1. NUCLEAR WAR AND ECONOMIC RECOVERY

1.1 UNCERTAINTIES IN MODELING NUCLEAR SURVIVAL

The study described in this report examines the social and economic conditions under which rational market mechanisms of distribution and exchange can be established following a nuclear war or other comparable societal disaster. As such, the report is not designed to help settle any debate about the probability and magnitude of nuclear devastation or the likelihood of survival for any particular population. As in the case of most large-scale risk analyses of events for which we have no previous experience, the predictions of all attempts to model such impacts depend heavily on the selection of initial assumptions and the choice of modeling programs and techniques (De Finetti 1974, Reaven 1986). Existing scenarios for nuclear war impacts range across the whole spectrum from the broad position that nuclear war would be similar to other kinds of wars and disasters in that it can be survived by taking adequate precautions (Winter 1963; Hanunian 1966; La Riviere and Lee 1966; Goen et al. 1970; Quester 1979) to the view that nuclear war would be a single cataclysmic event leaving nothing for which it would be worth surviving (Schell 1982; Zuckerman 1984).

Since none of these models can be falsified conclusively (Popper 1963) except in the event of a nuclear war, there is no scientific justification for preferring either position. Such judgments are essentially trans-scientific (Weinberg 1972) and ultimately political. Hence, it behooves us to adopt the most objective stance available, that of considering the full range of logical possibilities for nuclear destruction. In discussing the general economic effects of high-level resource destruction, we do not need to be concerned with whether it is caused by blast, fallout, or climatological disruption. Drawing on the entire range of predictions about the effects of nuclear war, it is possible to develop a reasoned and informed foundation for a variety of survival scenarios. In this chapter, we begin by elaborating the conditions necessary for the development of each scenario and identify its characteristics. We also discuss some of the general theoretical assumptions that constitute the starting point for our approach as well as the limitations that we have placed on the scope of our inquiry. Our aim, pursued in the later chapters, is to discuss the kind of market and exchange activity each scenario would possess given our starting assumptions. In this way we seek to prepare the conceptual building blocks from which strategies to deal with real post war situations can be built. However, such strategies are the stuff of future research and beyond the scope of this inquiry into the logical conditions for economic exchange to develop at different levels of destruction.

1.2 FOUR SURVIVAL SCENARIOS

The first step is to specify the range of initial scenarios within which institutional adaptations to contemporary American market

arrangements may arise in the wake of large-scale material and institutional devastation. Any such catastrophe may be presumed to affect existing markets in two important ways: 1) the destruction of resources (skills, goods, and currency to exchange) and 2) destruction of institutions (the social mechanisms that organize production, regulate exchange, and maintain trust in contracts and currencies). This distinction parallels that of Hill (1987) who approaches the problem of US post-disaster recovery by dividing the economy into the physical infrastructure and the institutional infrastructure. Either or both of these components may sustain light or heavy damage, depending on the extent of the catastrophe and the location of the affected market. In our model, the four permutations that result will determine the initial conditions for the development of possible post-disaster market arrangements.

1. Best case: Where institutions and resources survive largely intact (e.g., in rural or urban settings far from the centers of destruction) business is likely to continue as usual, at least until large-scale refugee immigration places a strain on endowments.

2. Institution intensive: Where resources are restricted, but institutions remain intact (e.g., in an undamaged urban location which is unable to obtain goods--especially food--from suppliers elsewhere) heavily regulated exchange, such as rationing, is a likely outcome.

3. Resource abundance: Where resources survive, but institutions are heavily damaged (e.g., in rural areas that are heavily dependent on centralized communications and external markets) self-regulating, informal market activities such as direct barter, are likely to arise.

4. Worst case: Where both institutions and resources suffer heavy damage (such as in the suburbs of a largely destroyed city) informal market activity, subject to might-is-right regulation, is a likely outcome.

Each scenario is presented as a static model. It is assumed, in each case, that we are concerned with peacetime economic recovery and not with a wartime command system of production and consumption. Hostilities are, therefore, presumed to have ended and there is no imminent threat of invasion either by the initial combatant or a subsequent opportunist aggressor. By the same token, we assume that relief aid from friendly countries or war reparations from the combatant are not yet available in sufficient quantities to affect significantly the rate of recovery in the US as a whole.

While these assumptions probably are unrealistic, they help to establish the bounding conditions within which real events would occur. It is equally unrealistic to suppose that any level of destruction would prevail evenly across the United States or that areas conforming to a single scenario will be isolated permanently from those operating under different conditions of survival. Any real survival situation is likely to include interaction between groups of survivors at different levels as well as potential intervention, such as assistance, from foreign countries. However, the complexity of such interactions is beyond the

limited scope of the present study which is to establish the conceptual framework within which such a study could be constructed.

It also is assumed that the initial medical effects of blast and fallout have been experienced by the surviving population. Where medical effects have been light, due either to the small scale or specific targeting of the attack, they will have contributed to a high rate of population survival, as in the institution intensive scenario. Where medical effects have been severe, as in the worst case, they will have exacerbated the initial effects of blast and fallout. Of course, a breakdown of medical services may quickly reduce a high level of population initially surviving an attack, to a state of resource abundance or even to the worst case. Hence the more destructive scenarios we have constructed need not be caused by initial blast and fallout, but may prove to be the result of medical and environmental consequences in the short-term aftermath. In this sense, our scenarios may not be those of the day after, but are intended to describe the first stable states of society that are realized following the initial trauma created by a nuclear war, but prior to interaction with other regions or intervention from other countries.

1.3 COMPARISON WITH OTHER SURVIVAL SCENARIOS

There is some correspondence between the four scenarios generated by our survival typology and those selected by the US Office of Technology Assessment (OTA) for its analysis, "The Effects of Nuclear War" (OTA 1980).

OTA's first case examines the effect of a single nuclear weapon over a single US city (Detroit). Presuming that the population is not adequately protected, the consequences of such an event would be appalling for the inhabitants, estimated at 220,000-2,500,000 dead and injuries ranging from 420,000-1,100,000; most of the injured would eventually die. The OTA projects that even national mobilization of available medical resources would be unable to care for this many injured. Nevertheless, for those parts of the US unaffected by the explosion and fallout, the primary institutions and organizations would continue to function on existing principles with the surviving resources. In other words, for those who escape the direct impacts, business could continue much as usual under our best case scenario.

The second case examines a hypothetical small attack limited to specifically targeted urban/industrial facilities; in this case, oil refineries. In addition to the prompt fatalities, estimated as high as five million in the absence of special civil defense facilities, OTA projects drastic economic consequences. Productivity would decline in all industrial sectors, and some would be eradicated due to the shortage of petroleum products and fuels. There would be strict allocation of remaining refined petroleum products and regulation of the use of private automobiles. In respect of the projected losses of vital endowments relative to the survival of civil institutions, this scenario corresponds to our institution-intensive system of formal allocations.

In the third case, OTA considers a limited counterforce attack on US missile silos and military installations resulting in relatively little direct blast damage to civilians and economic assets. The uncertainties of fallout effects are described as enormous, but considerable economic damage and disruption is viewed as inevitable. Since almost all areas could be decontaminated, in principle, within a few months, the endowments left to individual survivors might be quite extensive. However, the national loss of so many people and the disruption of economic life could be so great as to call into doubt the survival of major institutions of the formal market system. There are, therefore, some parallels between this scenario and our resource abundance scenario characterized by informal markets and trading systems.

The fourth case in the OTA analysis is a very large attack against an array of military and economic targets. Projections of fatalities in this event range from 70-160,000,000 dead during the first 30 days, followed by further fatalities due to severe shortages of medical care, shelter, and uncontaminated food supplies. The ensuing battle to restore production of food, energy, clothing, the means to repair damaged machinery, and of goods to trade with countries that had not been involved in the war, would be accompanied by the race to consume those goods that had survived the conflict and the wearing out of surviving machinery. The long march out of this worst case scenario will depend on society's ability to increase production to meet the rate of consumption before existing stocks are depleted.

Katz (1982) also describes four nuclear-survival scenarios which are comparable to our own and are based on a decreasing order of damage. His first outcome "Biological Survival of Individuals" describes a level of post-nuclear destruction in which individuals or groups survive but without the organized political, social, and economic structure of industrial society. This compares with our worst case scenario. The second outcome is the "Regional Survival of Political Structures" in which some local political units survive but central government is destroyed. This is similar to our resource abundance scenario. Katz' third outcome, "Survival of Central Government," in which central government has control over all pre-attack national territory, compares with our institution-intensive scenario. Finally Katz describes a fourth outcome "Survival Intact of Basic Societal Structure," in which national damage to the social, political, and economic structure is limited. This compares with our best case scenario.

Which ever post-attack scenario is realized, economic recovery will depend upon survivors' willingness to coordinate labor and to trade its fruits. Psychological research on human behavior in the wake of widespread or individual trauma raises the specter of economic paralysis rapidly reducing the surviving society to apathetic subsistence.

1.4 WILLINGNESS TO TRADE

Psychological research on human responses to disasters covers a wide spectrum of models and data sources. There is profound

disagreement about whether experience of cataclysm is fundamentally disabling for survivors.

Disaster researchers appear to be strongly polarized on the issue of post-disaster syndrome (PDS), some arguing that disasters cause severe negative psychological reactions in victims, including withdrawal from social activities which may extend as far as suicide (Moore and Friedsam 1959; Erikson 1976; Gleser, et al. 1981). Others claim that any psychological effects, if they exist at all, are minor and transient (Quarantelli and Dynes 1972; Taylor 1976; Sterling, et al. 1977).

The data used by supporters and critics of PDS vary systematically. Supporters have tended to employ a psychodynamic perspective which draws on direct concern with anxiety, subjective unhappiness and other maladjustments evidenced through clinical interviews and self-reporting. Critics usually base their findings on behavioral models measured by rating scales, observers' reports, or admissions to psychiatric care. However, it is evident that the incidence of PDS, however widespread, depends on three general dimensions: (1) characteristics of the disaster impact; (2) characteristics of the social system; and (3) characteristics of the individual.

It is beyond our scope to attempt to specify the effects of individual psychological predisposition on willingness to trade at the level of analysis proposed for this research. However, the characteristics of the disaster impact will be included in our modeling of the initial conditions described above. The longer the duration of the impacts and extensiveness of their scope, the greater is the likelihood that kinship and friendship networks will be disrupted, resulting in the possibility of diminished participation in social and economic activity (Barton 1969).

Supportive kinship arrangements and friendship networks are important characteristics of the social system, whose survival may be quite independent of the formal economic and civil-order infrastructures. These networks form the basis of any therapeutic community that is key to post-disaster recovery among victims (Drabek et al. 1975; Quarantelli 1980). As such, they are likely to be sources of variation in the level of participation in any markets that arise out of the various initial conditions of survival specified above.

1.5 DURABILITY OF VALUES AND CULTURAL CHANGE

Although we share the view that surviving kinship and friendship networks will be central to post-disaster recovery, we do not necessarily assume continuity in the behavior, values, and preferences that these social arrangements currently embody. This caveat particularly applies when these factors relate to the institutions of broader society beyond the immediate network, such as the nation state itself. While experience of localized disasters has been observed to strengthen existing values and the societal institutions that support them (Drabek 1986), these cases do not involve drastic long-term disruption of large-scale institutional structures. In the case of

nuclear war, the degree of continuity is likely to be high in the best case scenario which most closely parallels our previous experience with earthquakes, floods, and hurricanes. However, under the prospect of drastically changed long-term institutional conditions we assume that social systems and the values that they support will readily adapt. In the worst case scenario we can envisage the construction of local exchange patterns almost de novo and with little concern for pre-disaster legal prescriptions.

The assumption that survivors will build patterns of exchange based on their material conditions of survival and the forms of social organization that these can support may surprise some readers. There is a cherished belief, even among some professional social scientists, in the persistence of cultural values that will be preserved by survivors despite major upheavals in the social structure upon which culture is built. It may be comforting to believe that notions of democracy, justice through law, national identity, and the like are widely shared and deeply held values that will continue to constrain the behavior of most nuclear war survivors simply because these are deeply embedded in the culture that has gone before.

The problem with this belief is that, although individual preferences and habits of thought may survive initial disruption, the ability to transform individual preferences into collective action is dependent upon social organization. That is to say that although the psychological disruption predicted by supporters of PDS may be pessimistic, the evidence from history and anthropology indicates that when organizational forms of society are drastically altered, rapid cultural adaptation occurs. Nuclear war is neither a necessary nor sufficient condition for such drastic institutional changes and transformations in value structures.

For example, the Kampuchean population once had a reputation for being the most peaceable and gentle people of South East Asia, yet the sudden disruption of their traditional patterns of authority and governance resulted in one sizable segment of the population inflicting on its own people the worst genocide the world has seen since the Nazi era (Shawcross 1984). The great irrigation empires of the Orient, the Middle East, and Mesoamerica displayed astounding persistence. However, once they lost their sacred kings and temple bureaucracies (usually to outside invaders) their cultures crumbled with equally astounding rapidity (Wittfogel 1957). Lebanon, once an oasis of peace and religious tolerance in the Middle East has been reduced to a state of permanent warfare in only a decade (Meo 1965, Chami 1983). Air crash survivors today have been known to follow the precedents set by their nautical predecessors of resorting to cannibalism when stranded far from the social system that buttressed their personal beliefs that eating people is morally repugnant (Read 1974).

The cultural survival argument is rooted in a pre-scientific conception of culture. This is the catch-all conception of culture as an explanation of last resort to be invoked when social or economic explanations for collective human behavior are exhausted. Yet to state that the Dutch are so clean or the Italians demonstrative because of

their culture is simply tautologous stereotyping (Douglas 1978). It also represents an essentially static view of culture rooted in methodological individualism. The notion that culture consists of a package of enduring values carried in the minds of each individual member of society is quite at odds with modern cultural theory and its practical applications (Gross and Rayner 1985).

A whole generation of anthropologists deployed the term culture in so many ways (Krober and Kluckhohn 1952) that it became a distinctly unfashionable concept in Anglo-Saxon anthropology. However, since the 1960s, a concerted effort has been made to develop a scientific cultural theory, independent of psychology, capable of prediction (rather than mere description) and of falsification. According to this view, culture may be defined as a socially constituted sphere of discourse specified by the type of social organization adopted by its participants. While any topic may be the subject of the discourse (e.g. Marxism, democracy, the environment) the kinds of argument that can be introduced coherently are limited by how people experience social organization in their daily lives (Douglas 1986). If any population is characterized by a high level of face-to-face interaction within distinct organizational boundaries, it makes good sense to appeal to its members to act for the common good, but such arguments will have little chance of success where social interactions are fragmented and transitory. In the latter case, pointing to opportunities for individual advancement is more likely to produce the desired result. Similarly, to argue for the exclusion of an individual from employment on the basis that the job is "not women's work" or is a "young man's job" makes sense when gender and age are relevant factors in social structure, but is irrelevant in strictly egalitarian contexts.

We know that in the course of a day highly mobile individuals moving between different types of social organization shape their arguments to enhance their success in each context. The culture of each institution or organization does not, therefore, consist of a set of static values in the heads of its members, but of the constraints and opportunities placed on public discourse by the structural forms of social relationships themselves. Change the institutional context and any individual will have to modify the way his or her particular preferences are translated into social action. Strip away the institutional context, as in our worst case and resource intensive scenarios, and individuals will have to remake institutions with the social organization that they have left. In these scenarios, this refashioning is more likely to be based on family and local community structures than those of the now absent nation state.

Perhaps more profoundly, one needs to question the reality of shared national core values even before major upheaval. Close examination of values expressed in different constituencies of American society today reveals major discrepancies in interpretation of the central concepts that provide an illusion of uniformity. Scrutiny of the core values of American society reveals that apparently unanimous support for democracy, government by consent of the governed, depends on creative ambiguity about quite different, often incompatible principles for obtaining consent to governance (Rayner 1984, MacLean 1986),

including revealed consent, explicit consent, and hypothetical consent, as well as about the proportion of consenters required to make a decision (ranging between 50% +1 to an unopposed consensus).

The existence of widely shared core values in normal times may be more of an appearance based on assumed reciprocity of perspectives than it is a reality. The cohesiveness of modern complex societies rests on institutions that are capable of combining conflicting goals and interests without explicitly recognizing their diversity let alone reconciling them (Cyert and March 1963).

In those survival scenarios where such institutions are suddenly removed, there is every reason to suppose that surviving communities will have to innovate and that new institutional forms will emerge. To the extent that pre-disaster knowledge will guide individual preferences, people may try to reproduce institutions to match those destroyed. However, our premise is that such efforts will be severely constrained by the new circumstances.

1.6 ECONOMIC RECOVERY

Whatever combination of psychological effects and socio-cultural constraints help to shape the opportunities for economic recovery in any one of the four survival scenarios, there are some general considerations about the nature of recovery that apply to all possible cases.

As Greene, Stokley, and Christian (1979) point out, the definition of what constitutes recovery is subjective. Both Winter (1963) and Sobin (1970) suggests that the conditions necessary for recovery from nuclear attack cannot be met unless the losses of population due to failure of the economy to support those surviving the shelter period have been negligible, and the future production of goods and services sufficient to meet consumption requirements of the government agencies and of the population is assured. In this case, recovery is viewed as restoration of the pre-attack economic system in the short term. We assume that this would be possible only in the best case scenario.

If an attack causes the outright destruction of half or more of the US industrial capacity and a similar reduction in the labor force, many considerations contribute to the problems of economic recovery. For example, Greene, Stokley, and Christian list (1979:12):

> 1. The high degree of specialization of industry which makes for an equally high probability that some part of the production chain will be damaged. (But the existence of many similar competing plants increases the likelihood that broken production chains can be reconstituted.)
>
> 2. The flow of raw materials and parts could be seriously interrupted, and plant inventories of goods-in-process might or might not be of future value.

3. Transportation linkages could be disrupted. (But there is great redundancy in the transportation system, especially in trucking. Fuel might be the major limiting factor.)

4. Public utilities such as power, water, and communications could be out of operation in many areas for a long time, curtailing production.

5. Much of the surviving population might be too preoccupied with personal considerations to reenter the labor force.

6. There could be disproportionate losses of managers and highly skilled workers.

7. Lines of authority in many industrial enterprises could be broken. The authority of surviving plant managers to make decisions could be unclear. (The role of government in setting production goals and supporting them with allocations of materials and credit, guaranteed purchases, or establishment of a "futures market" remains unclear.)

8. The markets for which goods are produced may have disappeared with the attack. The "order book" could be worthless as a guide to future production.

9. Money, both specie and commercial deposits, could quickly become worthless. A new money, based on the realities of postattack values, would be difficult to establish. Without a monetary system which represents a reliable "store of value," complex economic activity could virtually cease.

10. Property rights could be in a state of chaos for some time. Many people could have lost everything--real property, securities, jobs. Insurance probably would be worthless in most cases. Other persons in possession of undamaged property, or inventories of food, medicine, fuel, and the like, could become rich overnight. Many of the dead would have died intestate; surviving heirs could not quickly establish their claims; courts would be overwhelmed. There would be cogent demands for war indemnification, with difficult problems of equity, social order, and economic efficiency involved.

Once again, many of these obstacles to economic recovery seem to assume short-term recovery to the pre-attack state. Others, such as willingness to engage in labor and trade, the loss of currency, and disruption of property rights would apply to our more extreme scenarios. The same authors divide post-attack economic recovery problems into two categories; physical problems and managerial problems. These correspond closely to our categories of resources and institutions.

With respect to resources, Greene, Stokley, and Christian (1979) argue that limitations in the ability to predict levels of damage to the various industrial sectors probably lie mostly in the uncertainties

about the type of attack that an enemy would undertake. However, with respect to all levels of physical damage, they list six management problems that would arise (p. 17). These are:

1. maintain communications;

2. get essential transportation, petroleum refining, and utility systems functioning;

3. keep the agricultural industry going;

4. avoid further deterioration of damaged or idle production equipment or facilities;

5. proscribe nonessential activities--at least those that would waste materials in short supply; and

6. mobilize manpower--in particular, to assure that people with specialized skills needed in the recovery effort are used effectively.

Other analysts also have emphasized managerial preoccupations of post-war authorities. For example, Winter (1963) suggests that four of the major tasks for the surviving infrastructure would be the reestablishment of private property rights; the use of money to prevent the inefficiency of a barter economy; price expectations, possibly by operating a futures market and by a limited set of price guarantees; and the traditional government operations in the provision of important public goods and services. These tasks presume the survival of an effective federal government, and therefore only apply to the best case and institution intensive scenarios. The issue of barter, in particular, is considered in the relevant scenarios and our conclusions.

Greene, Stokley, and Christian (1979:18) conclude that:

> The dimensions of the postattack management problems are almost limitless. This is an extremely complex and important area that has received only meager attention. For this reason, it has been given somewhat greater prominence in this report than most of the other obstacles to recovery. Unless more creative and imaginative study is applied to develop better strategies for managing the postattack economy, this barrier to recovery could turn out to be the most difficult of all (original emphasis).

These are precisely the problems that we seek to address in the following pages. However, we do not define economic recovery as the short-term restoration of modern industrial capitalism since this is likely to be a long and difficult process in all but the best-case scenario. The route from the worst case to industrial society could span several generations. Hence, we define recovery here as achievement of a sustainable system of production and exchange that satisfies the conditions necessary for subsequent economic growth and technological development.

1.7 CONDITIONS FOR SUSTAINABLE RECOVERY

In order to establish any sustainable economic framework, it will be necessary for a range of functions to be performed either by the market itself, or by the institutions that regulate or engage in economic exchange. Fourteen such functions can be identified from the social-science literature, eight of which are primary or constitutive functions in that they collectively comprise the exchange activity. Six further functions can be identified as secondary, or emergent functions in that they are not essential to exchange at its inception, but will emerge as exchange persists, usually as instruments of increased efficiency. These functions are listed below.

Primary functions:

1. Define property rights.

2. Convey supply/demand information (including advertising).

3. Provide opportunity for legitimate transaction.

4. Limit provisions of legitimate contracts.

5. Enforce contracts other than by physical coercion.

6. Settle disputes.

7. Maintain civil order.

8. Legitimate other functions.

Secondary Functions:

9. Guarantee currency and close substitutes.

10. Administer distributive justice, including taxation.

11. Monitor and modify operations in response to changing circumstances.

12. Mitigate risk.

13. Exploit comparative advantage, specialization, and division of labor.

14. Reduce transaction costs for intertemporal or interregional transactions (e.g., through credit).

The manner in which each of these functions is fulfilled in each survival scenario is discussed in chapters six through nine. However, any such description needs to be preceded by consideration of the nature of markets and other exchange structures, as described in chapters two through five. Each of the exchange structures described in these chapters consists of a series of rules vectors that provide various

alternative means of fulfilling each of the functions. So, the rules vectors define the exchange structures, the exchange structures combine to define exchanges in each scenario in which the functions are fulfilled by a rule or combination of rules from the structures that are present in that scenario. Chapter ten contains a summary and extension of policy-relevant conclusions about exchange and markets after nuclear war.