Counter-Terrorism Efforts by Government in case of hostage taking by negotiation and bargaining: A Game Theoretic Analysis

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Abstract

This paper talks about the short term and long-term terrorist and the scenario of hostage taking. It takes into consideration whether the government should negotiate with them or not. It goes on to look into the expenditure by government on anti-terrorist activities depending upon the incidence of attacks and the political stability.

Keywords

Counter-terrorism; Game Theory; Government; Private players; Vigilance; Complements; Substitutes.

JEL Codes: C70, D74, H10, H56.

1.Introduction

The world is constantly living under the fear of terrorist attacks today. So, it is immensely important for the governments to chalk out a detailed strategy in advance to deal with such attacks.

The terrorist group can be short term or long term. Short term group gets highly discouraged after a failure as it values immediate success. Whereas, the long-term terrorist group keep continuing with their activities even after failure. At the same time, the government can also be short term when there is political instability or long term when there is political stability. If the government is short term, it will not negotiate with the terrorists anyway as it knows that doing so will not yield any benefit to it. But if the government is long term, then it may or may not choose to negotiate with the terrorists.

The terrorist groups can resort to bombing, taking hostages, kidnapping or skyjacking. In the last three cases, the terrorist group wants the government to come to the negotiation table. The government, on its part, has to keep aside a part of the country's budget for anti-terror activities like increasing security at the airports, installing metal detectors, strengthening intelligence, taking measures to de-radicalise the youth etc. This paper addresses the question whether the government should negotiate or not with the terrorist groups. It goes on to look into the expenditure by government on anti-terrorist activities depending upon the incidence of attacks and the political stability.

2. Literature Review

2.1 Bargaining between the government and the terrorist organisation

Terrorist organizations can resort to many techniques to attack the targeted country. It may be in terms of bombing the important places, kidnapping the people, taking hostages and even skyjacking. In the last three cases, the terrorists want the government to come to the negotiation table to exchange their people by satisfying the terrorist wants which are mostly in the form of release of prisoners, demand for ransom or some other political demands like leaving their area etc. Now, the question that lies before the authorities is how to formulate their policy in order to address the threat posed by the terrorist group.

Lapan & Sandler (1998) set up an extensive game theoretic model to analyze the conditions under which the government will choose to negotiate with the terrorists and the amount of deterrence expenditure it will incur to tackle the terrorist attack. Their model includes two players: the government and the terrorist organization. The government moves first and decides the amount of its deterrence expenditure. The terrorist organization, after taking this into account, moves next and its strategies include attacking or not attacking the country. Attacking here means taking hostages in terms of skyjacking or kidnapping the citizens of the country to bring the government to the table for negotiation in the form of release of prisoners or demanding ransom. The government does not have perfect information about it and hence, it attaches a probability that the terrorist organization will attack. If it attacks, then again, the government attaches a probability that it will be a successful attack. And if it has been a successful attack, then there is a probability attached by the terrorist organization that the government will negotiate with it.

Solving the extensive form game, the paper arrives at the conclusion that the probability of terrorist activities increases with the increase in the probability of success and increase in the probability that the government will negotiate. Also, while the traditional wisdom says that as long as the government is successful in giving a 5 credible threat that it will not negotiate under any circumstances, the terrorist organization will not attack the country, as it will not gain anything out of it. But this paper finds out that even after giving such a credible threat, the terrorist organizations may still go on to attack the country because in that scenario, though it will not be able to persuade the government to negotiate with it, it will be able to gather publicity through media coverage. This will, in turn, help the

organization to become popular and attract more recruits into it. The paper also finds that from the government's point of view, if it increases the deterrence expenditure, then the likelihood of terrorist attack decreases.

In this paper, I have extended this model to include short term and long-term terrorist organizations and how the policy of the government and actions of the terrorist groups will be affected when there will be political stability.

The empirical testing of the bargaining framework between the government and terrorist organization is equally important for framing of policies. Atkinson, Sandler & Tschirhart (1987) presents the pioneering paper which econometrically estimates the bargaining framework between the terrorist organization and the country after the terrorists take hostages in the form of skyjacking, kidnapping and barricading incidents and demand for concessions in the form of release of prisoners, ransom or airing of its propaganda.

Using ITERATE data for all the terrorist incidents from 1968 to 1977 and applying the Tobit model, the paper estimates how the change in the cost of bargaining effects the incident's length and the final ransom being paid or the shootout.

The results of the paper show that (a) releasing hostages sequentially led to a decrease in the terrorist organization's cost vis a vis the government; (b) ceteris paribus, the terrorists are able to persuade the government for greater ransom if its initial demand is greater; (c) ceteris paribus, the terrorist organization is able to acquire a higher ransom in the case where the hostages belong to different nationalities because in such a scenario, the governments of the countries to which the hostages belong put pressure on the targeted country's government to give in to the demands of the terrorists on an urgent basis.

This paper can be extended to see how the terrorist groups will behave when they are short term or long term and how will they take into account the political stability of the country. The expected terrorist behavior can be used by the government to formulate the policies to address the problem of the terrorist attack.

Now, moving on to the bargaining framework where pirates are involved. Ambrus, Chaney & Salitskiy (2014) set up a dynamic bargaining model where the pirates (taken as sellers) do not have information regarding the valuation of hostages by the government (taken as buyers). Ransoms have been used by the criminals since historical times in the exchange of prisoners and property. In such a scenario, they start offering prices and negotiate with

the government. The government can accept or reject the deal. If the deal is rejected, then the pirates do not have any idea whether this step by the government was taken because of low valuation of the hostages or because of lack of resources on the part of the country. In this situation, the pirates again quote a lower price for the hostages and again the government has to either accept or reject it. Such a process continues until time "T" when the price offered by the pirates is equal to the valuation of hostages by the government.

So, in the theoretical literature, it has been proved that delayed negotiations are common in such situations even though delays prove to be leading to increased mistreatment towards the hostages. This is attributed to asymmetric information (Sobel and Takahashi, 1983; Fudenberg, Levine and Tirole, 1985; Gul and Wilson, 1986; Admati and Perry, 1987). While it is intuitive to say that delays in negotiation can signal the pirates that there is a low valuation attached to the hostages by the government, but this had not yet been proved empirically.

So, Ambrus, Chaney & Salitskiy (2014) use this model to test the hypothesis whether the delay in negotiation actually leads to the reduction in the ransoms paid by the government. To test it empirically, it uses the data on captives taken by North African based pirates and the negotiations done with them by the Spanish negotiation teams. They take the days in captivity as a proxy for the negotiation delay. It has been found that with an increase in a year's captivity, the ransom price for the hostage decreases by 8%.

Hence, the paper is in conformity with the literature which claims that delay in negotiations leads to a reduction in the ransom price in case of a dynamic bargaining model involving asymmetric information.

Now, this can be extended to terrorist organizations taking hostages. The government even while choosing to negotiate can zero in on optimal time when they will negotiate with the terrorist depending upon their valuation of the hostages. This paper can be extended to take into account the decisions by the government when there is political stability (long term government) or political instability (short term government). Also, the short term and long-term nature of terrorist organization in terms of their patience can be incorporated to see how long they are willing to negotiate with the government.

2.2 Signalling and reputation building

Leeson (2010) uses the theory of signalling and reputation building to explain the practices of using the skull flag (Jolly Roger) by the pirates and their infamous practice of torturing the captives.

Being rational agents, the pirates always aim for profit maximization or cost minimization. They try to capture the captives without any violence as a battle between them and the merchantmen is expensive for them. The pirates know that battle, most probably, will inflict injuries on the pirates along with causing damage to their ships. All these, in turn, increase their costs in terms of loss of lives, repairing the ships and reducing their effectiveness in capturing the merchantmen further.

In order to minimize the cost, the pirates follow the strategy of – Slaughtering the merchantmen who resisted and showing mercy to those who cooperated with them. Whether this strategy will be successful or not will depend upon the credibility of the pirate's "surrender – or – die" policy.

The theory of reputation building predicts that the pirates, in order to have a credible strategy in the long run should follow the actions it promises strictly. This, in turn, will make the merchantmen to surrender peacefully to the pirates and not resist them. In this game, the merchantmen move first and they have two strategies which they can follow- either to resist the pirates or to surrender to them. The pirates also have two strategies - either to slaughter the merchantmen or to spare them.

This is a perfect information game and has a unique subgame perfect Nash Equilibrium where the merchantmen surrender and the pirates spare them. This, in turn, strengthens the reputation of the pirates and their act is spread through the media and by word of mouth. The paper also moves on to talk about the reason for the pirates to use the Jolly Roger flag. The aim is to distinguish themselves from the coast guard ships. The coast guards are authorized by the government for catching the pirates and the wrongdoers. The difference that exists between the pirates and the coast guard is that the pirates are not constrained from killing the resisting merchantmen, while the coast guards have to follow certain rules and regulations and they cannot slaughter a person without any reason. This creates a problem for the pirates, as if the merchantmen believe that they have been caught by the

coast guards, they have greater incentive to resist them. And this, in turn, makes the "surrender – or- die" policy of the pirates ineffective. In such a situation, it is extremely important for the pirates to distinguish themselves from the coast guard ships. They use the Jolly Roger to signal this to the merchantmen and it is a way to communicate to them that they do not want any conflict but they will rather show mercy to the merchantmen who will surrender peacefully. So, the Jolly Roger is used to create a separating equilibrium. This flag is inexpensive for the pirates as, if they are caught, their punishment remains the same in the case when the flag was not hanging on the ship. But hanging such a flag by the coast guard ships is expensive as, if they are caught with it, they will be punished, while if they do not hang the flag, they go unpunished for their acts.

Theory of reputation building and signalling can be used for the terrorist groups as well. The terrorist groups always want to create a reputation that they will spare the hostages if the government gives in to its demands, which are mostly political, while they will kill the hostages if the government fails to do the same. Also, the terrorist groups can adopt methods which distinguish them from each other.

3. Model

There are two players – The terrorist organization (T) and the government (G) of the country which the terrorist organization attacks. It is a game theoretic model which involves imperfect information. All the players in the model have rational expectations.

The terrorist organization can be short term or long term. But the government does not know the type of the terrorist group. So, it attaches probability that

$$P\{T \text{ is short term}\} = p$$

$$P\{T \text{ is long term}\} = (1-p)$$

The terrorist organization has to decide whether to attack or not. Here, it has been assumed that the group takes hostages by kidnapping or skyjacking. But the government does not know for sure whether there will be an attack or not. So, it attaches a probability that –

$$P\{T \text{ attacks} \mid T \text{ is short term}\} = \Omega$$

$$P\{T \text{ attacks} \mid T \text{ is long term}\} = w$$

The terrorists take hostages and they want the government to come to the negotiation table. So, the terrorist organization attaches –

P {G is politically stable} = δ

P {G is politically unstable} = (1-δ)

P {G will negotiate | there is political stability} = r

P {G will not negotiate | there is political stability} = (1-r)

Decision that the government will have to take

As the resources are limited and there are many sectors like education, health, infrastructure, environment etc which also compete for the same, the question that arises in front of the government is that how much will be optimal to spend on prevention of terrorist attacks in the form of deploying more security personnel, installing Door Frame Metal Detectors etc. Being rational agent, the government will do the cost benefit analysis and then zero in on the level of expenditure on prevention of terrorist attacks, that is, "D".

So, the probabilities attached by the government are-

P {Attack by T will be successful | T is short term} = Θ

P {Attack by T will be successful | T is long term} = Φ

Hence, the probability of success depends on D that is

Θ = K (D) and Φ = F (D) 1

K'(D) < 0 and F' (D) < 0

Θ and Φ also depend on other things, say, for example, the terrorist organization's strength. Then, D will also, in turn, depend upon these.

F(D) ≥ K(D), ∀D, that is, the probability that long term group will be successful isn't smaller than that of short-term group. Assumption 1

D = H (Θ, Φ); H' > 0 ; H" > 0 ; H (0) =0 2

The government's anti-terrorist expenditure increases with an increase in the probability of successful attack.

So, H (Θ, Φ) is like a cost incurred by the government.

Also, the government has to decide whether to negotiate with the terrorist group or not.

Since, the government does not know whether the terrorist group is short term or long term, it takes the weighted average of K(D) and F(D) line, that is, p. K(D) + (1-p). F(D), where "p" is the probability of the terrorist group being short term and "(1-p)" is the probability of the group being long term. Using this weighted average along with equation (1), a relation between the weighted average and "D" can be arrived at. On the basis of equation (2), a relation between H (Θ, Φ) and D can be plotted. From these two, the equilibrium "D" (D*) can be derived.

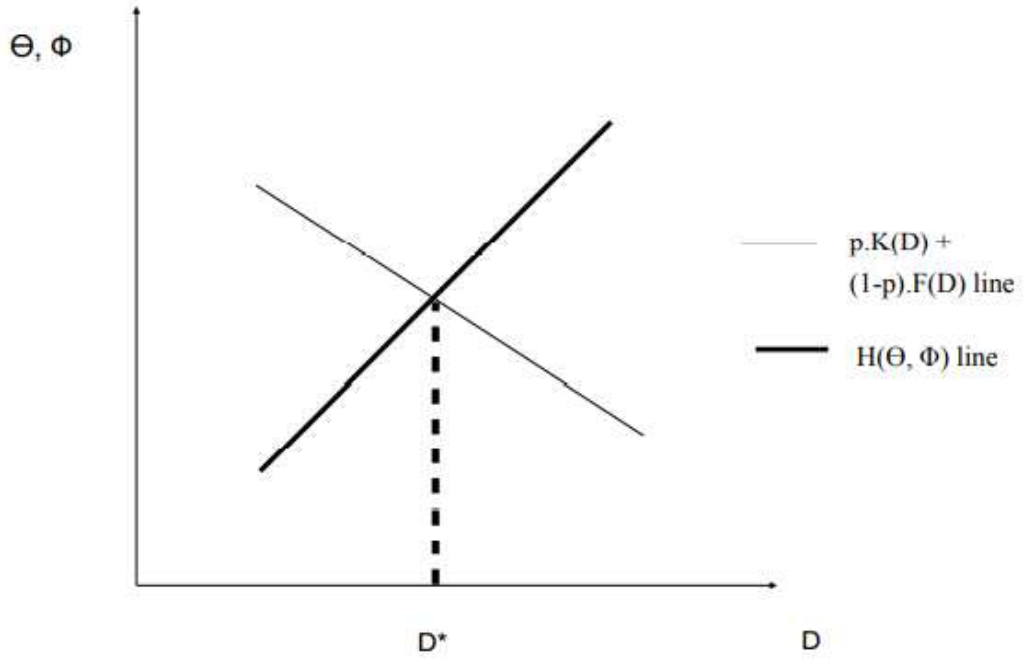


Figure 3.1 - Equilibrium level of expenditure on prevention of terrorist attacks that is "D"

Decision that terrorist organization has to take

The terrorist group has to decide whether to attack, that is, to take hostages or not. It is assumed that the government and the terrorist organization, both are rational and they take their costs and benefits into account before taking any decision.

Timing-

First, nature chooses the type of terrorist group (short term or long term) and the type of government (short term or long term). Then, in the next period, the terrorist group decides whether to attack or not. This attack can manifest into a successful one or a failed attempt

by the group. Simultaneously, the government decides the level of anti-terrorist expenditure "D" and whether to negotiate or not in the case of a successful attack (if it is a long-term government). But if it is a short-term government, it will not negotiate in any case. The game can be represented as follows. The first term in the brackets represents the terrorist organization's payoff, while the second term denotes the government's payoff.

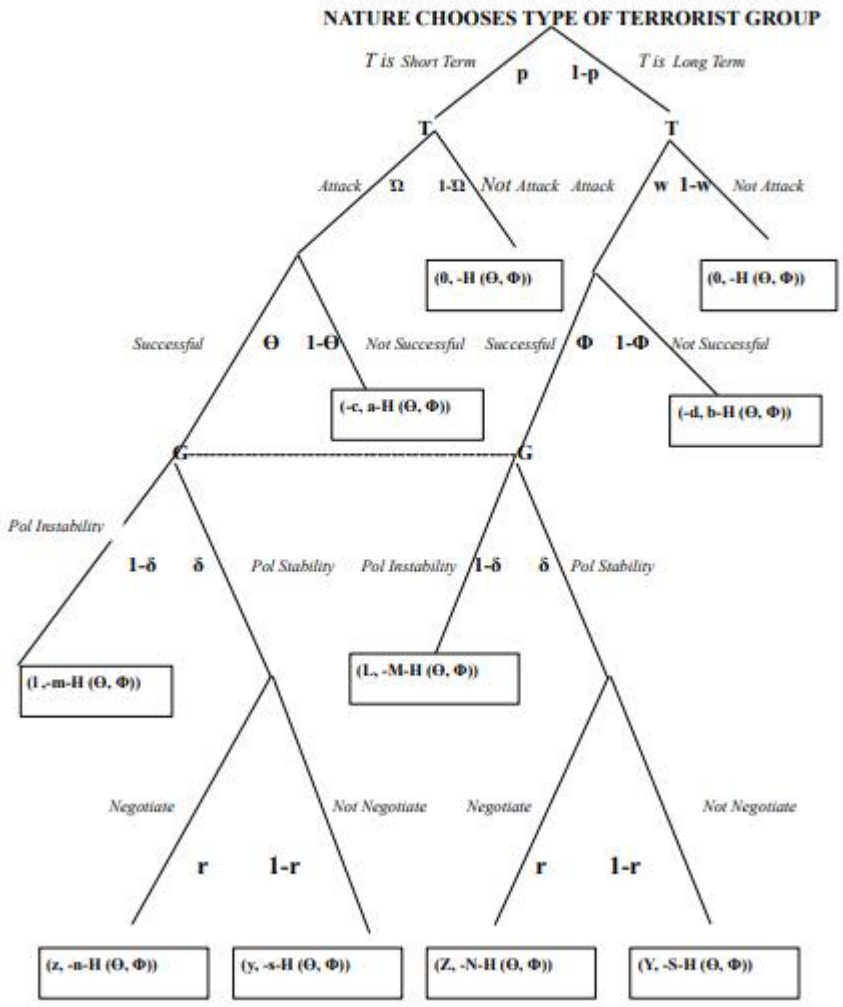


Fig 2 - Game tree representing the model

Explaining the payoffs

For the government

a, b > 0. It is the benefit that the government will have by making an attack to fail. It will be able to save its people, infrastructure and get a reputation of successfully handling terrorist attacks. So, the payoffs include the present discounted value of future benefits as well.

If there is no attack, then the government ends up just incurring the cost of H (Θ, Φ).

If the attack is successful but there is political instability, then the government will not negotiate. In this case, the payoffs to the government will be -m-H (Θ, Φ) when the terrorist group is short term and -M-H (Θ, Φ) when it is long term. The payoffs are in negative as by failing to prevent an attack, the government not only incurs the cost but it has to bear the damages as well.

a > - m; b > - M. This is so, because in the first case that is when the government gets a payoff of a-H (Θ, Φ) it has been successful in making the attack a failure, whereas in the second case, the terrorist organization has been successful in carrying out the attack. Also, m, M > 0.

If there is political stability and the attack has been successful and the government chooses to negotiate with the terrorist group, the payoff it gets is -n-H (Θ, Φ) when the terrorist organization is short term and -N-H (Θ, Φ) when the terrorist organization is long term. Also, n, N > 0.

If there is political stability and the attack has been successful and the government chooses not to negotiate with the terrorist group, the payoff it gets are -s-H (Θ, Φ) when the terrorist organization is short term and -S-H (Θ, Φ) when the terrorist organization is long term. Also, s, S > 0.

-m <- s; -M <- S. In both the cases the government will not negotiate but when there is political stability and it chooses not to negotiate, then it attains greater credibility and again the reputation factor comes in which helps in deterring the future attacks No assumptions have been made about the relative magnitudes of "n" and "s" ("N" and "S") [2].

For the terrorist organization-

When it is short term: z > l > y > -c. When it is long term: Z > L > Y > -d

It gets the maximum payoff when the attack is successful and the government chooses to negotiate with it (z, Z). Then comes the situation when there is political instability, though the government does not negotiate here, the group gets a payoff of "l" or "L" as they are able to create greater fear amongst the people who know that the government is not credible enough to take all the measures to avert a future attack. The group gets a lower payoff of "y" or "Y"

[2] This is because, there can be situations when the government might choose not to negotiate 1 in order to build its reputation for toughness. But at the same time, there can be situations, for example, when the terrorist group has taken hostages in a hospital, then the government gets a higher pay off by negotiation.

when there is political stability and the government chooses not to negotiate. In this case, the government is able to build a reputation that future attacks will not yield any results as the government will not bow down in any case. The terrorist organization incurs a cost when their attack actually fails due to the measures that were taken by the government (-c, -d). Finally, it neither incurs any cost nor gets any benefit when it chooses not to attack.

Z-Y > z-y because 3

• Z > z due to the fact that if the government negotiates, the long-term terrorist group gains more than short term group as it gets more recruits and there is upliftment of its reputation. But for the short-term group, its objective is met and it is out of the business. This point is validated by taking the present discounted value of the payoffs.

• Y < y again due to the reason as specified above, that is, if the government does not negotiate then the long-term group will lose more than the short-term group, if the present discounted value of the payoffs is taken. It will hamper the long-term group's future recruits.

Z+Y > z+y Assumption 2

Also, it has been assumed that –d > -c. If the terrorist attack fails, then the long-term terrorist group is still not as disappointed as the short-term terrorist group because the terrorist outfit with long term vision considers the experience of launching an attack itself to be valuable as it becomes a learning lesson for the future and also provides an exposure to its people. Whereas, the short-term terrorist group has a very limited horizon and does not care about the future as it is only concerned about the present attack.

3.1 Likelihood of attack

Proposition 3.1.1: The likelihood of attack increases with an increase in the probability of success and the probability of negotiation. It increases with political stability only if a politically stable government is sufficiently likely to negotiate, that is, r > max {r, r**}, where r* = (l-y)/(z-y); r** = (L-Y)/(Z-Y).*

Proof – See the Appendix 1

The first part of the proposition which claims that the likelihood of the attack by the terrorist organization will increase with an increase in the probability of success and the probability that the government will negotiate with it is apparent. As far as political stability is concerned, the

terrorists are more likely to attack as now there are chances that the government will come to the negotiation table, only if there is a politically stable government.

Proposition 3.1.2: Given the assumption 1 and assumption 2, long term terrorist group is more likely to attack than short term terrorist group provided political stability is sufficiently low ($\delta < (L-l)/(L-l+y-Y) = \delta^*$).

Proof – See the Appendix 2.

3.2 Negotiation and bargaining

Proposition 3.2.1: Even if the government pre commits that it will not negotiate (r = 0), still there can be attacks when "y" > 0 (if the terrorist group is short term) and "Y" > 0 (if terrorist group is long term).

Proof – See Appendix 1

The terrorist organization gains from taking hostages even though they know there is a firm commitment by the government to not negotiate with them because by attacking the country it gets much-needed publicity through media, which in turn helps the group to recruit people in the future.

3.3 Impact of political stability (probability of negotiation) on government's expenditure on anti-terrorist activity

This section tries to explain the change in "D" due to a change in the political stability of the country, which can be quantified by taking into account the probability of negotiation.

$c^* = (K(D)/ 1-K(D)) [(1-\delta)l + \delta\{ rz + (1-r)y\}]$ (From Appendix 1)

Long term terrorist group will attack when $d < d^*$

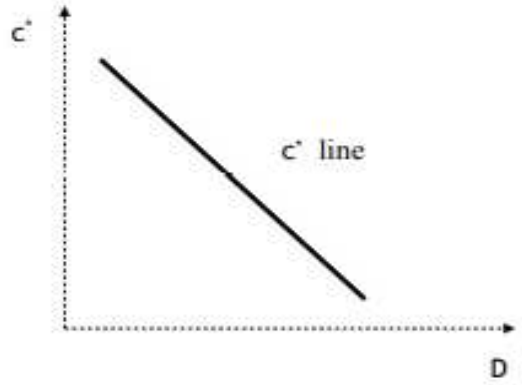
$d^* = (F(D)/1-F(D)) [(1-\delta)L + \delta \{rZ + (1-r)Y\}]$ (From Appendix 1)

Now, with the change in "r"- $\partial c^*/\partial r = (K(D) / 1-K(D)) \delta (z-y)$ 4

$\partial d^* /\partial r = (F(D)/1-F(D)) \delta (Z-Y)$ 5

As stated before, there exist a negative relation between the probability of successful attack (Θ, Φ) and "D" (from equation 1). Also, as probability of successful attack increases, c* and d* increases (From Appendix 1). So, it can be derived that there is a negative relation between c* , d* and "D".

So, plotting the above relation-



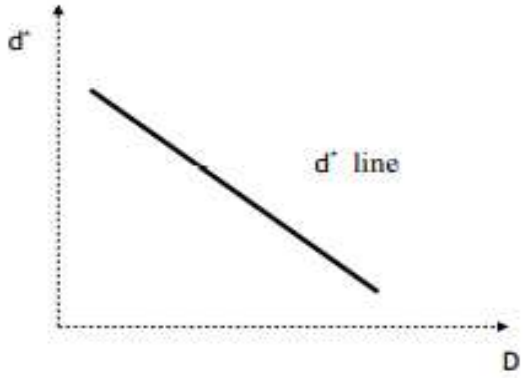


Figure 3.3.1 - Relation between c* and D

Figure 3.3.2 - Relation between d* and D

It has been assumed here that there is fixed "D" and probability of success of the long term terrorist group is not much lower than that of the short term terrorist group, that is, F(D) is not much smaller than K(D).

Since Z-Y > z-y (from (3)) and from the above assumption and equations (4) and (5), it is clear that the shift in d* will be more than the c* line due to a change in "r".

CASE 3.3.1 - d* line is steeper than c* line.

This denotes the case when the long-term terrorist group's critical cost, below which it will attack, is more responsive to the government's anti-terrorist efforts vis a vis the short-term terrorist group's critical cost.

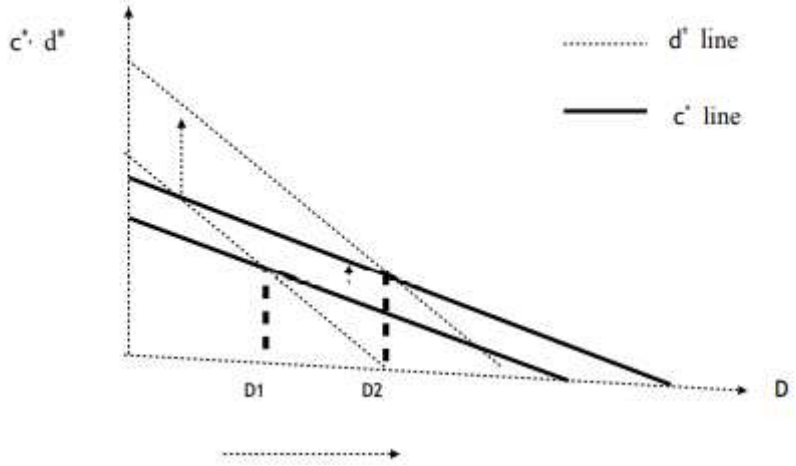


Figure 3.4-Impact of political stability (probability of negotiation) on government's expenditure on anti-terrorist activities line- d* line is steeper than c* line

So, it can be concluded that if the probability of negotiation increases, that is, when there is more political stability in the country and the critical cost for the long-term terrorist group is more responsive to "D" as compared to the short-term group, then the government's expenditure on anti-terrorist activities is likely to increase.

CASE 3.3.2 - c* line is steeper than d* line.

This denotes the case when the short-term terrorist group's critical cost, below which it will attack, is more responsive to the government's anti-terrorist efforts vis a vis the long-term terrorist group's critical cost.

CASE 3.3.2.1 - Shift in c* is very small

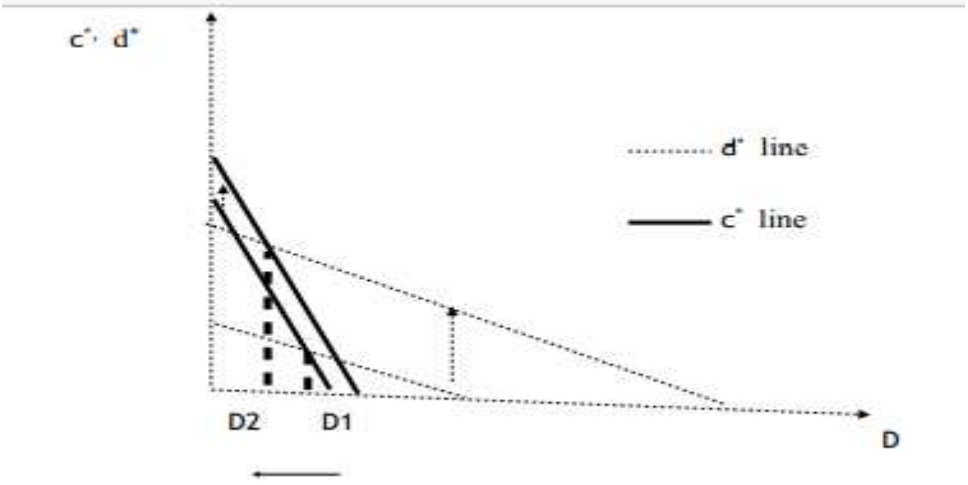


Figure 3.5.1-Impact of political stability (probability of negotiation) on government's expenditure on anti-terrorist activities line c* line is steeper than d* line- Shift in c* is very small

In this case, with the increase in probability of negotiation, "D" decreases.

CASE 3.3.2.2 - Shift in c* is more than the previous case, but still less than that of d*

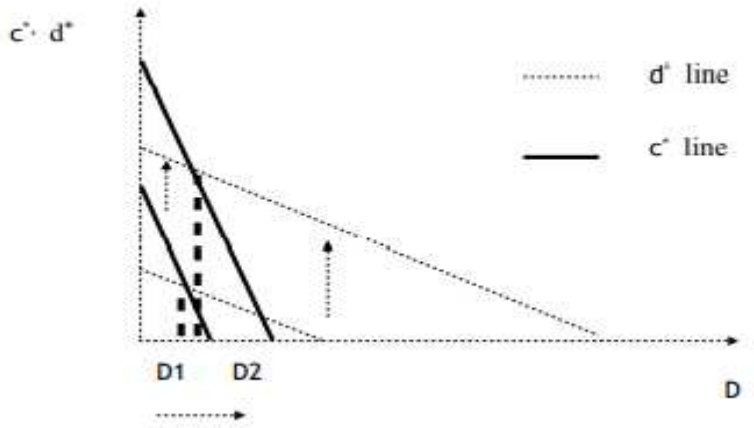


Figure 3.5.2- Impact of political stability (probability of negotiation) on government's expenditure on anti-terrorist activities line- c* line is steeper than d* line- Shift in c* is very small, but greater than in Figure 3.5.1.

In this case, with the increase in the probability of negotiation, "D" increases.

Proposition 3.3.1 - Increase in the political stability of the country (quantified with increase in "r") can lead to –

• *the increase in government's anti-terror expenditure ("D") if the critical cost of the long-term terrorist group is more responsive to "D" as compared to that of the short-term terrorist group.*

• *increase / decrease in government's anti-terror expenditure ("D") if the critical cost of the short-term terrorist group is more responsive to "D" as compared to that of the long-term terrorist group, depending upon the level of shift of c* line.*

4.Conclusion

No corner of the world has been insulated from attacks by terrorists in this second decade of the twenty-first century. The people around the globe are constantly living under the fear of such attacks. Under this scenario, this thesis puts the problem of terrorism in a game theoretic framework. Taking the government, terrorists, and the private players as rational economic agents, it gives various policy prescriptions. The first game theoretic model takes terrorist groups as short term and long-term depending upon their level of patience in case of failure. The government can also be short term or long-term depending upon the level of political stability in the country. A politically unstable government will not negotiate with the terrorists under any circumstance, whereas a politically stable government may choose to negotiate or not negotiate with them.

The various results drawn from this model are (i) the likelihood of attack increases with an increase in probability of success of the terrorist group, negotiation and political stability (only if a politically stable government is sufficiently likely to negotiate); (ii) The long term terrorist group is more likely to attack than the short term terrorist organization, provided political stability is sufficiently low as the short term group gets highly demotivated with a failure, whereas the long term group takes it as an experience and continue with their activities; (iii) Even if the terrorists know that there is a firm commitment by the government to not negotiate, still they may carry out the attacks in order to gain media attention and publicity.

There are areas within the scope of this study which can be further explored. These include - (i) The optimal time for the government to negotiate with the terrorist group depending upon government's valuation of the hostages; (ii) Theory of reputation building and signalling can be used by the terrorist groups to create a reputation that they will spare the hostages if the government gives in to its demands, which are mostly political, while they will kill the hostages if the government fails to do the same. It will be interesting to find out the optimal strategy by the government in such a scenario; (iii) Looking at repeated interactions between the countries

which are targets of potential attacks and analysing how this will influence the government expenditure to tackle the terrorist attack.

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