

“Abandon All Hope – Intractable Societal Conflicts”

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SUMMARY

Societal conflicts between a government and various insurgent factions can be represented as a n-player co-operative game. The relative objectives (preferences, values) and capabilities of all factions can be encoded as a finite state system, where each state represents a feasible configuration for a “peaceful settlement.”

The paper discusses the theoretical limits the economics literature imposes on such games and the possibility of (formally) intractable conflicts. Attention is drawn particularly to the following areas.

1. Feasible and stable configurations.
2. Feasible but unstable configurations.
3. Unfeasible configurations.

A selection of real world cases indicates many long running conflicts consist wholly of the third set. The reasons for this include supermajorities and defection costs, incomplete information and signalling by intransigence, incommensurable goods and the impact of negative rents and positive externalities. The paper concludes that for many real world cases conflict resolution efforts are doomed to fail and that factions will fight to the bitter end.

“The optimist claims we live in the best of all possible worlds, and the pessimist fears this is true.”

James Branch Cabell.

“Abandon all hope, ye who enter here”

Dante Alighieri, Inscription on the gate of Dis.

INTRODUCTION

The duration and frequency of intra-state wars exceeds that of inter-state wars. Though casualty rates per day per combatant tend to be lower in the former, they usually feature more deaths due to longer durations. In many cases these conflicts drag on indefinitely, with no appreciable progress by any side.

A casual survey of ongoing conflicts reveals the average duration is over 20 years [Table 1] [1]. Additionally, there is a wealth of other, minor conflicts, from Baluchistan through Cote D'Ivoire, simmering below the 1,000 fatalities-per-year level. History is also not short of examples of long-running conflicts¹ on both the inter-state and intra-state level.

Conflict	Start year
Algeria	1992
Burma	1950
Congo	1998
India (Kashmir)	1965
Indonesia	1986
Thailand	2001
Columbia	~1970
Sri-Lanka	1983
Somalia	1991
Iraq	2003
Afghanistan	2001
Sudan	1983
Turkey	1984
Peru	~1970
Israel (Palestine)	2000 ²

*Table 1: Durations for a selection of ongoing insurgencies.*³

This casual survey of the evidence might lead the reader to suppose that the world in 2009 was an unusually disordered. In fact, judged by violent deaths per capita year, the early 21st century represents an unusually peaceful period⁴ [2]. However, the existence of these long running conflicts poses a challenge for the strategic analyst. Why, given the wealth of resources devoted to conflict prevention and the sheer destructiveness of warfare, do people keep fighting over long periods when a decision cannot readily be forced? Secondly, how do we represent/model this?

This paper takes a broadly realist approach to the problem, within a rationalist framework. It aims to show that game theory describes the dilemmas factions in societal conflict face. It will suggest how particular features of Counter-Insurgency conflicts can be

¹ Alas, the impressively named 100-Years War suffered from numerous periods of peace, but the sentiment holds.

² Refers to the Al Aqsa or 2nd Intifada. The general Arab-Israeli conflict has been ongoing from 1948 of course.

³ In a couple of instances the participants have changed from the original factions and thus they represent "overlapping" rather than truly continuous conflicts.

⁴ This is true whether one considers inter-state conflict, intra-state conflict, or genocide within an otherwise ordered state, whether state-sponsored or otherwise. [2]

represented in such a system, and the implications from the formal economics literature for concluding peace settlements.

CONFLICT AS A GAME SYSTEM

The use of game theory to analyse conflict situations dates back to the dawn of the discipline [3]. Most famously, the “prisoners dilemma” was used to illustrate the hazards of the nuclear arms race⁵. Within this period most applications concerned 2-player games, and often those with a zero-sum value. Since the 1960’s a wider appreciation of game theory as a tool to examine interactions between self-interested entities has come to dominate the public choice economics literature (and to a lesser extent that of political philosophy and evolutionary psychology). Strangely though, little of this awareness has filtered back into the defence domain.

This is especially curious given the rise of the post-cold war world, and in particular low-intensity conflicts, with many different political factions competing against each other in a complex environment rather than the familiar “red-vs.-blue” combat simulation.

Here, game theory has developed the lesser-known branch of n-player co-operative games. The primary advantage of using n-player games over 2 player games is that they can better represent many-sided operational environments that are seldom, if ever, zero sum. They allow each faction to have different objectives and capabilities. Hence a wide range of scenarios can be sparsely described by a small set of tools.

Note, incidentally, that though the game is described as formally “co-operative”, this does not really mean that the players are friendly or co-operative in the common sense of the word. Rather the game concerns the search for agreement between the factions through an iterative process. As ever, game theory takes rational actors seeking to maximise their own benefit solely. In that sense, it subscribes tightly to the realist school of international relations.

In terms of a general model within a n-player co-operative game each player represents a faction in the conflict. A faction can be an army, a political party, an international or non-governmental organisation, charity, or religious institution. Note that a faction is distinguished from the general population or sub-group of the general population like an ethnicity because it exhibits *organisation*; having a distinct continuity, a formal decision-making mechanism⁶ and policy elite who uses it. Factions may represent or draw upon wider constituencies, but they are not synonymous with them.

The aim of each faction in the game is to implement its policy objectives. These can be anything from possession of territory, expropriation of taxes or drug smuggling, to the imposition of religious law and cultural and social policies on the general population. As a

⁵ Ironically, the results from a single and multiple iterations of this game are quite opposite, and the wrong lesson is often drawn.

⁶ It is interesting to consider whether factions themselves arise due to the “Iron Law of Oligarchy.”

whole, this set of policy objectives is known as *rents*⁷ [4]. Obviously, not all factions can enjoy all their policy objectives at the same time (otherwise there would be no conflict!). It is the interaction of factions in pursuit of rents that makes the game.

Factions attain their desired set of rents through membership of a coalition which commands a sufficient preponderance of coercive force to impose its will on all factions⁸. This coalition determines the allocation of all rents as agreed by its members.

Note that though the phrase "coalition" is used throughout this paper, it applies equally well to any alliance, peace treaty, settlement, or any functionally identical agreement over the "division of spoils."

The advantage of this approach for societal conflict is obvious. Any number of factions and their differing capabilities and objectives can be represented. The restrictions on the ability of those factions to form a dominant peaceful coalition (or settlement) constitutes the remainder of this paper. If such a coalition or settlement cannot be formed, then the conflict may be said to intractable.

A word of caution; the phrase *intractable* as used here refers to a conflict that is spatially and temporally limited. More formally, it is that factions and their capabilities are relatively immutable in the short term, whilst faction preferences are transitive and capable of being mapped into a finite set of objectives. Over sufficient time, the capabilities and objectives of factions change, as do their objectives (but usually slower than capabilities). Similarly outside intervention in sufficient force created new factions and can render intractable situations tractable. The term is used within *relatively* static strategic environments, and deciding on sufficient scope for the system remains the challenge of the analyst. Additionally, within this paper, the focus is upon the conditions for peaceful settlement of armed disputes or political stability. Wider applications for peaceful bargaining and joint ops are not directly considered.

FORMAL SYSTEM

There exists a set of military⁹ strengths S with n faction members. The military strength of the j^{th} faction is given as S_j .

There exists a set of majority coalitions T with p members. Each k^{th} member of T is a vector of length n . Let the value of $T_{kj}=1$ when the j^{th} faction is a member of the majority coalition and 0 otherwise. A coalition is a majority coalition and member of set T if it satisfies the condition; i.e. the coalition simply contains a majority of all military strength.

⁷ The term originates in the economics literature, where it has the common meaning of a fee for a service. However within the specific field of public choice it holds the narrower meaning of compulsory fees or behaviour enacted under threat of coercive (state) force.

⁸ i.e. it has a sufficient "monopoly of force" as to comprise a *de facto* state.

⁹ This could as well be voting strength or other general indication of power-capability in more "civilised" situations.

$$\sum_{j=1}^n T_{kj} S_j > \sum_{j=1}^n (1 - T_{kj}) S_j$$

Equation 1: Coalition requirements.

Additionally there exists a set of rents for every k th coalition, R , with m members. Let the value of the i^{th} rent equal 1 if the rent is enabled (by the majority coalition), and equal to 0 otherwise. If the i^{th} rent is enabled then let its value to the j^{th} faction be P_{ij} . The payoff for the j^{th} faction in a coalition for a given configuration of rents is therefore as follows:

$$\text{Payoff}_{jk} = \sum_{i=1}^{i=m} R_i P_{ij}$$

Equation 2: Faction payoffs

Let a combination of a specific coalition T_k with a specific set of rents R_i of rents be called a *configuration*. The problem for the factions in the game becomes to ally with other factions that form a *minimum*¹⁰ coalition with an arrangement of rents that yields them the greatest payoff. Obviously, factions are constrained in their ability to form these majority coalitions by incommensurable value sets, and the ability of other factions to form coalitions of their own which exclude them.

A coalition, P_k , is stable insofar its members are not tempted to defect to another coalition. A member will defect to an alternative coalition if he does better than he did before. Therefore a coalition is stable if there are no alternative coalitions in which all members of the new coalition do as well or better¹¹ than they did under the old. Formally, a configuration coalition T_x with rent arrangement R_i is stable if:

$$T_{xj} \sum_{i=1}^{i=m} R_i P_{ij} \geq T_{kj} T_{xj} \sum_{i=1}^{i=m} R_i P_{ij} \quad \text{For all } k, j$$

Equation 3: stability requirements.

It can be shown that in many circumstances there are no stable coalitions, even if there are feasible ones. This arises when solutions are intransitive; e.g. where configuration 1 dominates configuration 2 which dominates configuration 3, which in turn dominates configuration 1. Though this rules out the possibility of a unique solution it is still meaningful (and useful) to talk about a solution set. A solution set is that set of configurations whose members are only weakly dominated by other members of the solution set. The resulting region is referred to as the core of the game.

¹⁰ A coalition whose last member is just sufficient to grant majority status. Coalitions larger than this size are inherently wasteful, but see later section on supermajorities. [5].

¹¹ This is "Weakly dominated," as opposed to strongly dominated where all factions do better.

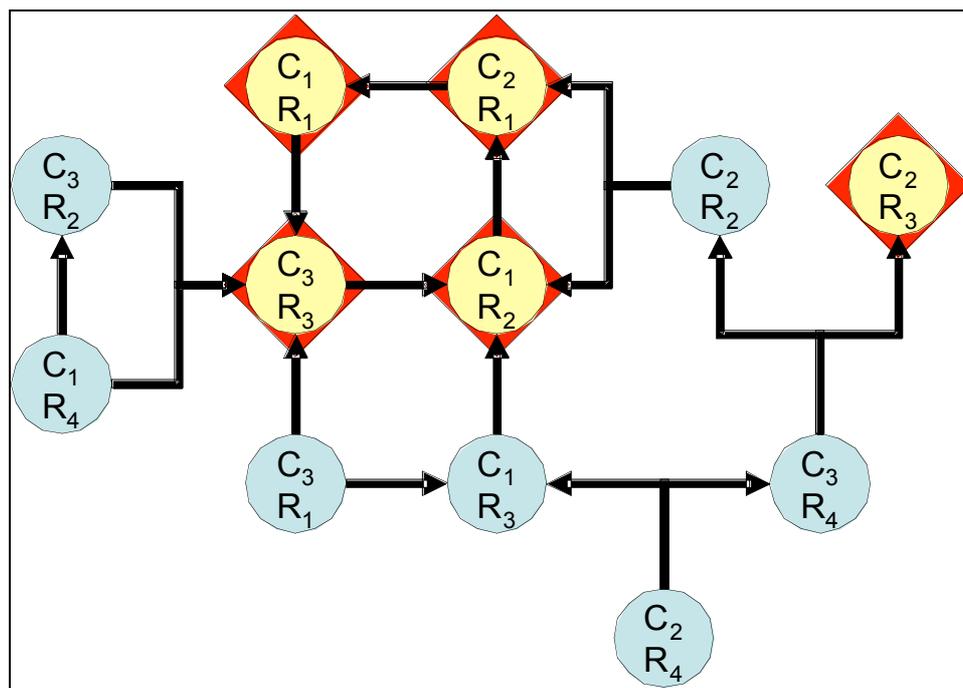


Figure 1: Example of configuration dominance.

Figure 1 shows a typical solution space for 3 coalitions with 4 possible arrangements of rents. Lines of 'dominated by' are given by arrows and the core of the game is highlighted and boxed.

A configuration is defined as a combination of a specific coalition and specific arrangement of rents. If a solution is taken as equivalent to a political settlement, the applications for game theory in modelling conflict resolution becomes clear. The remainder of this paper explores some implications and how they relate to real world events. Throughout, complications will be added to the simple model here and examples given.

SIMPLE EXAMPLE

As an example consider a civil war in which 3 factions (S1, S2, S3) are fighting over control of a large city and a small city, which cannot be divided further. All factions value the large city over the small city and the small city over nothing. If any two factions ally, they possess enough common strength to subdue the third and divide the cities between them. What behaviour can we expect?

The first thing to note is that there are 3 coalitions that can be made ($\{S1, S2\}$, $\{S2, S3\}$, $\{S1, S3\}$). Each of these coalitions contains 2 possible arrangements of rents, with the 3 cities divided in a 2-1 proportion. This means there are 6 configurations to consider in our solution set. Note there is no incentive to make a full 3-member coalition as this is always dominated¹² by the 2-member coalitions.

¹² Because 1 member of such a coalition would get nothing, and be superfluous to the majority requirement.

	Factions		
	S1	S2	S3
Coalition 1A		small	large
Coalition 2A	small	large	
Coalition 3A	large		small
Coalition 1B		small	large
Coalition 2B	small	large	
Coalition 3B	large		small

Table 2: Simple example of coalition-rent configurations.

The second thing to note is that all the configurations in Table 2 are unstable. Any excluded faction is able offer the minor partner in the extant coalition a better deal than presently (“listen, deal with me instead and you can have the large city rather than the small you currently hold”). The solution set as a whole is transitive. Configuration 1A loses to configuration 2A loses to configuration 3A and so on, with configuration 3B losing to configuration 1A and so forth.

NEGATIVE RENTS AND EXTERNALITIES

The simplest extension to the above model is to consider what happens when rents generated within the coalition can be negative as well as positive. Negative rents are probably the major reason for ongoing conflict in the real world. This can be understood instinctively; unless a settlement offers conflict factions more than they could get by continued violence, they have no incentive to settle. The existence of negative rents allows us to reduce the number of feasible (peaceful) solutions in the core of the game.

Of course, sometimes the sum of positive rents for a faction can outweigh a particular negative rent and membership in a coalition remains a “good deal” overall. Many real world factions support an unpopular position because of their status in a coalition government.

More formally, when a configuration contains a coalition member who’s summed payoff is negative, then that configuration becomes unfeasible. Because dominating configurations are at least as good for all members, the definition of weak dominance, no unfeasible configuration will dominate a feasible one. Hence they cannot be found in the core of the game, but can change the core of the game (by removing configurations that were within it). Ultimately a game may have no feasible solutions in it; the core is empty. In such cases the problem is formally intractable; there’s no settlement that can satisfy a sufficient number of parties and we should not expect one to arise.

The simplest example of this may be World War II, where it is hard to imagine any settlement could have been reached between the axis and allies. Indeed, the period gave us the terms “unconditional surrender” and “total war.” There are grounds for believing the Israeli-Palestinian conflict may be in the same class.

A closely related issue to negative rents is that of positive externalities. These arise when a faction gains an advantage from *not* being a member of coalition. Positive externalities can be thought of as a "background payoff," occurring to factions which are not members of the coalition but whom derive benefits from its existence. As with negative rents, if a faction would do better outside a coalition than within it, then the configuration is unfeasible. The subsequent effect is also to reduce the number of feasible configurations, again, possibly to zero.

An example of positive externalities are the benefits narco-insurgents gain from the local presence of lawful states. The latter maintain effective sanctions on the consumption of drugs and consequently keep profits for the former high. Another is the benefits Norway enjoys from the activity of OPEC. Despite not being a member of the oil cartel, Norway enjoys the benefits of the cartel's behaviour in terms of a higher global price of oil.

INCOMMENSURABILITY AND THE MAXIMAL COALITION

In economics theory a *maximal* coalition can form in the absence of externalities. That is, a coalition where the arrangement of rents yields the greatest absolute benefit summed across all factions. Even factions which were either not a member of such a coalition or did not greatly benefit from it would benefit from the arrangement. This apparently strange condition arises from the possibility of *side payments*. These are pair-wise transactions between factions, in which the greatest beneficiaries pay the least beneficiaries for their support. Because the most productive configuration has been chosen, the average payoff for all factions is maximised by this strategy, (though not all factions will get the same amount¹³). This is tightly related to Coase theorem [7], which shows that an efficient (in the sense of good-maximising) arrangement will arise regardless of original allocations.

Whilst this is not uncommon in corporate cases¹⁴, in real-life politics grand coalitions seldom rise, or endure. A winner(s) take all phenomenon manifests itself, especially in the politics of the third world. Excluded factions are often brutally marginalised or actively persecuted. Something is preventing the maximal coalition from forming.

In practise, side payments are difficult to implement because many public goods are incommensurable between groups. Maximal coalition factions lack a general ability to "compensate" non-members for their support of an unpopular platform. Furthermore, the arrangement of rents under a maximal coalition is likely to increase the power of its members relative to other factions. There would be little incentive to continue payments over time, once power had been consolidated.

Many power-sharing agreements suffer from this enforcement problem. In Zimbabwe, President Mugabe used the 1980 Zanu PF- Zapu power sharing deal to co-opt and destroy his rival Joshua Nkomo¹⁵. Similar Communist-led grand coalitions formed in eastern Europe

¹³ The efficient division of the side payments can be determined through Shapley values [6], which give a sense of "opportunities foregone" when factions join the maximal coalition.

¹⁴ Common example is competitive markets in public goods such as RF-spectrum licensing.

¹⁵ History, therefore, does not bode well for Mugabe's current opposition.

after WWII. In nearly all cases communist control of defence and security ministries was used to consolidate power, gradually eliminating the minor coalition partners¹⁶.

NON-INDEPENDENT PAYOFFS

The simple model assumes that payoffs to different factions are independent. That is, the value of rents received by one faction has no effect on the value of rents received by another. In practise, factions do evaluate the benefits to others as well as themselves and gauge their position accordingly. In this view, it is not enough to win, someone must have lost. Though the resulting system is not (necessarily) zero-sum, there is a substantial effect from considerations of *spite* and *envy* in a faction's evaluation of their payoff.

In technical terms, spite refers to actions seeking to destroy another factions payoff even when it brings no benefit to one's own, Envy refers to actions seeking to acquire payoff that someone else possesses. Both effects have strong observational support from psychology and economics [8], [9], and have serious implications for the outcome of co-operative games.

In the simple model it is assumed that two configurations with identical coalitions but different rent arrangements exhibit (at least weak) dominance when moving to the new deal is Pareto-efficient (i.e. no faction becomes worse-off). However, if the move exacerbates relative payoffs within the coalition the move may not be supported by some factions. In conjunction with the incommensurability and side payments restrictions, this has the effect of again reducing the size of the feasible configurations. From a modelling perspective, various functions for measures of inequality¹⁷ can be applied to the set of faction payoffs for a given configuration, and these configurations rejected if they exceed a threshold value.

It is noted that some factions may exhibit more envy or spite than others. The clearest historical example might be the Khmer Rouge, with a radical agrarian platform that extended to genocide as a means of increasing social equality. Similarly, hegemonising or totalitarian factions in particular tend to develop *weltanschauung* which empathises the destruction of enemies amongst their key goals. Existential challenges to other factions cannot be reconciled through negotiation with them. Current debates about the commitment in the Hamas charter to the destruction of Israel illustrates the difficulty of haggling over payoffs with a faction whose ultimate goal is that one doesn't have *any* payoff at all (or more precisely, a very large negative one). When such systems are 2-faction it reverts to a truly zero sum game. Though Nash equilibria may exist in such a system strategies are now adversarial rather than co-ordinating in the technical sense and the scope for an meaningful settlement is lost.

¹⁶ The post-war "grand coalition" in Hungary is particularly instructive. Though the communists were a minority here, the rent distribution of ministries clearly favoured them and was used to consolidate power further.

¹⁷ For example, the Theil index [10]

INCOMPLETE INFORMATION

So far, it has been assumed that the strengths and rent preferences of all factions are *common knowledge*, that is Wknown to all that they are known to all", in an infinite regression. If this assumption is relaxed, then several complications occur in coalition/settlement formation.

Firstly, a faction benefits from a lack of common knowledge of its preferences, of what it wants, and what it is willing to trade. Potential partners have a dilemma; their coalition proposal must be sufficient to place all partners in positive payoff, but at the same time not sacrifice too much of their own opportunity for positive rents.

It becomes nearly impossible to make minimum bids because the threshold of acceptance is unknown. Depending on their attitude to risk and delay, coalition proposers must over-bid on the rent arrangement. Conversely, factions receiving coalition proposals are incentivised to lower the perception of their rents¹⁸. As a faction's threat to defect if they receive negative payoff is a *credible threat*¹⁹, a perception of a small rent profile will generate more favourable proposals.

To these ends, factions manipulate others perceptions by means of *signalling*, behaviour designed to send information about preferences [11]. Valid (positive payoff) offers can be rejected to generate underestimates of the values attached to a factions rent, in the belief that a better offer will be along shortly. Factions can ostentatiously eschew offers of settlement and continue paying the costs of conflict by prolonging the struggle. This indicates positive externalities; (or else they would be looking for a settlement). Confronted by a faction with positive externalities, prospective partners must sweeten any proposed deal to overcome these externalities.

Hence uncertainty over rents allows several bargaining strategies around intransigence and delay which are inimical to rapid conflict resolution. The side that comes last to the negotiating table tends to enjoy a presumptive advantage.

An interesting historical example is furnished by midway through World War 1, where the popular notion developed that the side which could last "5 minute more" would prevail. To this end, defeatism would become self-fulfilling, and only an intransigent statement of demands could itself ensure a settlement on favourable terms.

Similarly, the Iran-Iraq war was marked by a long phase of positional warfare after the Abadan offensive of 1984 where it became clear neither side enjoyed a decisive advantage. However the war dragged on for 4 years, with Iran adopting an intransigent stance with a set of minimum conditions it knew was impossible to be met.

Incomplete knowledge of faction strength has more ambiguous effects. It favours all factions to be thought as strong as possible, because this increases the proportion of feasible configurations in which they are a coalition member. However, uncertainty over actual faction strengths complicates coalition formation. Who is the most powerful faction? Which

¹⁸ Like car dealership doing a part-exchange, faults with your vehicle will be exaggerated, "That's not worth much to me. What else have you got?"

¹⁹ Being both rational and enforceable.

collection of allies will command a sufficient majority to enforce a settlement? As with uncertainty over rents/

Overall the effect of uncertainty is to eliminate coalitions that are barely feasible (i.e. where one member is close to negative payoff), and to greatly increase transaction costs (themselves a constraint on coalition formation).

SUPERMAJORITY

In the simple model a practical coalition is formed with a simple majority. This coalition is assumed to have sufficient power to enforce its will against all non-members. Establishing this effective or satisficing²⁰ monopoly of violence is the sine quo non of statehood, and for any settlement or agreement to be enforceable.

In practise a 50-per-cent-plus-one majority of force is unlikely to be sufficiently powerful enough to subdue all others. The 20th century has been the century of the guerrilla, and quite small insurgencies have resisted considerably larger government forces. Force ratios of 10 or 20-to-1 are not uncommon for long-lasting insurgencies²¹.

The number of holdout factions, as well as their strengths, is likely to be significant. One large holdout faction is likely to be more problematical than many small factions. Additional consideration, such as terrain, demographics, tactics, and non-uniform distribution of forces mean that even small minorities may enjoy local monopoly of violence²². The task of the insurgents is also easier by their nature. To disrupt government control through population coercion they only need to exercise a majority for an hour a day. For the state, it is a 24-hour job. You have to guard your supporters all the time, but the insurgents only need to shoot them once.

The requirement for a supermajority rather than simple majority goes some way to addressing this. It explains why a great many conflicts continue; the settlement coalition simply isn't big enough to subdue non-members. Supermajority restricts the number of coalitions that can form and hence the number of feasible configurations. As with negative rents, it reduces the core of the game. Additionally, larger coalitions increase both the transaction costs and the chance that at least one member will suffer negative payoff, so the effects are synergistic.

²⁰ Even stable states do not have an absolute monopoly of force, and the challenge is not (solely) from insurgencies. Even low-level crime represents a breach of the monopoly, though it may be sufficiently removed from the experience of most citizens as to be negligible. When crime is organised on a larger scale, as with the Albanian, Sicilian, and Chechen mafias, then the power may be questioned in earnest. State stability is a continuum not a step function.

²¹ Interestingly enough, Vietnam is not amongst these. There the overall ratio of forces was often only about 3-to-1 in US/ARVN favour.

²² Despite CENTCOM estimates of superiority ranging from 5-to-1 to 8-to-1 in manpower (to say nothing of equipment and quality), US forces in Iraq often struggled to maintain effective security of the population on a day-to-day basis. Large, remote, (though secure) bases were one part of that. One less-commented aspect of the US "Surge" was an *operational* shift from Bn-level cordon-and-sweeps with formation training to smaller, dispersed, urban outposts manned 24-7 coupled to direct mentoring of Iraqi units.

TRANSACTION COSTS

In the simple model above, deal making is taken to be cost-free, and it is assumed to be as easy to join one coalition as another. In practise there are costs to joining a putative coalition and to leaving an existing one. In the former case, allying or dealing with some factions is easier than with others simply due to physical, economic, political and cultural constraints²³. Similarly the time and attention of policymakers for negotiation is limited. Finally, large coalitions cost more to administer and maintain.

Transaction costs do have an upside; because generating alternative partners is expensive they tend to cement a coalition once it has formed. Indeed without defection costs coalitions would cycle endlessly through any intransitive loop encountered in the game core. When building a coalition, a high cost of defection is a desirable component, and related to the general enforcement problem. Factions considering defection must take into account not only the immediate advantages but the *signalling* of their low defection costs, and hence untrustworthiness as a coalition partner.

However, the immediate impact of transaction costs is to reduce the core of the game, the set of feasible configurations. When a transaction cost to a faction to join a configuration is greater than the payoff generated by that configuration, then the configuration becomes unfeasible. Large coalitions suffer disproportionately from this, as costs are added with additional members, but the scope for a mutually satisfactory arrangement of rents necessarily decreases with them. This can be understood as no additional ($n+1$)th member can improve the possible rent arrangement for the existing members of a n coalition of size (at best, it makes the current settlement no worse for them). Where the number of factions is large, and large coalitions are required for (super) majorities, transaction costs can dominate the system and inhibit settlement.

COALITION COHERENCE

Underlying all coalitions is the problem of coherence. It is assumed in the simple model that factions can fix the arrangement of rents, and monitor the compliance of their members, enforcing penalties if necessary. In practise each of these assumptions is questionable and the problems facing coalition coherence resolve into prevention, detection and enforcement. Firstly, members must be prevented from arbitrarily altering the rent arrangement to their benefit or leaving the coalition. Defection costs, as discussed, go some way to addressing this, but in practise coalitions are dependent upon the good will of their members to deliver many of the rents involved.

A classic example of unilateral adjustment of rents arrangements is cheating in cartels, when one member exceeds quota to gain a disproportionate share of benefits. Even if aware of the transgression, it may be impossible for other cartel members to apply meaningful sanctions. Additionally cartel breakers often enjoy "first-mover advantage". They can present their partners with a *fait accompli* that leaves them a choice of either acquiescing to the

²³ At the least, it helps to have a common language!

defection, or defecting in turn, to mutual disadvantage²⁴. This is doubly tempting if the arrangement of rents is to be delivered asynchronously and irreversibly. Factions would have no incentive to follow suit once they had what they wanted²⁵.

Many real-world peace agreements have to be staggered through several stages to allow for mutual verification of commitments and preclude the possibility of being left “holding the baby”. The 1998 Good Friday agreement in Northern Ireland obfuscated the process of IRA disarmament for precisely this reason.

The majority of peacekeeping missions concern themselves with coalition coherence issues by “underwriting” a settlement. Peace-enforcement goes one step further by imposing costs on factions in violation of agreement.

Bosnia provides a clear example of both stages. Initial UNPROFOR deployment was capable of monitoring and reporting the behaviour of all sides, but lacked the political will and military capability to enforce compliance with the numerous undertakings. Ceasefires were routinely violated as convenient by all factions (and blamed on each other). Later IFOR provided a sufficient margin of capability to punish aggressors, at least in conjunction with other factions. In these cases, UN-intervention force constituted an additional faction of its own. Given the approximate parity and mutual enmity that had arisen between the principal Serb, Bosnian, and Croatian factions this allowed them to become part of nearly every feasible coalition and to dictate terms.

The effect of coherence problems generally is to increase transaction costs where there is incentive for factions to cheat (i.e. the delivery of rents is dependent on mutual good will). Where effective monitoring of such systems is impossible then coalitions are likely to disintegrate from the pressure of individual rent adjustments leading to general defections.

SUMMARY

This paper has outlined a simple formal model for behaviour of factions attempting conflict resolution, and extended it to show how real world obstacles are incorporated.

The model is simple and elegant, and allows analysts to quantify the difficult issues and arrive at deductions about the likelihood, composition and support of any settlement. With a reasonable number of factions and rents the system can be exhaustively analysed and the game core of possible settlements identified.

The addition of negative rents, externalities, incomplete information, incommensurability, transaction costs, non-independent all serve to decrease the number of feasible configurations. If the number of feasible configurations becomes zero, then the conflict may be described to be genuinely intractable; insoluble *despite* the goodwill and efforts of all parties. The number of real world conflicts in this set may be larger than commonly supposed.

²⁴ *Star Wars* captured this one quite nicely: Lando Calrissian: “Wait, we had a deal!”, Darth Vader:” I’m altering the deal. Pray I don’t alter it further”

²⁵ “First, you agree to disarm and then we’ll discuss your demands for autonomy...”

To recognise a conflict as intractable is to recognise expenditure of effort on resolving such through an agreed settlement is futile, though it may still be efficiently managed or contained. The outcome of such conflicts rests ultimately upon the entry of additional factions or a change in the capabilities of existing ones to force a unilateral outcome.

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