Defensive Counterterrorism Measures and Domestic Politics

Todd Sandler
University of Texas at Dallas, tsandler@utdallas.edu

Kevin Siqueira
University of Texas at Dallas, siqueira@utdallas.edu

Follow this and additional works at: http://research.create.usc.edu/published_papers

Recommended Citation
Sandler, Todd and Siqueira, Kevin, "Defensive Counterterrorism Measures and Domestic Politics" (2007). Published Articles & Papers. Paper 64.
http://research.create.usc.edu/published_papers/64

This Article is brought to you for free and open access by CREATE Research Archive. It has been accepted for inclusion in Published Articles & Papers by an authorized administrator of CREATE Research Archive. For more information, please contact gribben@usc.edu.
DEFENSIVE COUNTERTERRORISM MEASURES AND DOMESTIC POLITICS

KEVIN SIQUEIRA AND TODD SANDLER†

School of Economic, Political and Policy Sciences, University of Texas at Dallas, GR31, 800 W Campbell Road, Richardson, TX 75080-3021, USA

(Received 31 July 2007; in final form 31 October 2007)

Unlike most of the literature, this paper includes domestic political considerations in which two countries must decide defensive countermeasures against a common terrorist threat. A delegation problem arises as voters strategically choose a policymaker whose preferences differ from their own. As a consequence, countries limit the presumed oversupply of defensive countermeasures. Thus, the inclusion of domestic politics gives a new perspective on counterterrorism. The timing of elections is also shown to make a difference.

Keywords: Terrorism; Externalities; Counterterrorism; Delegation problem; Domestic politics

JEL Codes: H41, D72

INTRODUCTION

Since the unprecedented terrorist attacks on September 11, 2001, economists and political scientists have increasingly turned their attention to theoretical and empirical analyses of transnational terrorism (see, for example, Drakos and Kutan, 2003; Enders, 2007; Faria and Arce, 2005; Heal and Kunreuther, 2005; Kunreuther and Heal, 2003). To date, little attention has been paid to how domestic politics (e.g. voters’ election of policymakers) can impact policy decisions, such as defensive efforts to harden targets. When two or more countries independently confront a common terrorist threat or network, countries are portrayed as over-supplying defensive measures compared to an optimum level (e.g. Arce and Sandler, 2005; Sandler and Siqueira, 2006). These measures not only reduce the probability that a country will be attacked at home, but they also curb the amount of damages in the event of an attack.

Defensive actions are costly to the provider and to other potential target countries. The latter follows because hardening targets at home increases the probability of an attack on relatively softer targets abroad. It is this ‘transference’ that may induce targeted countries into a competitive and wasteful fortification race, especially if such defensive actions do not greatly reduce the terrorists’ proclivity for attacking. Such competitive defensive efforts may be attenuated somewhat as the associated negative (transference) externality is partly internalized if a nation’s interest abroad is at risk.

†Corresponding author. E-mail: tsandler@utdallas.edu
The purpose of this paper is to show that voters’ strategic actions to choose a policymaker may lessen excessive defensive spending as voters partly internalize the transference externality through delegation. In particular, the median voter elects a policymaker who places less weight than the voter on expected damages from a terrorist attack. With strategic delegation (see, for example, Persson and Tabellini, 1992), countries have incentives to commit to lower defensive countermeasures than in the absence of such delegation. Such delegation-induced strategizing by mutually targeted countries can improve their well-being as defense is allocated more efficiently.

THE MODEL

We assume that just two countries are in the terrorists’ cross hairs and we represent these countries’ defensive decision with a two-stage game. In the first stage, voters in each targeted country elect a policymaker, while accounting for the impact that this election will have during the second stage, when defensive measures are determined. Based on their preferences, policymakers in the two countries simultaneously and independently choose protection levels in the second stage.

Terrorist behavior is captured in reduced form by a probability of attack function that reflects attack transference between targeted countries. Let \( \theta_i \) denote country \( i \)'s defensive efforts to reduce its vulnerability to terrorism, and let \( \pi_i(\theta_i, \theta_j) \) represent the probability of a terrorist attack in country \( i \). This probability function indicates that \( i \)'s defensive measures limit the likelihood of a home attack with diminishing returns to effort: \( \partial \pi_i/\partial \theta_i < 0 \) and \( \partial^2 \pi_i/\partial \theta_i^2 > 0 \). Additionally, it also assumes that greater defense in country \( j \) raises the likelihood of an attack in \( i \), but at a decreasing rate: \( \partial \pi_i/\partial \theta_j > 0 \) and \( \partial^2 \pi_i/\partial \theta_j^2 < 0 \). Greater defensive action by one country is assumed to increase the marginal effectiveness of the other country’s defense, so that \( \partial^2 \pi_i/\partial \theta_i \partial \theta_j < 0 \). This is also consistent with reducing the marginal transference of an attack (\( \partial \pi_i/\partial \theta_j \)) that stems from the other target’s defensive efforts. Finally, \( \pi_i(\theta_i, \theta_j)=1-\pi_i(\theta_i, \theta_j) \), so that the probability of an attack in \( j \) equals the probability of no attack in \( i \), as the terrorists go for the softer target or flip a coin when both countries are equally fortified. The terrorists are, however, determined to attack one of the countries, which is consistent with al-Qaida affiliated groups that are not deterred by target hardening (US News & World Reports, 2007).

The Policymaker

The elected policymaker, \( g \), in country \( i \), is assumed to minimize his or her anticipated taste-weighted damages and defense costs as denoted by:

\[
Z_{ig} = \alpha_{ig} \left[ \pi_i(\theta_i, \theta_j)D(\theta_i) + \left[ 1 - \pi_i(\theta_i, \theta_j) \right] d \right] + C(\theta_i)
\] (1)

In equation (1), \( D(\theta_i) \) and \( d \) denote the associated damages to country \( i \) and its interests when either attacked at home or abroad, respectively. \( D(\theta_i) \) is assumed to be decreasing and linear in \( \theta_i \), while \( d \) is constant with respect to \( i \)'s defense actions at home. For all \( \theta_i \), home attacks are more damaging to \( i \)'s interests than attacks abroad so that \( D > d \). \( C(\theta_i) \) represents country \( i \)'s strictly increasing and convex cost of defensive efforts. Also, let \( \alpha_{ig} \) depict the weight that \( i \)'s policymaker places on the expected damages from a terrorist attack. This weight varies continuously over the unit interval, so that voters can be characterized as having a continuous
choice over competing policymakers with different abhorrence for terrorist-induced damages. Analogous objective functions characterize the agents in country \( j \).

The policymaker chooses defensive efforts to minimize equation (1) subject to the constancy of defensive efforts in country \( j \), \( \theta_j \). This gives the following first-order condition (FOC):

\[
\alpha^{ig} \frac{\partial \pi_i}{\partial \theta_i} (D - d) + \alpha^{ig} \pi_i D' (\theta_i) + C' (\theta_i) = 0
\]  

(2)

In equation (2), the two left-hand terms are negative and indicate the marginal benefits associated with defensive efforts, stemming from transferring the attack abroad and limiting damages from attacks at home, respectively. These marginal benefits are set equal to marginal defense costs. Given our assumptions, the second-order condition, \( \partial^2 Z^{ig} / \partial \theta_i^2 > 0 \), is satisfied.\(^1\)

Our assumptions are also sufficient for each country’s best-response function (BR) to be upward sloping (see equation (3)), with \( \theta_i \) and \( \theta_j \) on the vertical and horizontal axes, respectively:

\[
\left( \frac{\partial \theta_i}{\partial \theta_j} \right) = \frac{-\alpha^{ig} \frac{\partial^2 \pi_i}{\partial \theta_j^2} (D - d) - \alpha^{ig} \frac{\partial \pi_i}{\partial \theta_j} D' (\theta_i)}{\partial^2 Z^{ig} / \partial \theta_i^2} > 0
\]

(3)

This positive slope indicates that defensive measures are strategic complements. We also have that country \( i \)’s defensive efforts increase with greater weight given to terrorist damages:

\[
\left( \frac{\partial \theta_i}{\partial \alpha^{ig}} \right) = \frac{-\frac{\partial \pi_i}{\partial \theta_i} (D - d) - \pi_i D' (\theta_i)}{\partial^2 Z^{ig} / \partial \theta_i^2} > 0
\]

(4)

Utilizing the second-stage FOCs for both countries, we can characterize the comparative-static change to Nash equilibrium levels (denoted by \( \ast \)) of the countries’ defensive measures in response to a greater weight given by \( i \) to damages from terrorism attacks. Because defensive actions are strategic complements, country \( i \)’s enhanced concern for damages augments defensive measures in both countries – through a rightward shift in \( i \)’s best-response curve and a movement along \( j \)’s best-response curve. The results are given by the following system of equations, summarized in matrix form:

\[
\begin{bmatrix}
A_{ii} & A_{ij} \\
A_{ji} & A_{jj}
\end{bmatrix}
\begin{bmatrix}
\frac{d \theta_i^*}{d \alpha^{ig}} \\
\frac{d \theta_j^*}{d \alpha^{ig}}
\end{bmatrix}
= \begin{bmatrix}
B_i \\
0
\end{bmatrix}
\]

(5)

where:

\[\frac{\partial^2 Z^{ig}}{\partial \theta_i^2} = \alpha^{ig} \frac{\partial^2 \pi_i}{\partial \theta_i^2} (D - d) + 2 \alpha^{ig} \frac{\partial \pi_i}{\partial \theta_i} D' (\theta_i) + C'' (\theta_i) > 0.\]

\(^1\) The second-order condition is
Using Cramer’s rule, we obtain:

\[
\begin{align*}
A_{ii} & \equiv \alpha^{ig} \frac{\partial^2 \pi_i}{\partial \theta_i^2} (D - d) + 2\alpha^{ig} \frac{\partial^2 \pi_i}{\partial \theta_i^2} D'(\theta_i) + C''(\theta_i) > 0 \\
A_{ij} & \equiv \alpha^{ig} \frac{\partial^2 \pi_j}{\partial \theta_j \partial \theta_i} (D - d) + \alpha^{ig} \frac{\partial^2 \pi_j}{\partial \theta_j^2} D'(\theta_j) < 0 \\
A_{ji} & \equiv \alpha^{ig} \frac{\partial^2 \pi_j}{\partial \theta_i \partial \theta_j} (D - d) + \alpha^{ig} \frac{\partial^2 \pi_i}{\partial \theta_i^2} D'(\theta_j) < 0 \\
A_{jj} & \equiv \alpha^{ig} \frac{\partial^2 \pi_j}{\partial \theta_j^2} (D - d) + 2\alpha^{ig} \frac{\partial^2 \pi_j}{\partial \theta_j^2} D'(\theta_j) + C''(\theta_j) > 0
\end{align*}
\]

and

\[
B_i = -\frac{\partial \pi_i}{\partial \theta_i} (D - d) - \pi_i D'(\theta_i) > 0
\]

Using Cramer’s rule, we obtain:

\[
\frac{d\theta^*_i}{d\alpha^{ig}} = \frac{B_i A_{jj} - A_{ij} A_{ji}}{A_{ii} A_{jj} - A_{ij} A_{ji}} > 0 \text{, and } \frac{d\theta^*_j}{d\alpha^{ig}} = -\frac{B_i A_{jj} - A_{ij} A_{ji}}{A_{ii} A_{jj} - A_{ij} A_{ji}} > 0
\] (6)

where the denominators are assumed to be positive to ensure the static stability of the equilibrium (see Appendix).

**Graphical Representation**

Figure 1 displays the policymakers’ equilibrium in the second stage. Policymaker \(j\)’s choice of defensive measure, \(\theta_j\), is on the vertical axis, while policymaker \(i\)’s choice of defensive measure, \(\theta_i\), is on the horizontal axis. The two thick best-response paths, \(BR_i\) and \(BR_j\), represent the respective policymaker’s choice of his or her \(\theta\) for alternative levels of the other policymaker’s defensive measure. The second-stage Nash equilibrium is at \(N_1\), where the two paths (assumed linear for simplicity) intersect. The relative slopes of the best-response paths ensure a stable equilibrium. If, say, policymaker \(i\) had more interests in country \(j\) (i.e., foreign investments) such that \(d\) increases, then \(BR_i\) would shift left and both policymakers would reduce their defensive measures with policymaker \(i\) engaging in the greater reduction.

Next, we focus on the thinner \(BR_i\) path that follows from an increase in policymaker \(i\)’s concern for expected damages from a terrorist attack at home – see equation (4). As \(\alpha^{ig}\) increases, \(BR_i\) shifts to the right as shown and stage-two equilibrium levels of defensive actions increase in both countries – see \(N_2\) – with policymaker \(i\) expending the greater increase in defensive measures. These changes in the equilibrium levels of the \(\theta_s\) correspond to equation (6).

**The Median Voter**

We now turn to the first stage where each country’s voters elect a policymaker to whom they delegate authority for defensive counterterrorism measures in stage two. We thus assume that the voters in each country effectively solve their collective action problem with respect to their
country’s provision of national public goods through voting. Under majority rule and other standard assumptions, the median voter proves to be decisive in electing the policymaker who, voters anticipate, will act in his or her self-interest at the second stage of the game. These voters, in effect, behave strategically by taking into account the defensive race that may ensue between the two countries’ policymakers. As such, the voters act as a leader with their respective policymaker acting as a follower. Since voters’ preferences differ by the single-dimensional weights that each voter places on expected damages, the median voter theorem applies when preferences are strictly convex in $\alpha^{ig}$. Assuming such preferences, we represent the choice of the electorate as that of the median voter, who chooses $\alpha^{ig}$ to minimize:

$$Z^{im} = \alpha^{im} \left[ \pi_i(\theta_i^*, \theta_j^*) D(\theta_i^*) + (1 - \pi_i(\theta_i^*, \theta_j^*)) d \right] + C(\theta_i^*)$$

The associated FOC is:

$$\left[ \alpha^{im} \frac{\partial \pi_i}{\partial \theta_i} (D - d) + \alpha^{im} \pi_i D'(\theta_i) + C'(\theta_i) \right] \frac{d\theta_i^*}{d\alpha^{ig}} + \left[ \alpha^{im} \frac{\partial \pi_i}{\partial \theta_j} (D - d) \right] \frac{d\theta_j^*}{d\alpha^{ig}} = 0$$
Utilizing the FOC for \( i \)'s policeman from equation (2) in equation (8) and rearranging slightly, we obtain the following expression:

\[
\left( \alpha^{im} - \alpha^{ig} \right) \frac{\partial \pi_i}{\partial \theta_i} (D - d) + \pi_j D' (\theta_j) \right] \frac{d \theta_j^*}{d \alpha^{ig}} + \left[ \alpha^{im} \frac{\partial \pi_i}{\partial \theta_j} (D - d) \right] \frac{d \theta_j}{d \alpha^{ig}} = 0
\]  

(9)

for which it follows that \( \alpha^{im} > \alpha^{ig} \), based on the signs of the terms in equation (9).

This last inequality means that the median voter for each country strategically elects a policymaker who puts less weight than the voter on expected damages. This then limits defensive spending. Consequently, delegation and strategic voting may mitigate a tendency to overspend on hardening targets and, thus, make both countries better off. This result can be best understood by describing the above equation not only as the trade-off that the median voter faces in terms of benefits and costs, but also in terms of the non-strategic and strategic effects of delegation — respectively, the first and second terms of equation (9). The non-strategic benefits are host-country based, reflecting the reduced damages and smaller probability of attack derived from shoring up home defenses. In contrast, the strategic effect represents costs for \( i \)'s voters, because their selection of a policymaker who places greater weight on expected damages results in increased defensive spending by the other country and, thus, an augmented likelihood that \( i \) is attacked, \( \partial \pi_i / \partial \theta_j > 0 \). When, therefore, the median voter delegates defensive decisions to someone who puts less emphasis on such actions, the voter uses foresight and delegation to lessen defensive spending both at home and abroad.

The effects of delegation are displayed in Figure 2, where \( E \) indicates the equilibrium in the absence of delegation when \( \alpha^{ig} = \alpha^{im} \). In the presence of delegation with \( \alpha^{im} > \alpha^{ig} \), \( BR_i \) shifts leftward to \( BR_i^* \) and \( BR_j \) shifts downward to \( BR_j^* \), so that the delegation equilibrium at \( E_2 \) implies much reduced levels of defensive measures in both countries, compared with \( E_1 \). The implied leader-follower behavior of delegation causes voters partly to internalize the transfer-externality when multiple countries are targeted by the same transnational terrorist group. In so doing, they vote in policymakers who downplay defensive measures to limit competitive defensive races. Such actions by voters in both targeted countries may improve welfare and resource allocation.

**EXTENSIONS**

Next, we ask what would happen if elections in the two countries are not simultaneous. Will the sequential timing of the elections undermine a country’s incentives to delegate, thereby altering its defensive measures? Recall that the terrorists are equally likely to hit either target country if \( \theta_i = \theta_j \). Suppose then that both countries are alike in all aspects except for the timing of elections: country \( i \) holds elections in the first stage, while country \( j \) holds elections in the second stage.

Starting in the second stage, it can be easily shown that voters in country \( j \) will elect a policymaker with the same weight on damages as that of the median voter. Insofar as country \( j \) holds elections after those of country \( i \), there is no strategic advantage to limiting its defensive measures. In terms of our earlier discussion, the strategic effect from delegation for country \( j \) vanishes. However, in the first stage, the electorate in country \( i \) still has an incentive to elect a policymaker who limits spending. Unfortunately, this can work against country \( i \) as it draws a higher probability of attack, given the asymmetry of the resulting equilibrium. Thus, election timing in targeted countries can determine which country faces the greater likelihood of suffering from a terrorist attack.
The above discussion may also provide clues to the possible implications of what might happen if voters choose policymakers using considerations other than, or in addition to, strategic ones. Suppose, for example, that the voters’ choice of policymaker is also partly expressive, meaning that voters also gain from expressing support toward a candidate who supports a particular position (see, for example, Brennan and Hamlin, 1999). To allow for this possibility in the present context, assume that it is more costly for voters to express support for policymakers who are different from them. In other words, voters find it less costly to elect policymakers who are more like them in terms of the weight that they place on expected damages from terrorism. In this scenario, voters’ concerns may tend to offset the strategic effects of voting in the first stage of the game and, thus, diminish the moderating effects of delegation on defensive spending during the second stage of the game. That is, when confronted with a common terrorist threat, the source of voters’ motivation can also make a difference.

CONCLUDING REMARKS

In the context of a transnational terrorism threat, we have shown that domestic political considerations can lessen over-deterrence when voters strategically elect a policymaker to account for attack transference. If, however, a country confronts just domestic terrorism, then
over-deterrence is not a concern (Sandler, 2005) and there is no reason for the electorate to act strategically, since hardening targets at home are not transferring attacks abroad.

ACKNOWLEDGMENTS

This research was partially supported by the US Department of Homeland Security (DHS) through the Center for Risk and Economic Analysis of Terrorism Events (CREATE) at the University of Southern California, grant number 2007-ST-061-000001. However, any opinions, findings, and conclusions or recommendations are solely those of the authors and do not necessarily reflect the views of DHS.

References


APPENDIX

Following Cornes and Sandler (1984) and others, our notion of static stability is based on the simple adjustment process:

\[
\frac{d\theta_i}{dt} = s^1 \left[ \theta_i(\theta_j) - \theta_i(t) \right] \quad \text{for } i, j = 1, 2 \text{ and } i \neq j
\]  

where the constant parameters \(s^1\) and \(s^2\) are the positive speeds of adjustment, \(\theta_i(\theta_j)\) is country \(i\)'s best-response function, and \(\theta_i(t)\) denotes the actual value of defensive measures at time \(t\). Taking a linear (Taylor series) approximation of the system (A1) around the neighborhood of the equilibrium, we get:

\[
\begin{bmatrix}
\frac{d\theta_1}{dt} \\
\frac{d\theta_2}{dt}
\end{bmatrix}
= \begin{bmatrix}
-s^1 & s^1 \frac{\partial \theta_1}{\partial \theta_2} \\
-s^2 \frac{\partial \theta_2}{\partial \theta_1} & -s^2
\end{bmatrix}
\begin{bmatrix}
\theta_1 - \theta_1^* \\
\theta_2 - \theta_2^*
\end{bmatrix}
\]  

where \(\partial \theta_j/\partial \theta_i = -A_{ij}/A_{ii}\) for \(i, j = 1, 2\) and \(i \neq j\), is the slope of each country’s best-response function. Static stability then requires that the determinant of the 2×2 matrix be negative definite. Given the positive speeds of adjustment, this requirement reduces to:

\[
\text{det} \left( \begin{bmatrix}
-s^1 & s^1 \frac{\partial \theta_1}{\partial \theta_2} \\
-s^2 \frac{\partial \theta_2}{\partial \theta_1} & -s^2
\end{bmatrix} \right) < 0
\]
or

\[ s^2 \left( 1 - \frac{\partial \theta_j}{\partial \theta_2} \frac{\partial \theta_2}{\partial \theta_1} \right) > 0 \quad (A3) \]

from which we get our assumed condition, required for stability in the text, namely that \( A_{ij}A_{jj} - A_{jj}A_{ii} > 0 \). This requirement on the relative slopes of the country’s best-response paths is incorporated in Figures 1 and 2 where the equilibriums display static stability, since:

\[ 1 > \frac{\partial \theta_1}{\partial \theta_2} \frac{\partial \theta_2}{\partial \theta_1} \]

In equation (A4), the left-hand expression is the slope of country \( j \)’s best-response path and the right-hand expression is the inverse of the slope of country \( i \)’s best-response path.