Microeconomic Foundations of Terrorist Behavior

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Abstract

This paper develops a model of rational terrorist behavior. It is argued that such an approach allows for the integration of multiple perspectives advanced by several other academic disciplines. In addition, the results suggest a variety of factors that may explain the choices made by terrorists as well as policy levers that may provide the basis for a counterterrorism strategy. *"Many terrorisms exist, and their character has changed over time and from country to country.*

I. Introduction

Researchers in a variety of academic disciplines have long sought to identify the factors that motivate individuals to engage in terrorist behavior. No consensus has yet emerged in this large (and, since September 11, 2001, rapidly growing) literature, though more and more writers seem to be converging on the opinion that the search for a root cause is hopeless and perhaps even counterproductive. However, given that the problem of terrorism promises to grow more even pervasive in the future, there is good reason to argue that the search for causes should command more, not less, attention. Just as the doctor seeks out causes prior to prescribing treatment, public policymakers might do well to seek out the determinants of terrorism before framing a counterterrorism strategy. In the final analysis, however, prediction is even more important than prescription. In light of this fact, a better understanding of the causes of terrorism might enhance our ability to predict future occurrences of such activity.

There are a number of critical issues around which this search for motivation revolves, though none is more central or more controversial than the definition of terrorism itself. The range of available definitions is quite broad, and the political and strategic implications of the various alternatives is anything but insignificant. The CIA, for example, in accordance with Title 22 of the US Code, Section 2656f(d), defines terrorism as "premeditated, politically motivated violence perpetrated against noncombatant targets by subnational groups or clandestine agents, usually intended to influence an audience." Terrorism, according to the FBI, is "the unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives." The U.S. Department of Defense, on the other hand, defines terrorism as "the unlawful use of — or threatened use of — force or violence against individuals or property to coerce or intimidate governments or societies, often to achieve political, religious, or ideological objectives." A number of issues emerge from just these three comparisons alone. For instance, is the actual use of force a necessary element of terrorism, or does the mere threat of force also constitute terrorism? While a civilian is clearly a noncombatant, what about military personnel who are off-duty at the time they are attacked? How do political and social objectives differ from military objectives, and is it necessary to know the motivation of the attacker before deciding whether or not an act of violence constitutes a terrorist attack?

Ironically, the difficulties associated with defining terrorism are, to some degree, mitigated by the paucity of meaningful large sample datasets dealing with the problem. Absent good data, it becomes impossible to answer most questions dealing with terrorist motivations. And such questions do abound. Are terrorists fanatics, irrational in their decision making and driven by rage to lash out at their enemies? Are terrorists mentally ill, incapable of controlling their impulse to violence and, as such, victims of their own disease? Can a single explanation account for all terrorist behavior or is a different explanation required for different types of terrorists, e.g., national separatists, social revolutionaries, and religious extremists? Can a single explanation of terrorist behavior be applied productively at all points in time or is a different explanation required for different points in time?

This paper is based on the premise that a sound theoretical foundation is a necessary prerequisite to the development and testing of meaningful empirical hypotheses. I present herein an integrated theory of terrorism that pulls together many of the most important contributions from several areas of academic discourse. This theory is then used to construct a formal mathematical model of terrorism that provides valuable insights into both the causes of terrorist behavior as well as fruitful strategies for dealing with such behavior. Finally, it is argued that past failures to adequately "explain" terrorist behavior are due, at least in part, to disciplinary boundaries that made it all but impossible to frame the subject in a way that is amenable to productive analysis.

II. A Review of the Literature

While many different theories have been advanced to explain the phenomenon of terrorism, these theories ultimately fall into one of three categories. First, according to the psychological explanation, the individual possesses a set of personality characteristics that predispose him to acts of political violence. Second, the environmental or cultural explanation suggests that the individual is driven to violence by the social conditions he observes or the external circumstances in which he finds himself. And finally, the rational choice explanation posits that the individual deliberately chooses to engage in violence after purposefully weighing the costs and benefits of doing so. As we discuss each of these alternative sets of explanations, it is important to remember that the way we define terrorism will shape our views on its causes and cures (Kegley, 1990, 7).

Psychological explanations. In light of the popularity of such explanations of terrorism, it is important to note the agreement among experts that terrorists as a group do not exhibit any obvious psychopathologies. One psychological explanation argues that, in the course of their early life experiences, individuals acquire certain personality traits that are associated with terrorist behavior, e.g., alienation, willingness to take risks, self-centeredness, action-orientation, stimulus-hungry, and extroversion (Ross, 1996; Post, 1998). According to this view, "individuals are drawn to the path of terrorism in order to commit acts of violence" (Post, 25). The psychological mechanism of "externalization" and "splitting" (found also in narcissistic and borderline personalities) is more common among individuals who have experienced some psychological damage

during childhood. To the extent that people with a damaged self-concept haven't fully integrated the good and bad parts of their personalities, they experience the world as split into two parts: "me" and "not me." This split tends to facilitate the projection of negative feelings onto others and gives rise to a need for an enemy ("the other") to blame. Unable to face the consequences of the "injured self," self-hatred is transformed into hatred of others, and gives rise to a search for external targets against which to lash out. "Such people find the polarizing absolutist rhetoric of terrorism extremely attractive," according to Post (26-7). This line of thinking suggests that individuals become terrorists in order to join terrorist groups, which satisfies their need for belonging, and to engage in acts of terrorism, which satisfies their need to redirect their self-loathing onto others.

Environmental determinants. One theory that falls into this category of explanation is based on the frustration-aggression hypothesis , which suggests that acts of aggression are instigated by frustration (Miller et al., 1941). When people believe that they are entitled to a better life than that which they are currently living (or are reasonably capable of achieving, given the resources available to them), a state of relative deprivation exists (Gurr, 1970, 11). The discontent and frustration arising from the perception of relative deprivation can result in anger and, ultimately, aggression against the source of frustration. In linking political violence to perceived deprivation, Gurr provides the foundation for the commonly-held notion that terrorism is caused by poverty, hopelessness and anger.

> Mild deprivation will motivate few to violence, moderate deprivation will push more across the
> threshold, very intense deprivation is likely to galvanize large segments of a political community
> into action. (Gurr, 1970, p. 9)

Another argument that focuses on environmental factors is the notion of clashing civilizations advanced by Huntington (1996), which argues that when dramatically different cultures come into contact with one another, the threat to each culture's values and identity sets up a conflict that energizes individuals in each culture to lash out at the other. To the extent that such a dynamic actually exists — the Huntington thesis has sparked considerable controversy — the resulting hostility may also be a consequence of an inability of each group's members to understand and communicate with those of the other group.

Rational choice. Rational choice explanations cover a wide expanse of territory, from the economist's study of utility-maximization to the sociologist's exchange theory to the political scientist's "rational actor theory." All these approaches share much in common, but especially the belief that choice is a goal-directed activity that yields a payoff to the agent making the choice. According to this view, changes in either the benefits or costs of engaging in an act of terrorism are likely to produce changes in the behavior of terrorists. Crenshaw (1998, 10), whose approach is typical of rational choice explanations, argues that

> The wide range of terrorist activity cannot be dismissed as "irrational" and thus pathological,
> unreasonable, or inexplicable. The resort to terrorism need not be an aberration. It may be a
> reasonable and calculated response to circumstances.

The rational choice explanation raises some very interesting questions regarding the definition of terrorism and the strategy adopted by terrorists in fulfilling their objectives. For example, most definitions of terrorism assume that terror tactics are chosen because the fear and panic they create effectively motivates civilian populations to demand changes in the social or political policies of their governments. An equally plausible explanation is that this strategy is chosen as a result of the disparity between the military might of the terrorist organization and that of its intended target. In other words, terror tactics may, strategically, be a military choice and not a political one. The remainder of this paper focuses on developing a theoretical foundation for such a proposition.

III. Rationality and the Economic Approach to Behavior

According to Becker (1976), who has worked at the boundary between economics and sociology for much of his career, "The combined assumptions of maximizing behavior, market equilibrium, and stable preferences, used relentlessly and unflinchingly, form the heart of the economic approach [to the study of human behavior]." Significantly, he stipulates that this approach includes all behaviors, even those that have nothing to do with markets and material goods and wants. The economic approach "does not assume that decision units are necessarily conscious of their efforts to maximize or can verbalize or otherwise describe in an informative way reasons for the systematic patterns in their behavior." He notes with some disdain that "Examples abound in the economic literature of changes in preferences conveniently introduced *ad hoc* to explain puzzling behavior," a point that will assume special significance later on in this paper.

Consider an individual who has limited resources and unlimited wants or needs. Given the resource limitation ("scarcity" in economics jargon), this person must choose how to allocate his or her resources among a wide variety of alternatives, each of which satisfies a different combination of needs or wants, not all of which can be met at any given time. Economists assume that people are rational decision makers, which means that they behave in ways that *they believe* are in their own best interest. By assumption, then, this individual will allocate his or her scarce resources among alternative uses so as to produce the greatest level of personal satisfaction.

It is worthwhile at this point to tease out some of the implications of the rationality assumption. First and foremost is the observation that self-interested behavior encompasses an evaluation process whereby the costs and benefits of available alternatives are identified, quantified and compared, with the individual choosing the alternative that yields the greatest excess of benefits over costs. The second point, which immediately follows from the first, is that a change in the costs and/or benefits associated with the various alternatives or in the yardstick used for comparison purposes may result in a different alternative being selected by the individual. The last observation, more or less a corollary of the prior point, is that an individual can be induced to alter his or her choice by manipulating the costs and/or benefits associated with each alternative.

The decision to engage in terrorist behavior is, like any other decision, the result of a rational (resource) allocation process no different from the one just described. Though this is not a new idea, it has not gained much currency among those individuals who have historically worked in the area of terrorism research. This analytical framework, often referred to as "rational choice theory" by non-economists, has been widely criticized (a discussion of the nature of this criticism lies beyond the scope of this paper).

IV. Microeconomic Foundations

Consider an individual with the utility function

[1] $U = U(N_1, N_2, ... N_n)$,

where U is an index of the level of utility attained from the satisfaction, to varying degrees, of needs N_1 through N_n. We might imagine that these needs correspond loosely to those enumerated by Maslow in his celebrated theory of motivation, viz., physiological needs, safety needs, the need for belongingness and love, self-esteem needs, and the need for self-actualization. Maslow's theory (and others like it, e.g., Alderfer, 1969) "are based on the assumption that the deprivation of human needs energizes individuals to search for behaviors that satisfy their needs" (Martinko, 1995). These needs can be satisfied by many different behaviors, including, but in no way limited to, the acquisition of material goods and services. The acquisition of a new automobile, for example, may help to satisfyself-esteem needs *if* one's sense of self-worth is a function of his or her material possessions. To the extent that one's self-esteem is influenced by the opinions held by others, self-esteem needs can also be met through behaviors that are completely divorced from the acquisition of tangible goods, e.g., by doing volunteer work at the local hospital or community center.

The ability of individual i to satisfy needs $N_1 ... N_n$ is assumed here to be a function of the resources at one's disposal, e.g., money and time. Assume, further, that scarcity prevails in this hypothetical society, meaning that resource limitations are such that it is impossible to satisfy all of our needs. To the extent that resources used for one purpose are no longer available to be used for other purposes, the satisfaction of one need requires foregoing the satisfaction of another need; in other words, all resource allocation decisions entail tradeoffs or sacrifices. This scenario, a staple of economic model building, gives rise to what is commonly called "the economic problem," which we define here as "how scarce resources are allocated among alternative activities in order to satisfy competing human needs."

The model, to this point, has been couched in terms of "needs" rather than "goods" so as to underscore the fact that the choice mechanism under consideration can be applied to a far wider range of decisions than is generally done in conventional economic analysis. That the economic approach can shed light on all aspects of human behavior has been well-established by Gary Becker and others. Despite the overwhelming gains that have been made in this regard, there still remains significant resistance to applying economic analysis to "non-economic" behaviors, especially (but not only) among non-economists. Given that terrorism clearly falls outside the range of behaviors traditionally considered to be economic in nature, I have tried to develop a formulation that will, at least for some readers, allow them to set aside their reservations without too much discomfort.

To simplify the analysis, let us assume that there are only three activities in which to engage: labor, consumption of some composite commodity X, and terrorism. Labor, which is assumed to yield no intrinsic satisfaction, occurs for the sole purpose of generating income that is subsequently used to finance the other two activities. No saving is assumed to take place. Given our assumption that individuals consume goods and participate in terrorist activities because such behaviors satisfy, to some extent, one or more human needs N_j, we can write

[2] $N_j = N_j[X,T]$ j = 1 ... n

which, we substituted into [1] yields

[3] $U = U(N_1[X,T], N_2[X,T], ... N_n[X,T])$

or, more compactly,

[4] $U = U(X, T)$.

By re-writing the utility function in this way, I am setting aside a controversial issue that has commanded much attention in the psychology literature, specifically, the question of sequential (or hierarchical) needs satisfaction. Maslow's initial formulation of the hierarchy of needs argued that lower-level needs (such as physiological or safety needs) must be satisfied prior to higher-level needs (such as love and belonging or self-esteem). There does not seem to be much empirical support for Maslow's contention that some needs are prepotent, and successive needs theories (Alderfer, 1969) dismissed the notion that needs would be satisfied in a particular sequential order.

The utility function in [4] is now indistinguishable from that used in the conventional approach to studying consumer behavior. Assume that the utility function satisfies the usual curvature properties, that is, it is twice differentiable and strictly quasiconcave. Marginal utilities U_x and U_T are both assumed to be positive and decreasing in the relevant subset of the domain.

Digressing here for a moment, there is one extremely important point that must be made with respect to the arguments of the utility function. The assumption that terrorist activity is a source of needs satisfaction may be seen by some as begging the issue, for the question "Why do some people engage in terrorism?" is tantamount to asking the question "Why is terrorist activity in some peoples' utility functions and not others?" Somewhat controversially, the approach taken in this paper assumes that terrorist activity is an argument in *all* utility functions and not just those of terrorists. That, of course, does not mean that all people will engage in terrorist behavior. Two obvious possibilities present themselves. First, a person may refrain from terrorist acts if the marginal utility of such behavior is negative, i.e., terrorism is a "bad" and not a "good." And second, a person may forego the opportunity to commit a terrorist act if the cost of doing so exceeds the benefits that would accrue from such behavior. In a two-good model such as the one described herein, this latter possibility would result take the form of an endpoint solutions to the maximization problem. Since the goal of this paper is to gain insight into the factors that contribute to the decision to commit a terrorist act, we will focus our attention only on those individuals for whom the marginal utility of such behavior is positive. As a final caveat, I should point out that it is possible for a "bad" to be transformed into a "good," and vice versa, to the extent that tastes and preferences are shaped by learning and experience

Total income is defined as the sum of earned and unearned income. Assume that gainful employment (labor) yields earnings that can be used to purchase units of the composite commodity or the materials (goods and services) needed to engage in terrorist activity. The individual's budget constraint can be written as:

[5] $I = E + Z = P_x X + P_T T$

where

I = total income,

E = earned income,

Z = unearned income,

P_x = the price of the consumption good,

P_T = the price of terrorism materials,

X = the quantity of the composite good consumed, and

T = the quantity of terrorism in which the individual engages.

The terrorism production function is given by the equation

[7] T = T(M, L_T),

where

M = materials (such as guns or explosives) used to carry out a terrorist attack and

L_T = hours of labor used to carry out such an attack.

Assume that the production function is linear in L, implying that the productivity of labor engaged in acts of terrorism is constant, i.e., the marginal product of terrorists equals the average product of terrorists equals some constant t,

[8] t = T/ L_T

The time it takes to participate in terrorist activities (traveling to the site of the attack, planning meetings, surveillance, research, etc.) is determined endogenously in the model. A second constraint governs the tradeoffs between work and terrorism (the act of consumption is assumed to take no time and, for simplicity, no leisure is allowed in the model), and appears thus:

[9] E = wL = w(H - L_T)

where H is the total number of hours available during any given period and L is the number of hours provided to the labor market. By definition, H = L + L_T.

Solving [8] for L_T and substituting into [9] allows us to express earned income as

$$[10] \quad E = wL = w\left(H - \frac{T}{t} \right)$$

Substituting [10] back into [5] yields

$$\frac{U_T}{U_X} = \frac{P_T + (w/t)}{P_X}\left(P_T + \frac{w}{t} \right)_T + \frac{w}{t}\right)T$$

The left-hand side of the constraint equals the gross monetary resources available to fund both sets of activities; notice that unearned income Z may include outside funding (received in the form of a lump sum grant) from persons or groups willing to support the terrorist's cause. The right-hand side equals the money spent on the consumption good and on terrorism, and includes the foregone earnings associated with diverting time from paid work to unpaid terrorist activity. P_T, the first component in the full "price" of terrorism, is the dollar outlay per unit of terrorism for such things as bullets, explosives, documents, and travel. The second component is the foregone income per unit of terrorism.

Individuals are assumed to allocated scare resources (time and money) among alternative activities (work, consumption, and terrorism) so as to yield the highest level of utility, i.e., the greatest level of needs satisfaction. More specifically, individuals choose the values of X and T so as to maximize U(X, T) subject to the resource constraint $wH + Z \geq P_x X + (P_T + w/t)T$. Mathematically, this is expressed by forming the Lagrangian function B

[12] max π = U(X, T) + λ[wH + Z - P_x X - (P_T + w/t)T].

The utility-maximizing individual will choose quantities of work, consumption and terrorism so as to satisfy the following first order conditions:

[13]

[14]

[15]

where U_X and U_T are partial derivatives of the utility function with respect to X and T, respectively. Recall that, by assumption, $U_X > 0$ and $U_T > 0$ (and $U_{XX} < 0$ and $U_{TT} < 0$). Dividing [14] by [13], we obtain the standard result that the marginal rate of substitution equals the price ratio when utility is maximized.

[16]

Maximum utility is attained when the utility derived from the last dollar spent on terrorism is equal to the utility produced from the last dollar spent on consumption.

V. Comparative Statics

Equation [14], in conjunction with [15] and [10], fully describes the utility-maximizing combination of consumption goods and terrorist activity, as well as the distribution of hours between work and terrorism. This system of equations yields the solution values for the endogenous variables, which can be written solely as a function of the exogenous variables:

$\lambda^* = \lambda^*(P_X, P_T, w, Z, t)$

$X^* = X^*(P_X, P_T, w, Z, t)$

$T^* = T^*(P_X, P_T, w, Z, t)$.

Assuming that the second-order conditions for a maximum are satisfied, we can explore the comparative static properties of the model. We're especially interested in how changes in the exogenous variables impact the utility-maximizing level of terrorist activity. Totally differentiating first-order conditions [13] through [15] and arranging the system of linear equations in matrix form yields

[17]

where R is the "full price" of terrorism, or *Pr + (w/t)*.

The determinant of the coefficient matrix A is

or, after expansion and simplification

[18] $\left| A \right| = - P_X^2 U_{TT} + 2\, P_X R U_{XT} - R^2 U_{XX} > 0$ by assumption.

The assumption of a positive determinant imposes certain restrictions on the shape of the utility function which, if satisfied, ensure that the solution values are, indeed, maxima. According to Young's Theorem, $U_{XT} = U_{TX}$.

UNEARNED INCOME

Setting $dP_X = dP_T = dw = dt = 0$ in [17], the impact of a change in unearned income Z can be found by Cramer's Rule to be

[19] > 0 if $U_{XT} > 0$

[20] > 0 if $U_{TX} > 0$

Absent the assumption that the cross-partials are positive, both derivatives are indeterminate in sign. A standard result in consumer theory, this ambiguity allows for the possibility of both normal as well as inferior goods. This restriction on the signs of the cross-partials is controversial and will be examined in greater detail below.

PRICE OF COMPOSITE CONSUMPTION GOOD X

Setting $dP_T = dw = dt = dZ = 0$ in [17] and applying Cramer's Rule yields

[21] < 0 if $U_{XT} > 0$

[22]

The restriction on the sign of the cross-partial, i.e., $U_{XT} > 0$, is sufficient to produce the traditional downward-sloping demand curve for good X. That same restriction, however, isn't sufficient to produce a result of unambiguous sign in the case of terrorist activity. Again, this is a standard outcome; in the case of a two-good model, the sign will depend on the price elasticity of demand for good X. If demand for X is inelastic, total expenditures on X will rise and, given constant income, quantity of T will fall. Conversely, if the demand for X is elastic, the rise in P_X will cause total expenditures on X to fall and terrorist activity will rise.

MONEY COST OF TERRORISM

Setting $dP_X = dw = dt = dZ = 0$, the comparative static derivatives are

[23]

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[24] < 0 if $U_{TX} > 0$

As above, the derivative in the first case is indeterminate in sign. The second derivative indicates that, if terrorism behaves as a normal good, the demand curve will be downward sloping. This result is highly significant for the policy implications it generates.

WAGE RATE

Assuming no change in any of the other exogenous variables, i.e., if $dP_X = dP_T = dw = dt = 0$, the impact of a change in the wage rate is given by

$$[25] \quad \frac{\partial X^*}{\partial w} = \frac{1}{|A|} \begin{vmatrix} 0 & -L & -R \\ -P_X & 0 & U_{XT} \\ -R & T/t & U_{TT} \end{vmatrix} = \frac{-P_X L U_{TT} + P_X R(\lambda/t) + RLU_{XT}}{|A|} > 0 \text{ if } U_{XT} > 0$$

[26]

These computations make use of the fact that $(T/t - H) = -L$ using [8] and the definition of H. In looking at the effect of a change in the wage rate on consumption good X, it is seen that the restriction on the cross-partial is sufficient to generate an unambiguous sign. Equation [25] is consistent with [19], which is not surprising given that the income effect, in this case, is augmented by a substitution effect in the same direction. This occurs because a rise in the wage rate increases the opportunity cost of terrorism, raises its price and making it a relatively less attractive endeavor, all other things equal. The same restriction, however, is insufficient to determine the sign on the terrorism derivative: the income effect and the substitution effect are working in opposite directions in this case, and the relative magnitude of the two effects becomes critical.

PRODUCTIVITY OF TERRORISTS

Ceteris paribus, a unit increase in the productivity of terrorist labor will alter the utility-maximizing bundle as follows:

$$\frac{\partial T^*}{\partial t} = \frac{1}{|A|} \begin{vmatrix} 0 & -P_X & -(w/t)L_t \\ -P_X & U_{XX} & 0 \\ -R & U_{TX} & -(\lambda w/t) \end{vmatrix} = \frac{P_X^2(\lambda w/t) + P_X U_{TX}(w/t)L_t - RU_{XX}(w/t)L_t}{|A|}, U_{XT} \gtrless 0$$

[28] > 0 if $U_{TX} > 0$

These derivatives show the impact of a change in t, defined in [8] as the marginal (and average) productivity of labor in terrorist activities. Equation [28] indicates, perhaps not surprisingly, that terrorist activity will increase, ceteris paribus, as terrorist productivity increases, provided that the sign of the cross-partial is positive. A variety of different factors could contribute to an increase in the value of t, e.g., technological advances, an increase in capital goods utilized by terrorists, and an increase in terrorist efficiency due to better training. Given that the amount of capital available to the terrorist is not determined endogenously in this model, we might add to this list of determinants the price of capital equipment (as distinct from the price of materials reflected in the monetary cost of terrorism, P_t.

The results of this analysis are summarized in the table below.

SUMMARY OF THE COMPARATIVE STATIC RESULTS ($U_{XT} = U_{XT} > 0$ assumed)		Resulting change in the endogenous variables	
		X	T
An increase in the exogenous variable	P_X	-	?
	P_T	?	-
	Z	+	+
	w	+	?
	t	?	0

VI. Discussion of Results

The following comments assume that the signs of the critical cross-partials are positive, which rules out the possibility of either X or T being inferior in nature. If this assumption fails to hold, all of the comparative static derivatives become indeterminate in sign and depend critically on the relative magnitude of opposing forces. While this might, in fact, turn out to be the case, it is worth noting that the assumption *is* satisfied by the family of Cobb-Douglas utility functions, which are commonly used in microeconomic analyses.

Ceteris paribus, an increase in the money price of terrorism causes the amount of terrorism to decline. Alternative formulations of the model might produce a different conclusion. If we were to differentiate between alternative terrorist strategies, e.g., the use of explosives versus the taking of hostages, or between alternative targets, e.g., hijacking an airplane versus a cyber attack, an increase in the price of one of the alternatives might give rise to a substitution effect that increases the relative attractiveness of the other alternative. This substitution, called "transference" by Enders and Sandler (2006), might divert terrorist choice toward the less-costly method of attack or the less-defended target.

To the extent that terrorists choose between violent and nonviolent strategies, an increase in the price of violence may raise the likelihood of nonviolent action, though the sign of the derivative in the comparative static analysis makes this anything but certain. Given that a change in the price of good X has an ambiguous effect on T, we would be hard pressed to argue, for example, that a reduction in the cost of nonviolent action would result in less violence. This point has been made previously, though far less forcefully (Enders and Sandler, 2006; Frey and Luechinger, 2003).

A decrease in unearned income, which might include, but is not limited to, funds contributed in support of terrorist activities will cause a decline in terrorist behavior. It should be noted, however, that the impact may vary depending on the manner in which the funds are given. If the funds are earmarked for a particular use, perhaps unrelated to terrorism, the recipient will treat these funds as akin to a categorical grant, in which case the impact will depend on the recipients preference ordering. The conclusion that terrorism increases as available resources grow challenges the commonly-held belief that poverty fosters terrorism by creating a climate of resentment, hostility, and hopelessness. The poverty-terrorism connection has been rejected by many researchers, e.g., Krueger and Maleckova (2002) and Enders and Sandler (2006).

The effect of a change in the hourly wage rate is ambiguous, but only because of the opportunity cost of time devoted to terrorism. If the time cost of terrorism had been omitted from the model, the result would have been identical to that obtained for unearned income. But it's not only the monetary value of time that introduces some ambiguity into the model. While not formally reflected in the mathematics of the model, it's necessary to point out that a rise in the wage rate doesn't necessarily imply an increase in available work hours. If the wage rises but no vacancies exist, the opportunity cost of time devoted to terrorism is actually close to zero, in which case terrorism should be expected to rise.

On the question of poverty's impact on terrorist behavior, it's possible that a *decrease* in the wage rate (or unearned income) could actually cause terrorism to *rise* if economic deprivation shifts tastes and preferences in a way that makes terrorism more attractive. Gurr (1970), for example, argues that people are led to political violence when their perceived quality of life falls short of their expectations. This discrepancy activates a frustration-aggression response that induces rebellious behavior. If this line of reasoning holds water, it might be possible to argue that the sharing of information and images over the internet and via satellite television broadcasting contributes to an awareness of global inequality and stimulates the frustration-aggression reaction. This argument, which is consistent with the "poverty causes terrorism" reasoning, cannot be evaluated within the structure of the current model.

Another possibility not analyzed above is an autonomous change in preferences that may result from an experienced event. An attack on one's family, friends, country or coreligionists may motivate someone to strike back in an act of violence. This can be explained in economic terms as an increase in the benefits of engaging in a terrorist attack, e.g., the satisfaction derived from avenging a wrong, from bringing an enemy to justice, or from defending one's country, which increases the likelihood that such an attack will take place. Becker (1976) frowns down upon this type of an explanation, arguing that tastes and preferences are largely stable and advocating instead that the cause of changes in behavior be sought out in the environment within which such changes occur.

A drop in the productivity of terrorists will lead to less terrorist behavior, according to the results produced by the model. This is an important result, especially when the direction of change is reversed. Advances in communication, fund transfer capabilities, encryption technology, training effectiveness, and the quality of materials/weapons will stimulate terrorist activity (see Crenshaw, 1998, 14). Within this context, the growing availability of weapons of mass destruction points ominously to an increasingly dangerous future. From the perspective of counterterrorism strategy, careful attention should be paid to emerging technologies — with an eye toward anticipating their possible use by terrorists, who should be treated as innovative entrepreneurs looking for new ways of achieving established objectives.

This paper has demonstrated that the assumption of rationality can shed important light on the behavioral foundations of terrorism. The real test of this model's success, however, lies in its ability to generate testable hypotheses that can be empirically evaluated. It is likely — and unfortunate — that such tests will have to wait until a database of sufficient size, reliability and richness becomes available. For that to happen, a number of things must occur, the first of which is the emergence of a consensus with respect to the definition of terrorism. It is impossible to measure that which cannot be defined. Even if we could agree on a definition, obstacles would still exist. For example, it is impossible to gather data on terrorist activity when the identity of the perpetrator is unknown, which means that that individual's income, age, religion, nationality, etc. are also unknown. This problem is compounded by that fact that available data may suffer from selection bias: the identities of some terrorists may be known only if they are apprehended prior to the attack. Furthermore, some terrorist acts are never identified as such, while some nonterrorist attacks may be mistakenly ascribed to terrorists.

The economic approach to the study of behavior pulls together a variety of explanations and, in so doing, unifies several different disciplinary perspectives. The results derived herein should be sufficient to convince even the most skeptical person that there is no single, or root, cause of terrorism. The reality of multiple causation underscores one of the competitive strengths of the economic thinking, i.e., the practice of holding all other variables constant except the one being investigated (the ceteris paribus assumption). Clearly, casual empiricism can produce misleading conclusions and faulty predictions. The use of partial correlations, which don't control for the confounding influence of other variables, is fraught with peril, as is the arrival at conclusions on the basis of impressionistic data (see, for example, Eland, 1998, and Pipes, 2002).

Perhaps the single most important insight generated by this research is the central role played by the utility function in determining behavioral choices. The idea behind "rational man" is not that he behaves in a way that makes sense to the average observer, but that he behaves in a way that makes sense to him. This realization goes right to the heart of that oft-heard question, "Why do terrorists do what they do?" The answer to this question can only come from the terrorists themselves. For their behavior to make sense to others, it is important — no, essential — that the terrorists' values, beliefs, and expectations be laid bare and scrutinized.

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