payoffs are symmetric e.g. if a rogue state government benefits by 2 from developing nuclear weapons when the victim state concedes, than a victim state government gets a payoff of 2 from disallowing nuclear weapons when the rogue state ceases its weapons programme.

\(^{131}\) See Poundstone, W *Prisoner’s Dilemma* (New York: Doubleday, 1992) pp197-201

\(^{132}\) Snyder, GH “‘Prisoner’s Dilemma’ and ‘Chicken’ Models in International Politics” (1971) 15(1) International Studies Quarterly 66, 82
Therefore each player’s goal is to use coercion in order to induce its opponent to back down.

iii. Baseline game outcome

In the baseline Chicken game, two Nash Equilibria exist in pure strategies. In general, a Nash Equilibrium exists where each players’ strategy is a best response to the opponents’. If a rogue state chooses to develop nuclear weapons, the victim state’s optimal choice is to concede; whereas if a rogue state chooses to cease its nuclear weapons programme, the victim state is best to follow a policy of disallowing the nuclear threat. Conversely, if a victim state disallows a nuclear threat, the rogue state’s optimal response is to concede; whereas if a victim state chooses to concede, the rogue state’s best choice is develop nuclear weapons. The Nash Equilibria are thus:

<table>
<thead>
<tr>
<th></th>
<th>Cease nuclear weapons programme</th>
<th>Develop nuclear weapons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victim state government</td>
<td>Concede</td>
<td>(0,0)</td>
</tr>
<tr>
<td></td>
<td>Disallow nuclear threat</td>
<td>(-5, 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2,-5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-10,-10)</td>
</tr>
</tbody>
</table>

Game 1(b): Baseline Chicken game (payoffs in €billions; Nash Equilibrium shown in bold)

Ultimately, the winner of a Chicken game is the one who has the highest resolve in making the other believe it will defect, knowing the opponent will back down (cooperate) in order to avoid the worst possible outcome. Thus, if a rogue state government is determined to develop nuclear weapons and convinces the victim state of its resolve, the victim state will for the duration of the game be forced to concede in order to avoid the worst possible outcome. The outcome is the northeast box, with

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133 Ibid 84
payoffs (-5,2). On the other hand, if a victim state can demonstrate its resolve to
disallowing a nuclear threat and its preparedness to use any means necessary to achieve
this, the rogue state will be forced to cease its nuclear weapons programme with the
outcome being the southwest box with payoffs (2,-5). Rationality in a Chicken game is
therefore subjective: it depends on what a player expects about its opponent’s
behaviour.\textsuperscript{134} Assuming situations of symmetry of bargaining power and equal
toughness, however, a strategic move may be necessary in order to win the game.

It should be noted that the Pareto-optimum is an unlikely outcome. The Pareto-
optimum is the most efficient outcome where the combined payoff is highest. This
occurs with mutual cooperation and corresponding payoffs (0,0). Although desirable
from a social welfare perspective, it is an unstable outcome since both governments can
individually gain by defecting knowing it is not rational for its opponent to also defect.

C. Strategic Moves

A victim state may be able to dissuade a rogue state from developing nuclear weapons by
way of a strategic move. A strategic move alters payoffs\textsuperscript{135} or,

\begin{quote}
“influences the other person’s choice, in a manner favourable to one’s self, by affecting the other
person’s expectations on how one’s self will behave.”\textsuperscript{136}
\end{quote}

Thus the aim of the victim state is to change the payoffs of the baseline game or
otherwise commit to the choice of disallowing the nuclear threat.

\begin{footnotes}
\item[134] Ibid 85
\item[135] See Jervis, R “Cooperation under Security Dilemma” (1978) 30 World Politics 167
\end{footnotes}
i. Threats and promises

In a bargaining situation, threats and promises are devices that can affect the outcome. Essentially, threats involve punishment and promises involve reward.\(^{137}\) More specifically a threat is a,

“communication of one’s own incentives, designed to impress on the other the automatic consequences of his act.”\(^{138}\)

An important element of a threat is that of contingency. That is, a threat involves an action conditional on the move of the opponent. Therefore a threat turns a simultaneous game into a two-move game where the opponent, subject to the threat, moves first. Consequently if the victim state is to make a threat then the baseline game changes into a sequential game where the rogue state government moves first.

A threat must have some credibility. It therefore needs a “notion of commitment – real or fake”.\(^{139}\) The prior threat a victim state would use is if the rogue state develops nuclear weapons then it will deny this by way of a pre-emptive strike. Perhaps the commitment here is fake – in which case the victim state is bluffing. The victim state government certainly has the incentive to bluff and attempt to deceive the opponent that it has a dominant strategy of disallowing the nuclear threat, because if the rogue believes the victim state will disallow the nuclear threat it will be rational to cease its nuclear weapons programme in order to avoid the worst possible outcome of war.\(^{140}\) Another possibility is that the commitment is real. One strategy of committing to a threat is by delegating the decision to act to an agent. For example, a victim state government can relinquish its decision-making powers to a military commander who has a different

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138 Schelling (1960), op. cit. p35
139 Ibid p127
140 Stein, AA “When Misperception Matters” (1982) 34(4) World Politics 505, 513
payoff structure than his government (perhaps because he does not internalise the cost of war as much as his government), and make this visible to the rogue state. In any event, what is interesting to note is that the threat does not necessarily have to be 100 percent credible to be effective. It might be that the threat is credible enough. This depends, in turn, on what Ellsberg has termed the “critical risk” of the opponent, which is the amount of risk the opponent can tolerate before backing down.\footnote{Ellsberg, D Risk, Ambiguity and Decision (New York: Garland Publishing, 2001)} As such, if the rogue state has a low critical risk level, the victim state’s threat to disallow nuclear weapons development can be relatively less credible whilst still inducing the rogue state to back down and cease its nuclear programme.

Promises and threats work together in that whilst a threat suggests action conditional on the opponent’s move, a promise suggests omission of the action if the condition is not fulfilled. A promise may involve the alteration of the opponent’s payoffs in a positive way, but again this has to be credible. Use of hostages may make a promise credible.\footnote{Schelling (1960) op. cite. p135}

A special case of threat is brinksmanship. Brinksmanship is a tactic that deliberately lets the situation get somewhat out of control. It involves purposefully creating an identifiable – albeit perhaps small – probability of war.\footnote{Ibid p200} In other words, brinksmanship necessitates the appearance of irrationality: the player appears to be willing to do the unthinkable and suffer the worst possible consequences. The “rationality of irrationality” is the hope that it will incentivise the opponent to back down. Therefore one strategic move is for the victim state to engage in brinksmanship and appear willing to disallow the nuclear threat regardless of the consequences.
Brinksmanship may well be a tactic employed by rogue states. Critics of this thesis may argue it is flawed on the basis that rogue state governments are irrational and therefore it is folly to proceed on an assumption of rationality. However, brinksmanship demonstrates that there is a benefit to appearing irrational. Consequently, one should be weary that a rogue state government may not actually be irrational but instead just be employing a tactic of appearing irrational.

ii. Commitments

A commitment converts a sequential game into one a two-move one; where one player undertakes a commitment followed by the opponent’s decision.\textsuperscript{144} Thus a commitment gives an advantage to the player that moves first. Commitments can also make threats credible. For example, a driver in a Chicken game that threatens to drive straight can make a commitment by removing his steering wheel, thus leaving the final decision to the opponent whether to swerve and avoid mutual disaster (DC) or drive straight and collide (DD). For example, a victim state government can commit to disallowing a nuclear threat by way of making a public announcement to this effect. A government could thereby manipulate its payoffs by staking its reputation with voters to achieve disarmament of the rogue state. In this way it can make disallowing the nuclear threat a dominant strategy. Since it now has a dominant strategy, so long as the rogue state has complete information it will know the victim state will not choose “concede”. Therefore in order to maximise its own payoff the rogue state will choose “cease nuclear weapons programme”. The outcome will be (2, -5).

\textsuperscript{144} Ibid pp121-122
Rogue state government

<table>
<thead>
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<td>(2,-5)</td>
</tr>
<tr>
<td>Develop nuclear weapons</td>
<td>(-11, 2)</td>
<td>(-10,-10)</td>
</tr>
</tbody>
</table>

Game 2: victim state government changes its payoff by making a public announcement (shown in bold)

Hence, by making a visible commitment, a victim state may be able to direct the outcome of game in its favour.

C. Limitations of strategic moves

There is the possibility that strategic moves do not succeed. The whole essence of the Chicken game is that it is conducted under imperfect information. Neither player has certain knowledge over which action the other takes. A bluff may not deceive a rogue state because it may correctly expect a victim state has an incentive to misrepresent its payoffs. A somewhat credible threat will not be adequate it if does not exceed the rogue state’s level of critical risk. The presence of imperfect information, therefore, might never guarantee the success of a strategic move.

Moreover, there are dangers associated with strategic moves. Imperfect information may lead a victim state to underestimate the rogue state’s resolve to develop nuclear weapons. With an erroneous belief the rogue state will back down, the victim state has an incentive to maintain coercion. If both states sustain a coercive strategy attempting to make its opponent back down, the likelihood of premature and mutually

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145 Fearon op. cite. p381
costly conflict is increased. Therefore dangers of conflict during the game are even more pronounced where the victim state is employing the strategy of brinksmanship and the threat of looming conflict is not sufficient to deter the rogue state. Hence, a further drawback of using strategic moves is that rather than leading to a cessation of a rogue state’s nuclear programme they might actually lead to conflict.

**D. Implications**

In a crisis “there are many conceivable stopping points along the escalation ladder before the ultimate rung is reached”.\(^{147}\) It has been shown that interventions may alter a rogue state’s aggressive nuclear ambitions and thus avert more costly anticipatory self-defence. However these interventions may not be successful. If unsuccessful, following the conclusion of the game and the subsequent growth of the nuclear threat, it will be individually rational to conduct anticipatory self-defence according to the model in Part V. After \(t^*\) the expected costs of nuclear aggression are above the costs of anticipatory self-defence. Thus the Chicken game transforms into a Prisoner’s Dilemma where each player has a dominant strategy of defecting.

One policy conclusion from the analysis is that where a rogue state presents a threat of nuclear aggression, the victim states should attempt non-military interventions in order to dissuade it from its nuclear programme. This is because the situation might be resolved at less cost than armed conflict. Therefore, from an economic perspective, there is normative foundation for the necessity rule under existing international law that requires means short of armed force to be, or have proven to be, inadequate. A rule of necessity obligates states to exhaust diplomatic and other methods of peaceful

\(^{147}\) Snyder op. citc. 93
resolution. This is economically efficient since both parties benefit from foregoing mutually costly armed conflict.

Another policy conclusion is that international law should aim to achieve the Pareto-optimal outcome. This means the law should facilitate the resolution of military crises peacefully through mutual cooperation. A tit-for-tat strategy, where a player cooperates during the first round and then retaliates to defection with defection in subsequent rounds, has been shown to be an optimal strategy. Applying a tit-for-tat strategy in light of the shadow of the future (i.e. in light of future trade or economic aid agreements) is likely to increase cooperation in a repeated Chicken game. However, the game played between a rogue and victim state is a one-shot game. This can be achieved through issue linkage. Therefore the answer lies in the international community linking the nuclear issue to such matters as trade and aid agreements. Non-nuclear imports can be used as bargaining chips to encourage mutual cooperation over the nuclear issue.

E. Application of the theory

The theory presented in this part will be used to analyse international situations where strategic interventions were or are involved. The applications highlight the robustness of the theory presented.

149 Oye op. cit. pp14-15
i. Cuban Missile Crisis

Using the game-theoretic construction considered above, the naval blockade imposed on Cuba by the USA can be regarded as a strategic move that induced the Soviet Union to back down. Ordinal values are used to illustrate the Chicken game:

<table>
<thead>
<tr>
<th></th>
<th>Khrushchev's Soviet Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kennedy’s Administration</td>
<td>Concede</td>
</tr>
<tr>
<td>Concede</td>
<td>(0,0)</td>
</tr>
<tr>
<td>Blockade</td>
<td>(1,-1)</td>
</tr>
</tbody>
</table>

Game 3: Game played during Cuban Missile Crisis (payoffs shown as ordinal values)

From President Kennedy’s point of view, the best outcome is to gain a propaganda victory by getting the Soviet Union to back down (1,-1). The second-best outcome is for peaceful, mutual compromise (0,0). The next preferred outcome is to be forced to back down whilst the Soviets continue to deliver missiles (-1,1). The worst possible outcome is to blockade and the Soviet Union continuing to deliver nuclear missiles, since this leads to war, and possibly nuclear war (-2,-2). The vice-versa applies to Premier Khrushchev.

By committing to a blockade, Kennedy gained a first-mover advantage. The USA induced the Soviet Union to concede, because if the Soviets continued to deliver missiles (i.e. ran the blockade) things would have slipped out of control and led to war. It was the Soviet’s interests to avoid war, since a payoff of -1 is better than -2, so Khrushchev conceded. Although at the time it was viewed as a US victory (1,-1), it later
emerged that Kennedy secretly agreed to withdraw missiles from Turkey.\textsuperscript{151} Therefore the actual outcome was mutual compromise (0,0). However, the Cuban Missile Crisis could have led to nuclear war (-2,-2). The crisis was “a contest in risk taking”;\textsuperscript{152} thus blockade was a brinksmanship tactic.

ii. Iran

It is submitted that the USA and Iran are currently playing a Chicken game. This is because the best outcome for each player is to win over the other. The USA’s first preference is to disallow the Iranian nuclear threat whilst Iran suffers from subjugation and ceases its programme, with ordinal payoffs (1,-1) respectively. The preferred outcome of Iran’s leadership is to develop nuclear weapons whilst the USA concedes and bears an expected cost of nuclear aggression (-1,1). The worst outcome for both is for the US to conduct a strike (-2,-2) whilst the second-best outcome for both is mutual compromise (0,0):

<table>
<thead>
<tr>
<th>Iran Leadership</th>
<th>US Administration</th>
<th>Concede</th>
<th>Disallow nuclear threat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Cease nuclear programme</td>
<td>Develop nuclear weapons</td>
</tr>
<tr>
<td>(0,0)</td>
<td>(-1, 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1,-1)</td>
<td>(-2,-2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thus there is a battle of resolve between the two governments. The preferred outcome of the US Administration is to disallow the nuclear threat whilst the Iran leadership

\textsuperscript{151} Blight, JG; BJ Allyn & DA Welch \textit{Cuba on the Brink: Castro, the Missile Crisis, and the Soviet Collapse} (Maryland: Rowan & Littlefield, revised ed., 2002) p5

\textsuperscript{152} TC Schelling, \textit{Arms and Influence} (Yale University Press, 1966) p96
ceases its weapons programme and fully complies with inspections (1,-1). The preferred outcome of the Iran leadership is to develop nuclear weapons whilst the US Administration concedes (1,-1). The battle of resolve is the reason why there are pronouncements by the US Administration such as it will "repel nuclear hopefuls".\textsuperscript{153} If the USA can convince Iran of its dedication to disallowing a nuclear threat, it hopes that Iran, wishing to avoid conflict (-2,-2) by developing nuclear weapons will instead opt for the rational choice of ceasing its nuclear weapons programme, with the outcome (1,-1). From Iran’s perspective, a payoff of -1 is better than -2: ceasing its weapons programme is better through coerced peaceful means than coercion by means of war.

iii. North Korea

It is contended that the standoff between the USA (and other players such as South Korea) and North Korea is a Chicken game, following the same reasoning as applies with USA and Iran game:

\begin{center}
\begin{tabular}{|c|c|c|}
\hline
\textbf{US Administration} & \textbf{Concede} & \textbf{Develop nuclear weapons} \\
\hline
\textbf{Cease nuclear programme} & (0,0) & (-1, 1) \\
\hline
\textbf{Disallow nuclear threat} & (1,-1) & (-2,-2) \\
\hline
\end{tabular}
\end{center}

\textit{Game 5: Chicken game between USA and North Korea (payoffs shown as ordinal values)}

One means of inducing North Korea to cease its nuclear weapons programme is to promise economic benefits for doing so. In other words, North Korea’s payoffs can be altered in a positive manner by way of strategic intervention in the form of offering

economic concessions on the condition it gives up development of nuclear weapons. If
the economic concessions are sufficiently high enough, the North Korean leadership will
prefer to cease it nuclear weapons programme over developing such weapons, in
circumstances where the US does actually concede. This has the effect of switching
ordinal payoffs for North Korea:

<table>
<thead>
<tr>
<th>US Administration</th>
<th>Concede</th>
<th>Develop nuclear weapons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cease nuclear programme</td>
<td>Develop nuclear weapons</td>
</tr>
<tr>
<td></td>
<td>(0,1)</td>
<td>(-1, 0)</td>
</tr>
<tr>
<td></td>
<td>(1,-1)</td>
<td>(-2,-2)</td>
</tr>
</tbody>
</table>

Game 7: Game between USA and North Korea with promise of economic concessions (payoffs shown as
ordinal values with the effect of economic concessions shown in bold)

By offering economic benefits that more than compensate for the cessation of nuclear
weapons, the dominant strategy for North Korea is to cease its nuclear programme.
This is because an ordinal payoff of 1 is preferred to 0, and an ordinal payoff of -1 is
preferred to -2. Indeed, analysts suggest one rationale for North Korea’s nuclear
weapons programme is to compel states to offer economic concessions.¹⁵⁴

(2007) IFRI Security Studies Department, Proliferation Papers p13 available online at:
VII. CONCLUSION

A novel Law and Economics framework for assessing anticipatory self-defence against rogue state nuclear attack is proposed. The model suggests taking into account the probability and magnitude of harm, but also reflects the temporal dimension associated with nuclear threats. On the basis of comparing the falling costs of anticipatory self-defence against the growing expected costs of nuclear aggression, the model finds that the optimal timing of self-defence is when the costs of anticipatory self-defence equal the expected costs of nuclear aggression. Before this time, the victim state suffers reputational costs from not minimising collateral damage. After this time, the expected costs of nuclear aggression (taking into account the probability and magnitude of harm) become too high.

The imminence requirement of international law is rejected. Such a rule is, according to economic analysis, socially costly for the international community. Rather than maintaining international peace and security, the goal of the UN should be to minimise the cost of conflict. Consequently it is argued international law regarding anticipatory self-defence needs reformulating. The framework does however lend normative economic justification for the necessity and proportionality rules of international law. From an economic perspective, equivalent force (measured in terms of costs) is efficient – so international law can be refined further by not only requiring proportionality but equivalence between the aggressive use of force and the force used in self-defence (measured in cost terms). There is also normative economic justification for the necessity requirement, since strategic or non-strategic interventions may prevent war from occurring. In the context of the model put forward this is why a temporal dimension is desirable: time is important to allow diplomacy and other non-military
interventions such as economic sanctions. Such measures may achieve elimination of the threat at less cost than use of force.

An important part of the framework is assessment of aggressive intent. Whilst this is usually the preserve of international relations theory, it is argued public choice theory – a tool of Law and Economics – should be used to conduct a positive analysis of rogue state potential nuclear aggression. Nuclear weapon ambition is not irrational, but a product of rational choice. This is important because a victim state needs to correctly calculate the probability of nuclear aggression. Explaining the incentives for nuclear weapon ambition in terms of rational choice also enables recognition for the potential for strategic interventions that may alter the preferences of the rogue state towards not attacking.

The central focus has been on the threat of rogue state nuclear aggression. This is because of the relevance of the issue in contemporary international politics and also because of the particular technological nature of nuclear weapons that make an imminent attack difficult to detect. However, the framework may have implications for all cases of anticipatory self-defence, regardless of whether the attack is nuclear or non-nuclear. Additionally, the framework may have implications for domestic criminal law regarding self-defence against battery and assault. This is left for further Law and Economics research.
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