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Ethnic Conflict: A Model of Concessions

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Abstract

The Coase Theorem suggests that the ability of completely informed agents to make transfers should generally avert conflict. This thesis considers a complete information model of ethnic conflict where the dominated group consists of heterogeneous agents, but the dominant group can only bargain with the dominated group as a whole. This broadly captures a political system with race-based parties and coalitions. Moreover in this thesis the dominant group can make credible ex-ante transfers to the dominated group outside a standard bargaining framework. Then conditions arise where conflict occurs.

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1 Introduction

Human civilisation, particular in its recent history has been marked by an extraordinary pace of scientific and social development. So much so that some commentators have postulated an “end of history¹” where the advent of Western liberal democracy signals the end point of mankind’s ideological evolution and the final form of human government. However, one of the most intractable phenomena in the world today is conflict along ethnic lines as far afield as Central Africa, Sri Lanka, Palestine and the Balkans.

No doubt there are multiple reasons at work in ethnic conflict, but a common theme attested to is that ethnic conflict is a contest over resources. This treats ethnic conflict as a variation on a general bargaining game. But then *prima facie* conflict should not occur. Conflict is costly and reduces the aggregate resource. So if agents know the consequence of conflict they should surely be able to make transfers and settle on an agreement before hand?

The literature points to information asymmetries as a common source of inefficiency. If complete information is assumed, it is typically commitment problems in a repeated game context that are cited as the dominant reasons why an efficient allocation is not attainable. It is possible to ad-hoc construct examples where inefficient outcomes are obtained. However this thesis provides an intuition as to a general mechanism that underlies many

¹This comes from Francis Fukuyama’s provocatively titled book, *The End of History and the Last Man*

conflicts in the world. Moreover it provides a counter-intuition as to the effect of transfers.

This thesis assumes complete information and considers an interaction between a dominant ethnic group A and its rival B . However agents have heterogeneity in their costs of conflict. Moreover A cannot make separate offers to the heterogeneous B . I.e. there is bilateral bargaining but one party has multiple agents. This is a common feature in many contexts around the world. e.g. ethnic political parties would typically represent both wealthy and poor. Into this bargaining framework, A can make a unilateral concession to B which is an ex-ante transfer. This mechanism allows A to ex-ante influence the profitability of conflict to the different agents in B . This generates two results. One is efficiency, but with the unilateral concession being a tool that maximises A 's share of the surplus. The other is conflict where the unilateral concession improves the profitability of conflict to A by reducing the incentives of others to fight. Both these results are broadly consistent with political theories such as "divide and rule." The thesis also obtains some interesting statics as to when both results will be obtained.

This is a particularly interesting result for the following reason. Prima-facie, an extra mechanism of transfer such as the unilateral concession would appear to be efficiency enhancing. Indeed the literature emphasises the role of unilateral concessions as a signalling device between asymmetric agents that can lead to efficient outcomes. In this thesis it can lead to an inefficient outcome or an efficient allocation that favours the dominant power.

That said, the primary policy imperative that emerges from this thesis is not to eliminate unilateral concessions. Pivotal to this result is the imperfect bargaining mechanism where A cannot make separate offers to the high and low cost B 's. Thus this thesis would suggest that ethnic-based coalitions are more susceptible to being exploited by opponents who play upon the economic heterogeneity present within those coalitions. Hence the solution would be for political representation more along economic interests. This would avoid divergent economic interests being captured by ethnic-based parties.

2 Literature Review

The literature on ethnic conflict spans a range of disciplines and encompasses many different paradigms, some of them opposed, as to what motivates ethnic conflict. Horowitz (1985) classifies the dominant paradigms of understanding conflict as economic interests, modernisation theory and cultural pluralism whilst also advocating his own taxonomy of the causes of conflict. The traditional “economic interests” argument for conflict is that agents are motivated by increasing their share of finite resources. Therefore, in an ethnic conflict, ethnicity is merely the marker under which coalitions form to agitate for greater resources. Ethnicity does not provide the motivation. Social scientists and anthropologists have long recognised “pork allocation” as a substantial motivation in conflict. Other explanations of conflict however are no doubt valid and it is likely that many conflicts involve a range of factors at work.

This thesis emphasises the “economic interests” paradigm of explaining conflict. Agents are rational and self-interested and choose actions to maximise their share of finite resources. In this sense, ethnic conflict is a specific expression of a general bargaining problem. The most obvious question that arises is why can’t agents agree on an allocation and avoid conflict? Consider agents contending over a finite pie. Conflict or any exercise of political power imposes costs that reduce the ex-post size of the pie to be distributed. Consequently there must be ex-ante divisions of the pie that deliver a greater slice to the bargainers than from conflict. Goemans (2000) notes,

If both sides knew how the pie would be divided after the war, both would be better off if they divided accordingly before the war.

Conflict then is not only inefficient but Pareto-inferior. This was the contention of Coase (1960) in his Theorem that if completely-informed agents can costlessly bargain, efficiency should be the outcome. Thus within the game-theoretic bargaining literature, inefficient outcomes are the exception, rather than the rule. Alternating-offer bargaining over a single divisible object often leads to a unique, efficient, subgame perfect equilibrium allocation in Rubinstein (1982). Why then does inefficiency occur?

A standard answer is that inefficiency is the result of information asymmetries. It is important to note that asymmetric information itself does not always preclude an efficient outcome. The Coase Conjecture (1972) posits that even with incomplete information the ability to alternate offers quickly should produce agreements without costly delay. However, there is a vast body of work that shows how in many contexts information asymmetry is the source of inefficient equilibria. However, there are circumstances where asymmetric information is too broad an assumption. Fearon (2004) identifies protracted stalemate wars e.g. Sri Lanka, as a situation where over the years fighters know the capacity and resolve of their opponents. This poses the question of whether there are theoretical explanations of conflict within a complete information framework.

Some complete-information models of conflict deliver inefficient equilibria but can be shown to be dominated by Pareto-improving efficient equilibria. One case is infinitely repeated games. Inefficient equilibria exist but with sufficient patience on the part of players, those equilibria are Pareto dominated by efficient outcomes. Infinitely repeated games frequently support inefficient outcomes because of the “equilibrium switching” method that is used to establish Folk Theorems, Fudenberg and Maskin (1986). However ethnic conflicts are not typically infinitely repeated games. Once the offer is accepted the game ends. Pareto domination of inefficient equilibria by efficient outcomes occurs in wage-bargaining models where parties impose costs on each other between offers as in Busch and Wen (1995) and Muthoo (1999). Models of strikes which are a narrower class of the above case as in Fernandez and Glazer (1991) and Haller and Holden (1990) deliver similar results. Also games where the players have the option of renegeing and retracting on previously accepted offers have inefficient equilibria that are Pareto dominated by efficiency e.g. Muthoo (1999). Slantchev (2003) constructs a complete information model of war where outcomes are endogenously determined by previous behaviour as opposed to a lottery over exogenously fixed outcomes. His model supports an inefficient equilibrium but it is not the only one.

However the literature also points to situations where conflict will be the

unique subgame perfect equilibrium (SPE). One class of explanation points to commitment problems that arise in a repeated stochastic game, even if the bargainers have complete information. An efficient allocation exists, but the bargainers cannot credibly commit to it. More specifically, to avert conflict, one party has to buy off another by making a transfer. Resource constraints typically mean that the transfer must take place over multiple periods. However, over multiple periods, the transferring party can reach a level of strength such that it is profitable to renege. Bargaining therefore breaks down. A lot of the literature constructs specific scenarios where the above commitment problem occurs. In Acemoglu and Robinson (2000, 2001) incumbent governments cannot commit to future redistribution. In Fearon (1998, 2004) the central government cannot commit to future power sharing. In Alesina and Tabellini (1990) and Persson and Svensson (1989), political parties cannot commit to future spending levels. This is similar to Besley and Coate (1998) where the incumbent government's decisions influence the identity or preferences of future governments. This too leads to inefficiency. Political parties in de Figueiredo (2002) impose inefficient administrative procedures to protect their programs because future governments cannot commit to not overturning them. Moreover Fearon (1995) and Powell (1999) show that in addition to commitment problems, a rapidly shifting distribution of military power can lead to war. The above examples are all specific models that harp on a common theme. But Powell (2004) derives a general inefficiency condition that is common to the above models and defines when conflict will occur in a repeated stochastic game. Large, rapid changes in the parties' relative power cause inefficiency. Specifically, the equilibria must be inefficient even with complete information if at some time along any efficient path, the expected per-period shift in at least one of the parties' minmax payoffs is larger than the bargaining surplus. Powell (2004) identifies the drivers of this condition as follows. Firstly, parties cannot commit to future allocation decisions and secondly, the payoffs that parties can secure through the inefficient use of power varies over time. Combined with resource constraints, this creates a quickly changing strategic environment where every efficient path is dynamically inconsistent. These results also highlight the relevance of political structures and constitutional mechanisms to limit commitment problems.

Notwithstanding the ability to articulate general conditions as in Powell (2004), the above examples highlight that within a complete information environment, the prospect of inefficiency is highly conditional on the specifics of the game form being considered. Even the condition in Powell (2004) is a general condition for a specific type of game. Hence the literature is primarily engaged in constructing bargaining situations where inefficiency is possible. The most interesting cases are bargaining mechanisms that ostensibly would appear to assist the achievement of efficient outcomes yet can be shown to deliver the opposite. Weinberger (2000) outlines a model with a “selective acceptance” rule on the outcome of two-issue negotiations. The model is an alternating-offer game that allows for settlement on one issue while negotiation continues on the other. Ostensibly such flexibility would appear to be efficiency enhancing. However the result presented is that if one issue is indivisible there are inefficient subgame perfect equilibria with no Pareto-improving alternatives. Furthermore if parties have opposing valuations, rapid communication guarantees inefficiency.

In this thesis, which is a single period complete information game, an agent of inefficiency is a mechanism termed the “unilateral concession.” The model consists of two ethnic groups A and B . Ethnic group A is assumed to have political power which allows them to control society’s common resource. The unilateral concession is an irrevocable ex-ante transfer made by group A to group B before bargaining commences. This determines the size of the pie in the bargaining game. Group A then makes a standard offer to group B . Group B can accept or reject the offer. If they accept the game ends. If they reject it the game goes to conflict, where Group B chooses whether to fight or be passive (not fight). The unilateral concession takes on significance when one considers that group B consists of two types of agents, those with a high cost and those with a low cost of conflict. The conflict subgame where the fight/passive decision is made is a simultaneous game between the high and low cost group B . In that subgame, the unilateral concession determines the profitability of conflict to the two groups of B . The interesting result is that it is often in the interest of A to offer a unilateral concession that makes conflict unprofitable to the high cost B , effectively “buying them off.” Any conflict that then occurs will only be “partial” i.e. only the low cost B will fight.

This thesis gives two main results. The main result is that in a certain class of games, conditions arise where inefficiency occurs. Under those conditions the unique SPE is for group A to offer a unilateral concession and then not make an offer to appease those of group B that fight. It is optimal for group A to engage in partial conflict. The second result is that in another class of games, efficiency is always the outcome. But the optimal solution for A is to make a unilateral concession to buy off one subgroup from fighting and make an offer that appeases the fighting group. So in the presence of heterogeneity, the unilateral concession either leads to inefficiency or skews the chosen efficient outcome in the dominant group's favour. There is a bargaining imperfection that drives both results. The unilateral concession derives its potency from the fact that group A cannot negotiate with the high and low cost group B separately. The unilateral concession is given to all of group B and most importantly, the same offer is made to all of B . Thus even though the payoff to the two groups of B may be different in the conflict subgame, to avoid conflict, A must offer a contract to all of group B equivalent to the highest attainable payoff in conflict. It is a case of bilateral bargaining but where one party, in this case, group B , has two agents.

The distinction between the class of games where the unilateral concession induces inefficiency and that where it induces group A -optimal efficiency is the ability of the subgroup of B that fights to exclude the non participating members. That is if exclusion occurs, the expected gain from conflict to the B that fight is high. But group A must make an equivalent value offer to all group B . Then it is possible that the expected gain to group B from conflict exceeds the expected loss of group A . Hence no transfer can avoid conflict. This thesis then effectively models an imperfection in multiple agent bargaining, with the unilateral concession being the mechanism that exploits this mechanism. However, just like the selective acceptance rule in Weinberger (2000), the unilateral concession would prima facie appear to be efficiency enhancing. Another instrument of making a payment to B , even if it allows for buying off B or "divide and rule" strategies would intuitively seem to be positive for efficiency.

The literature on unilateral concessions often emphasises its positive and

efficiency enhancing effects, particularly in a context of asymmetric information. The unilateral concession is thought to stabilise cooperation by making non cooperative behaviour unprofitable. The unilateral concession operates as a signalling device between asymmetric parties that enables settlement to occur e.g. Chatterjee (1996). Hence much of the game theoretic literature on unilateral concessions is used in an international relations framework, with negotiations between superpowers or states with asymmetric information and divergent goals. Caruso (2007) presents a partial equilibrium model of conflict where two asymmetric agents contest a stake. Unlike standard contest models, agents have the option of choosing a second instrument to affect the outcome of the conflict. That involves making a unilateral concession to invest in peace talks. The result is that under some conditions, an asymmetry in the evaluation of the stake can lead to a concession from one agent to the other. Specifically, the agent with a higher valuation makes a concession, proportional to the optimal choice of “talks.” This can lead to a Pareto-improving outcome. Larson (1997) and Lepgold and Shammnbaugh (2001) also present unilateral concessions as a valid tool of bargaining in an international relations context. The unilateral concession signals one party’s commitment towards a settlement. Guner (1997) in a case study of water disputes between Syria and Turkey advocates unilaterally conceding as a potentially Pareto-improving mechanism in conflict. Senese and Quackenbush (2003) in a model of deterrence suggests that unilateral settlements are more likely to avoid future conflict compared to negotiated settlements. Whilst asymmetric information is the general environment in which unilateral concessions emerge in the literature, there are also attempts to indicate what type of governments are likely to offer such concessions. Kriesberg (1992) argues that authoritarian regimes can more easily make unilateral concessions than democratic leaders, who are under pressure to show that they have not “given away the store.” This is used to explain why most U.S.-Soviet agreement arose not through a tit-for-tat process but from a pattern of asymmetric concessions by the Soviets.

The contrast with the present thesis is stark. Unilateral concessions in the above literature can be an optimal decision that induces a Pareto optimal peace. Here the unilateral concession directly induces inefficiency. A crucial difference is that in this thesis, the unilateral concession operates in

a complete information environment. Hence it is not so much a signal of good faith as it is a targeted ex-ante attempt by A to control the ensuing bargaining game. Moreover the above literature typically involves bilateral negotiations between state actors. Here group A is dealing with two agents that require different concessions to be appeased. But group A can only make the same offer for both subgroups of B . It is in this environment where the unilateral concession then is optimally used to induce conflict as a “buying off” of one subgroup.

It follows that the other strand of the literature that this thesis builds on is the area of multiple agent bargaining. With heterogeneous costs, group A is effectively dealing with two agents for group B . The literature that analyses one agent bargaining with two parties typically deals with the issue of hold out problems. Cai (2000) expanding on Coase’s farmer railroad bargaining game shows that it is the presence of multiple farmers whom the owner has to negotiate with in an endogenous order that causes inefficiency. A series of inter-dependent hold out problems is created since every farmer wants to stall the bargaining process in the hope of getting a larger share. Since a larger group of people finds it easier to stall the process, delay is shown to increase in the number of bargainers. Other papers study variations of multiple-person bargaining with a firm. Jun (1987) assumes that a firm bargains with two unions simultaneously. The firm in Jun’s model cannot play off one union against the other so there is a unique and efficient equilibrium. In Stole and Zwiebel (1996), the bargaining outcome is always efficient because the order of reaching agreements with the firm is fixed among the workers.

Whilst this thesis considers the effects of a dominant group dealing with two agents, it is quite different from the literature in several key ways. The above literature looks primarily at the order of bargaining as a means of determining whether efficiency or inefficiency occurs. Here the fact that this thesis concerns ethnic conflict and not generic bargaining brings out a pertinent difference. Holding out is essentially an endogenous means of increasing one’s payoff. In this thesis group A makes an offer to both subgroups of B simultaneously. Rejection of an offer by at least one subgroup leads to conflict. Moreover conflict in this model is a lottery over exogenous

outcomes. Therefore, the payoff that each subgroup of B can obtain by rejecting the offer is fixed and known. There is no prospect of endogenously increasing the payoff. Holdout and bargaining order then becomes irrelevant. What drives inefficiency is a unique bargaining architecture that the literature has not considered. This architecture is that group A is unable to make separate offers to each subgroup of B . Unlike the holdout problem, the efficiency inducing offers that will satisfy each subgroup is known, but is not implementable. Effectively group A is negotiating with one party but that party has two agents. In the above literature one bargaining party equals one agent. Multiple agents is synonymous with multiple parties. So it is the presence of multiple agents for one party in a bilateral bargaining mechanism that creates an environment where inefficiency can occur. The literature has not considered this feature. The prospect of inefficiency can be intuited from the fact that understanding this thesis in that sense shows why the Coase Theorem does not hold. A critical assumption in Coase (1960) is that agents can costlessly bargain. When offering a contract that appeases the group B subgroup with the highest expected return from conflict, that same offer has to be made to the subgroup with a lower expected return from conflict. That is effectively imposing a cost on bargaining. So bargaining takes place, but it is imperfect.

As aforementioned, this thesis whilst adding to the broad literature on bargaining is motivated by ethnic conflict. Thus this thesis can be seen as adding to the literature on ethnic conflict specifically as well. The following section reviews the literature on ethnic conflict.

The premise of this thesis is that the motivation for ethnic conflict is control of a finite resource. Whilst economic objectives may be the motivation, that itself does not explain why ethnic conflict occurs. Consider that agents are differentiated on the basis of a range of different markers, ethnicity, wealth etc. And agents can form coalitions on the basis of different markers. Is there a reason ethnic coalitions appear predominant? Moreover if resource allocation is the motivation behind agents actions it would be *prima facie* expected that class based coalitions form. Horowitz (1985) points out that it is “modest hyperbole to suggest that the Marxian prophecy has had an ethnic fulfillment.” It is logically consistent to argue

that even if the motive for conflict is economic, other factors separately determine why coalitions form along ethnic lines. Horowitz (1989) points to the colonial structures in Sri Lanka and Malaysia to explore why race-based political parties emerged in the former but not the latter.

However there is a body of literature that shows that if coalition formation is seen as a choice variable, ethnicity is the optimal coalition type. Esteban and Ray (2008) shows that ethnic conflict is salient because heterogeneous wealth levels within ethnic groups create a positive synergy for conflict. I.e. the poor supply labor, the rich supply resources. On the other hand class divisions create homogeneous groups. Conflict is clear and well defined, but hard to conduct for the poor who would lack the resources to successfully fight. Moreover the rich have a low opportunity cost of resources but no incentive to initiate a conflict. Furthermore they show it is often the incentive of the rich to propose an ethnic alliance to prevent a class conflict initiated by the poor. And it is the incentive of the poor to accept. Kapferer (1998) rejects the “economic interest” story of conflict and identifies the role of history and myth. However it is possible then that inflammatory myth may provide a tool for agents with an economic interest in conflict to get the masses to follow i.e. affecting mass beliefs in a coordination game. Robinson (2001) suggests that the salience of ethnic coalitions can come from the immutability of race compared with the prospect of mobility with respect to class. I.e. once the poor become the rich, conflict ends. Esteban and Ray’s acknowledgment that ethnic coalitions are heterogeneous supports the contention of this thesis that group A and B have heterogeneous costs.

Esteban and Ray (2008) are primarily concerned with the issue of which coalition is salient. As such they do not propose when conflict will occur but they suggest that when it occurs it will more likely than not be ethnic in nature. However their acknowledgment that ethnic coalitions have a heterogeneous characteristic implies that those distinctions would play a role in the outcome of conflict. This thesis takes up where Esteban and Ray (2008) leaves. This thesis treats the issue of coalition formation as exogenous and focuses on the outcome of conflict, with particular attention to the role of heterogeneity. Moreover if “synergy” as Esteban and Ray (2008) term it can be seen as both subgroups of B fighting together, the unilateral concession

in this model becomes a mechanism that group A employs to break down such synergy.

Caselli and Coleman (2006) does not model coalition formation as a choice as in Esteban and Ray (2008) but still provides some intuition as to coalition formation. The coalitions in Caselli and Coleman (2006) are exogenous and ethnic-based. However their model introduces a stage post-conflict which is “switching”. I.e. the losers can “switch” and pass themselves off as members of the dominant coalition. This then reduces the ex-post benefit from discrimination. Caselli and Coleman (2006) introduce a notion of “ethnic distance” that measures the ability of coalitions to withstand ex-post infiltration. This demonstrates why ethnic coalitions on identities like race may be stronger than religion. I.e. it is easier to change religion than to change skin colour. This does not address the issue of why race is preferred to class. However their model, like this thesis, constructs ethnicity broadly and includes race, religion, caste etc. Thus individuals can hold multiple ethnic identities concurrently. So their model provides a reason as to why some ethnic identities would be a preferred coalition marker to others.

As aforementioned however, the emphasis in this thesis is not so much on coalition formation which is exogenously set but on the engagement between parties in a conflict game. Caselli and Coleman (2006) presents a sequential model where the “dominant” party chooses a Peace (P) stance which is to share the resource equally or a Conflict (C) stance which is to appropriate the resource. The weaker party then responds with a Peace or Conflict move. Conflict occurs if CC is chosen. Then they allow for switching. In their model, there is no allowance for transfers. Either the dominant party appropriates completely or they share equally. This thesis is a model of optimally set transfers which would be a logical mechanism in a conflict situation. Their model also does not include any heterogeneity within the ethnic groups. Interestingly it allows for the non-dominant group to exploit a Peace move by the dominant party and seek to appropriate the resource. But without a specific context, this seems to be a large assumption.

A body of literature considers conflict where transfers are allowed to be made. Grossman (1994, 1995) show that redistribution via land reform

is the optimal response of a landowning class to the threat of extra-legal appropriation of land rents. In fact Azam (2001), considering the specific case of Africa argues that violent conflicts must be considered a failure of the state to perform some of its fundamental tasks. The corollary being that the increased provision of services by the state e.g. transfers, can avert conflict. Falkinger (1999) also shows that redistribution can lead to socially stable outcomes. Gershenson and Grossman (2001) show how the Soviet elite used cooption of people i.e. giving them a share in the surplus as a means of control. Azam (1995) analyses the choice of the government between raising its defence expenditures or giving away some “gifts” to opponents, as a means to defending a position of power. If the government is a Cournot-Nash player, then there is no gift in equilibrium, and any increase in the budget will lead to inefficient defence expenditures. However, if the government is a Stackelberg-leader, then the gift is used as a policy tool for staying in power. This thesis is different because it examines the role of unilateral concessions, not just the standard offer. Moreover, the ability to make the unilateral concession actively leads to a situation of conflict rather than peace.

The ability to make transfers does not always avoid conflict, as in this thesis. Within a complete information framework, one reason is commitment problems e.g. Powell (2004) and other repeated stochastic games. Another reason transfers cannot avert conflict is if the expected gain from conflict to one party exceeds the expected loss to the other. Effectively there is a discrepancy in the valuations of conflict. Gershenson and Grossman (2000) present a model of civil conflict where the duration of conflict depends on the value agents ascribe to political dominance. This is a general notion and is based on the intuitive idea that a dominant party has the power to appropriate economic rent, dictate social and religious policy etc. Different parties may value those powers differently. The value of political dominance to both parties is exogenously set in Gershenson and Grossman (2000). Jackson and Morelli (2007) in a model of war, endogenously model why one party may have a higher valuation of conflict than the other. Jackson and Morelli (2007) consider a measure of “political bias” where the bias stems from the amount of the surplus, the leaders of both parties expect to expropriate from conflict. If the bias is high then transfers may not be

able to stop conflict. The ability to expropriate resource is a key driver of the inefficiency in this thesis. The unilateral concession induces a situation where only one subgroup of group B fights. Why is an offer unable to settle the issue? If the subgroup of B that fights can appropriate the resource all for themselves, they require a high concession to be appeased. But the bargaining framework requires that same offer to be made to all of group B . This can exceed the expected loss to group A from conflict.

The reason the unilateral concession in this thesis generates inefficiency is due to heterogeneous costs among group B . Hence this thesis builds on the understanding of heterogeneity within ethnic groupings. Esteban and Ray (2008) identify the synergy of rich and poor as a motivating factor in conflict. Esteban and Ray (1999) link the level and pattern of social conflict to the society wide distribution of individual characteristics including race, wealth etc. They show conflict to be closely connected with the bimodality of the underlying distribution of characteristics. This thesis not only identifies heterogeneity but shows the unilateral concession as a mechanism that exploits that heterogeneity towards the interests of A .

There are some other interesting features in the literature on ethnic conflict that is not examined by this thesis. Mc Dermott (1997) and Falkinger (1999) allow for measures of effort and productivity by agents. Then conflict and discrimination distorts effort levels. A possible implication is that a dominant power may want to give productive minorities the resource but then appropriate the return. Chang (2007) also considers the incentives for third-party intervention in conflict. Moreover, this thesis exists within a complete information framework. In Esteban and Ray (2001) conflict arises from incomplete information. A benevolent planner knows the winning payoffs and that the cost of expending resources is identical and isoelastic across all players. But the planner does not know the value of the elasticity. This is shown to prevent a Pareto-improving social decision rule, as long as there are at least four agents.

This thesis also seeks to do some comparative statics on the variables that relate to conflict. To this end, this thesis is assisted by some empirical literature and case studies on the causes of ethnic war. Collier and Hoeffler

(2001) show that conflict tends to occur when a dominant group is large and strong, but not so large that the resource it acquires by discriminating is negligible relative to the cost of conflict. Miguel et al. (2004) also show that economic conditions affect the probability of conflict. There is also a vast body of empirical literature that models the effects of conflict on various economic outcomes. However that literature is more concerned with the consequence of conflict whilst this thesis is concerned with the causes. That said, the economic consequences of conflict no doubt would be relevant to the incentives of conflict for agents in a complete information model.

3 The Theoretical Model

Consider an economy where agents belong to one of two ethnic groups, A and B . Ethnicity in this model is a broad term and refers to a variety of group identities e.g. race, caste, religion, colonial power etc. Without loss of generality, let group A have mass r and group B have mass 1, where $r > 0$. The economy also has a stock of common resources X . Assume that group A is dominant and controls the resources. Group A can then restrict the access of group B to X . However agents are heterogeneous in their costs of conflict. A proportion m of agents are assumed to have a high cost of conflict c_1 and the remainder have a low cost of conflict c_2 where $c_1 > c_2$. This distribution is the same within both ethnic groups. So there are now four subgroups, high cost A , low cost A , high cost B and low cost B .

The game form is the standard used in the bargaining literature. First, group A makes an offer to group B . The offer is a share, α , of X , where $0 \leq \alpha \leq 1$. This is the offer stage. However the decision makers of group A will be acting for the interests of either their high or low cost agents. Group B then decide whether to accept or reject the offer. This is the response stage.

If the offer is accepted, the payoff to an individual member of group A is

$$(1 - \alpha) \frac{X}{r}$$

and the payoff to an individual member of group B is

$$\alpha X$$

Because group B consists of two types of agents, the response decision is a simultaneous Nash game played by the high and low cost B . If both subgroups accept, the game ends. If at least one subgroup of B decides to reject the offer, the game goes to the second stage which is conflict. In the conflict stage the offer is removed. There are two outcomes in conflict. Either A win and retain X or B win and acquire X . In the conflict stage, group B choose a fighting or passive stance. This decision is also a simultaneous Nash game played by the low and high cost B . If a subgroup adopts a fighting stance, they incur the cost of conflict c_i , $i = 1, 2$. If they are passive they face no cost. However if both subgroups fight group B wins the conflict with probability p . If only one subgroup fights, group B wins the conflict with probability q , where $p > q$. If no subgroup of B fights then group A win with probability 1. It is important to note that if group B wins the conflict, X is evenly distributed amongst all of group B irrespective of who participated. X is presumed to be a public good. As long as at least one subgroup of B chooses to fight, the entire A is forced into conflict. However, being the dominant group, A is assumed to have some apparatus of the State at their disposal. Therefore individual agents in A face the cost βc_i , $i = 1, 2$ where $0 \leq \beta \leq 1$.

The following diagrams illustrate the game form where HC means high cost and LC means low cost.

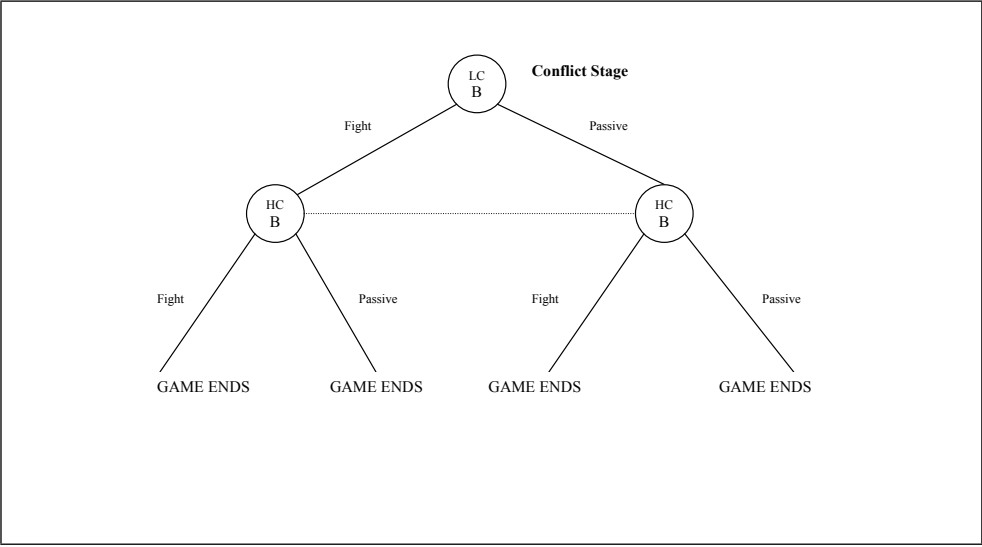
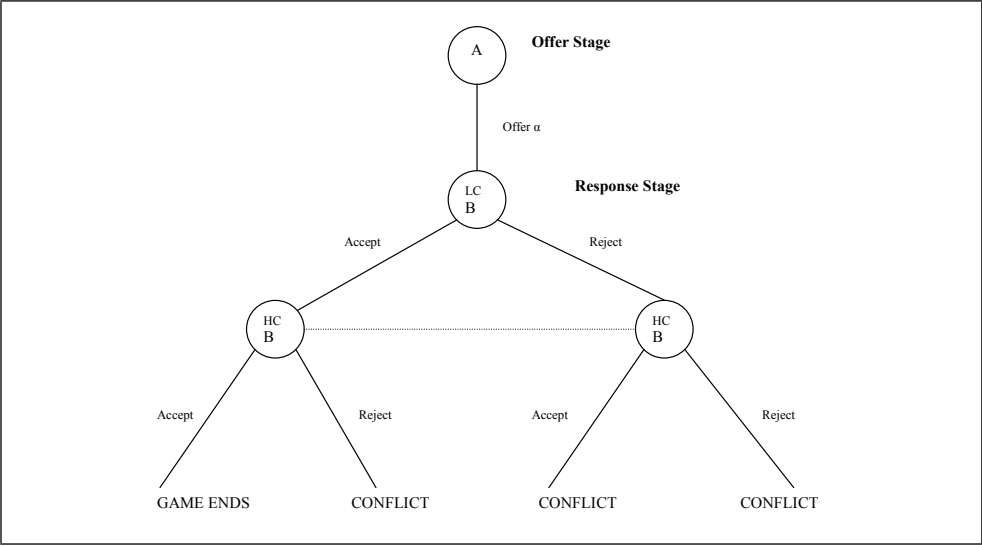


Figure 1: Heterogeneous Game Form

By backward induction, one must first consider the conflict subgame.

As aforementioned, this is a simultaneous Nash game between the high and low cost B , with the following payoffs.

	Fight	Passive
Fight	$pX - c_1, pX - c_2$	$qX - c_1, qX$
Passive	$qX, qX - c_2$	$0, 0$

Table 1: Conflict Subgame

The conditions under which each outcome will be an equilibrium are as follows, where F denotes Fight and P denotes Passive.

FF	FP	PF	PP
$X > \frac{c_1}{p-q}$	$\frac{c_2}{p-q} \geq X > \frac{c_1}{q}$	$\frac{c_1}{p-q} \geq X > \frac{c_2}{q}$	$X \leq \frac{c_2}{q}, X \leq \frac{c_2}{p-q}$

Table 2: Conflict Subgame Equilibrium Conditions

The particular equilibrium outcome and whether there exist multiple equilibria will depend on the relationship between the parameters, X , c_1 , c_2 , p , q and r .

The assumption is made that there must be some positive payoff from conflict with all of group B participating.

$$pX - c_1 > 0 \tag{1}$$

Furthermore, to simplify the analysis and avoid multiple equilibria, it is assumed that

$$\frac{c_1}{q} > \frac{c_1}{p-q} > \frac{c_1}{p} > \frac{c_2}{q} > \frac{c_2}{p-q} \tag{2}$$

The generality of the result is not affected by the assumption in (2)². Given the assumption of (1) and (2), there are only 2 possible conflict subgame equilibria FF and PF.

Having determined the equilibrium conditions for the conflict subgame, consider the response subgame. This also is a simultaneous Nash game between the high and low cost B , with the following payoffs.

	Accept	Reject
Accept	$\alpha X, \alpha X$	Conflict Subgame Equilibrium
Reject	Conflict Subgame Equilibrium	Conflict Subgame Equilibrium

Table 3: Response Subgame

The decision for both groups of B is simple.

It is a weakly dominant strategy to accept the offer if,

$$\alpha X \geq \text{Conflict Subgame Equilibrium Payoff}$$

Proposition 3.1. *Peace is always the outcome of this game. There is an efficient allocation that is acceptable to all parties.*

Proof. First determine the minimum offer, α^* that will be sufficient to induce peace for each possible conflict subgame equilibrium. The heterogeneity of B becomes highly relevant for this. To induce peace both the high and low cost B must be willing to accept α^* . Hence the choice of α^* must deliver a payoff equal to the highest payoff from the conflict subgame equilibrium. This is a consequence of A being unable to make separate offers to the low and high cost B .

²This assumption implies that $p > 2q$ and $c_1 > 2c_2$

The following table shows the minimum peace-inducing offer, α^* , for each possible conflict subgame equilibrium.

	FF	PF
α_2^*	$p - \frac{c_2}{X}$	q

Table 4: Minimum Peace-Inducing Offers

Hence at the offer stage, A can either make the offer α^* that induces peace or a lesser offer for which the game goes to conflict. The following table shows the payoffs to group A under both peace and conflict for both conflict subgame equilibria.

	FF	PF
Peace	$(1 - \alpha^*)\frac{X}{r}$	$(1 - \alpha^*)\frac{X}{r}$
Conflict	$(1 - p)\frac{X}{r} - \beta c_i$	$(1 - q)\frac{X}{r} - \beta c_i$

Table 5: Group A Payoffs

Substituting the appropriate α^* for each case of the conflict subgame equilibrium reveals that the payoff to A from peace is greater than the payoff from conflict. Hence peace is always the outcome. \square

3.1 The Unilateral Concession

A variation is now introduced into the model. A is now able to make an ex-ante transfer to B before the game starts. The transfer is called a unilateral concession and is a share γ of X where $0 \leq \gamma \leq 1$. This concession is distinct from and in addition to the standard “take it or leave it” offer that A makes in the basic model. The unilateral concession is an actual transfer, a “free” gift, not an offer to be accepted or rejected. Furthermore, since it is ex-ante, it occurs outside any bargaining process. The transfer is made and the remaining resource is what is up for bargaining. Importantly, the transfer is irrevocable. Even if A and B engage in conflict, the unilateral concession cannot be recovered by A .

Is irrevocability a plausible assumption? If X is a physical resource, then an ex-ante transfer is easily committed to. And given that A in this model is reactionary i.e. it is B that initiates conflict, it is possible that A 's intention in conflict is to defend the status quo instead of recovering a previously made concession. Where X involves rights of some kind, then constitutional measures may be required for an ex-ante transfer to be justified.

The option of offering a unilateral concession ex-ante slightly changes the definition of the offer α . Since the unilateral concession is irrevocable, the game becomes identical to the original game earlier, except the resources being fought over is $(1 - \gamma)X$. Let \hat{X} be $(1 - \gamma)X$. With a unilateral concession, the standard offer α is now defined as a share of \hat{X} .

Given that B holds the unilateral concession irrespective of the bargaining outcome, when considering B 's payoffs, one need only consider its holding of \hat{X} for simplicity.

The intuition behind the unilateral concession is this. The imperfection in the bargaining structure is such that group A has to make the same offer to both subgroups of B . So in order to avert conflict it has to make an offer to all of B equivalent to the highest payoff to a subgroup of B from the conflict subgame. The unilateral concession then is a mechanism that group A can use to affect the outcome of the conflict subgame. The unilateral

concession may change the incentive of agents with a high cost of conflict. I.e. it may no longer be individually rational to fight. Hence the offer that A has to make to ensure peace is the payoff that the low cost B get from fighting by themselves. Making a lower offer to all of B plus the unilateral concession may possibly be a lesser transfer than making a higher offer to all of B .

The following diagrams illustrates the game form.

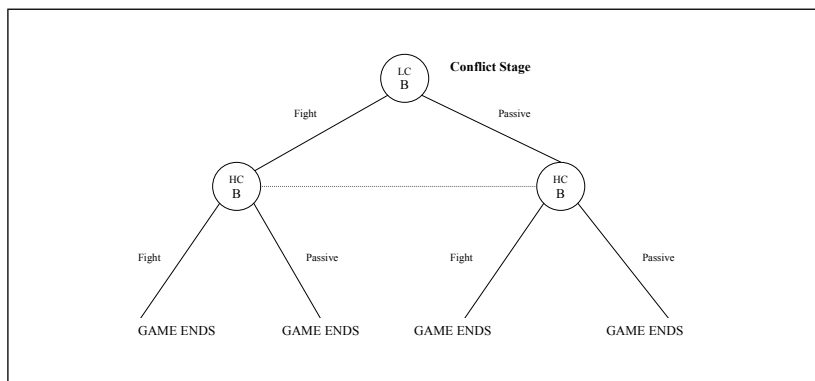
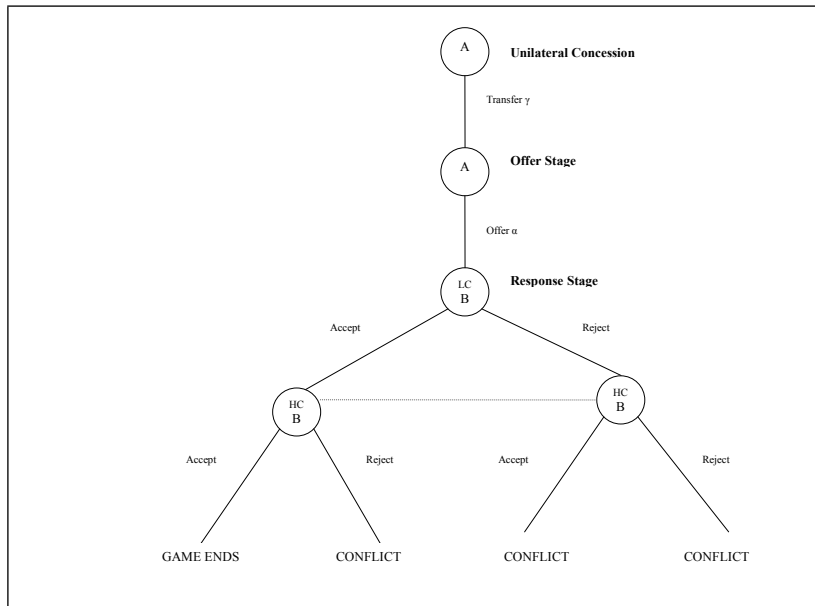


Figure 2: Heterogeneous Game Form with Unilateral Concession

By backward induction, one must first consider the conflict subgame.

This is a simultaneous Nash game between the high and low cost B , with the following payoffs.

	Fight	Passive
Fight	$p\hat{X} - c_1, p\hat{X} - c_2$	$q\hat{X} - c_1, q\hat{X}$
Passive	$q\hat{X}, q\hat{X} - c_2$	$0, 0$

Table 6: Conflict Subgame

The conditions under which each outcome will be an equilibrium are as follows.

FF	FP	PF	PP
$\hat{X} > \frac{c_1}{p-q}$	$\frac{c_2}{p-q} \geq \hat{X} > \frac{c_1}{q}$	$\frac{c_1}{p-q} \geq \hat{X} > \frac{c_2}{q}$	$\hat{X} \leq \frac{c_2}{q}, \hat{X} \leq \frac{c_2}{p-q}$

Table 7: Conflict Subgame Equilibrium Conditions

From (1) and (2), the only possible conflict subgame equilibria are FF, PF and PP with no multiple equilibria³. With a unilateral concession, A has a mechanism for determining which of the above equilibria occur. One can determine the optimal unilateral concession, γ^* that induces each of the conflict subgame equilibria. If A is seeking to induce a particular subgame, it is always optimal to offer the minimum unilateral concession that induces that subgame.

The following table gives the optimal unilateral concession, γ^* that induces each of the possible conflict subgame equilibria.

³There is no loss of generality by this assumption. The most interesting subgame equilibrium is when the high cost fight but not the low cost. When that equilibrium occurs, it always exists as a multiple equilibrium with the low cost fighting and the high cost passive. In those circumstances neither of those equilibria end up in the SPE, because it is optimal for A to induce FF

	FF	PF	PP
γ^*	0	$1 - \frac{c_1}{(p-q)X}$	$1 - \frac{c_2}{(p-q)X}$

Table 8: Optimal Unilateral Concessions

Having determined the equilibrium conditions for the conflict subgame, consider the response subgame. This also is a simultaneous Nash game between the high and low cost B , with the following payoffs.

	Accept	Reject
Accept	$\alpha\hat{X}, \alpha\hat{X}$	Conflict Subgame Equilibrium
Reject	Conflict Subgame Equilibrium	Conflict Subgame Equilibrium

Table 9: Response Subgame

The decision for both groups of B is simple. It is a weakly dominant strategy to accept the offer if,

$$\alpha\hat{X} \geq \text{Conflict Subgame Equilibrium Payoff}$$

Proposition 3.2. *Peace is always the outcome of the heterogeneous game where unilateral concessions are allowed. There is an efficient allocation that is acceptable to all parties.*

Proof. One can determine the minimum offer, α^* that will be sufficient to induce peace for each possible conflict subgame equilibrium. Again, both the high and low cost B must be willing to accept the offer. Hence α^* must deliver a payoff equal to the highest payoff from the conflict subgame equilibrium.

The following table shows the minimum peace-inducing offer, α^* , for each possible conflict subgame equilibrium.

	FF	PF	PP
α^*	$p - \frac{c_2}{\hat{X}}$	q	0

Table 10: Minimum Peace-Inducing Offer

A can either make the offer α^* that induces peace or for any lesser offer, the game goes to conflict. The following table shows the payoffs under both peace and conflict.

	FF	PF	PP
Peace	$(1 - \alpha) \frac{\hat{X}}{r}$	$(1 - \alpha) \frac{\hat{X}}{r}$	$(1 - \alpha) \frac{\hat{X}}{r}$
Conflict	$(1 - p) \frac{\hat{X}}{r} - \beta c_i$	$(1 - q) \frac{\hat{X}}{r} - \beta c_i$	$\frac{\hat{X}}{r}$

Table 11: Group A Payoffs

Substituting the appropriate α^* for each case of conflict subgame equilibrium reveals that the payoff to A from peace is greater than or equal to the payoff from conflict. Hence α^* will always be offered by A . Therefore peace is always the outcome. □

Proposition 3.3. *A sufficient condition exists for making a unilateral concession to be the unique SPE of the heterogeneous game.*

Proof. It is sufficient to consider the payoff to A that arises from the 3 cases of conflict subgame equilibria. In all cases, peace is the outcome so the payoff is of the form $(1 - \alpha^*)(1 - \gamma^*) \frac{X}{r}$. One can divide all the payoffs by $\frac{X}{r}$. Then substituting for α^* and γ , allows one to measure the return from each SPE candidate .

$$\text{FF} \qquad 1 - p + \frac{c_2}{X} \qquad (3)$$

$$\text{PF} \qquad \frac{c_1(1 - q)}{(p - q)X} \qquad (4)$$

PP

$$\frac{c_2}{(p-q)X} \tag{5}$$

The payoff from PP, which is to make a wholly unilateral concession is strictly dominated by the payoff from PF which is a part unilateral concession, part standard offer.⁴ Hence the only possible equilibrium outcomes are PF or FF which is a wholly standard offer. Setting (4) > (3) provides the sufficient condition under which PF delivers a higher payoff to A than FF which is

$$\frac{c_1(1-q)}{p-q} > (1-p)X + c_2 \tag{6}$$

If this condition holds, the unique SPE will be A making a unilateral concession to ensure the high cost B does not fight, and a standard offer such that the low cost B do not fight. The intuition behind this result is that making a high offer to all of B is more expensive than the unilateral concession plus a lower offer to all of B . This result flows from the bargaining framework where A has to make the same offer to both subgroups of B . Keeping in mind that this example assumes (1) and (2), an example where PF is the outcome is $p = 0.8$, $q = 0.35$, $r = 0.55$, $c_1 = 20$, $c_2 = 8$ and $X = 50$. To show where the condition does not hold and A offers a wholly standard offer, consider the above example except with $X = 120$. \square

Observation 1. The unilateral concession is not used in a homogeneous model

In a homogeneous model, all agents have identical costs of conflict. So there is no longer the imperfection that group A has to offer group B something other than its payoff from the conflict subgame. This is different from the heterogeneous case where the high cost B gets an offer equivalent to the low cost B payoff from conflict. The absence of any cost discrepancy would mean that in the homogeneous case, efficiency would always be the outcome. A would always make a transfer equivalent to B 's expected gain

⁴This is revealed by considering the assumption in (1) and (2) which reveal that $p > 2q$ and $c_1 > 2c_2$. It is also intuitive. Offering a wholly unilateral concession involves a larger transfer than the standard offer.

from conflict. Moreover it is intuitive that in that setting, a standard offer would be used and not a unilateral concession. A unilateral concession involves more of a transfer than a standard offer in order to achieve the same incentive. It is only used in a heterogeneous context because A cannot offer separate standard offers to B . Moreover, as shown, it is never optimal to make a completely unilateral concession. The unilateral concession is effective because it is designed not to eradicate the incentive to fight completely, but reduce the incentive of the high cost from fighting. The unilateral concession effectively sets the marginal benefit of the high cost B joining the conflict to zero. Then the required offer to ensure peace is the return from one subgroup of B fighting, which would be lower than if both fought. So in a homogeneous setting, and with the basic assumption in (1) that there is a positive payoff to conflict, it would be intuitive that the standard offer is always used to achieve peace. Using a unilateral concession would give B a larger transfer.

3.1.1 Comparative Statics

It would be interesting to see how movements in parameters affected the likelihood of the unilateral concession being used. Comparative Statics are somewhat difficult to do in this model. Parameter relationships determine the relative attractiveness of SPE payoffs. But those parameter relationships also determine the possible conflict subgame equilibria and the conflict subgame equilibria determine the possible SPE. Hence moving a parameter may increase the likelihood of a particular SPE. However moving a parameter far enough may change the conflict subgame which then changes the set of attainable SPE. For analytical convenience, this model has assumed the parameter relationships as in (1) and (2). However this puts a limitation on “ceteris paribus” as some parameters are bounded. Moving one parameter, holding all else constant is by definition prevented. Nonetheless some comparative statics can be obtained.

Observation 2. As X increases, the unilateral concession is less likely to be used.

As X increases, the larger the unilateral concession becomes that is re-

quired to stop the high cost B fighting as the return to conflict increases. As X increases, the size of the standard offer increases as well, but the incremental increase in the required unilateral concession exceeds that of the standard offer.

Observation 3. As c_1 increases, the unilateral concession is more likely to be used.

As c_1 increases, the higher the cost of conflict to the high cost B . Hence, the incentive for them to accept a unilateral concession is greater i.e. the unilateral concession becomes cheaper.

Observation 4. As c_2 increases, the unilateral concession is less likely to be used.

This is a limited static because c_2 is bounded under $\frac{c_1}{2}$. But to the extent that that relationship is maintained, an increase in c_2 means the unilateral concession is less likely to be used. This makes sense, in that as c_2 increases with c_1 constant, the standard offer becomes less expensive.

Observation 5. The likelihood of using the unilateral concession is U shaped in p

This makes sense in this way. Where p is low, the cost of offering a unilateral concession is cheaper, as the high cost have a smaller gain from participating in conflict. Where p is high, there is an incentive to offer the unilateral concession. That is because the standard offer that would have to be made if a unilateral concession was not offered, would be very high as the payoff from both subgroups of B fighting is very high. No doubt, the required unilateral concession also increases but it is outweighed by the incremental increase in the standard offer.

Observation 6. As q increases, the unilateral concession is less likely to be used.

Again q is bounded under $\frac{p}{2}$. But holding p constant and maintaining that relationship, an increase in q increases the standard offer that A needs

to give in addition to the unilateral concession. It may then be more profitable to just give a wholly standard offer.

It is also interesting to note that the results are independent of β and r , which is a measure of state power and the size of A respectively. This is reflective of a simplicity in the modelling. Typically those parameters would have an effect on p and q but that is not modelled here. m also has no bearing on the result, because irrespective of who fights for B , the resource is shared. m might be expected to have some bearing on the relative probability of each subgroup of B winning in conflict. i.e. it may not be the case that both the low and high cost subgroup of B have the same probability of victory q .

3.2 The Modified Case: No Free Riding

The previous section assumed that because X was a public good, even if only one subgroup of B fights, the winnings are shared with all of B . However that may not always be the case. The group that fights may be able to exclude the others from the resource. There may be differences in wealth or strength between the subgroups that gives the fighting subgroup the power to expropriate the resource. Alternatively the ability to expropriate the resource can be explained in terms of the nature of X . If X is some budget for ethnic public goods, e.g. temples and cultural institutions, then expropriation may not be possible. But if X is a physical resource like land etc. then even though it is notionally public, the subgroup that fights and acquires the resource will find it to easier to exclude others. In this section, it is assumed that if one subgroup of B fights, it retains the resource for itself without sharing with the passive B . There is no free riding.

In this scenario, inefficiency exists as a possibility. Why? With expropriation, the expected loss from conflict to A may be less than the expected gain of B . Consider the situation where only one subgroup of B fights. The expected payoff from conflict to that subgroup will be high since it can exclude the other members of B . But in the bargaining framework, to appease the fighting B , group A has to offer that high expected payoff to all the members of B . But that level of transfer may exceed A 's expected loss from conflict. Then no transfer is able to stop conflict. However, this

is only the case where the subgame occurs that a single subgroup fights. A by offering a unilateral concession, determines which subgame occurs. So in that sense, it is not a situation of A being backed into a corner where conflict is the only option. A can choose the SPE path, so if conflict occurs, A must want it to occur. Thus the incentive to conflict is this. Making a unilateral concession increases the profitability of conflict to A because by reducing the incentives of others to fight, A now has a higher probability of victory.

The game form is identical to the earlier heterogeneous case except the payoffs in the conflict subgame are now different. The case where both subgroups of B fight is the same as before. They win with probability p and share X equally. However if only one subgroup fights, they win with probability q as before, but that subgroup retains the entire X . Again, if no subgroup of B fights, A retains X with probability 1.

First consider the case with no unilateral concession.

The new conflict subgame is as follows.

	Fight	Passive
Fight	$pX - c_1, pX - c_2$	$q\frac{X}{m} - c_1, 0$
Passive	$0, q\frac{X}{(1-m)} - c_2$	$0, 0$

Table 12: Conflict Subgame

Given the assumption of (1), the unique equilibrium of the conflict subgame is PP. Then the overall result is the same as the model with free riding. The outcome is peace, with A offering an acceptable concession $\alpha^* = p - \frac{c_2}{X}$.

Now consider the situation where A can offer a unilateral concession, γ . Again, α now refers to a share of \hat{X} .

The conflict subgame is as follows.

	Fight	Passive
Fight	$p\widehat{X} - c_1, p\widehat{X} - c_2$	$q\frac{\widehat{X}}{m} - c_1, 0$
Passive	$0, q\frac{\widehat{X}}{(1-m)} - c_2$	$0, 0$

Table 13: Conflict Subgame

The equilibrium conditions are given by.

FF	FP	PF	PP
$\widehat{X} > \frac{c_1}{p}$	$\frac{c_2}{p} \geq \widehat{X} > \frac{c_1 m}{q}$	$\frac{c_1}{p} \geq \widehat{X} > \frac{c_2(1-m)}{q}$	$\widehat{X} \leq \frac{c_2(1-m)}{q}, \widehat{X} \leq \frac{c_1 m}{q}$

Table 14: Conflict Subgame Equilibrium Conditions

Depending on the relationship between the parameters, many equilibria are possible, some of them multiple. The assumption in (1) that there is a positive profit to conflict with both subgroups of B fighting is maintained. In order to simplify the analysis (2) is relaxed and replaced with a new assumption, which is

$$\frac{c_1}{p} > \frac{c_1 m}{q} > \frac{c_2(1-m)}{q} > \frac{c_2}{p} \quad (7)$$

From the assumption in (7) the only possible conflict subgame equilibria are FF, PF and PP, none of them multiple. Implicit in (7) is that $m < \frac{1}{2}$. So there are more low cost B than high cost B . With a unilateral concession, A has a mechanism for determining which of the above equilibria occur. As noted in 3.1 the optimal unilateral concession that induces each of the conflict subgame equilibria is the minimum one. The following table gives the optimal unilateral concession that induces each of the possible conflict subgame equilibria.

	FF	PF	PP
γ^*	0	$1 - \frac{c_1}{pX}$	$1 - \frac{c_2(1-m)}{qX}$

Table 15: Optimal Unilateral Concessions

Having determined the equilibrium conditions for the conflict subgame, consider the response subgame. This takes the same form as before with the following payoffs.

	Accept	Reject
Accept	$\alpha\widehat{X}, \alpha\widehat{X}$	Conflict Subgame Equilibrium
Reject	Conflict Subgame Equilibrium	Conflict Subgame Equilibrium

Table 16: Response Subgame

The decision for both groups of B is simple. It is a weakly dominant strategy to accept the offer if,

$$\alpha\widehat{X} \geq \text{Conflict Subgame Equilibrium Payoff}$$

Proposition 3.4. *A sufficient condition exists under which partial conflict is the unique SPE of the modified game with unilateral concessions.*

Proof. One can determine the minimum offer, α^* that will be accepted for each possible conflict subgame equilibrium. Again, both the high and low cost B must be willing to accept the offer. Hence α^* must deliver a payoff equal to the highest payoff from the conflict subgame equilibrium. The following table shows the minimum peace-inducing offer α^* , for each possible conflict subgame equilibrium.

	FF	PF	PP
α^*	$p - \frac{c_2}{X}$	$\frac{q}{1-m} - \frac{c_2}{X}$	0

Table 17: Minimum Peace-Inducing Offer

The game then goes to the offer stage. A can either make the offer α^* that induces peace or for any lesser offer, the game goes to conflict. The following table shows the payoff to A under both peace and conflict.

	FF	PF	PP
Peace Payoff	$(1 - \alpha^*) \frac{\widehat{X}}{r}$	$(1 - \alpha^*) \frac{\widehat{X}}{r}$	$(1 - \alpha^*) \frac{\widehat{X}}{r}$
Conflict Payoff	$(1 - p) \frac{\widehat{X}}{r} - \beta c_i$	$(1 - q) \frac{\widehat{X}}{r} - \beta c_i$	$\frac{\widehat{X}}{r}$

Table 18: Group A Payoffs

For conflict subgame equilibria FF and PP, peace prevails since offering the applicable α^* delivers a payoff greater than or equal to conflict. Those SPE candidates can be called AFF and APP, with A denoting accept. However for the conflict subgame equilibrium PF the outcome is not clear. There are circumstances under which the expected return from conflict offers a higher payoff to A than peace. Then A will not offer α^* . Let this SPE candidate be called RPF, where R denotes reject. However there are circumstances where peace is preferred and α^* is offered. Let this SPE candidate be called APF. Substituting in for α^* and γ , the condition for which RPF is preferred to APF is

$$qc_1 > \frac{p(1-m)}{m}(c_2 + r\beta c_i) \quad (8)$$

However, in order for partial conflict to be the SPE of the game, it is not sufficient that RPF be preferred to APF. RPF must be preferred to APF, AFF and APP. Substituting in for α^* and γ , the payoff to A from all of those equilibria are as follows.

RPF

$$\frac{c_1(1-q)}{pr} - \beta c_i$$

APF

$$\frac{c_1}{pr} \left(1 - \frac{q}{1-m}\right) + \frac{c_2}{r}$$

AFF

$$(1-p) \frac{X}{r} + \frac{c_2}{r}$$

APP

$$\frac{c_2(1-m)}{qr}$$

From the assumption in (7), APP is always strictly dominated by APF. Again intuitively, it is never optimal for group A to offer a wholly unilateral concession as it will have to transfer more than necessary. Hence there are two conditions for conflict to occur. That is that the payoff from RPF is greater than the payoff from APF and that the payoff from RPF is greater than AFF. The first condition has been shown in (8). The second condition can be expressed as follows.

$$c_1 q < c_1 - p\beta c_i r - p(1-p)X - pc_2 \quad (9)$$

Combining (8) and (9), gives the single sufficient condition under which conflict will occur.

$$\frac{c_1}{p} - \beta c_i r - (1-p)X - c_2 > \frac{1-m}{m}(\beta c_i r + c_2) \quad (10)$$

So under the above condition (10), conflict will be the unique SPE of the game. A simple example can be given as well, remembering that the example must also satisfy the assumption in (1) and in (7). Therefore, an example where conflict is the equilibrium is $X = 17$, $c_1 = 35$, $c_2 = 5$, $p = 0.85$, $q = 0.6$, $r = 0.6$, $m = 0.25$, $\beta = 0$. For an example where peace prevails, take the same example but with $X = 200$.

The intuition can be seen in two ways. With expropriation, the expected gain to group B from A having to make a large offer is greater than the expected loss of A from conflict. So once on that SPE path, peace is not possible. However this SPE path is chosen by A . Other choices of the unilateral concession would have ended with peace. So this result is not just that A has no way of achieving peace due to a problem with the valuation of conflict. A prefers conflict and deliberately induces that path. So in that sense, the intuition is that A can find it optimal to use a unilateral concession to buy off the high cost B in order to create a situation of profitable conflict.

As aforementioned, the bargaining imperfection that incentivises the use of the unilateral concession is that A is not able to make separate offers to the high and low cost B . However in the first model, the fact that the agents share the resource avoids inefficiency. I.e. even though A has to make the high cost B an offer equivalent to the conflict payoff of the low cost B , the aggregate payment can never be greater than the expected loss from conflict by A . Hence peace always occurs. The unilateral concession at best can improve the payoff to the A . With expropriation, that guarantee is no longer there. The bargaining imperfection leads to a situation where the expected loss from conflict is less than the conflict averting transfer. But in this case, whilst the bargaining imperfection is the foundation for the efficiency, the unilateral concession is pivotal. I.e. if the unilateral concession was not available to A , then peace would have occurred. So whilst bargaining imperfections drive inefficiency, the ability to make a unilateral concession is shown to be pivotal in the loss of overall welfare. This is quite counter-intuitive. An additional instrument of transfer would appear to be welfare enhancing.

□

3.2.1 Comparative Statics

It would be interesting to see how movements in parameters affected the likelihood of conflict occurring. As in the earlier model, comparative statics become problematic as the earlier assumptions put bounds on some parameters. Nonetheless some insights can be gained.

Observation 7. Conflict is more likely where the group A decision-makers maximise the payoff for their low cost members.

Conflict is more likely because the cost to them is less. This may seem somewhat trivial, but must be noted. This takes on significance depending on the assumptions of the electoral system and if particular groups are pivotal to a government holding power. This model has not made those assumptions. However the model points to the likelihood of conflict being highly affected by the interaction of demography and political systems.

Observation 8. Conflict is more likely where β is smaller.

β is the other component of the cost of conflict to A in addition to c_i , $i = 1, 2$. So again it may seem somewhat trivial that the lower β is, the more likely conflict is, because the cost of it is lower. As defined in the model, A only faces the cost βc_i , $i = 1, 2$ because the apparatus of State is used to wage conflict. This suggests that the more powerful and efficient the state is, the lower β becomes and hence the higher likelihood of conflict. If β is some coefficient of state power, then it is plausible for it to also affect the probabilities p and q of victory by B in conflict.

Observation 9. Peace is more likely where r is larger.

This makes sense. The larger A is, the little it has to gain from conflict. The resource must be divided up amongst more people, of which any benefit is highly likely to be outweighed by the cost. A was assumed at the start to be the dominant group. However no assumption was made as to whether it was the majority, only that it had more power. Hence r may have some bearing on the probabilities p and q as well as c_1 and c_2 .

Observation 10. Conflict is more likely where m is larger.

As m becomes larger the proportion of B who have a low cost of conflict is smaller. Thus the individual payoff to the low cost B from fighting by themselves becomes higher. But the payoff required to avert conflict becomes higher. This can lead to the situation where the expected loss from

conflict is less than the expected gain of the other party. Hence partial conflict would be more likely than peace.

Observation 11. Peace is more likely where X is larger.

As X increases, the expected payoff from conflict becomes larger. However, the cost of the unilateral concession to induce conflict becomes larger as there is a higher marginal gain to the high cost B from joining in conflict. The increase in the required unilateral concession dominates the increase in the expected payoff to conflict.

Comparative statics with c_1, c_2, p, q is much harder because those parameters are bounded by the assumption in (7). Only small shifts can occur in some parameters before other parameters need to shift in order to preserve (7). However some points can be noted.

Observation 12. As c_1 increases, conflict becomes more likely.

As c_1 increases, the incentive for the high cost B to fight declines. Hence it becomes profitable for A to “buy off” the high cost B by offering a unilateral concession. The expected payoff from conflict less a small unilateral concession may be higher than making a high transfer to obtain peace.

Observation 13. As c_2 increases, conflict becomes less likely.

Again assuming c_2 moves within its bound such that other parameters are unchanged, an increase in c_2 reduces the likelihood of conflict. That is because the cost of the offer that appeases the low cost B becomes cheaper.

Observation 14. The likelihood of conflict is U shaped in p

This makes sense in this way. Where p is low, the cost of offering a unilateral concession is cheaper, as the high cost have a smaller gain from participating in conflict. So the expected payoff from conflict less a small unilateral concession is likely to be high. Where p is high, there is an incentive to offer the unilateral concession. The required unilateral concession

will be higher but that will be less than the expected offer that is induced without the unilateral concession as the payoff from both subgroups of B fighting is high. So the expected return to conflict less a larger unilateral concession will be preferred to making an even larger offer to B .

Observation 15. The likelihood of conflict is independent of q

This is counter-intuitive. $1 - q$ is the probability of A winning the conflict. How then can it be independent? When combining the two conditions for conflict, q was influenced by all the above parameters. So in that sense, q is affected by movements in other parameters. Particularly, the assumptions that define the conflict subgame equilibria, bound q . So as the other parameters move, q necessarily moves.

4 Discussion

The above results show the unilateral concession in one class of games as a mechanism of improving the efficient outcome to A and in another class of game as inducing an inefficient outcome. What is driving this result? As in the case of the “selective acceptance” rule in Weinberger (2002), the unilateral concession in this thesis does not deliver interesting results in its own right. It plays a unique role in certain conditions, that being with heterogeneous agents. The bargaining imperfection that generates both the above results is this. A is unable to negotiate with the high and low cost B separately. If that were so, efficiency would always occur. Unilateral concession or no unilateral concession, A could make a standard offer to each subgroup of B equivalent to their expected gain from conflict. Examined this way, it becomes apparent why inefficiency may arise in this model with respect to Coase (1960). The fact that A has to offer the same contract to both subgroups of B despite the fact that one subgroup achieves a lesser value payoff in conflict, is effectively a cost on bargaining. Hence Coase’s assumption of costless bargaining is breached.

But is this bargaining structure plausible. Surely A can distinguish between the two groups of B and make separate transfers. The most convincing

argument is that whilst the low cost B may be visible when they fight, A has no way of knowing that in advance and is therefore not able to give them an independent concession. Moreover, any attempts to do so would give all of B an incentive to pass themselves off as members of the low cost group.

Another reason is that given that X is a public good, A is not able to apportion it to constituent groups of B . Then the issue is not so much whether A can identify the subgroups of B . Even if A can identify the low cost B , A may not be able to enforce a particular division of resources. Particularly if A disappears once the transfer is made e.g. A is some colonial power. In the final model where exclusion was allowed, one justification was that the low cost B had some superior strength that allowed it to expropriate X . So A may not be able to enforce a division between the subgroups of B .

It is possible in a political context that there are limitations on who governments can deal with. e.g. a group may exist as a coalition but it is not possible to deal with them. One reason may be a principle-based argument, with an extreme case being terrorist groups. A may in principle refuse to deal with extremists. Another reason may be practicality. The low cost B may exist as a coalition but if it is a non-political actor, it may not be able to credibly accept concessions.

As such it is a credible situation where A is only able to deal with B as a monolithic bloc, despite the presence of two types of agents. Horowitz (1989) points out how the existence of race-based parties in Sri Lanka unlike Malaysia led to a more stable domestic situation in the latter, despite Malaysia ex-ante having more ingredients for racial conflict than Sri Lanka. That makes sense, in that if the options for political systems are race-based or class-based, a class-based political coalition has ethnic heterogeneity but that it is not material in terms of the economic payoff agents require. Economic homogeneity lends itself to more efficient outcomes.

In games where B have heterogeneous costs but the resource they fight over is purely public in nature, efficiency is always the outcome i.e. peace. But the unilateral concession is an optimal choice under certain conditions.

So the bargaining imperfection creates an opportunity for the unilateral concession to be profitable for A , but not inefficient. Because any acquired resource must be shared, the expected gain of B is always less than or equal to the expected loss from conflict to A . Hence there will always be an efficient i.e. peaceful settlement. However the unilateral concession can become a cheaper way of achieving peace for A . The unilateral concession is used to change the equilibrium in the conflict subgame. Effectively, the unilateral concession is made to buy off the high cost B i.e. make conflict unprofitable for them. So if fighting occurs, it would only be the low cost B i.e. partial conflict. Hence the offer that is made to B in the bargaining game need only be equivalent to the payoff from conflict with only the low cost B fighting. So circumstances arise where making a unilateral concession and then making all of B a lower offer is cheaper than a zero unilateral concession and making all of B a more expensive offer. Efficiency is always the outcome but the use of a unilateral concession can sometimes be the optimal efficient allocation for A . It is a tool that skews the bargaining process in A 's favour.

The most interesting result occurs where B have heterogeneous costs but the non-participating B will be excluded. This immediately raises the individual payoff to the B that do fight. It then becomes apparent why inefficiency may occur. If the conflict subgame is such that only one group of B fight, their expected payoff becomes very high. So in order to ensure peace, a high contract must be given to all the B . However the level of resource that such a contract takes up may leave A worse off than with conflict. The expected gain to B from partial conflict exceeds the expected loss of A . Hence conflict occurs. But remember that the choice of unilateral concession defines the conflict subgame. The unilateral concession is a choice variable. So if the unilateral concession is chosen such that only one group of B finds it profitable to fight, the outcome can be conflict. But should such a unilateral concession be chosen? A can make a zero unilateral concession such that both parties fight. Then it would be optimal to make an offer equivalent to the expected return of conflict to the low cost B to all of B . This thesis argues that it is optimal for A to make the unilateral concession that buys off the high cost B , knowing that the outcome is partial conflict. The expected gain from conflict, (now with a higher probability of victory because only one subgroup of B fights) less the unilateral concession

is greater than the certain peace that comes from a zero unilateral concession and making a high standard offer. So the inefficient outcome has a multiplicity of causes. It arises due to a misalignment between the expected loss of one party from conflict compared to the expected gain of the other. This misalignment occurs due to the ability of one subgroup to exclude non-participating members which increases the payoff to conflict. Moreover due to a bargaining structure where all members have to be given the same offer, the transfer required to avert conflict is very high. But crucially, this misalignment is deliberately brought on by A . Without the unilateral concession, it would never occur. So the model is not an intractable situation of either war or a crippling peace. It is a choice to induce a profitable conflict. A in some sense, wants conflict. The unilateral concession improves the profitability of conflict to A by reducing the incentives of others to fight.

So in that sense, three factors are pivotal for inefficiency in this model. Without heterogeneous costs and the inability to bargain with the low and high cost B separately, there would be no inefficiency. Secondly, without the ability of subgroups to exclude non-participating members, inefficiency can never occur. Thirdly, without the unilateral concession being available as an instrument, no inefficiency would occur. In the final model with exclusion allowed, where A could not make a unilateral concession, peace was still the outcome. It was the introduction of the capacity to make unilateral concessions on top of the above described features that induced an inefficient SPE.

This provides the remarkable and counter-intuitive result, that a mechanism of making transfers actually engenders conflict as an SPE. This is similar to Weinberger (2000) where selective acceptance was thought to be prima-facie efficiency enhancing. Intuitively a mechanism of making transfers would be thought to enhance peace. In a sense, in the first model, the unilateral concession makes peace more profitable to A , but in B it allows for a profitable conflict. The common effect of the unilateral concession in both cases is to increase the payoff to A .

4.1 Policy Implications

Ethnic conflict is such an intractable phenomenon that virtually most of the discussion has some policy implications.

Firstly the basic result shows how a policy of “divide and rule” effectively setting one subgroup against another can work. This is the result from the first model. The dominant group finds conflict unprofitable and wishes to avoid conflict. The way it does so is by making conflict unprofitable to one group of the population. Then with a low capacity to fight, fairly small concessions keep rebellion at bay. This in fact is the way most colonial powers operated. In both the Roman and British empires, the conquered populations consisted of an elite class that enjoyed the benefits of the empire and stood to lose from conflict.

More importantly is what the model suggests about the use of concessions to do this. Because of the bargaining imperfections between the parties, unilateral concessions are used to buy off one subgroup to create that reduced incentive for conflict. Abstracting from colonial situations and to bargaining in general, this is a theoretical basis for why in negotiations, one party may offer an ex-ante concession before the formal bargaining process.

This may also prompt some revisiting of the standard reason that unilateral concessions are offered as a sign of goodwill between asymmetric parties. If one allows for heterogeneity in the party being offered the concession, then it is possible that the motive is in fact to split the opposing coalition. This would have relevance to the international relations literature which typically advocates the “signalling argument.” Consider the interaction of two state actors. This typically has the feature in this model. States deal with each other as states. E.g. the U.S does not deal with high cost and low cost China. It can only deal with China as a whole. Yet there are heterogeneous agents within China that have different interests. Hence the unilateral concession would act as a way for a state to play off the different domestic interests of a rival state against each other. Considered this way, it then can be seen how a unilateral concession could lead to the first result which is a profitable peace or a profitable conflict.

Interestingly the result in this model gives a rationale why a party pursuing the inefficient path, where the unilateral concession is chosen in order to induce conflict, may still make a standard offer. The thesis has argued that when conflict occurs it is a unique SPE. In a technical sense that is not true. When conflict is being pursued, A offers a unilateral concession to induce the high cost B not to fight. Then there exists an offer α^* that would persuade the low cost B not to fight. The model has simply said that A will then offer $\alpha < \alpha^*$. That α could be zero or $\alpha - \epsilon$, where ϵ is negligible. So in that sense there are an infinite range of SPE's corresponding to a choice of $\alpha < \alpha^*$. All those choices of α are refused and lead to the same outcome. However it can be understood why in political terms A would have a preference for offering $\alpha - \epsilon$ compared to 0, although mathematically in the model, they should be indifferent. Even though A knows the offer will be refused, A can then claim to have acted in good faith. It has after all, made a unilateral concession as well as making a standard offer. Particularly in an international relations context, making such an offer allows a discriminatory State to claim to be working towards a political settlement whilst deliberately pursuing conflict. So there is strategic benefit in offering the standard concession even if conflict is the desired outcome.

The thesis has advocated reasons why features of conflict are observed in the world, but are there any solutions? In the first model, where efficiency is guaranteed, the unilateral concession transfers more of the surplus to the dominant group. In the second case, it can lead to conflict. Purely on the basis of this model, one might say that unilateral concessions then are a welfare diminishing instrument and should be banned. This is ironic given that much of the literature identify commitment problems as a source of conflict. I.e. in this model, the assumption was made that the unilateral concession is irrevocable. In contexts where that assumption is problematic, commitment problems can occur. So the grain of the literature would be that credible instruments of transfer are optimal. Particularly in a repeated game context where transfers have to be made over time, the ability to make credible ex-ante transfers would be seen as a positive. But the solution that emerges from this model is not necessarily to weaken constitutions and limit the ability to make ex-ante transfers. In most cases that would not

be possible and the suggestion somewhat absurd. The unilateral concession is pivotal to conflict and in the earlier result it is pivotal to A obtaining a larger share of the efficient surplus. But also pivotal is the bargaining framework that underpins this entire model. I.e. a bargaining system where A negotiates with B as a monolithic coalition. It is this assumption that offers the most scope to policymakers. Excluding the case, where A is unable to enforce apportionment of the resource within B , the most obvious reason why the bargaining framework presented in this model occurs, is due to identification problems. A is unable to recognise the high and low cost B in advance. This is broadly analogous to the situation where the political system only consists of ethnic based parties, and a limited number of ethnic parties, so that heterogeneous members of an ethnic group only have singular representation. Again as aforementioned, monolithic ethnic political parties have the unique feature of economic heterogeneity unlike class based parties. So they have this feature that the elites or well off amongst them can be “bought off” by unilateral concessions. Indeed this is a reason why ethnic political parties are susceptible to the accusation that they serve the interests of the elite members of their group. This shows that the salience of ethnic conflict comes from not just the incentives of coalition formation as in Esteban and Ray (2008) and their synergy of operation, but in fact from the way opponents play off rival economic interests against each other. In a sense Esteban and Ray (2008) argue for ethnic conflict because of a stability or synergy from ethnic coalitions. This thesis shows how conflict emerges not as a result of the ethnic coalition working together in synergy but because they are easily divided. So what would allow for more efficient outcomes for policymakers in the context of this model? If operating at time zero, it is to steer away from ethnic based political parties to avoid that heterogeneity. Alternatively, if ethnic parties are the norm, then increasing the number of parties in the political process would allow for different agents to have multiple representation. This would also allow for the divergent agents within an ethnic bloc like B to negotiate with each other. In the present model, the imperfection is not just that A does not negotiate with the subgroups of B . It is that the two groups of B only play Nash games and do not contract with each other.

4.2 Features of the Model

It is also important to note that the model employed in this thesis is a simple one. As a result some parameters are treated as exogenous and independent when in fact there is the possibility of a relationship. This has created analytical convenience, but allowing for those relationships may affect the results. The clearest example is the choice of probabilities p and q assigned to victory by B when they fight together and as a subgroup respectively. Those probabilities would be affected by the relative proportion of B to A , the relative wealth of group B to A and the power of the state. Hence p and q would be decreasing in r . They would also be increasing in β , which reflects state power⁵. Also q would be affected by m . In fact this model assumes that the low and high cost B have the same probability of victory q . Given that the strength of A is common to both, that assumption means the low and high cost B either have the same population ($m = \frac{1}{2}$) and wealth or that aggregating those variables gives the high and low cost a parity of strength. Moreover, in the final model, the assumption is introduced that a subgroup of B may have some advantage that enables them to exclude the others. Surely that would increase its probability of unilateral victory compared with the other subgroup unless some other factor balanced out that advantage.

If the probabilities p and q were made endogenously reliant on wealth, population and state power, those parameters would have a potential relationship with c_1 and c_2 . An ambiguity in this model is the source of the heterogeneous costs. What is the reason behind some individuals having cost of conflict c_1 and others c_2 ? The ambiguity in this thesis was deliberate. There are multiple reasons behind cost heterogeneity. In that sense simply considering a society with heterogeneous costs allows for a general result on the effects of those costs independent of the drivers. However as noted in the previous paragraph, given that this model blocs B into coalitions on the basis of cost, the particular drivers of the cost discrepancy are relevant to ascertain the probability of each group's success in partial conflict. In this model given that p and q were fixed exogenously it was not necessary

⁵Remembering that β is the proportion of the cost of conflict borne by A with the remainder incurred by the state.

to introduce the drivers of cost heterogeneity. Generality is an advantage. But a more refined model would not exogenously fix p and q . In that case the drivers of cost heterogeneity would have to be considered. At one level, a higher wealth level would suggest a lower cost of conflict. A wealthy B can utilise technology, political and media apparatus or mercenaries to wage conflict more effectively and at lower personal cost. However, much of that is how wealth improves the probability of victory as opposed to minimise the cost. In fact, it is the wealthy's capacity to expend cost, that improves the probability of victory. Moreover even if the cost from conflict to a wealthy individual's person is less, that is likely to arise from expending other costs e.g. financial to minimise the cost to the person. This analysis points to the fact that a high wealth level may in fact increase the cost of conflict. This would be modelled as such. Individuals in conflict allocate some fixed proportion λ of their stock of wealth to fighting. So the cost of conflict becomes λy where y is the measure of wealth. Hence higher wealth causes a higher cost of conflict. Another way of thinking about it is that wealthier individuals have more to lose from a conflict, where as the poorer do not. A scenario where wealthy individuals may have a lower cost of conflict would be if some resources e.g. media and political machinery can be used without cost, but are accessible only to the wealthy but not the poor, maybe for reasons like education levels. It is important to note that including a stock of wealth in the payoffs to agents would not have changed our result. c_1 and c_2 would then just become cy_1 and cy_2 respectively, with heterogeneous wealth driving the cost discrepancy. What is relevant is including wealth as an input into the probability of success in conflict. As such if there is a relationship between the cost of conflict and wealth, that should be reflected in the probability function for the high and low cost B .

Assuming costs are increasing in wealth, creates an interesting scenario. The high and low cost B become the rich and poor B respectively. Then m becomes pivotal. If $m \geq \frac{1}{2}$ then the rich B can be presumed to have a higher probability of victory by themselves. They have both higher wealth and more numbers. If $m < \frac{1}{2}$ then whether the wealthy or poor B has a higher probability of victory will depend on the competing effects of wealth and manpower. The relative attractiveness of partial conflict for both sub-groups will depend on the interaction of wealth, numerical strength and

costs i.e. y , λ and m . This model, due to the parameter assumptions only considered the subgame where the low cost i.e. poor B engaged in partial conflict. However the above suggests the situation where the high cost B engage in partial conflict is a real scenario. This is relevant when considering ethnic conflicts. Some conflicts are characterised by the agitation of the wealthy, educated class of the oppressed group with the poorer members seemingly disengaged. However others are largely led by poorer members with the wealthy members conspicuously absent.

Considering A , if r was included as a factor affecting the probabilities p and q , then as r increased, the payoff to conflict to A would diminish but their probability of victory would increase i.e. p and q would become smaller. This would challenge the static result in this model.

Another point of note, though somewhat incidental is that the model only considers private costs of conflict and not social costs. Most models of conflict would have X reduced by a fraction as a result of conflict. e.g. degradation of natural resources or a depletion of the budget because the State is engaged in conflict, as in this model. Excluding social costs of conflict was simply done for analytical convenience. Including social costs would not change the range of SPE, but it would expect to limit the range of outcomes where conflict occurs. Social costs reduce the potential payoff from conflict.

4.3 Repeated Games

A potential criticism of this model is that it is only a single period game. Most conflicts typically would take place over multiple periods. Moreover, in a repeated game, past actions can influence future equilibrium paths. So a repeated game extension is more realistic than the assumption in this model that conflict is mere lottery on exogenous outcomes. Solving the present game in a repeated setting is beyond the scope of this thesis, but it is possible to raise some implications of extending it into a repeated game setting. If the present game were to be extended into further periods, what form would it take?

One possibility is the role of internal fighting within B . If A can be treated as some colonial power that battles for the equity of a country in the first period and then leaves, the subsequent periods would be interactions within B . Then both the high and low cost B can be expected to fight for their optimal share of the resource. The role of internal conflict within B is a natural corollary of modelling heterogeneity. What is the likely result of a repeated game? Whilst no attempt is made to solve the repeated game, the prospect of a subsequent internal conflict would undermine the ability of a single subgroup to expropriate the resource from the B that did not fight against A initially. They may expropriate the resource at first, but that surplus is likely to be challenged by the other subgroup in subsequent periods. In the second model, where free-riding is not allowed, inefficiency emerges because the offer A has to make to all the B is equivalent to the payoff that one subgroup gets from expropriation. The required offer exceeds the expected loss from conflict. If subsequent periods of fighting diminish that payoff, it may reduce the required offer that A has to make and an efficient outcome may be more likely.

A second way of thinking about the repeated game is to consider what happens to the standard offer α . If α is accepted in one period, does it remain in the subsequent period? If α vanishes in the next period if conflict is chosen, then the repeated game simply becomes the one-shot game multiple times with the same α being offered in each period. That is perhaps not realistic in a repeated game since at some point it has to be transferred. From the point α is transferred, then B has an incentive for conflict in the next period. α is already transferred so the offer in one period does not necessarily prevent A having to make another offer in subsequent periods. This reduces the benefit to A from making offers, so it is possible that commitment problems move the game in the favour of conflict.

This model presents conflict as initiated by B in response to expropriation by a dominant A . A 's rise to power is exogenous in this model and A 's role is primarily to strategically apportion X . However in a repeated game, one could model A asserting some strength. That may in some way counter the incentive of B to take an offer in one period and then demand another offer in the subsequent period. Although α is transferred at the end of one

period, in subsequent conflicts, previously accepted offers are contested by A . So B in a repeated game by choosing conflict, jeopardises previously accepted offers. This might slant the game towards efficiency.

Another factor that would take on greater significance in a repeated game is the role of social costs of conflict. For analytical convenience, this thesis only considered agent-specific costs in conflict. This did not affect the result but including social costs would narrow the range in which conflict could occur. In a repeated game, if social costs are included, the pie of resources gets smaller with every conflict. That would reduce the incentive from conflict and might push the game towards efficiency.

4.4 Other Extensions

Another set of extensions could be worthwhile to consider. It may not be analytically appropriate to extend all of them on to this model but they may be worthwhile topics of independent research.

One possible extension would be to give agents some productive capacity. This issue has been considered by the literature in Mc Dermott (1997) and Falkinger (1999). This productivity would highly likely be correlated with the group's high or low cost status as opposed to random. Although it is possible it could be a third dimension in addition to ethnicity and cost. Assuming productivity is correlated with high or low cost status, the incentive of B to fight would depend on their productive capacity e.g. if they would make a profit if they won the resource. So a wealthy/high cost B may have more incentive to fight due to higher productivity with the resource. The relationship between productivity and wealth may not always be in that direction. It would have a particular interplay with the characteristic of the resource. e.g. if the resource was professional job and university admission quotas, it may only be of interest to wealthy/educated agents. But if X is land and agricultural resources, it may be of concern to poorer rural members of B . In a sense productivity becomes more generally, the relevance of the resource to B . This may explain why some ethnic conflicts only engage a certain strata of the discriminated group. Of course if agents are fighting

over a financial budget, then one requires a generic notion of productivity because agents can be assumed to be neutral with respect to money.

The idea that logically follows from productivity is, can A then give the resource to productive B and then tax them? That might be efficient and deliver a higher payoff to A compared to restricting the B 's access to the resource itself.

This thesis makes the reasonable assumption that some “dominance” confers political power to A . It is not assumed whether $r > 1$ and it is a majority or whether it is a dominant minority e.g. apartheid South Africa. However whether the high or low cost interests of A are being maximised is left unmodelled. It is beyond the scope of this thesis to model the path of group A to power. e.g. coalition choice and any earlier conflicts. But the way in which A sustains power would be relevant to the extent that it imposes a constraint on its decision making. In particular if the rule of A is sustained by an electoral democracy, theories such as the median voter theorem and others would suggest that the distribution of high and low cost A crucially informs what decision is taken. If B has voting rights, then their relative population becomes significant. For simplicity, ignore B 's voting rights and just on the cost distribution of A . Then changes in m not only affect the profitability of conflict to B but it also affects the maximising decision of A . This would be quite different to the comparative statics in this model.

This also draws attention to another key assumption in the model. m is assumed to be a uniform distribution amongst A and B . However the cost distribution may be different. Then changes in the distribution of costs are considered separately for each ethnic group. This may be relevant in that in many conflicts, the warring parties have vastly different demographic profiles and those discrepancies inform the conflict. e.g. group identity may be correlated with a certain type of economic profile.

5 Conclusion

Conflict is an intractable phenomenon in the world at large. Yet standard bargaining logic would suggest that more often than not, complete information allows for an efficient transfer to be made. Conflict emerges in this thesis because a dominant party cannot make separate offers to heterogeneous members of an ethnic coalition. The unilateral concession then provides the dominant party with a mechanism of ex-ante influencing the profitability of conflict of the other side. The interplay between heterogeneous agents, an imperfect bargaining framework and the unilateral concession is shown to lead to either conflict or a peaceful outcome that favours the dominant party. This is a counter-intuitive result in the sense that an instrument of transfer can be shown to be pivotal to the achievement of an inefficient outcome.

The bargaining mechanism in this thesis is not an ad hoc construction. Indeed ethnic-based political parties are common in many societies and those parties straddle a range of divergent economic interests. Thus this thesis shows why such coalitions may serve the interest of dominant powers that exploit the internal economic fault lines within large race-based coalitions i.e. via conflict or a skewing of the peace. So this thesis adds a policy imperative against monolithic ethnic coalitions. Coalitions based on economic interests, or that reduce the extent to which a single party solely represents divergent interests would lead to more efficient and equitable outcomes.

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