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ENERGY, ECONOMIC AND URBAN IMPACTS OF U.S. POSTINDUSTRIAL DEVELOPMENT: A CRITIQUE OF THE POSTINDUSTRIAL PARADIGM

by

Rebecca J. Wykoff

A dissertation submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Urban Affairs and Public Policy.

Summer 2000

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OF U.S. POSTINDUSTRIAL DEVELOPMENT:

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Rebecca J. Wykoff

Approved: _____

Jeffrey Raffel, Ph.D.
Director of the School of Urban Affairs and Public Policy

Approved: _____

Daniel Rich, Ph.D.
Dean of the College of Human Services, Education and Public Policy

Approved: _____

Conrado M. Gempesaw II, Ph.D.
Vice Provost for Academic Programs and Planning

I certify that I have read this dissertation and that in my opinion it meets the academic and professional standard required by the University as a dissertation for the degree of Doctor of Philosophy.

Signed: _____

John Byrne, Ph.D.
Professor in charge of dissertation

I certify that I have read this dissertation and that in my opinion it meets the academic and professional standard required by the University as a dissertation for the degree of Doctor of Philosophy.

Signed: Paul T. Durbin

Paul Durbin, Ph.D.
Member of dissertation committee

I certify that I have read this dissertation and that in my opinion it meets the academic and professional standard required by the University as a dissertation for the degree of Doctor of Philosophy.

Signed: George C. Galster

George Galster, Ph.D.
Member of dissertation committee

I certify that I have read this dissertation and that in my opinion it meets the academic and professional standard required by the University as a dissertation for the degree of Doctor of Philosophy.

Signed: _____

Young-doo Wang, Ph.D.
Member of dissertation committee

ACKNOWLEDGMENTS

No work of this nature ever occurs in isolation. One cannot simply retreat to a remote cave to think great thoughts and produce astounding revelations regarding the workings of the world. The research and writing of a dissertation, rather, takes place in the present reality of one's day-to-day life circumstances which include not only the challenges of the work, but personal challenges, demands and often tragedies as well. Those to whom I am most indebted for their roles in this academic achievement, therefore, are those very special people who have supported me in the various facets of my intellectual growth and my human existence.

First and foremost, I would like to express my deepest gratitude to my advisor, colleague and close friend, Dr. John Byrne. JB has extended himself to me in the sharing of his remarkable knowledge, ideas, time, patience and compassion during those times that life's difficulties seemed nearly insurmountable. This dissertation truly would not have come to fruition without his guidance, his commitment, and his faith in me.

I also want to extend my heartfelt thanks to my committee: Dr. Young-doo Wang, Dr. Paul Durbin and Dr. George Galster. Young-doo has spent many hours working with me and has been generous in assisting whenever requested. I also thank him for his smiles, encouragement and friendship. Paul has been a great ally in questioning the impacts of technology on society and I appreciate his input and his willingness to serve on my committee. George deserves special recognition for his enthusiasm to go another round with me, having been my advisor at the

College of Wooster. I value his intellect, his concerns for those disadvantaged by the structures of our current society, and his guidance and friendship over the years.

I would also like to acknowledge the significant contributions to my intellectual development offered by Dr. Daniel Rich. I appreciate Dan's teaching, both formal and individual, his insights and his spirit of collegiality.

During my long association with the College, there have been many who have shared their friendship and support. I would like to thank, especially, Patricia Grimes, Kyunghee Ham, Insook Han, Shih-Jung Hsu, Cecilia Martinez, Sandra Matthews, Craig McDonnell and Jae-Shuck Song for their many kindnesses. I also wish to express special appreciation to Jae-Shuck, who offered his time and expertise to the technological aspects of my defense presentation and to Kyunghee, who produced the graphics for the dissertation and defense and helped in terms of critiquing my drafts and offering conceptual ideas and suggestions for sources.

My life would have been very different during this period of time without the sharing and care I have received from my dearest personal friends. I would like to express my most special thanks to Juyne Triplett and Cindy, Stewart and Jeffrey Lovell. Juyne has been a constant source of strength to me and has shared both the successes and the storms throughout our many years of friendship. The love and gratitude that I feel for my Delaware "family"—Cindy, Stewart and Jeffrey—is immeasurable. They have shared their love, their home and their encouragement and I feel blessed to have their ongoing presence in my life.

Finally, I want to express my heartfelt appreciation and love to my mother, Dorothy Wykoff, and to the rest of my family—Kim, Judy, Amanda, Ethan, David and Chris—for their love, encouragement, and patience.

This dissertation is dedicated with my deepest love and respect to the memory of my father, my friend, and my mentor in the truest meaning of the word, Dr. Norman L. Wykoff, and to the ideals and principles which guided the conduct of his life: human dignity, equity, morality, appreciation of the value and meaning of the present, and the quest for quality in all aspects of personal and social endeavor.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Postindustrial theory has become the mainstream model of social progress in the Western world during the latter half of the twentieth century. It is a technoeconomic vision of change which argues that society is transforming from the industrial order to new social forms and functions that are anchored in services and information rather than materials and manufacturing. Observable shifts cited as evidence of postindustrialization include the movement from blue-collar to white-collar occupations, the increasing scale of economic activities, and the widespread adoption of electricity-based technology.

This dissertation identifies three primary principles which define postindustrial theory: *abundance*, or expanding wealth and productivity; technological and economic *efficiency*; and *adaptation* to technological and economic forces. In the United States, postindustrialism has been challenged by the national urban crisis of the 1960s and the energy crises of the 1970s. The apparent contradictions to social well-being prompted a theoretical reconceptualization which defined the "crises" as "transition costs."

Empirical implications are defined and appropriate indicators identified to assess the validity of postindustrialism as an explanation of current phenomena and a guide for future development. The time frame for the analysis is 1967-1997, which encompasses the culmination of post-World War II growth, the periods of crisis, and present manifestations. It is concluded that postindustrial theory is less an explanation of contemporary social change than a presumption that change is

progressive. The period of "transition" is critically examined as one in which rapid increases in inequality, decreases in social health and growth in trends of unsustainable resource use occur. The future orientation of postindustrialism, and its appeal to aggregate trends as evidence of progress, ignores the existence of problems experienced by a majority of Americans and mounting threats to the natural environment.

It is argued that a new theory of political economy is needed which explains current conditions, provides an understanding of progress that incorporates the roles of politics and social valuation, and embraces the goals of equity, sustainability and social justice.

Chapter 1

INTRODUCTION

The world is changing, or so we are told. Technologically, economically, socially, politically, geographically—the world is a very different place than it was a mere half-century ago. The media and academic discourse are saturated with discussions of globalization, telecommunications and a myriad of events and indicators that prompt the assessment of progress in all aspects of individual and collective life.

For many social commentators, ranging from Turgot, Condorcet, Comte and Saint-Simon (Bury, 1960; Coser, 1977; Kumar, 1978; Saint-Simon, 1975) in the eighteenth century to recent thinkers such as Rosenberg (1972), Fuller (1977), the Progress and Freedom Foundation (1994), and Dyson (1998), the present era is one of technological optimism. Saint-Simon, one of the earliest technological enthusiasts, proclaimed that technology would usher in a "Golden Age" for humankind.

> Poetic imagination has put the Golden Age in the cradle of the human race, amid the ignorance and brutishness of primitive times; it is rather the Iron Age which should be put there. The Golden Age of the human race is not behind us but before us; it lies in the perfection of the social order. Our ancestors never saw it; our children will one day arrive there; it is for us to clear the way. (quoted in Kumar, 1978: 13)

Faith in technology is reflected in the belief that a transition of global proportions rests upon boundless technological possibilities, foretelling unparalleled growth and

progress. According to proponents, there is every reason to be optimistic, as technology holds the key to not only seemingly endless advance, but to the resolution of existing problems. The fundamental centrality of technology in daily life is expressed by Fuller.

> Take away all the inventions from humanity and within six months half of humanity will die of starvation and disease. Take away all the politicians and all political ideologies and leave all the inventions in operation and more will eat and prosper than now while racing on to take care of 100% of humanity. (1977: 141)

For others, such as Marx and Weber in the nineteenth century (Coser, 1977; Marx, 1976) and contemporary thinkers such as Mumford (1934, 1961), Ellul (1964), Noble (1977, 1983a, 1983b, 1983c, 1984), and Winner (1986), the present is marked by a sense of technological foreboding. Ellul, perhaps the most forthright critic of technology, questioned the blind acceptance of technological dominance in our lives.

> None of our wise men ever pose the question of the end of all their marvels. The "wherefore" is resolutely passed by. The response which would occur to our contemporaries is: for the sake of happiness. Unfortunately, there is no longer any question of that. One of our best-known specialists in diseases of the nervous system writes: "We will be able to modify man's emotions, desires and thoughts, as we have already done in a rudimentary way with tranquillizers." It will be possible, says our specialist to produce a conviction or an impression of happiness without any real basis for it. Our man of the golden age, therefore, will be capable of "happiness" amid the worst privations. Why, then, promise us extraordinary comforts, hygiene, knowledge, and nourishment if, by simply manipulating our nervous systems, we can be happy without them? The last meager motive we could possibly ascribe to the technical adventure thus vanishes into thin air through the very existence of technique itself. (1964: 436)

According to these commentators, the present is characterized as an age of increasingly problematic social discord and imbalance. Again, both the scale and the implications are global. These thinkers postulate that technology poses not necessarily the solution, but rather the question, and maybe the problem itself. Are technology and our present technological and economic institutions the stepping-stones to prosperity or do they portend social demise?

> Technological development has come to be viewed as an autonomous thing, beyond politics and society, with a destiny of its own which must become our destiny too. From the perspective of the here and now, technological development has become simply the blind weight of the past on the one hand, and the perpetual promise of the future on the other. Technological determinism—the domination of the present by the past—and technological progress—the domination of the present by the future—have combined in our minds to annihilate the technological present. (Noble, 1983a: 10)

At the center of this controversy is a body of social science theory, commonly referred to as "postindustrialism," which seeks to respond to this dispute. Postindustrialism is a relatively recent phenomenon, taking root in the post-war era. Proponents of this theory include White (1943, 1959, 1969), Bell (1967a, 1967b, 1967c, 1973, 1989), Kahn (1979, 1982), Drucker (1989a, 1989b, 1992, 1993), and Toffler (1980, 1990, 1995), among others. Postindustrialism embraces the enthusiasm of the technological optimists, and is founded upon it, but tempers it with the recognition that society and social institutions interact with technological systems in the creation of the future.

> In emphasizing the dominant and determining role of technology one should not lose sight of the influence exerted upon technology by social, philosophic, and sentimental factors...Technologies exist and function within social systems and are consequently conditioned by

> them. A social system may stimulate the technology it embraces, encourage full and free exercise of its functions, and promote its growth and development. Or it may restrict free technological exercise and expression and impose curbs upon its growth. (White, 1959: 27)

Postindustrial theory argues that society is in a period of transformation, but is indeed on the path to a promising future. Assuming that certain conditions are met, and that decisions are made within the prescribed theoretical and technoeconomic frameworks, postindustrialists argue that society can navigate the transition and progress to a new, higher state of development.

> (W)e are experiencing an era of transition—a readjustment of our economic structure in response to changes in the world economy, in the demographic characteristics of its population, in the price and availability of energy and other resources, and in the value we place on the noneconomic aspects of the quality of our lives and on the environment in which we live. Government policy will have a central role in determining how difficult and protracted this transition will be. We can make matters worse by resisting inevitable change, by mismanaging the economy so as to inhibit the investments that will help us accommodate to the new conditions, and by selecting inefficient, ineffective means of implementing government policies. Or we can ease the transition while making progress toward social goals. (President's Commission for a National Agenda for the Eighties, 1980a: 5-6)

Postindustrial theory has itself gone through transition. Initially presenting a very optimistic and rather unqualified and straightforward vision of the future, it has been refined to a theory of guarded optimism. The enthusiasm evidenced in the mid-century years, which proclaimed that poverty would be a thing of the past and that energy would be bountiful was dampened in the 1990s as postindustrialists acknowledged that social problems will persist to some extent.

The emergence or continuation of social issues should not, however, stand in the way of the benefits to be derived from technology and economic growth.

> If we are suffering from the crash of our old institutions, we are also pioneering a new civilization. That means living with high uncertainty. It means expecting disequilibria and upset. And it means no one has the full and final truth about where we are going...We need to feel our way, leaving no group behind, as we create the future in our midst. (Toffler and Toffler, 1995: 87)

This dissertation examines the premises of postindustrial theory to determine its adequacy in addressing the conflicting views on the interrelationships between technology, society, and development. By means of two significant social crises that have occurred in the postwar era—the urban crisis of the 1960s and the energy crises of the 1970s—this dissertation will examine the postindustrial interpretation of our contemporary condition and whether this understanding is empirically and theoretically adequate. Specifically, it is argued that we are at a crossroads and must decide if we are in transition to a better era or if the postindustrial thesis is merely an ideological apologia for an era with deepening social problems.

The Characteristics of Postindustrial Society

Postindustrial theory, in part, has been formulated based upon several discernable shifts in the characteristics of society during the second half of the twentieth century. These alterations, such as the growth in the use of electricity and the increasing presence of information and services in economic interactions, have been utilized as the basis from which to project eventual outcomes as society moves from the old industrial order to new postindustrial configurations. The major

characteristics of the new society, as identified by postindustrialists, are identified below.

Table 1.1 Characteristics of Industrial and Postindustrial Society

Characteristic	Industrial Society	Postindustrial Society
Knowledge	Empirical	Theoretical
Major Product	Goods	Services, Information
Labor Force	Blue-collar	White-collar, Professional/Technical
Concept of Space	Physical Space	Political/Economic Space, Cyberspace
Scale	Local	National/International
Policy Orientation	Place-focused	People-focused
Energy Basis	Fossil Fuels, Nonrenewable	Electricity, Eternal

As shown in Table 1.1, the basis of knowledge will shift from empirical to theoretical in nature, as society increasingly engages in intellectual and conceptual pursuits. The major product of this new society will no longer be goods, or the physical products of manufacturing, but rather will be services and information. Concomitantly, the labor force will shift from primarily blue-collar industrial workers to white-collar professional and technical workers. Physical space will no longer be primary in human interactions as the basis of societal relationships will be found in economic and political space, which may or may not coincide with geography. Cyberspace, or the electronic interconnection of computer networks, exists well beyond any concept of physical location.

The scale of this new society, then, can no longer be considered to be local but is rather national or international in nature. Individuals will consider

themselves to be part of the larger society, or the national and international communities, and allegiances as well as interactions will be national or international in scope. Policy will be directed toward people, rather than places, coincident with the diminishing importance of the physical realm. The new economic and societal activities of postindustrialism will be supported by plentiful and clean energy in the form of electricity, replacing the limited and "dirty" fossil fuels of the industrial era. According to postindustrialism, the characteristics of the new society will become increasingly apparent as society navigates the transition from an industrial to a postindustrial state.

The Principles of Postindustrialism

Three basic principles regarding social progress have been offered by postindustrial theory to both characterize the transition period and guide social action in support of the transformation. The principle of *abundance* serves as the foundation of postindustrial theory. It asserts that society will evidence progress through ever-expanding wealth and productivity. This material abundance will bring about rising living standards for all and increasing levels of comfort, well-being and security (Kahn, 1979; President's Commission, 1980a; Toffler, 1990). The principle of *efficiency* defines the means of accumulation and the maximization of productivity in both economic and technological terms (Bell, 1973; Stockman, 1982, Sant, 1982; Ohmae, 1990). The principle of *adaptation* then prescribes the social response to the technological and economic forces which are purported to create abundance. According to the adaptation principle, social systems must adapt to technological and economic dynamics, and the type and extent of possible change

is defined within strict parameters that are consistent with unfettered technological innovation and economic growth (White, 1943, 1959; Baumol, 1981).

Utilizing these three principles, postindustrialists have concluded that the modern era remains progressive and that social advance through new technology and economic forms awaits society. The "challenges" to the onward path of progress wrought by the urban and energy crises were reconceived by postindustrial advocates as the "growing pains" of transformation. Postindustrialists acknowledge that during the transition to a new state there will be additional impediments and difficulties that must be overcome. However, given enough time, resources and the appropriate social responses, seeming contradictions and anomalies will be overcome or, at least, muted in their impact.

The challenge of this dissertation is to evaluate whether postindustrialism is a viable theoretical framework to either guide or assess the progress of contemporary society. Or, is it a case of the "emperor's new clothes"—a theory that has been embraced by many and has, in fact, become the mainstream model, but is not grounded in reality? Both theoretically and empirically, there are reasons to question the adequacy and the accuracy of postindustrialism as a model for social advance and well-being.

Analytical Framework

The postwar era in the United States has been one of stark contrasts. The period has been marked by unprecedented increases in economic growth and great strides in technological development. Conversely, the period has been beset by at least two crises of national proportions. The urban crisis brought into focus the realities of crumbling cities and massive poverty and inequality amid the

supposed prosperity and social well-being of the nation. The energy crises not only defined and accentuated the vulnerability of a society dependent upon the escalating consumption of scarce resources, but also precipitated and underscored the increasing awareness of its consequences evidenced in the flagrant disregard of environmental and developmental sustainability. Thus, the crises of American cities and the energy system offer fertile empirical and theoretical grounds for deciding the dispute over how to characterize our contemporary fate—are we in a postindustrial transition to a progressive future or are we so blinded by promises of riches that we, as a society, are compromising the present and future of the human condition?

This dissertation will examine the thesis of postindustrial theory in terms of its assessment and predictions in the urban and energy arenas. In both, postindustrial theory was challenged by crisis, and responded with the pronouncement that the "crisis" was, in reality, a transition cost associated with movement to a new state. Postindustrialists have made assertions regarding the outcomes and the future configurations of society that can be examined empirically.

The empirical analysis of this dissertation will address the propositions of postindustrialism in the context of the urban and energy crises and subsequent developments. Current social and energy trends will be examined and compared with postindustrial predictions. Through the use of the three principles, empirical propositions are derived and social and energy indicators identified. The time period to be examined is 1967-1997, which not only provides analysis of the period of most recent change, but locates the analysis within the framework of the years before, during and after the major disruptions to postindustrial development represented by the urban and energy crises. Thus, the 1967-1972 period illustrates

the culmination of the impacts of post-World War II economic momentum while providing a baseline for the extent of the social inequities that had become apparent during the 1960s. The years during the remainder of the 1970s capture the fluctuations in energy consumption that resulted from the two periods of crisis (1973-1974 and 1978-1979) and concomitantly track social indicators in the aftermath of the heightened awareness of urban and social conditions. The decade of the 1980s represents a period of relative national inattention to the urban and energy arenas, while the 1990s witnessed brief disruptions in the form of the 1992 riots in Los Angeles and the 1990 invasion of Kuwait by Iraq, as well as growing concern with the energy sources of environmental pollution.

Despite the protests of postindustrialists that society is still navigating the process of transformation and, therefore, that new societal forms have not fully emerged, policy recommendations based upon this framework have been in evidence for more than thirty years. Postindustrialists have called for specific actions on the part of both governments and the private sector based upon their analyses and empirical predictions. Further, this theory of social change has influenced national perceptions and decisionmaking. From the Commission on the Year 2000 (Bell, 1967c) to the President's Commission for a National Agenda for the Eighties (1980a, 1980b) through, most recently, the Secretariat on Electronic Commerce (U.S. Department of Commerce, Secretariat on Electronic Commerce, 1998), as well as countless academic research efforts, the theory of postindustrialism is clearly apparent in the arena of public policy. It is thus not only appropriate, but perhaps necessary, to pause in the present and evaluate the claims of postindustrialism and the contemporary dynamics of "progress."

Key Propositions and Variables

The postindustrial thesis has been presented by its proponents as a positive framework from which to view and assess social change. Underlying this thesis is the belief that social problems will be resolved in due course, and that technological and economic forces will lead society toward a better future. As a means of examining this movement, critical assumptions are derived from the postindustrial principles. Social indicators are identified to not only assess trends, but to evaluate the manifestations of those trends in the contemporary United States.

The principle of *abundance* is quantitative in nature, and asserts that "more is better" and "growth is good." In the urban/social context, abundance means the material wealth and well-being of society. The urban/social abundance principle can be stated as follows.

- In the near term, urban fortunes can be expected to falter. In the near and longer terms, national fortunes will improve and society, as a whole, including its current urban communities, will be better off.

Indicators to address abundance and its manifestations include Gross Domestic Product per capita, disposable personal income, distribution of income, the Gini index,[1] wealth inequality, poverty rate and the number of persons below poverty level, and residence of the poor.

In the energy context, abundance is conceived as secure and uninterrupted flows of energy, enhanced through the accelerated development of the electricity system which is flexible in the use of energy inputs.

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[1] The Gini index is a measure of income inequality.

- Postindustrial society will increase its reliance on electricity because of its technological versatility. Technology intensity will substitute for traditional natural resource intensity.

Indicators of energy abundance include both total and sectoral consumption of primary energy, electricity, and non-electricity energy and the use of petroleum, coal, nuclear energy and imports.

The principle of *adaptation* prescribes the social response to technological and economic forces in support of the goals of abundance. Urban/social adaptation involves the expeditious movement toward a postindustrial society.

- The more adaptive a society is to the postindustrial, post-urban trends—to a service economy and information society—the lower the transition costs. This is especially true for urban communities.

In the urban/social arena, key variables are the incidence of service and manufacturing jobs; wage distribution and structure; conditions of labor force participation including the skill levels of labor demand, work effort and the incidence of non-traditional employment arrangements; and an index of social health.

In the energy realm, the corollary principle of adaptation defines a multiplicity of inputs and the use of nuclear power as a nearly infinite energy source.

- The fuel mix will change dramatically as the Electric Society makes full use of the complete range of energy options. Nuclear power, in particular, will produce cheap, abundant and, indeed, "eternal" energy.

Key variables in the energy arena include electricity consumption, consumption by source, total and percent of inputs at electric utilities, consumption of energy in the

transportation sector, nuclear energy use, oil imports, greenhouse gas emissions and evidence of the fragility of the electricity system.

Finally, the principle of *efficiency* is grounded in the maximization of productivity in economic and technological terms, and relies upon the workings of the market to allocate costs and benefits. Urban/social efficiency entails new configurations for the postindustrial society.

- Postindustrial technology will lead to a new efficiency revolution that will advance society as it moves beyond its current urban-industrial form. Technology-led efficiency gains will offset any short-term costs to urban communities.

Urban/social efficiency is evaluated on the basis of productivity growth; the impact of cost restructuring on income; and the subsidization of locations and industries, segregated development and selective urban development and resettlement patterns associated with the military-industrial complex.

Energy efficiency will incorporate the use of technology to reduce energy resource consumption.

- Through sophisticated technology, the Electric Society will be technologically and economically more efficient. New high-technology industries, energy systems and social interactions will be less energy-intensive.

Energy efficiency is assessed through sectoral energy intensity, energy savings, technological efficiency and the share of total energy dissipated by electricity losses.

The examination of postindustrial principles through social and energy indicators provides the basis for an assessment of the viability of postindustrialism as a framework for both understanding current phenomena and serving as a guide for future development.

Key Findings

The findings of the empirical analysis present grave contradictions between the world promised by postindustrialists and contemporary reality. Issues of equity, sustainability and social justice have found no resolution through three decades of postindustrial development. In social, energy and environmental terms, our collective quality of life and prospects for the future have been severely compromised.

The postindustrial era in the United States, to date, has been undeniably a period of decline in social well-being. As illustrated by the Fordham Institute for Innovation in Social Policy's (1995) index of social health, which combines sixteen social problems into one indicator, social well-being has declined dramatically from 1970-1993, with three of the four worst years occurring during the 1990-1993 period. The Gini index (U.S. Department of Commerce, Bureau of the Census, 1998a), which is a general indicator of income inequality, has shown steady and rapid increase from 1967-1997, indicating rising levels of inequality. The absolute number of persons in poverty has increased (U.S. Department of Commerce, Bureau of the Census 1998a) and poverty is no longer restricted to central cities but has spread to the suburbs (U.S. Department of Commerce, Bureau of the Census, 1999). Labor force participation is increasingly characterized by part-time and temporary employment (U.S. Department of Labor, Bureau of Labor Statistics, 1995, 1996b; Bluestone and Harrison, 1988) that lacks basic supports such as health insurance and pension contributions (Rifkin, 1995; Uchitelle, 1997) and offers lower wages (Weinberg, 1996; Bluestone and Rose, 1997). Average real compensation has stagnated and gains have become more unequally distributed (U.S. Council of Economic Advisers, 1995; Burtless and Mishel, 1995). Job growth is concentrated

in lower-paying employment and work effort has increased (Bluestone and Rose, 1997). Productivity growth has slowed, due almost entirely to a decline in multifactor productivity growth, or the efficiency with which capital and labor are used (U.S. Council of Economic Advisers, 1997). Concurrently, the economic and geographic landscape of the United States strongly reflects sheltered and subsidized development resulting from the military-industrial complex (Markusen et al., 1991). Segregation by class and race are only exacerbated by this type of urban growth, and communities and regions that are not favored are even more severely disadvantaged (Markusen et al., 1991).

In the urban and social arena, postindustrialism has resulted in a society that is increasingly organized to meet the needs of the elite. The realization of abundance is hardly evident in the urban and social experience of all but a few as income and wealth become more and more concentrated and poverty is institutionalized. Social adaptation has come to mean, for most, working more and earning less while accepting lower levels of security and employment benefits and experiencing widening disparity as the information age brings yet another level to disadvantage. Efficiency has not been evidenced in terms of productivity, or in the workings of the market. Rather, U.S. society has experienced increasing social polarization through the job market, employment structures and targeted development. In short, many of those "left behind" in the 1960s are left even further behind in the 1990s, and numbers have been added to their ranks in many cases. The indicators of postindustrial social change do not support the postindustrial propositions. Instead, the indicators portray a dismal present and no sign of improvement in the foreseeable future.

The key findings in the energy arena are no more promising than are those in the urban/social context. Total energy consumption grew significantly during the thirty years under analysis, and growth was evidenced in all sectors (residential, commercial, industrial and transportation). In terms of end-use energy, for all purposes other than mobility, electricity has become the primary form of end-use power (U.S. Department of Energy, Energy Information Administration, 1991, 1997, 1998a, 1999a). Concurrently, the consumption of petroleum has risen, relying increasingly upon imported sources as domestic production has decreased. In 1997, the quantity of total imported petroleum increased by 290.2% from its 1967 level (U.S. Department of Energy, Energy Information Administration, 1998a) and, by 1999, over half of the U.S. petroleum demand was met by imports (U.S. Department of Energy, Energy Information Administration, 1999c). The type of energy sources utilized in the United States has not altered significantly during the thirty-year period, and fossil fuels (coal, natural gas and petroleum) continue to dominate as energy resources, including their use as inputs to electric utilities (U.S. Department of Energy, Energy Information Administration, 1991, 1997, 1999a). Energy intensity closely follows fluctuations in energy prices; as prices fall, the intensity of energy use rises, and the reverse was also found to occur (U.S. Department of Energy, 1995). Energy savings are not proportional by sector, and the "old" industrial sector has contributed substantially to energy savings while the "new" commercial sector has not (U.S. Department of Energy, Office of Policy, 1995). In the market-driven postindustrial economy, the commercial sector has been least responsive to market signals (U.S. Department of Energy, Energy Information Administration, 1991, 1997, 1999a). Finally, increasing dependence upon

electricity as the primary form of end-use power has institutionalized an inherently inefficient energy system, as approximately one-fourth of the energy expended in the United States in the late 1990s was dissipated in the form of electricity losses (U.S. Department of Energy, Energy Information Administration, 1999a).

Postindustrialism in the energy arena has produced an energy system that is wasteful, unsustainable and vulnerable. Abundance, according to the post-crisis postindustrial definition of secure and uninterrupted supplies, has not been substantiated, and can be disputed on the basis of increasing reliance upon imports and the fragility of the electricity system in which centralized power stations and the interconnected grid are susceptible to disruption in the form of brownouts and blackouts. Energy adaptation through diversity in the fuel mix has not been evidenced, as fossil fuels continue to constitute the basis of energy use. The consequences of fossil fuel dependence are directly linked to environmental degradation, most notably in the production of greenhouse gases. In the United States, the greenhouse gas emissions rate per capita is nearly 26 tons of CO_2 equivalent per year. A sustainable global rate has been estimated to be in the range of 2.6-3.3 tons per person annually (Byrne, Wang, Lee and Kim, 1998). Neither has adaptation occurred in the substitution of activities. Postindustrial predictions of the increasing use of communications in place of transportation have not been borne out. Neither have claims of efficiency been demonstrated, as growing quantities of energy are lost in the production and transmission of electricity. In concert, these findings point to an energy system that is untenable in a world of finite resources.

Outline of Chapters

Chapter 2 will trace the development and manifestations of postindustrial theory in the postwar era. Built upon the conception that society is experiencing a fundamental change from the industrial era, and retaining much of the technological optimism that had marked the previous period, postindustrial theory has sought to capture and identify the nature and scope of transition and to portray the possibilities for the future. This chapter will present the arguments of major postindustrial proponents and describe the society that they portray. It will then derive, in Ellul's terminology (1964), the "characterology" of postindustrialism. It will be argued that postindustrialism is organized around three fundamental principles—abundance, efficiency and adaptation. These principles form the cornerstones of the theory and have become embedded in modern social inquiry. It will cite the major social shifts embraced by postindustrialists as evidence of transformation, including the change in the economic base from manufacturing to services, the rise of the professional class and the increasingly international character of economic activity. Of particular significance to this discussion are the primary shifts identified in the urban and energy arenas.

According to postindustrialists, physical space is no longer relevant, having been conquered by economic space and the national and international flows of transactions and information through cyberspace. This reconceptualization has essentially rendered obsolete the notions of place, locality and community in the traditional sense. Further, the national and international foundation of economic activity has become the social criterion for assessment of well-being. The implications for urban areas are ominous and are witnessed in the glaring absence of national urban policy.

In terms of energy, postindustrialists have proclaimed that the increasing reliance upon electricity signals a momentous step toward progress. While this view is neither new nor limited to postindustrialists (see, for example, Geddes, 1971; Mumford, 1934), postindustrialism proclaims that it signifies not only the release of humankind from its dependence upon nature but also independence and invulnerability in political and economic terms. The intent of Chapter 2 is to define the theory of postindustrialism, identify its analysis and predictions for the social structure, derive the three principles which encapsulate the theory, and set the stage for the detailed examination of postindustrial theory in the urban and energy contexts.

Chapter 3 will critically examine postindustrial perceptions of change in the urban system through the prism of the urban crisis. It will present the urban context in the postwar period, specifying the social and economic dynamics of an urban society marked by high industrial productivity and rising levels of economic growth and living standards. It then reviews the urban crisis of the 1960s and the ways in which poverty, social discord and deteriorating social and physical infrastructure were "discovered" amidst rising prosperity. It examines national policy efforts to rectify urban problems, ideological challenges to postindustrialism, the postindustrial response to urban conditions and how postindustrialism translated the "crisis" into the "growing pains" of transition to a new social infrastructure. According to the tenets of postindustrialism, no longer would traditional forms of social organization be adequate to support the new society; rather, national economic well-being would become the barometer of progress. This chapter will then present the postindustrial framework for a society based not on physical and

spatial dynamics, but upon the digital flows of information, communication and economic activity. Finally, Chapter 3 will examine the principles of postindustrialism as theoretical statements in the urban/social arena and translate these statements into empirical propositions which will then be explored in Chapter 5.

Chapter 4 provides a corresponding analysis for the energy arena, proceeding from the postwar energy system through the crises that marked the 1970s. As occurred in the 1960s with the urban system, the energy crises challenged the postindustrial framework for progress, but were reconceptualized as a problematic dependence upon foreign energy sources which would be rectified by independence in energy production through increasing reliance upon electricity as the primary form of end-use power. Despite analysis by opposing social commentators that energy resources must be conserved and energy use curtailed, postindustrialists argued that energy abundance is essential for continued economic and productivity expansion. They urged rapid expansion in the use of electricity and the reliance upon technological innovation to provide not just an adequate but an unlimited energy base into the distant future to support ongoing societal functions as well as the electronic foundation of society and the economy. As in Chapter 3, the principles of postindustrialism will be examined as theoretical statements and translated into empirical propositions in the context of the energy system. These propositions will then be explored in Chapter 6.

Chapters 5 and 6 identify appropriate empirical indicators for the propositions developed in Chapters 3 and 4 as a means to test these claims. In Chapter 5, social indicators including income distribution, poverty rates, labor force

characteristics and productivity growth are utilized to assess the viability of postindustrial predictions. In Chapter 6, energy and electricity consumption, the mix of energy inputs, energy intensity and electricity losses provide the basis for a critical analysis of postindustrial propositions. In both chapters, empirical findings serve as the basis for conclusions regarding the validity of postindustrial theory in explaining current phenomena and address the postindustrial pronouncements of transition. Do the present trends in fact support a thesis of transformation, or are they indicative of increasing fragility and looming social and environmental crisis?

Chapter 7 engages the theoretical sufficiency and empirical adequacy of postindustrialism as a framework for defining, identifying and guiding social progress. In the particular historical context of the United States, does a technoeconomic theory of change and progress make sense? The chapter concludes that postindustrial theory is less an explanation of contemporary social change than a presumption that social change is progressive. This presumption of progressiveness is based on broad, aggregate trends rather than careful analysis of the social, technological and environmental dynamics upon which these trends are founded. It is argued that the future-orientation of postindustrialism fuels its optimism, while concurrently providing a rationale for neglecting to engage the present circumstances of individual and collective life. The fascination with numbers and technology, and the rallying cries of "more is better" and "growth is good" that have characterized ideas of progress have propelled this line of social inquiry in a direction far removed from human values. The conclusion of this dissertation is that a new paradigm for social progress is essential; that the dynamics of political economy must be taken into account in the exploration and explanation of contemporary society, and that the

terms of the debate include the present reality as society charts a course for the future.

Chapter 2

THE ROOTS OF POSTINDUSTRIAL THEORY

Virtually by definition, the process of development entails change in societal structures. Alterations in resource, economic and spatial configurations have been utilized to demarcate broad stages of growth, most commonly identified as preindustrial, industrial and postindustrial.[1] In the current era of postindustrialism, longstanding empirical observations include spatial restructuring, the adoption of electricity as the primary form of end-use power, and the shift toward an economy increasingly characterized by services and information. However, conceptualizations of the process of change have undergone frequent modification. Social science has increasingly relied upon the concept of technological dominance, which has been refined and elaborated into what has come to be called "postindustrial theory," in the attempt to explain these new empirical realities. The significance of postindustrial theory lies in its adoption as the prevailing view of social change in Western societies, influencing both the understanding of the process of change and the way in which society engages questions of both progress and development.

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[1]The period following industrialism has generally been termed "postindustrial" and will be referenced in this way throughout this dissertation. However, a number of other characterizations have also been utilized by proponents, including "superindustrial" (Kahn, 1979), "post-capitalist" (Drucker, 1992, 1993), "post-business" (Drucker, 1989b), "Third Wave" (Toffler, 1980, 1990, 1995), "post-history" (Fukuyama, 1989b, 1992), and the "digital age" (Negroponte, 1995).

This chapter identifies the roots of postindustrial theory and presents its architecture in terms of three defining principles—abundance, adaptation and efficiency. These principles, in combination, constitute what will be termed, using Ellul's concept (1964), the "characterology" of postindustrialism.

The Origins of Postindustrial Theory

Throughout the greater part of the industrial era, resources, technology and space were conceptualized in physical terms. Space was defined geographically, with a focus upon physical configurations and core/periphery relationships. Production and technological systems were understood in terms of tangible goods and capital equipment. Resources, also, were conceived as physical inputs to society and its production processes. The realm of urban and economic interactions, supported by technological and resource bases, was circumscribed by the issues and realities of physical proximity for the production and exchange of primarily tangible goods. Industrial urban areas developed at the intersections of natural resource sites and viable transportation pathways, in sharp contrast to the hinterland, which remained relatively isolated from the processes and manifestations of industrialization. Thus, space served as a crucial concept in the comprehension of societal interactions, and the relationships among physical entities dominated industrial structures and conceptual frameworks.

By the middle of the twentieth century, this definition of space and developmental processes in physical terms became viewed as not only limiting conceptually, but was challenged as inaccurate for understanding contemporary phenomena. Doubts were initially voiced within a branch of economics which has evolved into the field of regional science.

Perroux (1950) examined the everyday concepts of space utilized in modern life, challenging the banal sense of space which "creates the illusion of the coincidence of political space with economic and human space" (1950: 90). According to Perroux, such illusions must be recast and reconceptualized to accommodate the reality of the "delocalization" of economic activity. Economic spaces are no longer local; rather, such spaces are abstract and are defined by the relations among economic elements, which are not reducible to physical or political boundaries. Perroux proposed that the concept of space could no longer be captured in physical or even social terms. Instead, in the contemporary economic and technological order, social activities should be understood as only incidentally spatial in character. Perroux's argument can be extended to resources and technology, which have likewise been historically understood primarily in terms of banal space, but in reality are framed by the existing and ever-changing relationships among their components.

The Process of Postindustrial Transition

Independence from social and physical specification and limitation, found in Perroux and the regional science school, has been embraced and elaborated into modern concepts of social progress. Throughout the social sciences, an emphasis on technological development as the engine of progress and the determinant of social structures has found expression. Foretelling systematic postindustrial theory, anthropologist Leslie A. White (1943, 1959, 1969) examined the development of culture, proposing that it is, in reality, a function of the relationship between energy and technology. The driving principles of abundance,

efficiency and adaptation form the foundation of White's theory of social progress or, in his terms, cultural evolution.

White laid the foundation for his theory of cultural change by utilizing the concept of basic needs, distinguishing between those that can be addressed internally and those which must be met through external sources. Along similar lines, he identified energy resources as human, in which energy can only be increased through the application of technology, and non-human, which encompassed the harnessing of natural energy sources. According to his premise, cultural evolution gained its start when energy was extended beyond inherent human capabilities through the utilization of technological means to access non-human energy. Culture, or the form and extent of the satisfaction of human needs, is then the product of energy utilized and the technological means by which it is consumed, or $E \times T = P$ (*energy* utilized per capita per time unit times *technological* means for expending energy equals *production* of goods and services per time unit). The development of culture is predicated upon the increase in energy utilized, the improvement in efficiency of the mechanical or technical means, or both.

> *(T)he* law of cultural evolution: *culture develops when the amount of energy harnessed by man per capita per year is increased; or as the efficiency of the technological means of putting this energy to work is increased; or, as both factors are simultaneously increased.* (White, 1943: 338) (italics in original)

At the most basic level, culture is the means by which security and survival are ensured, and culture advances only as more energy is harnessed and put to human use.

> The human struggle for existence expressed itself in a never-ending attempt to make of culture a more effective instrument with which to provide security of life and survival of the species. And one of the

> ways of making culture a more powerful instrument is to harness and to put to work within it more energy per capita per year...In the case of man, the biological urge to live, the power to invent and to discover, the ability to select and use the better of two tools or ways of doing something—these are the factors of cultural evolution. (White, 1943: 339)

White proposed that cultural evolution is marked by revolutions within the technological and institutional spheres. According to his analysis, the process of cultural development evidences periods of conflict between technological and institutional systems, which is resolved when one system eventually exerts greater force than the other, thus forcing accommodation to its requirements. In the event that the technological system overcomes the institutional, cultural development can proceed, fueled by increasing quantities of energy, and generating new institutional arrangements. Should the institutional system circumscribe or restrict technological development, however, cultural advance is impeded and can only be recommenced through the injection of sufficient amounts of energy to ultimately undermine the institutional constraints. Although there is a degree of interaction between the two and social systems condition technological systems, White maintained that "technological systems engender social systems rather than the reverse" (White, 1943: 347), and society progresses only as institutional structures yield to technological demands.

White proposed more than half a century ago that culture had, at that time, experienced one complete revolution, and that human history had advanced as far as the second stage of a second. The first revolution experienced initially a technological stage, from a nomadic life based upon a wild food economy to a sedentary life with an economic system based upon agriculture and animal

husbandry. The second stage was predicated upon the first, evidencing the transformation from a tribal to a "civilized" society. As productivity increased, thus advancing cultural development, new types of social arrangements became possible. The division of labor, the establishment of a market system, and the development of a class structure were the logical outcomes of the efforts to devise a social system appropriate to technological capacity. Once the existing technologies had reached maximum efficiency, however, either new technologies or new energy resources had to be identified and developed in order for culture to advance. The beginning of the second revolution, then, was founded upon the interaction of new machine technologies powered by energy in the form of fuel. These two elements combined to yield heightened levels of productivity which furthered the development of culture.

Upon the foundations of this first revolutionary cycle, the present revolution is demonstrating the same patterns, marked by technological change as the first stage, followed by the current period of institutional adjustment. The technological stage of the second revolution, characterized by industrialization, was ushered in by the steam engine and the utilization of coal and oil as new energy sources. The challenge has thus been made to the social system of the previous era, which must ultimately succumb to the Power Age and forge new types of social relations.

> The Industrial Revolution has run its course, and we are now entering upon the second stage, one of profound institutional change, of social revolution. Barring collapse and chaos, which is of course possible, a new social order will emerge. It appears likely that the human race will occupy the earth for some million years to come. It seems probable, also, that man, after having won his way up through

> savagery and barbarism, is not likely to stop, when at last he finds himself upon the very threshold of civilization. (White, 1943: 350)

As underscored throughout the discussion, the key to the future lies in the energy situation, and civilization will be enabled to flourish provided that new and increasing sources and per capita levels of energy can be harnessed and utilized through appropriate technological means.

The Initial Postindustrial Framework

As a shift to new economic and technological structures has been promoted and cited by many social commentators, both a great deal of speculation regarding the future forms and characteristics to be assumed by society and a continuous assessment of current trends have been engendered. One of the most noted and influential analysts has been Daniel Bell, who has been involved for over three decades in examination of the structural characteristics of what he termed "postindustrial society" as it undergoes the process of transformation from the old, industrial system to new service and technologically-based patterns.

In 1965, Bell was appointed chair of the Commission on the Year 2000, which was created by the American Academy of Arts and Sciences to assess the consequences of current policy decisions, identify issues and problem areas anticipated for the year 2000 and explore alternative futures and methods of forecasting. Members of the Commission represented a wide range of interests and experience, and were brought together to provide a broad base from which to consider the potential societal configurations which would characterize the beginning of the new millennium. In the words of the chair, this work was viewed as critical in both significance and immediacy.

> (T)he world of the year 2000 has already arrived, for in the decisions we make now, in the way we design our environment and thus sketch the lines of constraints, the future is committed...The future is not an overarching leap into the distance; it begins in the present. (Bell, 1967c: 1)

Bell's understanding of the potential and the future of postindustrial society went far beyond its incorporation in the findings and forecasts of the Commission, for it has provided a foundation for subsequent inquiry into the nature and manifestations of postindustrialism which has continued into the present. The characterology of postindustrial society and the projections regarding the path of development constructed by Bell have formed a basis of analysis that has influenced the major disciplines of social science including economics, political science and sociology. It has also had wide-ranging impacts on national policy, perhaps most critically in the area of urban policy. Bell's ideas undergird the findings of the President's Commission for a National Agenda for the Eighties, appointed at the beginning of the decade to assess current societal conditions, identify probable changes during the decade and propose policy to guide the nation during this time. Bell served as a member of the Commission, and his ideas were accorded national legitimacy through the adoption of his framework by the Commission for the evaluation and development of recommendations concerning postindustrial conditions, issues and policy implications.

Bell's work has had a longstanding and pervasive influence on both social inquiry and policy development, and his framework is clearly apparent in much of contemporary social evaluation and forecasting. As the foundation for analysis of the development of postindustrial conceptualizations, Bell's theories and

assessments of change in society will be presented in some detail. Subsequent theoretical analyses will then be addressed.

Systematization of Postindustrial Theory: Sources of Change

In his early work with the Commission on the Year 2000 (1967c), Bell specified four major sources of change which are driving postindustrial development and altering social structures. The first is technology, which not only provides the means for mastering nature and transforming resources but creates new constraints and imperatives. Bell acknowledged that technology is significant in its social and economic consequences pertaining to everyday life, but he proposed that its effects are of greatest impact on the structure of intellectual life and the structure of organizations. According to his analysis, the conception of technology itself is changing, and is increasingly characterized as finding a basis in "intellectual" rather than machine applications.

> Technology is not simply a "machine," but a systematic, disciplined approach to objectives, using a calculus of precision and measurement and a concept of system that are quite at variance with traditional and customary religious, aesthetic, and intuitive modes. Instead of a machine technology, we will have, increasingly, an "intellectual technology" in which such techniques as simulation, model construction, linear programming, and operations research will be hitched to the computers and will become the new tools of decision-making. (Bell, 1967c: 5)

The development of economic and social arrangements appropriate to new technological capabilities will thus present a range of issues and challenges for human society during the years ahead.

The second major source of change is the diffusion of goods and privileges throughout society. Diffusion is understood to herald the realization of

the goal of equity, as growing numbers of individuals and groups increasingly demand and gain access to both material goods and social rights formerly attainable only by the few. As diffusion occurs, it is accompanied by alterations in the scale and size of institutions, resulting in the redefinition of institutional characteristics.

Bell explored this phenomenon further in other works (1967b, 1973), proposing that the rate of diffusion has been radically affected by advances in communication which impact not only expectations, but provide a vehicle for the mobilization of interests. Although in many realms technical criteria will become increasingly important in decisionmaking, the "social map" of a country is dependent upon the value system of society. Social demands cannot be addressed in terms of technical or rational criteria, but must be mediated through the political system. Value conflicts will rise not only from growing numbers and awareness of disparate preferences, but also as a result of the process of defining social choices through attempts to accommodate diverse values. Such conflicts will serve to increase the complexity of decisionmaking and broaden the arena of power. Diffusion will necessarily be accompanied by institutional change, as institutions are forced to meet growing demands and confront new challenges.

> (C)hanges in number also mean a change in scale. Increases in size change the nature of organizations, give rise to multiple hierarchies, introduce new problems of coordination, and pose new questions of order and planning. (Bell, 1967b: 112)

Anticipating the types of change that will be engendered by the diffusion of goods and privileges is thus dependent upon the identification of the social claims which will come to the forefront.

A third source of change is found in structural developments. One of the key structural changes is the national character of society, which encompasses

not only the centralization of the political system, but its ascendance, with the market, as a key locus of decisionmaking. The other major structural change is the transformation to a postindustrial state, in which the basis of the economy is shifting from goods to services and the locus of innovation is shifting from the industrial sector to intellectual institutions. These structural changes raise issues of the means of access to social position, the reorientation of social structures to new primary institutions, the increasing need for the development of human rather than financial capital, and the compatibility of technocratic decisionmaking with political structures.

The final source of change is the relationship of nations to each other, and especially that of the United States to the rest of the world. International relationships include technological, political and social factors. The preceding quarter of a century was strongly influenced by World War II, the growing number of nations that have emerged since its end, and the political and military position of the United States in the Cold War. Bell proposed that critical areas for the present and future include the problem of détente in a nuclear age, the growing discrepancy between rich and poor nations, the political divisiveness of racial issues, and technological and moral changes in the balance of power.

Bell explained that of crucial significance in the coming years regarding all of these changes are the kinds of social arrangements needed to deal with the problems of a communal society in which the public sector assumes an increasing role, institutional changes and social restructuring, and the disjunction between culture and social structure. As society becomes increasingly technocratic and more

functionally organized, the cultural elements of society emphasize opposing demands for individualism and the enhancement of the self.

The Dimensions of Postindustrial Change

Technology, the diffusion of goods and privileges, structural developments and international relationships all serve as agents for societal change. Bell explained that the transitions currently in evidence involve the transformation from a manufacturing to a service economy, from material or political position to knowledge as the source of power, and from empiricism to theory as the basis of that knowledge. These transitions have promoted change in the social structure along five dimensions: the change from the production of goods to an economy based upon services; the growth of the professional and technical class; the centrality of theoretical knowledge; the control and planning of technological change; and the growth of a new intellectual technology to manage the "organized complexity" (1973: 28) of postindustrial society.

The primacy of the service sector is evidenced by increasing levels of service employment, as well as by the growth of white-collar workers and professional and technical positions as a proportion of total employment. Just as the occupational structure will shift to meet growing demands for the production of services and information, so will the character of desired knowledge shift from empirical to theoretical in nature. The university will replace the business firm as the central innovator of society, and the government will assume an expanded role in the acquisition and utilization of technical knowledge for planning and decisionmaking. The professional and technical workforce will increasingly utilize

an "intellectual technology" appropriate to new functions and the accommodation of the escalating complexity and quantity of information.

> To say that the major institutions of the new society will be intellectual is to say that production and business decisions will be subordinated to, or will derive from, other forces in society; that the crucial decisions regarding the growth of the economy and its balance will come from government, but they will be based on the government's sponsorship of research and development, of cost-effectiveness and cost-benefit analysis; that the making of decisions, because of the intricately linked nature of their consequences, will have an increasingly technical character. The husbanding of talent and the spread of educational and intellectual institutions will become a prime concern for the society; not only the best talents, but eventually the entire complex of social prestige and social status, will be rooted in the intellectual and scientific communities. (Bell, 1967a: 30)

As the universities become the central innovative institutions, they will assume the role of the "gatekeepers" of society. Class position will increasingly be determined by the criteria of intellectual accomplishment, authority, and status conferred by peers, which marks the new meritocracy. The centrality of the university in the new order will necessarily prompt changes throughout society, for "in this situation a new kind of American city may emerge with a society and an intellectual life considerably different from any that exist presently" (Bell, 1967c: 375).

The postindustrial society, according to Bell, will result from changes in the economic base, which necessarily are affected by, and effect changes within, existing structural arrangements. As social structures undergo these changes, stresses and tensions are to be anticipated. The processes of planning and decisionmaking will serve to accentuate value conflicts as society becomes more

national in character and government preempts the market in decisionmaking. One of the major issues in society will therefore be the effective mediation of technical/rational means with diverse societal values and preferences. Moreover, technology is serving to shape and sharpen political demands, as communication advances foster the accessibility of information and the pace of production intensifies pressure for the diffusion of goods and privileges. The possessions of the few will increasingly be demanded by the many, in terms of both material goods and social claims. As society becomes more "communal," the drive for equality will affect the size, scale and structure of institutions. Organizational changes, in combination with the nationalization of society and the internationalization of technology, markets and organization, will support and reinforce the tendency toward technocratic decisionmaking and control.

Elaboration and Specification of Postindustrial Theory

Bell's conceptualizations of the postindustrial society have been adopted and expanded by a number of social commentators during the past three decades. As exemplified by Toffler, one of the most prolific and comprehensive theorists of what he calls the "Third Wave," postindustrial proponents have argued that the very foundations of society—technological, economic, social and cultural—are undergoing fundamental transformation.

> Every civilization operates in and on the biosphere, and reflects or alters the mix of populations and resources. Every civilization has a characteristic techno-sphere—an energy base linked to a production system which in turn is linked to a distribution system. Every civilization has a socio-sphere consisting of interrelated social institutions. Every civilization has an info-sphere—channels of communication through which necessary information flows. Every civilization has its own power-sphere.

> Every civilization, in addition, has a set of characteristic relationships with the outside world—exploitative, symbiotic, militant or pacific. And every civilization has its own super-ideology—a kit of powerful cultural assumptions that structure its view of reality and justify its operations.
>
> The Third Wave, it should now be apparent, is bringing revolutionary and self-reinforcing changes at all these different levels at once. The consequence is not merely the disintegration of the old society but the creation of foundations for the new. (Toffler, 1980: 349-350)

According to postindustrialists, this change is not an extrapolation of the past, but rather represents entirely new configurations from which patterns are beginning to emerge.

> Today, behind the confusion of change, there is a growing coherence of pattern: the future is taking shape...This Third Wave of historical change represents not a straight-line extension of industrial society but a radical shift of direction, often a negation, of what went before. It adds up to nothing less than a complete transformation at least as revolutionary in our day as industrial civilization was 300 years ago. (Toffler, 1980: 349)

This transformation does not imply that all activities and interactions are replaced or superseded by new forms. Rather, it represents an alteration in the locus of change, which then permeates all aspects of society. Pre-existing relationships are altered as different means and manifestations of organization are introduced and create new organizational structures. Growth in one area does not mean a mere increase in quantity and thus more of the same, but promotes a realignment of interrelationships.

> The postindustrial society is not a projection or extrapolation of existing trends in Western society; it is a new principle of social-technical organization and ways of life...Postindustrial developments do not replace previous social forms as "stages" of social

> development. They often coexist, as a palimpsest, on top of the others, thickening the complexity of society and the nature of social structure. (Bell, 1989: 167)

Postindustrial society will continue to rely upon certain tasks and activities of preceding eras, including the extractive industries such as farming, mining, fishing and timber which characterized the preindustrial period, and the fabrication or production of goods through the application of energy to machines that was evidenced in the industrial age. In postindustrial society, organization is marked by processing, control and information activities, and new services are added to the existing complex of personal and domestic services introduced in the preindustrial society and the industrial support services that arose in the following era. These new types include human and professional services, both of which necessitate an expansion of higher education and the diffusion of abstract conceptual, technical and alphanumeric skills. Theoretical knowledge dominates the realm of innovation in terms of both new knowledge and continuing functions such as the production of economic goods and services.

> In the past, employers sought to accelerate production through the speedup of the workers...Under the new system of wealth creation, however, hands-on labor costs plummet as a percentage of overall cost, and speed is gained not by sweating the work force but through intelligent reorganization and sophisticated electronic information exchange. Knowledge substitutes for sweat... (Toffler, 1990: 237)

The nature of business has changed, reflecting enhanced professionalization, increasing scale, and a shift in the power base.

> In emerging post-industrial societies, even those engaged in primary and secondary activities find themselves closer to white collar tertiary activities than to the traditional primary and secondary blue collar interactions with and against nature or materials. The society

> is...characterized by organizational and professional pluralism, particularly in the distribution of power and prestige...Its business activities may be dominated more by transnational corporations than by purely national corporations or indigenous individual proprietorships. The emphasis is on the "knowledge" industries and the growth of bureaucratic and intellectual elites. (Kahn, 1979: 13)

Knowledge imparts meaning to all endeavors as it transforms data into information, requiring education, skill and specialization.

> Information is data endowed with relevance and purpose. Converting data into information thus requires knowledge. And knowledge, by definition, is specialized. (Drucker, 1989a: 209)

Organizations of all types are becoming increasingly characterized by their production of information and their use of knowledge. This, in turn, not only alters the nature of work, but creates change throughout organizations.

> (T)he business, and increasingly the government agency as well, will be knowledge-based, composed largely of specialists...Large organizations will have little choice but to become information-based. Demographics, for one, demands the shift. The center of gravity in employment is moving fast from manual and clerical workers to knowledge workers...Economics also dictates change, especially the need for large businesses to innovate and to be entrepreneurs. But above all, information technology demands the shift...(A)s advanced technology becomes more and more prevalent, organizations have to engage in analysis and diagnosis—that is, information...As soon, however, as an organization takes the first tentative steps from data to information, its decision processes, management structure, and the way its work gets done begin to be transformed. (Drucker, 1989a: 207-208)

The economy, once based upon the production of goods, is increasingly characterized by information and information services as "bits" replace "atoms" (Negroponte, 1995) as the basis of exchange. The scale of economic activity is no longer local, regional, or even national—it is borderless and encompasses the globe.

> (T)he rapid dispersion of technology, the explosive growth of the FX empire—in short, the cumulative, relentless flow of information around the globe—has taken years to alter the landscape long familiar to corporate strategists. But it has done its work well. Today if you look closely at the world Triad companies inhabit, national borders have effectively disappeared and, along with them, the economic logic that made them useful lines of demarcation in the first place.[2] (Ohmae, 1990: 172)

What is most crucial to economic development is the willingness and skill to participate in the world economy, and the recognition that place and physical resources are no longer the defining characteristics of economic activity.

> We have to accept the fact that, for developing and developed economies alike, for Canada and Australia as well as for Brazil and the OPEC nations, natural resources are no longer the key to wealth. We have to accept that national borders have little to do any longer with the real flows of industrial activity. We have to accept that information and knowledge—a trained and literate population, not military hardware—are the real sources of strength.[3] (Ohmae, 1990: 193)

The centrality of information has been one of the hallmarks of postindustrial theory and the society that it portrays. Current postindustrial literature strongly emphasizes the role and potential of information in postindustrial society, most recently apparent in the significance ascribed to the transmission of that information through cyberspace. Cyberspace, manifested through networks such as the Internet, has been credited with enhancing knowledge, creativity, community, and democracy, and the revolution ushered in by computer theory and

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[2]Ohmae utilized "FX" to denote "foreign exchange," and the "Triad" refers to the United States, Japan, and Europe.

[3]"OPEC" represents the Organization of Petroleum Exporting Countries, a consortium of primarily Middle Eastern nations engaged in the production of oil.

technology signifies "nothing less than the dawn of the next level of civilization" (Robertson, 1998: 6).

> More ecosystem than machine, cyberspace is a bioelectronic environment that is literally universal: It exists everywhere there are telephone wires, coaxial cables, fiber-optic lines or electromagnetic waves. This environment is "inhabited" by knowledge...existing in electronic form...Cyberspace is the land of knowledge, and the exploration of that land can be a civilization's truest, highest calling. The opportunity is now before us to empower every person to pursue that calling in his or her own way. (Progress and Freedom Foundation, 1994: 2-3)

Information technology enthusiasts proclaim that cyberspace allows for the creation of "virtual communities" (Rheingold, 1987) and "electronic neighborhoods" (Progress and Freedom Foundation, 1994) in which people relate to each other on the basis of common interests rather than physical proximity. This technology is credited with the potential to foster both personal and economic interaction and facilitate cooperation on a global scale (Naisbitt, 1994, Mitchell, 1995), empower individuals (Negroponte, 1995, Naisbitt, 1994), celebrate diversity (Progress and Freedom Foundation, 1994), and impact all arenas of life as it creates new structures and interrelationships.

> Cyberspace is not a surrealistic future that we confront, it is already upon us. The global economy is being shaped by it...(C)yberspace is not an abstraction—simply expressed, it is the society and culture of a people who are individually empowered by digital connection. The digital connection that enables cyberspace is ubiquitous and non-hierarchal. The result is an abundance of information, readily available, with an economy characterized by its low barriers to new entrants, and diminished economies-of-scale. What is important about the requisite infrastructural change is the conversion from analog to digital...Dynamic competition, among new and different industries and technologies, will replace the static competition of the industrial age. (Keyworth, 1997: 7)

Far from the threat of alienation or isolation, the Internet will multiply the possibilities and enhance the quality of human interactions and development.

> The Net is not going to push us into some antiseptic, digital landscape. It is a medium for us to extend our intellectual and emotional selves...(T)he Net will celebrate human nature and human diversity...Precisely because there will be so much information, so much multimedia, so many options, people will learn to value human connections more, and they will look for it on the Net as they do in other places. (Dyson, 1998: 8)

The contemporary postindustrial framework continues to echo and elaborate the defining characteristics initially espoused by Bell (1967a, 1967b, 1967c, 1973): the predominance of information and services, the ascendance of knowledge as the source of power and the transference from empiricism to theory as the basis of that knowledge. For over three decades, postindustrialists have championed the increasingly intellectual nature of technology, proclaimed the diffusion of goods and privileges enabled through technology and economic growth, and declared a new global order as the boundaries between people and nations have become more obscure and permeable. Most recently, the introduction of computer technology and its attendant networking capabilities is heralded as a new frontier for exploration and opportunity and as representing the expansion of the possibilities for progress envisioned by postindustrialists.

The Principles of Postindustrialism

The postindustrial paradigm has been built upon a world view that embraces the dominance of technoeconomic structures in guiding and defining social progress. Social well-being has been viewed as an outgrowth of technological progress and productivity, as material growth is seen to elevate the condition of

humanity. This material growth is supported by technological and economic efficiency and the ability of society to adapt to new economic and technological structures. Three defining principles can thus be derived from the postindustrial literature—abundance, adaptation and efficiency. These principles, taken together, form the characterology of postindustrialism.

The Principle of Abundance

The principle of abundance is central to the postindustrial conception of progress. Ever-expanding wealth and productivity promise to bring about rising living standards for all and increasing levels of comfort, well-being and security. The concept of abundance involves economic abundance, or material well-being, and also envisions energy abundance, in the form of resources adequate to meet increasing needs, in order to assure that productivity and other social processes continue and flourish. Integral to the pursuit of abundance, characterized by wealth creation and certain energy supplies, are two driving forces: an ever-decreasing reliance upon nature as the source of human well-being and the realization of societal goals for democracy and equality. Decreasing dependence upon nature not only frees humankind from being victim to its vagaries, but gives man the capacity to control his destiny and in time to control nature itself. Once man is able to focus upon his own resources as the basis of his further development, his well-being becomes increasingly assured, and continuing productivity allows ever-greater independence and self-direction. Humankind will be enabled to engage in intellectual, cultural and recreational pursuits, freed from the drudgery of toil and the uncertainty of meeting basic needs. The farther humanity moves from mere subsistence and competition for scarce resources, the more likely the possibility of

attaining an egalitarian and truly democratic society. The principle of abundance proclaims that the higher the productivity, the greater the possibility for all to enjoy society's bounty in both material terms and social opportunities.

The realization of abundance as the premiere goal and ultimate achievement of society and social progress underlies the future-orientation and optimism of postindustrial theory. Endless growth and productivity are proposed to someday produce universal rewards when economic concerns no longer dominate humankind's attention or energies. A new kind of society and a different structure of social relations will then be made possible. Although the development of a new human purpose and the processes of transition and reorientation of values and goals is expected to be difficult, humankind will at last be able to concentrate upon the development of his moral and spiritual potential as his primary concern.

> The economic problem, the struggle for subsistence, always has been hitherto the primary, most pressing problem of the human race...For the first time since his creation man will be faced with his real, his permanent problem—how to use his freedom from pressing economic cares, how to occupy the leisure, which science and compound interest will have won for him, to live wisely and agreeably and well...It will be those peoples, who can keep alive, and cultivate into a fuller perfection, the art of life itself...who will be able to enjoy the abundance when it comes. (Keynes, 1963: 366-368)

The long-range vision of a more humane and human-centered society in which man will be freed to explore and eventually attain his potential as an individual and social being guides postindustrial theory and provides the foundation for the principle of abundance. Only by rendering questions of economic security obsolete, thus divorcing them from the focus and primary purpose of societal endeavors, will humanity be enabled to flourish. Although the specific

configurations of society are uncertain, the economic and technological potential is vast.

> We do not claim to know much about the long-term outlook for humanity, except that we believe it will probably be incredibly affluent by current standards and that the accompanying technology can give the average individual capabilities that have previously been reserved for gods or magicians. (Kahn, 1979: 21)

Within the next century, not only is massive change expected to be evidenced in the human condition, but the foundation will be laid for the onset of a new era.

> Almost all of humanity will be materially better off. The traditional grinding absolute poverty, famine, pestilence, disease and incapacity, illiteracy, and backbreaking toil, all of which have been humanity's lot throughout history, should be almost gone, and with luck for once and for all...If all goes well, the centuries to come could well be when humanity's true history begins. (Kahn, 1979: 15-16)

These changes will create the conditions for more open and egalitarian social structures, promoting great strides in social justice.

> An expanding economy makes it possible to devote ever greater resources to equalizing opportunities for all Americans to gain access to education, jobs, health care, and other elements of the "good life." (President's Commission, 1980a: 6)

Indeed, the new era represents the possibility of advance in human and social relationships.

> (T)he Third Wave is not just a matter of technology and economics. It involves morality, culture and ideas as well as institutions and political structure. It implies, in short, a true transformation in human affairs. (Toffler and Toffler, 1995: 11)

The use of technology to create increasing levels of wealth enabled a mass consumption society in which the fruits of progress could be enjoyed by

growing numbers of people. This has been heralded as a major move toward not only the attainment of an abundant and affluent society, but as fostering the spread of democracy and equality, which assume various forms including equal access to goods, information and opportunity. More than twenty years ago, Daniel Boorstin (1978) proposed that technological innovations, widely available, reduce disparities of access and promote the convergence of human experiences. Utilizing television as an example, he proclaimed that "the great levelers, broadcast messages and images, go without discrimination into the homes of rich and poor, white and black, young and old" (Boorstin, 1978: 7). In the present context, computer technology has been credited with the capacity to enable individuals to advance beyond the role of recipient through an interactive medium, providing them with the opportunity and ability to disseminate their own thoughts and creative products.

> The teleputer—a revolutionary PC of the next decade—will give every household hacker the productive potential of a factory czar of the industrial era and the communications power of a broadcast tycoon of the television age. Broadcasting hierarchies will give way to computer heterarchies—peer networks in which the terminals are essentially equal in power.[4] (Gilder, 1994: 38)

Communication technology must be available to all, as it is fundamental to not only the goals of equality and access, but to the creation of prosperity through a new economic platform.

> The widest diffusion of communication capabilities is an inseparable part of the new system of wealth creation. The direction is almost inevitably toward what the old Bell phone company called "universal service"—i.e., ubiquity—combined with interactivity, mobility, convertibility, and connectibility. (Toffler, 1990: 364)

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[4] "PC" represents "personal computer."

The material well-being and continuing economic growth which support postindustrial visions of human possibilities are dependent upon both increasing technological capacity and capability and the assured supply of energy to power this advance. Energy has been viewed as both central to, and necessary for, development and will continue to be so.

> When primitive man learned how to make fire, he had discovered controllable energy, which then became a "servant" destined to perform an endless series of "miracles"...This discovery may have been the single most vital factor which allowed mankind to develop modern civilization...There is certainly no question that mankind's future well-being is intimately linked to the prospects for an abundant supply of energy at reasonable prices. (Kahn, Brown and Martel, 1976: 58-59)

The quest for abundant energy to support continuing growth has produced both new sources and increasing quantities over time, and technological innovation is expected to perpetuate this trend well beyond the immediate future.

> The prospect of running out of energy is purely a bogeyman. The availability of energy has been increasing, and the meaningful cost has been decreasing, over the entire span of humankind's history. We expect this benign trend to continue at least until our sun ceases to shine in perhaps 7 billion years, and until exhaustion of the supply of elemental inputs for fission (and perhaps for fusion). (Simon and Kahn, 1984: 25)

Long-run energy security will be attained when eternal or renewable sources are developed or utilized that will provide unlimited and economically feasible supplies of clean energy. Nuclear proponents, such as Alvin Weinberg, have proposed that abundant and cheap power, accessible through nuclear energy, provides nations with not only secure and certain energy supplies, but fosters

decreasing economic dependence and political vulnerability in the international arena.

> What emerges is the outline of an autarkic world—one in which the primary energy source, based on breeder reactors (or, if we are lucky, on fusion reactors), is available to all countries, not only to countries that possess indigenous fossil fuel, or are rich enough to import such fuel from others. (Weinberg, 1971: 416)

Beyond the ability to provide energy for millions of years, nuclear power has been seen as so far-reaching in its potential applications that global social and technological problems could be addressed, material desires could be satisfied, and international stability ensured, but has been promoted as democratic in the feasibility of its implementation.

In the postindustrial vision, technology and economics converge to utilize both human and energy resources in the creation of a prosperous and equitable society. Abundance, in short, is the means to attain the cornucopia of social progress. Participation in this endeavor represents the highest calling of humankind.

> (W)hen you develop new technology, build new goods, and expand the scope of our creative activities, you are on the side of the angels—you are promoting human improvement, and the quality of life. (Simon, in Myers and Simon, 1994: xv)

The Principle of Adaptation

In concert with the principle of efficiency, the postindustrial principle of adaptation supports the processes involved in the creation of abundance by defining the social response to technological and economic change. Within the postindustrial context, technological progress is seen as not only the predecessor and driving force

for social and institutional progress, but identifies the parameters within which such change can occur. In accordance with this dynamic, the appropriate response for social institutions and systems in the development process is understood to be adaptation and accommodation. The desired role of society, then, is defined as one of embracing and encouraging forms and structures complimentary to technological and economic dictates.

> (T)echnology is the basis upon which the cultural system as a whole rests. Secondly, it is the technology of a culture that determines in a general way the form and content of social systems, philosophies, and sentiments. In the system that is culture, technology is the independent variable, the other sectors the dependent variables. All human life, and consequently culture itself, depends upon the material, physical, chemical means of adjustment of man as an animal species, as living material systems, to the surface of the earth and to the surrounding cosmos. This fact is so obvious that to emphasize it would be quite superfluous were it not for the prevalence of theories which rest upon other premises. Society, philosophy, and sentiment are, in effect, nontechnological forms of expression of the basic technological process. (White, 1959: 26)

As technological systems form the basis of society, social interactions and social progress, they demand a supportive form of social organization. Only when social systems reflect the needs of technological systems will progress be evidenced. The role of society is thus to provide an environment congenial to technological growth and productivity.

As one of the primary institutions of society, cities assume a central position in leading society to adapt to different circumstances and must be allowed to change.

> Cities are not permanent; their strength is related to their ability to reflect change rather than to fend it off...Standing at the intersection of virtually all the important shaping forces of an era—demographic,

> economic, political, cultural—cities articulate, and continuously rearticulate, our changing national circumstances...(C)ities serve us better as mirrors than as museums. They must be permitted to reflect changing technological capabilities and social circumstances, rather than be constrained by an attempt to preserve under glass any particular historical combination of them. To attempt to restrict or reverse the processes of change—for whatever noble intentions—is to deny the benefits that the future may hold for us as a nation. (President's Commission, 1980a: 65-66)

In the urban context, technological and economic alterations have redefined the functions of cities, and the advantages historically offered by urban areas are no longer relevant in defining their viability within a different technological framework. Cities must be allowed to redefine their roles, assuming new functions that contribute to productivity and discarding those that do not. Intervention in this process through policy attempting to reverse or redirect the impacts of this transition is seen as ill-conceived and ultimately detrimental.

> Such measures may serve as palliatives which bring temporary relief...But such programs are to be questioned not only because they are wasteful and their benefits destined to be short lived but, more important, because they actually serve to stretch out the unhappy period of transition and impede the readjustment toward the new and more desirable equilibrium. (Baumol, 1981: 12-13)

Cities, as social institutions, will be better off in a shorter span of time if given the opportunity to directly confront and accommodate to the technological and economic forces by which they will inevitably be shaped.

National policy and the government's role in fostering the changes apparent in an era of transition should focus upon accelerating the movement toward expanding the economy and productivity, as "the growth of the nation's economy and the economic future of American cities and urban areas rest on accelerating the

restructuring of the economy" (Committee on National Urban Policy, 1983: 181). Whether fostering change or not, social structures will eventually succumb to technoeconomic forces and will be better positioned in the event that such change is welcomed and accommodated.

> Regardless of how inattentive they may be, communities all over the world are being led...toward reforms that are market based, because they are market driven. The power of those market forces may be tempered somewhat from time to time by political decisions, but it is certain they will not be denied.
>
> States and communities (and countries) ought to begin to actively work *with* those market-based forces, recognizing that the ultimate economic security comes from having a more productive and lower-cost venue than can be had elsewhere. (McKenzie, 1997: 160) (italics in original)

New social structures will require a new energy system appropriate to the prevailing technology, production processes, markets and distribution of population.

> (T)he energy problem is not just one of quantity; it is one of structure as well. We not only need a certain *amount* of energy, but energy delivered in many more varied forms, in different (and changing) locations, at different times of the day, night, and year, and for undreamed-of purposes. (Toffler, 1980: 135) (italics in original)

The energy base of the postindustrial society will replace the industrial energy regime which was characterized by finite resources, a restricted number of fuel types, centralized production, and limited options.

> This new base will have characteristics sharply different from those of the Second Wave period. For much of its supply will come from renewable, rather than exhaustible sources. Instead of being dependent upon highly concentrated fuels, it will draw on a variety of widely dispersed sources. Instead of depending so heavily

> on tightly centralized technologies, it will combine both centralized and decentralized energy production. And instead of being dangerously over-reliant on a handful of methods or sources, it will be radically diversified in form. This very diversity will make for less waste by allowing us to match the types and quality of energy produced to the increasingly varied needs. (Toffler, 1980: 136)

Energy will be available from a multitude of sources and will utilize a number of technologies for its production and use. End-use energy will increasingly be delivered in the form of electricity in the spaceless electronic society of the postindustrial age.

Postindustrial theory posits that the baseline from which to gauge human and social well-being is abundance. Goals for performance in wealth creation and productivity then serve to circumscribe political, social and economic policy within the framework of the dominant technoeconomic forces. In the present context, the digital economy is viewed as demanding a much more free and unfettered environment.

> The pace of technological development and the borderless environment created by the Internet drives a new paradigm for government and private sector responsibilities. Creating the optimal conditions for the new digital economy to flourish requires a new, much less restrictive approach to the setting of rules. (U.S. Department of Commerce, Secretariat on Electronic Commerce, 1998: 50)

According to postindustrialism, social institutions must follow and reflect technological structures. Individuals, as well, must adapt or be left behind.

> Although not all Americans need enter the electronic age, it's a fair bet that many Americans, even the poor, must. They *must* because they *must* meet the competition from all those other people who are taking advantage of the available opportunities in the new West. I suspect that Americans in all income brackets will continue to face

> the challenges of the vital forces at work. The genie is out of the lamp. That is fact...Stuffing the genie back in the lamp is simply not an option. (McKenzie, 1997: 135) (italics in original)

There is no turning back and there is no standing still. Individuals, cities, energy systems, governments and private interests must all face the new realities and move forward to join the onward march of progress.

The Principle of Efficiency

The principle of efficiency defines the means of accumulation and the driving force of maximum productivity which support and promote the goals of abundance. This principle relies upon technological efficiency in which technology is accorded the capacity to identify and utilize the most productive means, and its economic counterpart which seeks the minimization of costs and the maximization of benefits.

Central to the concept of economic efficiency is the operation of the free market, or the practices of capitalism. According to proponents, capitalism encourages competition, rewarding those that can produce more with less and those that produce the goods most desired in the marketplace, eliminating those that lag behind. The "invisible hand of the market" thus identifies the most efficient, hence most productive, operations, supporting those that contribute to the goals of abundance. Technological efficiency encompasses the most effective means of production and organization, fostering decreasing inputs for ever-increasing levels of production, distribution and consumption. In tandem, technological and economic efficiency represent the means by which to assure growth in productivity.

Daniel Bell (1973) defined efficiency as the "economizing mode" evidenced throughout the economic, technological and occupational systems which comprise the social structure of society.

> Economizing is the science of the best allocation of scarce resources among competing ends; it is the essential technique for the reduction of "waste"...the conditions of economizing are a market mechanism as the arbiter of allocation, and a fluid price system which is responsive to the shifting patterns of supply and demand...The words we associate with economizing are "maximization," "optimization," "least cost"—in short, the components of a conception of rationality. (Bell, 1973: 275)

Rationality in all aspects of life is a hallmark of visions of postindustrial society. A new era of efficiency is proclaimed to be at hand, which will be realized through innovations in management, organization and social interactions.

> Everyone accepts the fact that modern technology, which is at the heart and soul of the reorganization of the world economy, has forced firms to become more competitive, to restructure, to become more cost-effective. A growing number of people recognize...that the forces of technology and capital flows are forcing governments to cap their growth and to become more cost-effective. Now, people must realize that those same forces at work on firms and governments are at work on all social structures, including...groups and whole societies. Groups must accept the fact that rules matter; behavior of their members matter to the long-term survival and prosperity of the groups. They must realize that those groups who develop cost-effective rules and are able to sustain them will prosper, while other groups will languish. (McKenzie, 1997: 221)

The free market and the dynamics of competition are nowhere more evident than in the arena of cyberspace, which is increasingly geared toward more specialized demands of consumers, changing production processes and the fast pace of innovation.

> With technological progress opening new ways to serve yesterday's markets, one-time monopolies are being replaced by competitive battlegrounds. Even where monopolies do emerge, the pace of technological change is threatening to make them short-lived. This is true not only for digital technology, but for all the goods and services in cyberspace...(T)he very nature of competition in cyberspace is different...(T)he dynamic competition of cyberspace, where different industries with different technologies compete to meet customer's needs...allows competing technologies and new products to challenge the old ones and, if they really are better, to replace them. (Keyworth, 1997: 4)

In the postindustrial information age, the technological system itself is undergoing rapid change as innovation in technological infrastructure yields not only higher performance but productive efficiency.

> In all eras, companies tend to prevail by maximizing the use of the cheapest resources. In the age of the fibersphere, they will use the huge intrinsic bandwidth of fiber, all 25,000 gigahertz or more, to simplify everything else. (Gilder, 1997: 9)

An efficient society is free from constraints and pursues profits and productivity wherever an opportunity exists. As proposed by Perroux (1950) a half century ago, in this type of economically-oriented arrangement, physical or political space is of no consequence. Economic space reigns and the primary force in the economy is the human mind.

Information and knowledge are not only the keys to prosperity—they are the means through which efficient operations are identified and realized.

> The caterpillar has turned into a butterfly. The critical assets of companies are no longer steel and buildings. They are more often than not the information and the brainpower at the companies' disposal for creating the quintessential company asset—good ideas for doing things better, faster, cheaper, and more profitably at the most favorable location on earth. (McKenzie, 1997: 152)

Efficiency encompasses the concepts of raising productivity and lowering costs or inputs. Technological innovation has enabled the substitutability of knowledge for other, physical inputs.

> Knowledge is a substitute for both resources and shipping...Nothing illustrates the substitutability of knowledge for other resources (better) than the recent breakthroughs in superconductivity, which at a minimum will drive down the amount of energy that now must be transmitted for each unit of output...Superconductivity can slash that loss. (Toffler, 1990: 87)

Knowledge also impacts the production process by reducing time demands, which are critical to overall productivity, particularly in the current economy.

> In addition to substituting for materials, transportation, and energy, knowledge also saves time. Time itself is one of the most important of economic resources, even though it shows up nowhere on a company's balance sheet. Time remains, in effect, a hidden input. Especially when change accelerates, the ability to shorten time—for instance, by communicating swiftly or by bringing new products to market fast—can be the difference between profit and loss.
>
> New knowledge speeds things up, drives us toward a real-time, instantaneous economy, and substitutes for time expenditure. (Toffler, 1990: 88)

Postindustrial society, according to proponents, is an efficient society. Nowhere is this more evident than in the expansion of computer power which, concurrently, has reduced demands for other resources.

> Output has continued to rise with the growth in computer power, with the speed of available personal computers increasing by a factor of five or six during the time this book was to be turned from manuscript to printed pages. The downsized production processes, all requiring progressively less energy and material inputs, including iron and oil, have effectively freed up land and known oil reserves and iron deposits for doing things other than expanding farms and

> building larger factories, pieces of machinery, and mainframe computers. In a meaningful sense, computers have become modern oil derricks... (McKenzie, 1997: 115-116)

The massive quantities of land, materials and other resources committed to the productive capacities of the industrial era are, essentially, being returned to society by the efficiency and productivity of the computer age. The postindustrial era, built upon an infrastructure of computers and networks, and utilizing knowledge as its primary input, is argued by proponents to have altered the economic landscape. According to postindustrialists, technology and the economy have converged to foster competition, flexibility and rationality, giving rise to an efficiently functioning marketplace.

The Period of Transition

Underscored throughout postindustrial theory is the uncertainty and challenge of navigating and mastering the process of transition. While long-term projections are positive, optimistic and full of promise for society, and the means of getting there are outlined by the principles of abundance, adaptation and efficiency, the impediments and difficulties of adhering to the principles and managing successfully to avoid distraction from the ultimate goals of society are of vital concern.

The process of transition to a postindustrial state is understood by postindustrial advocates to be difficult and uncertain; uncertain both in terms of its eventual outcome and dimensions, and in terms of the influence of policy, government and human response to the challenges of adjustment. The postindustrial society will be a new state, with as yet somewhat obscure outlines.

> (T)wo things cut through everything as the Third Wave thunders in our ears. One is the shift toward a higher level of diversity in society—the de-massification of mass society. The second is acceleration—the faster pace at which historical change occurs. Together these place tremendous strains on individuals and institutions alike, intensifying the super-struggle as it rages about us.
>
> Accustomed to coping with low diversity and slow change, individuals and institutions suddenly find themselves trying to cope with higher diversity and high-speed change. The cross-pressures threaten to overload their decisional competence. The result is future shock.
>
> We are left with only one option. We must be willing to reshape ourselves and our institutions to deal with the new realities.
>
> For that is the price of admission to a workable and decently humane future. (Toffler, 1980: 360-381)

Stressed by postindustrial advocates is the proposition that the transition to this new state is the central issue and circumstance of our time. Society has not arrived at this new state, but is rapidly moving toward it. What is certain is that this movement is away from the industrial order.

> The vast majority of people in the world share our vision of a complicated, complex, probably somewhat dangerous transition period which, on the whole and always barring bad luck or bad management, will be marked by rising living standards and less rather than more sacrifice. Eventually almost all of the problems will be dealt with satisfactorily...and true post-industrial society will emerge. (Kahn, 1979: 240)

The specific configurations of the emerging society remain somewhat unclear, but there is an optimism among postindustrialists that predictions will be supported and a "more decent and democratic" (Toffler, 1980: 350) civilization will

be realized. In order to get to "there" from "here," however, all must do their part in facilitating the transition process.

> Nothing "post" is permanent or even long-lived. Ours is a transition period. What the future society will look like, let alone whether it will indeed be the "knowledge society" some of us dare hope for, depends on how the developed countries respond to the challenges of this transition...period—their intellectual leaders, their business leaders, their political leaders, but above all each of us in our own work and life. (Drucker, 1993: 16)

The benefits of a postindustrial society envisioned by its advocates are expansive, inclusive and liberating. In essence, postindustrialism offers society a deal—to bear with the dislocations and make the necessary adjustments in order to realize untold prosperity and contentment at some point in the future. Hopes are bright for the future and current conditions are a small price to pay.

> Often, as Second Wave institutions crash about our heads, as crime mounts, as nuclear families fracture, as once reliable bureaucracies sputter and malfunction, as health delivery systems crack and industrial economies wobble dangerously, we see only the decay and breakdown around us. Yet social decay is the compost bed of the new civilization. In energy, technology, family structure, culture, and many other fields, we are laying into place the basic structures that will define the main features of that new civilization.
>
> In fact, we can now for the first time identify these main features and even, to some extent, the interrelationships among them. Encouragingly, the embryonic Third Wave civilization we find is not only coherent and workable in both ecological and economic terms, but—if we put our minds to it—could be made more decent and democratic than our own. (Toffler, 1980: 350)

Empirical Implications

The specification, refinement and projections of postindustrial theory during the latter half of the twentieth century provide fertile ground for empirical exploration and analysis. From Bell's (1967a, 1967b, 1967c, 1973, 1989) original framework to the more recent claims of human improvement voiced by Simon (Simon and Kahn, 1984; Myers and Simon, 1994), McKenzie (1997), Toffler (1980, 1990; Toffler and Toffler, 1995), Kahn (1979; Kahn, Brown and Martel, 1976; Simon and Kahn, 1984) and others, postindustrial proponents have predicted specific manifestations of change. Driven by technological and economic forces, change will be evidenced in the movement toward a society based on services and information, spatial restructuring, the dominance of electricity as the primary source of end-use power, and the prevalence of computers and information technology. The empirical implications of these claims will be outlined below in accordance with the postindustrial principles of abundance, adaptation and efficiency.

The principle of abundance serves as the foundation for the emergence of the new society. Postindustrialists have portrayed the abundant society as one in which increasing wealth and productivity will yield rising living standards, increasing levels of well-being and security, the diffusion of goods and privileges and dependable supplies of energy.

The principle of abundance, in the urban realm, can be stated as follows.

- In the near term, urban fortunes can be expected to falter. In the near and longer terms, national fortunes will improve and society, as a whole, including its current urban communities, will be better off.

In the social and urban arena, postindustrialists have forecast specific manifestations as society navigates the transition. Society will be characterized by the production

of services and information, fostering corollary growth in service employment and the percent of the labor force engaged in white-collar, professional and technical positions. National income will increase and all segments of society, including urban areas, will evidence rising economic well-being.

In energy terms, the abundance principle can be stated as below.

- Postindustrial society will increase its reliance on electricity because of its technological versatility. Technology intensity will substitute for traditional natural resource intensity.

Postindustrialists have projected that technology will lead to reductions in the use of primary energy and that electricity will dominate as the primary form of end-use power. In the new energy system, dependence upon industrial era fossil fuels, including petroleum and coal, are expected to diminish. Reductions in the use of petroleum, in particular, will foster enhanced levels of energy security and autonomy.

The principle of adaptation supports the attainment of abundance in postindustrial society as social structures make appropriate adjustments to technological and economic dictates, resulting in the creation of an environment conducive to continued growth. Roles will be redefined and all options will be explored.

In the urban and social realm, it is claimed that the more adaptive society is to the forces driving postindustrialism, the easier the transition will be.

- The more adaptive a society is to the postindustrial, post-urban trends—to a service economy and information society—the lower the transition costs. This is especially true for urban communities.

Postindustrial society will be characterized by the growth of service and information jobs, in general, and the demand for educated "knowledge" workers, in particular. As society accrues growing levels of wealth, job security and compensation will be enhanced and social and economic polarization, especially evident in urban areas, will decline. Overall social health and well-being will rise.

Energy adaptation will involve the use of numerous resources as the energy system responds to technological and economic change.

- The fuel mix will change dramatically as the Electric Society makes full use of the complete range of energy options. Nuclear power, in particular, will produce cheap, abundant and, indeed, "eternal" energy.

The Electric Society will be characterized by alterations in the sources and mix of primary energy, and the use of fossil fuels will decline. Electric utilities will reflect these changes as technology introduces new means for electricity generation. Nuclear power will be prevalent, and will provide nearly inexhaustible energy. The flexibility of electricity will support the substitution of activities, such as the growing use of communications in lieu of transportation. Reliance upon electricity will provide the assurance of uninterrupted supplies, and new inputs for its production will yield a decline in negative environmental impacts.

Finally, the principle of efficiency, in conjunction with adaptation, will support the attainment of an abundant postindustrial society. Technological and economic efficiency will foster competition, flexibility and rationality through the workings of the market and will assure growth in productivity. The application of technology will substitute for the input of physical resources.

Urban and social efficiency will be rendered by technology and will lead to new urban configurations as society reaches a postindustrial state.

- Postindustrial technology will lead to a new efficiency revolution that will advance society as it moves beyond its current urban-industrial form. Technology-led efficiency gains will offset any short-term costs to urban communities.

Productivity will rise as a result of technological and economic efficiency. Driven by market forces, urban areas will seek, and eventually attain, a new equilibrium as they assume postindustrial forms and functions and shed the settlement patterns that characterized the industrial era.

Market forces and technology will also produce efficiency gains in the energy system, reducing the intensity of energy use.

- Through sophisticated technology, the Electric Society will be technologically and economically more efficient. New high-technology industries, energy systems and social interactions will be less energy-intensive.

As the leading sector of the economy, the commercial sector will exhibit gains in energy savings and declines in energy intensity. Overall, the postindustrial society will be more efficient in its energy use.

Conclusion

Postindustrial theory provides an understanding of the processes of social change and development that is rooted in the relationship between technology and society. Society will advance and humanity will attain its highest calling, according to postindustrialism, if it adheres to the dictates of the technoeconomic forces that establish a framework for, and drive the processes of, change and social relations. Emerging in the postwar period, postindustrialism has proclaimed that a transition is at hand. Growth in productivity and national wealth will free humankind from the drudgery of toil and the uncertainty of meeting basic needs as

all will be able to enjoy the bounty of an advanced society. In the long-run, productivity growth and national economic security will foster a society increasingly characterized by equality, democracy and social justice as the expanding economy eventually equalizes opportunities and access to goods and information and mediates the social issues and disparities of previous eras. Questions of want will be rendered obsolete, and economic concerns will no longer dominate, having been overcome by technological application and advance.

In this new societal framework, the forms and structures of the age of industrialism will be replaced. The scale of social and economic interactions will be national or international in nature, and the use of computers and information technology will essentially create a borderless world. Interests and commonalities of purpose, rather than physical proximity, will form the communities of the future. The growing realm of cyberspace will be non-hierarchical, offering low barriers to new entrants and dynamic rather than static competition. Dependence upon nature will be reduced and natural resources will no longer be of primary concern. Technological advance will ensure long-term security and stability through the use of eternal/renewable resources which will be unlimited and economically feasible.

Indications of the transformation and the outlines of the coming society are proposed based upon empirical observations of alterations in technological and economic structures. Movement toward an information and service-based society, a shift to knowledge as the source of power and a change from empiricism to theory as the basis of that knowledge, spatial restructuring, electrification and information technology are all identified as evidence that a transformation is underway.

Postindustrial projections anticipate a society that ameliorates the ills of previous eras and marks the beginning of true civilization. In the short-term, however, dislocations are to be expected as social systems adjust to new structures. Although the transformation may prove difficult and uncertain, it is expected that society will evidence less rather than more sacrifice and that problems and dislocations will be dealt with satisfactorily.

The observations, recommendations and predictions of postindustrialism regarding the urban and energy systems will be examined in Chapters 3 and 4, respectively. In each area, challenges were posed to postindustrial theory and in both instances, the response was returned that the disruptions and inequities being evidenced were actually manifestations of transformation to a new age. As discussed at length in the preceding section, postindustrialism has made claims in both the urban and energy arenas regarding the specific configurations of change. These claims can be examined empirically, and will form the substance of, respectively, Chapters 5 and 6.

Chapter 3

FROM CRISIS TO TRANSITION (I):

POSTINDUSTRIAL VIEWS OF CHANGE IN THE URBAN SYSTEM

The prevalence of postindustrial theory in the analysis of societal structures and subsequent policy actions is clearly evident in the acceptance of its core assumptions for understanding the late twentieth century challenge of urban decline. American urban "problems" had long defied resolution through traditional theory and policy perspectives. The urban crisis brought to the forefront the apparent contradiction between postindustrial pronouncements of prosperity and the stark reality of poverty ravishing urban America. The nation's urban problems gained visibility in the 1960s, as the civil rights movement and the "plight of the cities" took center stage in national policy debates. The urban riots during the decade called into question the existing structural relationships that seemed to be building at once abundance and deprivation. The contradiction of urban decline and social progress brought forward demands for political intervention to mediate growing social disparity and to devise appropriate responses. This call to action faded from the public agenda only a few short years after it arrived. While the nation gave serious policy attention to urban issues in the late 1960s, by 1980, the President's Commission for a National Agenda for the Eighties had concluded that place-based urban policy should be replaced with a people-based, national strategy (President's Commission, 1980a, 1980b). The country briefly considered urban

problems again in 1992 in the aftermath of the Los Angeles riots, but concern rapidly dissolved and a national urban policy is still absent from the public agenda.

Early in the urban crisis, measures were undertaken to "fix the problem." Efforts were directed toward restoring the central business districts of large cities and to reverse the fortunes of decaying neighborhoods. When it became clear that rescue would be expensive, long-term, and prone to defeat, however, the crisis was reconceptualized as evidence not of contradiction with prevailing theories but of a transformation to postindustrial society. The "crisis" in cities was redefined as the cost of separation from the old industrial order necessary to realize the "transition" to the globalized, high-technology service-oriented structures of postindustrialism. Urban decline was not to be mourned but rather treated as a natural outcome of social reorganization. In sum, postindustrial interpretations recast the apparent problems of urban America as the growing pains of transformation to a more desirable and prosperous social order.

This chapter reviews the urban crisis and the temporary challenge it posed to postindustrial theory. It will describe the efforts undertaken to ameliorate the conditions of crisis and the ensuing postindustrial interpretation of the causes and consequences of what subsequently came to be viewed as a period of transition. Postindustrial expectations for urban places in America's future and the governmental and societal roles in achieving that future are examined. The intent of this chapter is to locate American social and urban policy responses of the late twentieth century within the broader postindustrial interpretation of societal development and change.

The Postwar Urban Context

Following World War II, the United States experienced unprecedented levels of economic growth, marked by the expansion of technological capacity and capital accumulation, and high and sustained rates of industrial productivity. The expanding national income that characterized the postwar boom was accompanied by rising personal incomes, the expansion of the middle class, and a substantial increase in the general standard of living. The flourishing economy also accelerated geographic growth and dispersal, evident most clearly in the rapid and widespread extension of urban development beyond existing boundaries.

Growth in this period was assisted by several national policies adopted in the preceding decade as part of the New Deal legislation attempting to counteract the conditions of the Great Depression. These early urban policies reflected the belief that existing urban-industrial structures and settlement patterns signified the final stage of development, requiring only proper management and minor adjustments (Fox, 1985: 84-85). Settlement policy, redefined in urban terms, focused upon housing, city real estate, and the role of federal taxes in urban development processes in order to address the primary problems of slums, housing shortages, and urban blight in the nation's cities. The Housing Act of 1937 established public housing and provided funds for slum clearance and low-rent construction. Three years earlier, the Federal Housing Administration (FHA) and the Federal Savings and Loan Insurance Corporation (FSLIC) had been established in support of lending institutions hard hit by the financial crisis, with the additional purpose of expanding the capital market of the depressed home-building industry. In conjunction with tax write-offs for mortgage interest, the mortgage financing and insurance available through the FHA and FSLIC strongly encouraged and supported

homeownership. Loans were granted, however, only to the "safest" borrowers, having stable income and buying homes in "economically sound" areas, in order to avoid the depreciation of capital investments. Loan policies regarding new construction came to be interpreted as meaning locations outside the city, where new developments were seen to foster homogeneous neighborhoods and stable property values. When building resumed after World War II, mortgage assistance, also available through the Veterans Administration, was directed to suburban development. The preference for suburban locations is evident in the fact that, during its first twelve years, not a single home was insured by FHA on Manhattan Island (Judd, 1984: 280-281), the most densely populated area in the urban United States.

Economic development policy in the early postwar years was based upon the assumption that economic growth would be manifested spatially as metropolitan expansion. Urban policy thus became metropolitan policy and, from the late 1940s to the early 1970s, maintained the goal of supporting and revitalizing central cities in the interests of national economic growth. The centrality of cities in the national state of well-being was embraced by the nation's leadership, as exemplified by the comments of President John F. Kennedy.

> The central cores of our cities, with all their great richness of economic and cultural wealth, must be restored to lasting vitality...We neglect our cities at our peril, for in neglecting them we neglect the nation. (quoted in Glaab and Brown, 1976: 285)

Concepts of social progress and the development of a great society viewed the vitality and viability of the urban core as fundamental to the cohesiveness of all subsequent growth within the metropolitan environment.

> No society can be a great society without great cities. And a nation of ever-widening suburban enclaves thrusting outward from bankrupt cores is not a pathway to a great society or even a middling one...(A) suburb requires an urb and one reason for the growth of the fringe is that the cities survive at the core. (Abrams, 1965: 359, 362)

The Housing Act of 1949, designed initially for slum clearance and primarily residential projects, was revised in 1954 to provide for urban renewal and more comprehensive development objectives for the central city. Commercial and industrial development and the revitalization of economically-declining central business districts became the focus of capitalist planning efforts to save the city, which was seen as crucial to metropolitan and national growth. Comprehensive planning allowed for the coordination of numerous projects within the city, setting the stage for a linkage between urban renewal and the interstate highway program established in 1956. Although this combination appeared to foster metropolitan development based on core-periphery relationships, commuting to the central city declined as the beltways made suburban relocation increasingly attractive. Comprehensive planning also provided the framework for coordinating urban renewal with the economic and social functions of the central city, emphasizing the concentration of high-rise offices, large department stores and specialty shops. By the mid-1960s, federal programs and national-local government relationships appeared to have laid the groundwork for improving the physical structures and economic climate of central city areas, and the completion of several early urban renewal efforts fostered hopes of an "urban renaissance."

The development, growth and relative affluence which marked the first two decades of the postwar era underscored the potential for progress and social well-being enabled by sustained economic growth. Expanding economic

opportunities, national economic viability, policy efforts to strengthen metropolitan areas, and the legislated acknowledgment of equal rights embodied in the passage of the Civil Rights Act of 1964 suggested that the doors had been opened for all to participate in the growing wealth and prosperity of the nation.

The Urban Crisis

National confidence in the beneficence of the growth machine was abruptly and violently shaken in July 1964, as rioting broke out in Harlem. The fatal shooting of James Powell, a fifteen-year-old black male, by an off-duty police lieutenant precipitated a social upheaval that would shake the nation's cities for the remainder of the decade. Seven other riots occurred in black ghettos that summer, and rebellion and rioting spread during the ensuing years. From 1964-1967, fifty-five cities experienced riots, resulting in approximately 142 deaths, 4700 persons wounded, 20,000 arrests and hundreds of millions of dollars in property damage (Glaab and Brown, 1976: 305). Rioting persisted for three more years, exacerbated by the assassination of Dr. Martin Luther King, Jr. in March 1968. During the period from 1964-1970, over one hundred cities experienced major violent disturbances (Fox, 1985: 2), most begun as a result of an immediate provocation and concentrated in the commercial centers of black neighborhoods (Fox, 1985: 150). With the exception of several cities in the old South, rioting occurred in every sizable metropolitan center with a significant black population (Fox, 1985: 4-5).

The magnitude of rebellion and destruction forcefully challenged the feelings of well-being and national social progress that had been building in the postwar years, as poverty was "discovered" amid the general state of wealth. The newly-recognized marginalization of much of the urban population sharply

contradicted the postwar American experience of overall economic boom and prosperity. Those "left behind" in the cities, in terms of both physical location and access to expanding economic opportunities, suddenly became visible as an ominous anomaly to perceptions of societal advance and well-being.

Local and state governments responded to the urban unrest by appointing commissions to ascertain the causes and implications of the riots. In 1967, President Lyndon Johnson formed the National Advisory Commission on Civil Disorders, headed by Illinois Governor Otto Kerner. The "Kerner Commission" identified discrimination and the widening division between races as the precipitating causes of the riots. Concluding that "Our nation is moving toward two societies, one black, one white—separate and unequal" (National Advisory Commission on Civil Disorders, 1988: 1), strong anti-discrimination measures were recommended in the areas of housing, education and employment. It was the view of the Commission that parity of opportunity and attainment would only be realized through racial integration. On the basis of this assessment, legislation was enacted to eradicate exclusionary tactics in housing, discriminatory practices in employment, and the segregation of schools on the basis of race.

Investigations precipitated by rioting within the inner cities sparked extensive inquiry into prevailing urban conditions. The instability of city governments, decay and deterioration of the physical city, and widespread poverty, crime and racial tension illuminated the pervasive urban realities of distress, despair, and political and economic isolation. The postwar boom, which had apparently heralded the fulfillment of the American dream, was now undeniably confronted and challenged by an "urban crisis."

Resources were rapidly mobilized to address the racial and economic manifestations of the crisis and to identify and rectify the causes of poverty, which had persisted despite the growing economy and federal social policy. President Lyndon Johnson launched the War on Poverty, which incorporated a number of programs designed to eliminate the causes which were identified as perpetuating poverty and to remove constraints and barriers to mainstream life. Discrimination was attacked through the recently-enacted Civil Rights Act; the lack of skills necessary for employment was addressed through the Job Corps; the lack of acculturation to the world of work and preparation for education was confronted by the Head Start program; and the lack of political participation by the urban underclass was to be overturned by community action programs (Fox, 1985: 127-128). Under the newly-created Department of Housing and Urban Development, and within the rubric of the President's Great Society legislation, the Model Cities program was initiated to provide a forum for coordinated and comprehensive amelioration of the social and physical problems of central cities.

The turmoil engendered in the 1960s by the riots and the urban crisis had produced an atmosphere of urgency in solving the problems of cities. Intellectual and political assessments, critiques and remedies abounded in attempting to understand and correct the factors which had caused the derailment of cities and their residents from the path of progress. Despite massive efforts, however, the legislation, programs and policies that had been designed to rectify the physical and socioeconomic problems of central cities were seen by both liberals and conservatives as having ultimately met with little success. Capitalistic planning and government intervention had proven to be ineffectual in reversing either urban

decline or the fortunes of the urban population. Urban vitality continued to be impeded by the decay and deterioration, fiscal distress, poverty and abandonment which finally provoked the conclusion that cities had become ungovernable.

By 1969, the Nixon Administration had concluded that urban renewal had reached its limits. Attention having been diverted to other issues of national concern, President Richard Nixon proclaimed in 1973 that the urban crisis was over (Fox, 1985). Almost symbolically, during that same year, the Pruitt-Igoe public housing development in St. Louis, Missouri, was dynamited by the federal government. Twenty years previously, Pruitt-Igoe had been heralded for its progressive design, its positive contribution to the renaissance of the city and its impact on the renewal of some of the nation's worst slums. Typical of much public housing development, it deteriorated over time into a setting for crime, violence and decay. At the time it was abandoned, less than one-eighth of the units were occupied (Glaab and Brown, 1976: 289). The demolition of this housing project was indicative of the atmosphere of futility in undertaking efforts to better urban conditions.

As the cities crumbled, the suburban ring flourished and expanded, redefining the texture and significance of the various elements of the metropolitan environment. New, smaller cities sprang up in previously undeveloped areas, altering the composition of urban America. Postwar beliefs that the final stage of development had been achieved in the structures and settlement patterns of the urban-industrial complex were challenged on every front. The emerging suburban boom, alongside central city decay, began to be cited as evidence that a transition was underway. In contrast to earlier thinking, the eventual outcome was perceived

to be positive, and to be indicative of progressive social change and transformation. The "problems" of the cities were seen to be remnants of the old order, which would eventually be overcome by the "solutions" becoming apparent in the suburbs. A new understanding of the dynamics of growth and the possibilities for change would be needed to explain coincident boom and decline. An urban-focused postindustrial thesis would emerge to address these issues.

Postindustrial Response to the Urban Crisis

As public efforts and social theory accelerated in the late 1960s to address the urban crisis, a radically different strain of thought was gaining momentum. The seeds of postindustrial theory, planted by Leslie White (1943, 1959, 1969) and others, began to take root in explorations of the ways in which this theory of social progress could be relevant to the events occurring in the urban arena. In the urban context, demographic, technological and economic change was seen to necessitate specific configurations for urban areas in the interests of social progress. As national economic growth and prosperity became viewed as the means to serve the general welfare, local concerns were to be superseded by the goals of national well-being. The emerging urban theory proclaimed that growth demanded efficient development patterns and adjustment to new structural arrangements. Postindustrial theory, applied to the urban environment, presented both an explanation for recent events and a framework for future development.

The Logic of Postindustrial Urban Change

Edward C. Banfield (1968, 1974) was one of the first to apply postindustrial theory to the issues confronting urban America, directly challenging

the premises and policies guiding efforts to address the "urban crisis." Most problems identified as marking the "urban crisis," he pronounced, were not matters of absolute material well-being, but rather should be classified as issues of desire.

> They have to do with comfort, convenience, amenity, and business advantage, all of which are important, but they do not affect either the essential welfare of individuals or what may be called the good health of society. (Banfield, 1974: 4)

Banfield proposed that few problems are actually as large as they appear to be and that, by any measure, the well-being of society was improving. Although expectations and rising standards had outpaced improvements in performance, serious problems directly affected only a minority. He cautioned against equating the rate of progress with progress itself; although the pace of social progress might not be as rapid as some desired, this did not mean that there had been a failure to advance. At the most fundamental level, he redefined the terms of the debate, framing his argument with the assertion that the "real" issue concerned national welfare or, as he expressed it, the "good health of society," which is determined by those circumstances or measures that serve the welfare of the nation in general. According to this premise, when conflicts or issues arise, primary consideration must be given to the overall health and well-being of society.

Banfield's analysis of the urban situation hinged upon what he termed the logic of metropolitan growth. This logic is determined by three imperatives—demographic, technological and economic. The "inexorable, constraining character" (1974: 25) which defines these imperatives guides growth in such a way as to yield predictable patterns. It is only within these parameters that alteration is possible.

> Given a rate of population growth, a transportation technology, and a distribution of income, certain consequences must inevitably follow; that the city and its hinterland must develop according to a predictable pattern and that even an all-wise and all-powerful government could not change this pattern except by first changing the conditions that give rise to it. The argument is not that nothing can be done to improve matters. Rather, it is that only those things can be done which lie within the boundaries—rather narrow ones, to be sure—fixed by the logic of the growth process. (Banfield, 1974: 26)

Banfield proposed that policies should follow the realities of the changing economic structure, and that market mechanisms should be allowed to operate unencumbered. The process of "middle-class-ification" had sharply reduced the size of the working class, resulting in the bifurcation of the class structure into the upper middle class and the lower class. Automation and technological change had precipitated the revision of the class structure by simplifying the skills and knowledge demanded for many lower-wage and production-based jobs, requiring less training for certain workers than was previously necessary. Banfield concluded that, beyond acquiring a basic level of competence, investment in education and training of the lower class might actually be an overinvestment, representing an economic loss to society (1974: 152-153). Further, interference in the workings of the market had only exacerbated current problems such as unemployment, which would easily be eradicated if the price of labor were allowed to decline to the point where it would be purchased (1974: 118).

Given the constraining nature of demographic, technological and economic imperatives, Banfield proposed that the options for addressing the urban crisis were limited, and many that did exist would not be acceptable on moral or political grounds. Much of the concern regarding the crisis could be attributed to

the American political style, which is future-oriented, embraces moral and material progress, and is confident that all problems can be solved with enough effort.

> Faith in the perfectibility of man and confidence that good intentions together with strenuous exertions will hasten his progress onward and upward lead to bold programs that promise to do what no one knows how to do and what perhaps cannot be done, and therefore end in frustration, loss of mutual respect and trust, anger, and even coercion. (Banfield, 1974: 280-281)

Although government is limited in what actions it can effectively take, this should not be seen as a signal for despair. Rather, allowing the logic of metropolitan growth to chart its own course should give rise to optimism regarding the eventual resolution of existing problems.

> That government cannot solve the problems of the cities and is likely to make them worse by trying does not necessarily mean that calamity impends. Powerful accidental...forces are at work that tend to alleviate and even to eliminate the problems. Hard as it may be for a nation of inveterate problem-solvers to believe, social problems sometimes disappear in the normal course of events. (Banfield, 1974: 281)

One of the strongest "accidental forces" at work was seen to be economic growth, which would enhance the wealth of society, bringing about the end of hardship. Economic growth would serve the welfare of the general populace, promoting and extending society's good health. Banfield warned that this process could be undermined, however, not only by inappropriate governmental actions but also by misguided conceptualizations of the processes at work. Misunderstanding of the causative factors of the problems of urban areas and their residents and displacing the responsibility for current conditions could actually lead to self-fulfilling prophecies, compromising further development.

> There does appear to be a danger to the good health of the society in the tendency of the public to define so many situations as "critical problems"—a definition that implies (1) that "solutions" exist or can be found and (2) that unless they are found and applied at once, disaster will befall...(A)lthough there are many difficulties to be coped with, dilemmas to be faced, and afflictions to be endured, there are very few problems that can be solved...(A)lthough much is seriously wrong with the city, no disaster impends unless it be one that results from public misconceptions that are in the nature of self-fulfilling prophecies. (Banfield, 1974: 285)

Thinking that government programs are the only solution may lead to actions and behavior that worsen current conditions, distracting the natural course of events and eventually lending support to the original, though false, premises.

Banfield outlined the processes of urban growth and change, predicting the future configurations of urban and metropolitan areas according to the logic of metropolitan growth. Acknowledging the impact of postwar national urban policies, Banfield stated that federal efforts such as highway construction and home financing programs fostered outward expansion, subsidized the well-off who chose to leave the city, and were structured in such a way as to discourage renovation within central cities by those who were not so well-off (Banfield, 1974: 32). He explained, however, that these interventions speeded, but did not alter, the course of metropolitan change. Further, the effects of the suburbanization of population and business in the 1950s were not as severe as generally supposed, although this movement did contribute to the economic stagnation of central cities. From 1960-1968, the thirty largest cities gained more in revenues from the service sector than was lost in manufacturing and trade. Moreover, employment in these cities actually increased, although both population size and the quality of urban services declined (Banfield, 1974: 39). Banfield stated that these development trends could be

expected to continue, and that the only constraint on further outward expansion would be the availability of land (1974: 43).

According to the logic of growth, central city land values could be expected to decrease until at some point such values would become lower than those of the suburbs, prompting a return to the city. Although a trend toward some level of recentralization might be substantiated, evidenced by the retention of head offices and research and development activities close to urban universities, central cities would not regain their monopoly status as sites of accessibility, but might become only one of several nuclei within the metropolitan area. The rate of population growth, the technology of transportation, and the distribution of income which characterized the three imperatives would continue to guide development, while placing severe limitations on the policy alternatives available to government.

Banfield's analysis of the urban situation provided a framework for subsequent inquiry into the future of cities and metropolitan areas in a postindustrial society. The focus of such evaluations was later broadened to include the dimensions of the movement of population and business on a national scale, incorporating the issues of regional shifts and relative advantage. This change of perspective served to strengthen postindustrial arguments regarding urban issues, for determinations of the "good health of society," in Banfield's terms, became based on aggregated national, rather than local or regional, indicators.

The Primacy of Economic Growth and National Well-being

The shift in thinking which emphasized the primacy of national well-being in the analysis of urban questions was demonstrated in a 1980 essay written by Daniel P. Moynihan. The significance of this essay lies in its radical departure from

Moynihan's earlier advocacy (1970a, 1970b) of broad-based urban policy and his staunch support of governmental intervention in bolstering the viability and vitality of the nation's central cities. Moynihan (1980) proposed that government should not allow regional growth or decline to become political issues, as this would result in uneconomic policy efforts to promote investments in areas that were unable to attract or sustain investment otherwise. While he retained the belief that government must not stand on the sidelines should bankruptcy threaten central cities, his rationale for action in this case was predicated on the need to avoid the political upheaval which would be certain to arise in response to such an event. With this one caveat, he stressed that little can be done to prevent regional economic change, and that actions toward this end are unadvisable.

> Governments faced with economic decline typically resort to what can only be called sympathetic magic. They try to induce natural change by imitating it...Some of this sympathetic magic does no harm. But to the degree that resources are put to a less than optimal use, there will be a less than maximum return, and almost everyone will be a little worse off. (Moynihan, 1980: 222)

Underscoring his conviction that such issues must be prevented from entering the political arena, Moynihan appealed to the fundamental basis of personal and economic freedom.

> It would be contrary to the spirit of the Constitution for the federal government to intervene in our economy to try to prevent the natural movements of capital and people from one state or region to another...The founders of this nation understood that our political freedoms and national stability very much depended on our becoming a single economy with the freest possible movement of capital and labor. (Moynihan, 1980: 221)

The right to mobility must be preserved, allowing persons to seek the improvement of their positions, and retaining the promise extended throughout the nation's history to citizens and immigrants alike that their intentions to better their lives would be met with opportunities to do so.

Federal efforts to define urban phenomena and devise appropriate policy responses reflected the acceptance of postindustrial characterizations regarding the forces and manifestations of social change. The President's Commission for a National Agenda for the Eighties was charged with conducting an objective assessment of the issues and problems that would confront the nation during the decade and with developing policy recommendations to address those issues. Daniel Bell served as a member of the Commission, and the adoption of his framework for the analysis of postindustrial society is clearly apparent in the report of the Commission's Panel on Policies and Prospects for Metropolitan and Nonmetropolitan America, *Urban America in the Eighties* (1980b). The report identified the primary dimensions of societal restructuring as the development of a service economy, the ascendance of a professional and technical class, the centrality of theoretical knowledge, the potential for self-supporting technological growth and change, and the development of an intellectual technology to structure and address the information needs of the new society. Society as a whole, and cities in particular, were viewed as malleable entities, subject to the shaping dictates of the transformation.

> Recognition should be made of the near immutability of the technological, economic, social and demographic trends that herald the emergence of a postindustrial society and that are responsible for the transformation of our nation's settlements and life within them. (President's Commission, 1980b: 100)

The new institutional structures and spatial forms which would be evidenced would be determined by the larger forces defining the new order. Still amidst the throes of the transformation, cities were experiencing deconcentration, social and economic distress, and fiscal problems in the effort to adapt. The nature of production had changed from heavy manufacturing to high-technology and services, altering the composition of business and the viability of established industries. Concurrently, population and business were migrating both from the cities to the suburbs, and from the Frostbelt of the Northeast and the Industrial Heartland to the Sunbelt of the South and Southwest. The emerging national character of society was seen as effecting a lessening of spatial distinction, thus exacerbating existing constraints upon economic responsiveness and control at the local and regional levels. Within the broader changes occurring throughout society, the President's Commission concluded that the configurations and traditional functions of cities were being challenged on every front.

Both currently and historically, cities were considered to be the "products of ongoing change. As the locus of crises and tensions associated with the larger forces shaping society, they have and will continue to transform" (President's Commission, 1980b: 12). The summary report of the President's Commission, *A National Agenda for the Eighties*, stressed this point even more strongly, proposing that the role of cities was to reflect those larger forces, anticipating the future rather than clinging to the past.

> Cities are not permanent; their strength is related to their ability to reflect change rather than to fend it off...Standing at the intersection of virtually all the important shaping forces of an era—demographic, economic, political, cultural—cities articulate, and continuously

> rearticulate, our changing national circumstances...(C)ities serve us better as mirrors than as museums. They must be permitted to reflect changing technological capabilities and social circumstances, rather than be constrained by an attempt to preserve under glass any particular historical combination of them. To attempt to restrict or reverse the processes of change—for whatever noble intentions—is to deny the benefits that the future may hold for us as a nation. (President's Commission, 1980a: 65-66)

According to the Commission, those cities that could transform in accordance with the demands of the national economy by adjusting to new roles and functions would be able to prosper, and those that cannot would be forced to decline, as "a new hierarchy of places is emerging to accommodate simultaneously both decentralization and a dispersed reconcentration" (President's Commission, 1980b: 35). The ability of cities to adapt, therefore, would become the criterion by which their significance would be determined, and localities would be important only insofar as they contributed to national economic well-being.

A new policy orientation and definition of responsibility was seen as necessitated by the increasingly national character of society.

> Civic responsibilities should not be limited to place of residence...Local civic allegiances should be expanded into national civic allegiances. The fate of all people in all places is the responsibility of us all. National settlement patterns have become diverse; our common life depends on it, and our collective sentiments captured and implemented by public policies should foster the emerging arrangements, not deny them. (President's Commission, 1980b: 36-37)

According to the Commission, the federal government should develop policies to assist people, and to do so directly, rather than assisting people only indirectly by inappropriately targeting resources to places or local governments.

> From a long-range perspective, we urge the federal government to assign priority to the development of a blend of social

> and economic policies that encourages the health and vitality of the nation as a whole and all of its citizens regardless of where in the nation they might live. The urban consequences of essentially nonurban policies will continue to outweigh those of narrow and explicitly urban policies. The general implication is that, in the long run, the fates and fortunes of specific places be allowed to fluctuate. Throughout the process of economic change, people—more so than places—should be insulated from the multiple hardships that accompany the transformation of the nation—in its communities, its economy, and the larger society. (President's Commission, 1980a: 64-65)

Aligned with the dominant trends, a new "people orientation" should guide policy. This new orientation should emphasize mobility, which is viewed as frustrated by place-oriented policies. Strategies such as people-to-jobs were to be especially encouraged in order to match persons with employment opportunities.

Patterns of business disinvestment that resulted from the migration of business activity were understood to be "accompanied by a residue of social costs that are anchored to the places, and experienced by the people, left behind" (President's Commission, 1980b: 42). It is recognized that there will always be a class of people who will not be able to join the mainstream of the economy, regardless of its form. However, to the extent possible, people-to-jobs policies should be instituted to provide relocation assistance, and job training or retraining should be undertaken so that skills can be developed and utilized where needed in accordance with employment demands. In essence, changes in institutional structures were to be implemented in order to facilitate both the mobility of the labor force and its adaptation to new employment structures, skill requirements, and locations.

The dispersion of population and jobs, and the lower densities of the emerging urban settlement patterns, were regarded by the Commission as

advantageous in comparison with former, high-density patterns, for a "far-flung web of urban interdependence at lower densities has resulted in a large number of efficient and desirable consequences that are too easily overlooked or discounted" (President's Commission, 1980b: 32). Included among the positive effects of the relocation of both people and jobs to the suburbs would be the realization of consumer preferences for housing and service consumption, a potential reduction in commuting distances resulting in lowered energy usage and costs, reduced demands on infrastructure and the decrease of environmental externalities such as pollution and congestion (President's Commission, 1980b: 32-33). It was proposed that the emerging postindustrial society was moving in a direction that would enable the development of an efficient, productive and responsive urban environment founded upon a mobile political economy.

The Process of Urban Change

Many economists have argued that the processes of spatial and functional adaptation to new technological requirements, as proposed by the President's Commission, had in fact been occurring for some time. Utilizing the perspective of comparative statics, William J. Baumol (1981) detailed the process of evolution through which a new urban equilibrium would be attained. Baumol proposed that, as a result of technological capabilities, different economic activities would define the process of production, and revised expectations would be held regarding the cities which had traditionally served as the locus of economic and social interaction. Cities would undergo change in response to the migration of people and business to more advantageous locations. Baumol stated that during the stage of transition, due to the varying rates of economic adjustment and the long-

term usefulness of the built environment, cities would experience several phases of in- and out-migration, and would generally evidence decline before new functions were assumed and cities once again became attractive as locations for housing and business.

In the long-term, cities would be smaller, but economically stable, with functions directed toward services and administration rather than manufacturing. The population would reflect an increasing balance of different income groups, and the appeal of the city would experience a revival as social conditions were ameliorated and the inherent advantages of the city resurfaced. The ease of communication and transportation would facilitate face-to-face contact, while the size of the market would allow specialized consumer services. These services, in turn, would attract middle and upper income groups, who would then generate rehabilitation efforts and expanded services. Firms requiring professional personnel would be attracted to this new city type for its advantage in amenities.

Baumol proposed that technological changes have had negatives impacts upon cities and their residents, but that the attainment of a new equilibrium to restore economic viability necessitated that the process of adjustment is allowed to run its course.

> ...attempts to rehabilitate and improve these areas to any substantial extent will be disappointing at best. Such measures may serve as palliatives which bring temporary relief. But the reconstruction of housing in a devastated area which, even when rebuilt, cannot be expected to attract jobs for its residents must ultimately prove to be a cruel gift, even if it yields transitory political benefits, and perhaps initially, some benefits for its inhabitants. (Baumol, 1981: 12)

Policy intervention regarding the physical and economic city represented a waste of resources, yielding only short-term assistance and interfering with and prolonging the transition process.

> A rebuilt South Bronx can only lure the jobless into remaining longer where they have no economic prospects. One can be fairly confident that the reconstructed homes will be transformed into slums soon enough. (Baumol, 1981: 13)

Policy efforts should be directed toward fostering readjustment through measures such as the provision of incentives for emigration, job training, and reconstruction plans to accelerate the transition process. In regard to appropriate policy actions, Baumol reached conclusions similar to those of Banfield and the President's Commission.

> Understanding of the underlying forces offers us knowledge of the constraints which circumscribe our policy options. It is within the limits imposed by these constraints that we are free to act in a way that contributes to social welfare. (Baumol, 1981: 13)

A new state of equilibrium would eventually be attained as the product of the trials of adaptation. Only through allowing institutional mechanisms to seek and define a state of balance and order in relation to each other could equilibrium be expedited. Economic structures and urban forms and functions would ultimately converge with technological capabilities to yield new institutional frameworks for the progress of society.

Nijkamp and Schubert (1985) echoed Baumol's assertion that there is a lifecycle of urban development, proposing that innovation and technological progress are the driving forces of this process. Independent of political and cultural systems, cities progress through the stages of urbanization, suburbanization,

deurbanization, and reurbanization, which are linked by the processes of economic development and the movement of population and jobs. The structure of urban dynamics reflects the diffusion of economic activities enabled by new technologies, accommodating the possibilities of both urban growth and decline.

Nijkamp and Schubert proposed that the structural dynamics of urban systems are founded upon the system of production and its relationship to the research and development which operationalize technological breakthroughs. The urban development cycle begins with the research and development of new inventions, seeking locations with appropriate infrastructure, primarily in terms of access to universities and face-to-face interactions. As activity expands, however, it becomes increasingly constrained by the bottleneck factors of land, labor and capital. Concomitantly, face-to-face opportunities and the need for research decrease as inventions are introduced into the market. Suburban location becomes more attractive economically, although the marginal returns of a particular invention will eventually decrease to the point where production factors will seek locations that offer even lower costs. Growth in large urban areas may be reinvigorated by new inventions, aided by the reduced density and lowered costs resulting from the migration of population and businesses out of urban centers.

Nijkamp and Schubert proposed that the deurbanization stage characterizes postindustrial society, explaining that "(a)s the network of public and private infrastructure increasingly covers the whole country, urban areas appear to lose their comparative economic advantages and jobs begin to decentralise" (1985: 79). Inventions and innovations no longer need to focus on urban centers as the locations from which to develop, but are faced with a range of possibilities. Growth

or decline of an increasing number of areas is determined by the dominant and innovative sectors of the economy.

A New Hierarchy of Places

A framework for understanding the current ability of urban areas to adapt to the new structures evidenced by economic development has been presented by the Committee on National Urban Policy of the National Research Council (1983). The Committee proposed that urban areas would grow or decline in accordance with the movement of different sectors in the economy. The dynamics of economic restructuring, resulting from technological, institutional and demographic forces, have produced structural shifts to service industries and white-collar employment. The responsiveness of urban areas to these changes, and the ability to develop new or revised roles in facilitating national economic growth, provide the framework for what is seen by the Committee as an evolving urban system.

The Committee stated that a reconceptualization of the dimensions and influence of urban systems is necessitated, as places and physical realities are no longer adequate to describe the systems that mark an advanced industrial economy.

> We have become used to thinking of urban systems as discrete physical places, such as metropolitan areas...The new urban system transcends the metropolis and even the megalopolis...It is perhaps best to think of it as consisting of an increasingly interdependent group of major cities containing firms and agencies with overlapping and fluctuating spheres of influence that extend beyond their immediate metropolitan areas. In some cases these spheres of influence extend into other regions, in some cases to other nations. The parts of the system are linked not only by transportation and communications systems but also by corporate structure and business relationships. This functional interdependence often

> conflicts with political pushes toward more sharply defined localism. (Committee on National Urban Policy, 1983: 39)

The Committee based its analysis upon a classification scheme to identify the economic foundation and functions of the 140 largest metropolitan areas. While illustrative rather than definitive, the classification emphasizes the major trends of technological and business organizational structures, which are most clearly apparent in recently developed areas. Changes over time are anticipated as a response to the need for further adaptation or the refinement of functions.

The emerging urban system, based on new economic realities, is led by national and regional "command and control" centers which concentrate corporate and producer services. These centers have adapted to structural changes more easily than the more specialized "subordinate" centers due to greater diversity, the autonomous nature of their economic institutions, and stronger capacity to develop a service-oriented economy. As the most responsive elements of the system, the command and control centers dominate the economic and political decisionmaking of the urban network.

Command and control centers, both diversified and specialized, can be further defined by size and function, constituting a hierarchical system. Diversified service centers are characterized by growing service economies, increasing levels of producer services, and decentralized manufacturing and personal services. National centers contain the largest agglomerations of corporate complexes and the most advanced producer services. Major corporations are attracted to these centers due to the advantages of access, and increasing concentration essentially precludes the development of such large-scale services in other locations. Regional centers can be seen as smaller-scale versions of the national centers, serving as the headquarters of

less internationalized corporations and providing a more limited range of producer services.

National and sub-national centers are defined as the primary distribution sites for the urban system. Sub-regional centers are also strongly involved in distribution, and house corporate branch or division offices. Although the autonomy accorded headquarters in the larger centers can be enhanced to some extent through the internationalization of specific producer functions, the concentration of needed specialized services limits locational options to a small number of centers. The agglomeration patterns present only in the larger centers also contribute to the autonomy of those cities and localities, for such centers are relatively secure regarding their continued viability.

Specialized service centers also have command and control functions, but their roles are restructured to providing high-level activities focused upon education, government and/or a specific industrial sector. All include research and education institutions, and national regional centers provide producer services for these activities. Functional centers have national and international corporate activities such as research, production and central management for one or more industries. Service sectors are large in size, but narrow in scope. Production is decreasing in significance for these centers as administrative functions predominate. Functional centers have historically experienced a commitment to the community on the part of corporations, which has fostered cultural, educational and health-related institutions. Research and development capabilities appear to have assisted the industries in these centers in adapting to the larger industrial and economic changes.

The subordinate centers identified in the classification are oriented toward either production or consumer services such as residential, resort/retirement, and/or government. The largest production centers include most of the large industrial manufacturing centers of the Frostbelt and the military-industrial and mining-industrial centers, which are predominantly located in the Sunbelt. These areas are the least adaptable to structural changes, due to their singular focus and reliance upon displaced decisionmaking and resources which are controlled by other sectors or institutions.

The Committee concluded that metropolitan areas are exhibiting an increasing dichotomy between command and control functions and subordinate functions. Services essential to the new economy are found in the former type of centers, which have attained relatively high levels of autonomy and provide the focus of economic development. Manufacturing is declining in these areas, and the transition to a producer service base has increasingly supported nonproduction activities. Subordinate centers are also experiencing a changing occupational focus, but it is consumer, rather than producer, oriented. Production and consumer-oriented centers have the least adaptable labor forces and little capacity to accommodate to structural changes. Physical conditions and institutional arrangements also contribute to the inability of urban areas to adapt. In general, the command and control centers have risen to the demands of economic restructuring, and the placement of other centers in the urban system will depend upon their abilities to fulfill the needs for services in support of command and control centers.

According to the Committee, urban policy should be directed toward supporting and promoting economic development in those areas which have the potential to succeed within the new national and international system.

> Given all the trends in technology, economic organization, and demography...it appears that the growth of the nation's economy and the economic future of American cities and urban areas rest on accelerating the restructuring of the economy and in embracing a role of leadership of an advanced economy. It is in the national interest for our cities to be dominant centers of international corporations and services. Therefore, policies that promote industries, as such, need to be complemented by policies that help produce the urban environments in which the activities of an advanced economy can flourish. (Committee on National Urban Policy, 1983: 181)

Urban policy must be seen as the spatial component of economic development goals, as not only does the future of urban areas rely upon the well-being of the national economy, but national economic growth depends upon the development of appropriate infrastructure provided in the urban setting.

Urban Society without the "Urb"

Paul E. Peterson (1985) asserted that the dynamics of technological innovation and advance are the primary factors affecting economic change and the direction and pace of urban development. The impacts of technology on societal structures have rendered economic and social changes so vast that trying to reverse their direction or trying to preserve former patterns has become neither feasible nor desirable. Past efforts to revitalize central cities would not even be given consideration in the present, for the strength of technological forces has fundamentally reshaped and redefined urban society.

> The industrial city has become an institutional anachronism. If the great manufacturing centers of Europe and the American Snow Belt developed as by-products of the industrial revolution, their decline is no less ancillary to contemporary technological change...Industrial cities must simply accept a less exalted place in American political and social life than they once enjoyed. Policies must adapt to this new urban reality. (Peterson, 1985: 1)

Not only the policies, but also the theories regarding urban growth and change, must be reformulated. Such theories have traditionally focused upon the core of the city as the central point from which technological changes have precipitated all developments and interactions. Modifications to this theory incorporated the differentiation of activities, given structure by the transportation grid. Peterson stated that the development of the transportation network, which once supported the core, has ultimately led to the dispersion of activity such that it is no longer dependent on, or necessarily related to, the center. The deconcentration of economic activity and the pervasiveness of technological innovations and amenities throughout the nation have rendered the value of locations to be approximately equal, reducing the advantages of particular places to subjective criteria.

> In crucial respects all the United States is urban. Nearly every part is well connected to the nation's transportation and communication grid. Few places lack electrification, television, telephones, hospitals, or schools. Except for those desperate for high culture or haute cuisine, any region, town, or city can meet wants and needs as well as any other. Places are now so similar in all other respects that minor variations in climate can suddenly emerge as major determinants of economic activity. (Peterson, 1985: 8)

Given the dimensions of this new reality, hopes for the revival of industrial cities are fruitless. Neither market forces nor government action will reverse the processes of urban decline. Technological and economic advance cannot even be presumed to yield secondary effects that will be helpful to these urban areas, given the abundance of alternative locations. The decline of older industrial cities should therefore be viewed as "little other than an unfortunate by-product of technological advance and economic success in a land-rich society" (Peterson, 1985: 10). Cities must adjust to new circumstances, relying upon their own resources, both political and fiscal, to address issues of the quality of life within their borders and chart their transition through the larger and otherwise beneficial economic transformation.

The role of the federal government should not be one of assisting specific places, but rather one of establishing national services and standards, equalizing amenities and opportunities.

> Instead of developing remedies on behalf of urban areas, the federal government should concentrate its attention on policies that have no specifically urban component to them at all. In doing so, it would continue a well-established tradition of shaping urban futures largely through programs whose ostensible purpose was utterly different. (Peterson, 1985: 25)

While such policies would not target urban areas in particular, the nation's cities would receive indirect benefits through the dispersal of social responsibility and programs, which currently fall disproportionately upon them. Cities have traditionally provided higher levels of welfare benefits and social services than other localities. This burden would be eliminated as national standards are instituted, reducing the desirability of cities as preferable locations for those in need of

assistance programs. The resulting decreased demand for services would free resources for other purposes, allowing localities greater flexibility in meeting the challenges of urban change.

The Obsolescence of Cities

Adapting to new circumstances and realities has led W. Jackson Davis to proclaim that "the city is a dying institution" (1979: 253). Sociological and technological changes, as well as the search for efficiency, heightened by the constraints of the existing resource base, have combined to create new problems and exacerbate old ones in urban centers. The costs and inefficiency of energy use in central areas have contributed to urban deterioration as locations outside the city have become more economically attractive, prompting the flight from the cities. Although Davis stated that a "national urban policy of 'abandoning' the cities is unthinkable," he explains that attempts to revive the industrial city must ultimately fail.

> (I)t is illusion to believe that our cities can be rebuilt, at least on the same scale and organization as in the recent past. If energy and resources are truly in decline, then the age of the city as we have known it is nearly over. In this case an urban policy of rebuilding cities in the old mold is worse than futile—it is tragic. Attempts to rebuild America's decaying cities on the pattern of the past can only nurture false hope, create unfulfilled expectations, divert energy from productive paths, and delay an even more traumatic day of reckoning. (Davis, 1979: 253)

Social, physical and economic impacts of urban decline cannot be reversed, and trying to save the cities will only serve to worsen the conditions of their poor and disadvantaged inhabitants, creating further strain on the social structure of society. It is better to develop policies to assist these persons, recognizing that eventually

"industrial civilization must come to grips with the need to dismantle the majority of its cities" (Davis, 1979: 254).

The concept of a lifecycle for cities was echoed by Jay H. Moor (1986), who has questioned the perspective of the "right to life" which has accompanied the common attribution of human characteristics to cities. Cities have been portrayed as having hearts, arteries and souls, just like humans, yet are not granted the realization that at some point, life cannot be preserved. According to Moor, diagnostic capabilities have been clouded by a "moral consensus" to save the cities and have led to an irrational defense of their "right to life."

> No matter how moribund, how depleted the resource base, how decrepit the infrastructure, how great the brain drain, all towns must live, and live well, forever...(Yet)...(w)hen we think of the controversy over the use of life support systems on human patients, we would expect something similar for cities and towns. (Moor, 1986: 46)

Planners, in particular, have focused on assisting local economies in competing for jobs and businesses, regardless of economic potential or cost-effectiveness. Planners should instead assume a broader view toward creating "the regional institutions needed to aid the recoverable and to comfort the inoperable" (Moor, 1986: 46).

Of primary concern is implementing efforts to assist people in migrating to productive areas. People-to-jobs strategies, appropriate institutions and adequate resources should be available to ease the transition and support the inherent adaptability of America's people. Population movement in order to access better opportunities is part of the nation's legacy.

> (T)here is a precedent for packing it in. After all, ghost towns are a part of the American landscape. The right to a changeless existence

> is harmful myth that generates a fear of the future and ossifies our institutions. (Moor, 1986: 46)

People and places must be willing to adapt and change in the interests of long-term well-being.

In a classic essay exploring technological possibilities, Buckminster Fuller (1977) proclaimed not only that technological advance has and will continue to be the driving force of social progress, but that it is the only vehicle for positive and unparalleled change. Innovations in technology have required the development of appropriate social structures, resulting in an advanced standard of living. Human ingenuity must be directed toward technological opportunities to better the circumstances on earth. The only constraints to what can be accomplished are the physical laws governing the universe. Man-made laws and political processes serve only to introduce bias and impede the realization of human progress and well-being.

> Take away all the inventions from humanity and within six months half of humanity will die of starvation and disease. Take away all the politicians and all political ideologies and leave all the inventions in operation and more will eat and prosper than now while racing on to take care of 100% of humanity. (Fuller, 1977: 141)

Of fundamental significance is that technological civilization will enable the use of resources to support all of humanity, advancing to the point where the entire earth will be accessible for man's enjoyment. Prior to the invention of many technologies currently in use, society was geographically rooted and dealt with physical structures and goods which defined the importance of location. The functions which have historically defined cities, such as warehousing, production activities and housing of population have left, rendering cities useless and outdated.

> Cities, as we know them, are obsolete in respect to all of yesterday's functions. Trying to rebuild cities to make them accommodate the new needs of world man is like trying to reconstruct and improve a wrecked ship as the shipwreck rests upon the reef, pounded by the surf. The surf of technical obsolescence is invisible but is more inexorably powerful in its destruction than are pounding waves of the visible ocean. (Fuller, 1977: 140)

All physical activity has been removed from the cities, leaving only abstract, weightless activities such as culture and economic exchange. Cities that do not have such functions will disappear, as technological capability enables man to discard the concept that he must have roots, embracing the "higher" possibilities of motion and change through advanced science and technology.

From Urban Space to Cyberspace

The de-coupling of societal functions from physical places is nowhere more apparent than in the realm of cyberspace. Advances in communication technology have enabled the replacement of physical space and means of connection with wired networks and digital information. Comparing the "information superhighway" to concepts involving physical space, Elmer-Dewitt stated that "(i)n the superhighway system of the future, they (cables) are the interstate turnpikes" (1993: 53). The Internet, or "Net" as it is often called, has laid a foundation for technological, rather than face-to-face, interactions and allows information to be transmitted around the globe nearly instantaneously, removing barriers of space and time and enhancing efficiency.

> The Net has some unique advantages. It takes away many of the logistical difficulties of space and time; information flows faster; markets are more efficient. (Dyson, 1998: 14)

Cyberspace has allowed the creation of "virtual communities" (Rheingold, 1987), bringing persons together on the basis of interests, rather than location.

> Every night on Prodigy, CompuServe, Genie and thousands of smaller computer bulletin boards, people by the hundreds of thousands are logging on to a great computer-mediated gabfest, an interactive debate that allows them to leap over barriers of time, place, sex and social status. Computer networks make it easy to reach out and touch strangers who share a particular obsession or concern. "We're replacing the old drugstore soda fountain and town square, where community used to happen in the physical world," says Howard Rheingold. (Elmer-Dewitt, 1993: 60)

Rheingold has explained that traditional communities function through meeting other persons who are physically accessible and then getting to know them, while in virtual communities persons can meet, become familiar with each other and develop relationships regardless of where they are and whether they choose to meet in traditional social space. Common interests and values replace location as a starting point of social interaction, transcending spatial limits, and reducing the trial-and-error process of searching out those with whom one might be compatible.

Electronically-based virtual communities do offer a sense of place, although it is not defined in the traditional sense.

> I still spend my days in a room, physically isolated. My mind, however, is linked with a worldwide collection of like-minded (and not-so-like-minded) souls...My virtual community...It's a bit like a neighborhood pub or coffee shop: I don't have to move from my desk, there's a certain sense of place to it. It's a little like a salon, where I can participate in a hundred ongoing conversations with people who don't care what I look like or sound like, but who do care how I think and communicate. And it's a little like a group mind, where questions are answered, support is given, inspiration is

> provided, by people I may never have heard from before, and whom I may never meet face to face. (Rheingold, 1987: 78-79)

The sense of community based on technology is viewed as being superior to more conventional communities, as it extends the range of possible interactions and expands capabilities.

> (The Net is) a place where people meet, talk, do business, find out things, form committees, and pass on rumors...Some of the capabilities are different from the so-called real world. Anyone can go online and publish something that can be read anywhere in the world; a child can write to a president; a Hungarian merchant can find a Chinese customer. Above all, the Net is a home for people. (Dyson, 1998: 14)

Postindustrial enthusiasts claim that virtual communities are more democratic because they allow access to anyone possessing the appropriate equipment and remove the visual clues which have long provided a basis for prejudice. Gender, age, race, national origin and physical appearance are meaningless in cyberspace as persons are known only in terms of their ideas and feelings. Traditional concepts of space and place are rendered obsolete in a world given structure by electronic capabilities.

Conclusion

The urban crisis of the 1960s, in which the "discovery" of poverty, urban decay and isolation created wide-ranging efforts to ameliorate the conditions of cities and their residents, found "resolution" through the postindustrial redefinition and explanation of urban ills. Postindustrialism declared that urban areas were undergoing transformation and that the conditions being evidenced were merely the transition costs of the movement toward a new social order.

Demographic, technological and economic forces were understood to be driving the transition of U.S. society and the nation's cities from the old industrial base to a high-tech, services-oriented economy and society. These forces demanded specific configurations, including efficient development and new structural arrangements. According to postindustrialists, national economic growth would lead to the betterment of the general welfare and localism should give way to nationalism. The value and future of cities, therefore, was rooted in their ability to contribute to overall national well-being and prosperity.

The principles of postindustrialism outlined the manifestations of the transition and defined the expected outcomes. Urban abundance was predicated upon the "good health of society" (Banfield, 1974: 4) which would be experienced by all.

> ♦ In the near term, urban fortunes can be expected to falter. In the near and longer terms, national fortunes will improve and society, as a whole, including its current urban communities, will be better off.

The principle of adaptation encouraged eschewing historic functions and local focus. Rather, society must embrace postindustrial dynamics and urban areas, in particular, must adjust to the restructuring of the economy and find a place within it, thus lowering the negative effects of transition.

> ♦ The more adaptive a society is to the postindustrial, post-urban trends—to a service economy and information society—the lower the transition costs. This is especially true for urban communities.

Technology will define efficient roles, functions and spatial configurations for society which will contribute to the creation of abundance and raise national well-being.

- Postindustrial technology will lead to a new efficiency revolution that will advance society as it moves beyond its current urban-industrial form. Technology-led efficiency gains will offset any short-term costs to urban communities.

Postindustrialists explained that alterations in the urban system were only possible within the parameters of the demographic, economic and technological forces that were driving the formation of postindustrial society. Little could be done to prevent change, and any attempt to do so was deemed to be ill-advised. Local well-being depended upon national well-being and the realization of a single economy with free movement of capital and labor. New institutional structures and spatial forms would emerge which would reduce spatial distinctions and the significance of place. Policies should be directed toward people, rather than places, facilitating mobility and the adaptation of labor to new employment structures, skills and locations.

The role of cities, therefore, is seen to be the reflection of the larger forces shaping society. Postindustrialists proposed that cities have a lifecycle which is driven by innovation, the means of production and technological progress. A new urban form and equilibrium will emerge if the process of adjustment is allowed to run its course. Postindustrialists have identified the beginnings of an evolving urban system which has developed in response to the demands of an advanced economy.

The direction of change cannot be reversed or halted, and former patterns cannot be preserved. The deconcentration of economic activity has rendered the value of specific places to be virtually the same, distinguishable only by subjective criteria, such as climate or high culture, to confer advantage. Hopes for the revival of central cities in their historic form are futile and attempts to

restore cities in this manner will only worsen the conditions of the poor and disadvantaged.

According to postindustrial theory, technological advance is the driving force of social progress and is the only means to realize positive change. As the technological and economic bases of society are no longer tied to specific physical places and the concept of community increasingly finds its home in electronic impulses, cities have become obsolete.

Chapter 4

FROM CRISIS TO TRANSITION (II): POSTINDUSTRIAL VIEWS OF CHANGE IN THE ENERGY SYSTEM

The pattern of challenge to postindustrial theory, as evidenced by the urban system in the 1960s, was paralleled in the 1970s in the energy arena. Ironically, during the same year that President Nixon declared the end of the urban crisis, national attention became focused upon the energy situation, as international events created widespread panic regarding uncertain energy supplies and precipitous price increases.

The postindustrial concepts of "more is better" and "growth is good" had been nowhere more apparent than in the expansion of the energy system, not only in terms of serving as the fuel for productivity, but also as representative of, and the basis for, advanced technological achievement. During the postwar period, growth in energy supply was embraced as a prerequisite for economic growth and well-being. Abundant and cheap energy was taken as a given, and thoughts of energy dealt only with the means to realize the vision that energy would become "too cheap to meter" (Lewis Strauss, cited in Byrne and Hoffman, 1996: 11).

National attention was abruptly and unexpectedly focused on questions of energy supply and costs during two separate periods in the 1970s, as the energy "crises" occurring in the earlier and later parts of the decade appeared to jeopardize unimpeded growth. The "crises," however, faded from the public view, and concerns regarding energy reemerged only as a result of the connection between

energy and the "environmental crises" brought to light in the late 1980s and the 1990 invasion of Kuwait by Iraq.

As with the urban "crisis," the immediate response was to undertake measures to "fix the problem." Energy independence, especially through the development of domestic conventional and alternative sources, became the rallying cry of a nation faced with higher prices and energy shortages. As the decade ended, energy issues were reconceptualized as the problems of an untenable reliance upon foreign energy sources from an unstable part of the world. The proposed remedy for this uncertain dependence was to accelerate the shift to an electrified, synthetically-powered order made possible by increased domestic fossil energy production and to harness the chain reactions of the nucleus and adopt other high-technologies. Environmental externalities would also be addressed and redressed as new power sources were seen to be benign in their extraction, production and use.

This chapter reviews the energy crises of the 1970s and the ways in which these crises called into question the viability of postindustrial theory. It will present an overview of the precipitating factors leading to the crises, the policy measures undertaken to "fix the problem" and theoretical challenges to postindustrial ideology. It will then address the subsequent reconstruction of postindustrial theory that defined the energy crises of the period as part of an energy transition. The energy future and the governmental and societal roles in achieving that future, as portrayed by postindustrialists, will be examined. The intent of this chapter is to examine the nature of the challenges to postindustrial theory presented by the energy crises of the 1970s, and to provide an understanding of the ways in

which postindustrialism overcame those challenges through the reconceptualization of postindustrial theory.

The Postwar Energy Context

The unprecedented levels of economic growth that followed World War II were enabled by an expansive and expanding energy network. The United States government encouraged the growth of the energy system, based upon the principle that growth in energy consumption was a prerequisite for economic development. The national view subscribed to Leslie White's succinct analysis that "culture will advance, other things being equal, as long as the amount of energy harnessed and put to work per capita per unit of time increases" (1943: 347). Until the 1970s, this maxim was neither questioned nor seriously challenged, as growth in energy consumption continued unabated, walking hand in hand with economic boom. During this time, energy policy and energy politics operated practically autonomously, independent of other concerns, and focused largely on gaining access to ever-increasing supplies. In fact, there was no "energy policy" as such, but rather a series of distinct policies for each fuel type (Davis, 1982). Most significant in the energy arena to the unfolding of postindustrial society and the events that have occurred in the postwar period have been the concepts of mobility, despatialization, and the advance of technology and the economy, each of which is tied to energy abundance.

The geographic growth and dispersal that characterized the settlement patterns of the postwar era were both a factor in, and an effect of, an energy system that marked a mobile society. Increasing use of the automobile allowed greater flexibility of movement and location, and created growing demands for oil. As the

significance of geography was reduced through enhanced mobility, it was further minimalized by the availability of electricity at almost any location. Electricity comprised an expanding share of the total end-use energy mix, and became increasingly characterized by dispersed access and large-scale coordination through power pools. Visions of the electric society came to be formulated upon the prospect of nuclear power as the technologically-sophisticated form of power generation that would provide abundant energy for centuries to come.

Federal policy in the postwar years was based upon the goal that government should encourage and support energy growth as a means of assisting economic growth. Research and development into the production of nuclear electricity was both initiated and funded by the federal government (Davis, 1982; Stobaugh and Yergin, 1983; Byrne and Rich, 1986; Rosenbaum, 1987; Martinez and Byrne, 1996).

Likewise, the federal government played a fundamental role in the oil market and the development of oil resources. Following its discovery in the mid-nineteenth century, oil became the basic source of power for industrial civilization, and evolved into the largest industry in the world (Stobaugh and Yergin, 1983). By the end of World War I, the United States dominated the market, producing two-thirds of world oil from domestic sources and an additional sixth from Mexico. Into the early 1950s, the United States continued to produce domestically more than half of the world's oil. Almost concurrently, from the mid-1920s until the mid-1950s, U.S. companies gained a dominant position in the Middle East, supported by government assistance in establishing foreign operations and providing antitrust clearance intended to strengthen the position of the newly-formed consortium of oil

producers. Many in the government were confident that the control of foreign sources was as dependable as if those sources were owned by U.S. interests, and the federal government collaborated with the large companies to place as many foreign sources as possible under U.S. control (Stobaugh and Yergin, 1983). By 1955, the domestic and foreign production of the five major U.S. oil companies[1] accounted for two-thirds of the world oil market.

Although the United States had established itself as the leader in oil production, domestic consumption came to rely increasingly upon imported sources. By 1948, imports exceeded exports due to the lower costs of oil produced elsewhere, primarily in the Middle East. As the percentage of imports continued to climb, political events and the economic demands of exporting nations worked to compromise the dominance and security of the U.S. position. Exporting countries demanded higher prices, increasing royalties and growing shares of control and ownership of oil operations. In 1959, President Eisenhower imposed import restrictions for reasons of national security. Domestic production then increased, yet by 1970, spare capacity had been exhausted, and domestic production had reached its peak and began a subsequent decline. Demands for cheap oil encouraged a growing share of the market to be held by imports. Three years later, in April 1973, President Nixon lifted the import quotas to counteract the intermittent

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[1]The five U.S. companies considered to be international majors were Exxon, Gulf, Mobil, Socal and Texaco. Two British-based companies, British Petroleum and Royal Dutch/Shell, also held the position as international majors. In combination, the seven companies controlled 98% of the world market (Stobaugh and Yergin, 1983).

shortages that had begun to occur throughout the country (Stobaugh and Yergin, 1983).

The Energy Crises

American society in the 1970s experienced two periods of severe energy shortages. Both occurred as a result of the disruption of oil imports from the Middle East, and created a wide range of diagnoses and recommendations concerning the attainment of security and stability of the energy situation.

The First Crisis

The growth machine which had characterized the American economy in the postwar period, and which focused upon economic expansion and depended upon increasing energy supplies, suddenly experienced an apparent breakdown in October 1973 as the Organization of Petroleum Exporting Countries (OPEC) embargoed the export of oil to the United States and other nations. Issues of price and expanding supply were transformed into questions of the ability to obtain oil under any circumstances. Political forces had intervened in the process of economic growth.

In May 1973, President Sadat of Egypt advised King Faisal of Saudi Arabia that he was considering the repossession of Arab land then occupied by Israel. Although this possibility was communicated by King Faisal to the U.S. government through American oil executives, along with a warning from the king that American interests in the Middle East relied upon U.S. support of the Arab position, it received no response. On October 6, 1973, Egypt attacked Israeli forces along the Suez Canal. On October 17, OPEC agreed to reduce exports by 5% monthly until Israel changed its Arab policy (Rosenbaum, 1987). Two days later,

upon learning that the United States had provided arms to Israel, King Faisal reduced Saudi output by 25% to pressure neutral nations to support the Arab cause, and ordered an embargo against the United States and the Netherlands because of their support to the Israelis (Davis, 1982). Other OPEC nations quickly followed the Saudi example, and prices rose precipitously. On November 7, President Nixon warned the public of an "energy crisis" (Rosenbaum, 1987). The cutbacks were equivalent to less than 10% of world supply, but created extensive panic. Various OPEC countries conducted auctions for refiners of crude oil, and prices were officially raised by OPEC effective January 1, 1974.

In response to OPEC actions, President Nixon granted the federal government extensive authority. By late 1973, mandatory allocations were imposed for selected fossil fuels and the Federal Energy Office was established within the White House (Rosenbaum, 1987). President Nixon announced Project Independence in December, which included proposals to increase domestic supplies, limit imported oil and institute energy planning (Rosenbaum, 1987). Project Independence also called for nuclear energy to provide 30-40% of the nation's electrical power by the end of the 1980s and up to 50% by the year 2000 (Stobaugh and Yergin, 1983). The goal, as stated by the president, was that "by the end of the decade we will have developed the potential to meet our own energy needs without depending on any foreign energy sources" (quoted in Stobaugh and Yergin, 1983: 278).

In January of the following year, the president requested that Congress enact legislation to allow restrictions on the consumption of energy, to relax air pollution standards for automobiles and power plants, to establish an infrastructure

for energy research, and to create a windfall profits tax (Rosenbaum, 1987). Although the report detailing Project Independence was rejected by President Ford in 1974 due to its large-scale conservation requirements (Davis, 1982), by August of that year the federal government had acquired significant authority in terms of energy regulation. This authority was manifested through a variety of policy measures: the allocation and pricing of petroleum products, the institution of year-round daylight savings time, the establishment of a 55 mile-per-hour speed limit, the creation of the Federal Energy Administration and the Energy Research and Development Administration, the funding of new programs to promote solar energy research, and the advocacy of nuclear power development (Rosenbaum, 1987).

The embargo ended on March 18, 1974 (U.S. Department of Energy, Energy Information Administration, 1999b). During the period 1973-1974, OPEC raised the posted price of oil sixfold, which exacerbated the global recession and produced reductions in the demand for oil (Davis, 1982). By the end of 1974, prices were higher, but supply was stable, and President Ford rejected additional regulation of the market (Davis, 1982). Although the president proposed a number of energy measures including new federal energy regulations, marketplace solutions, the development of new domestic energy resources and the relaxation of environmental standards thought to inhibit domestic production, these initiatives did not pass in Congress (Rosenbaum, 1987). The major energy policies that were enacted were contained in the 1975 Energy Policy and Conservation Act which established efficiency standards for cars and appliances, a strategic petroleum reserve, and price controls for "new oil." However, the Act did not present a unified policy, or provide significant conservation in the short term (Davis, 1982).

President Jimmy Carter entered office in 1977 with the view that energy issues should be understood as a national emergency. Four broad objectives—centralized energy planning, efficiency and conservation, research and development, and environmental protection and social equity—guided the development of his energy strategy (Rosenbaum, 1987). The National Energy Plan he proposed in February 1977 addressed these objectives through provisions for new industrial and utility plants to use coal rather than oil or natural gas; efficiency standards for major appliances; requirements that utilities encourage conservation among their customers; gradual decontrol of domestic oil and natural gas; taxes on inefficient automobiles; tax credits for energy-conserving technologies; enhanced research and development for solar, synthetic fuels and other technologies; and the establishment of the Department of Energy. In conveying the critical nature of these measures to the American citizenry, the president stressed the primacy of energy for national well-being, and declared that the energy situation had become the "moral equivalent of war."

> The most important thing about these proposals is that the alternative may be a national catastrophe. Further delay can affect our strength and our power as a nation...Our decision about energy will test the character of the American people and the ability of the President and the Congress to govern this nation. This difficult effort will be the "moral equivalent of War"... (quoted in Rosenbaum, 1987: 7)

By the end of his administration, major programs included the decontrol of domestic oil and gas prices, energy conservation regulations, increases in spending for research and development, new controls on imported oil prices and oil industry profits, environmental safeguards on energy use, and the creation of the Department of Energy.

The Second Crisis

The years from 1974-1978 marked an "Indian summer" for oil (Stobaugh and Yergin, 1983). The combination of increasing productive capacity in the North Sea and Alaska, lowered demand in industrial nations due to slow economic growth, conservation efforts and U.S. price controls worked to provide a sense of well-being regarding energy supply and its prospects for the future. By 1978, OPEC price increases did not keep pace with inflation, and projections were being put forward regarding an oil glut, which would force down its real price. Despite the retrenchment during the crisis, U.S. consumption from 1973-1978 increased by 1.5 million barrels per day. During this period, the United States relied increasingly on Iran as an ally, and the extent of this commitment was evidenced in the transfer of military technology (Stobaugh and Yergin, 1983).

What had been unanticipated during this relatively tranquil period was that political conditions in Iran would cripple the tentative stability that had apparently been emerging in global energy relations. Iranian oil workers went on strike in December, 1978, abruptly halting production, as domestic unrest forced the shah into exile. A worldwide shortage of oil ensued, exacerbated by increases in OPEC prices. Although other countries such as Saudi Arabia increased production, expanded consumption levels created a shortfall. OPEC took advantage of this situation by raising spot market prices and adding surcharges on all oil, including that covered by long-term contracts. Under the direction of the new civilian government, the Ayatollah Khomeini announced that production would not approach previous levels and the consortium would be banned from the country. As Iranian oil began to come back on the market, other OPEC nations reduced production to maintain a tight market and high spot prices.

By the end of March, 1979, even OPEC could not control rising oil prices. Price hikes scheduled for December became effective immediately and members were allowed to add premiums to those prices at their discretion (Stobaugh and Yergin, 1983). The oil market changed as high spot prices encouraged producers to shift away from contract customers, resulting in the reduction of sales to independent refiners by the majors. This in turn forced more sales on the spot market and disrupted established supply relationships. As it became clear that the Iranian revolution had created a permanent reduction in world supply and that the supposed world surplus was smaller than had been thought, Saudi Arabia lost its ability to control the market price. Other producers began to question the impacts of rapid domestic development and to equate the export of oil with subservience to the West (Stobaugh and Yergin, 1983).

In June, 1979, a summit of Western leaders held in Tokyo resulted in agreement to limit imports, but highlighted the inability of these countries to present a unified front in challenging price increases. While the United States viewed the immediate issue as one of supply, directly attributable to OPEC actions, the other nations considered the United States to be a contributor to world oil problems by maintaining artificially low prices through price controls as well as allowing consumption to rise. Between 1973 and 1978, U.S. oil consumption had increased by 1.5 million barrels a day (Stobaugh and Yergin, 1983).

OPEC continued to raise prices into 1980, and at least four OPEC countries reduced output during that year to confront the large inventories developed by oil companies in 1979. By the fall, lowered demand due to reduced economic activity and conservation efforts, in conjunction with continued Saudi output, served

to slow price increases in the world oil market. However, in September, Iraq invaded Iran, creating supply disruptions and damaging production facilities. Again, reduced output escalated prices. Early in 1981, President Ronald Reagan ordered decontrol of domestic oil prices, which in turn reduced U.S. demand, created a competitive environment, attached greater significance to price rather than supply, and served to hold down world oil prices (Stobaugh and Yergin, 1983).

Thus, in less than a decade, the nation had experienced two major periods of disruption in oil supply and had witnessed two regional wars over the direction of supply and the pricing of oil. During this period, prices had multiplied by a factor of five—from $10.72 in 1972 to $53.39 in 1982 (U.S. Department of Energy, Energy Information Administration, 1998b). It had become very clear that something was wrong.

Energy Crises and Challenges to the Ideology of Postindustrialism

During the 1970s, U.S. energy policies included a number of approaches that attempted to address the realities of reduced or erratic supplies of oil. In general, national policy focused upon increasing energy supplies, reducing demand through conservation or efficiency measures, and bolstering domestic resources. By 1977, however, a theoretical position on the energy situation had emerged which countered the identification of the problem as an issue of supply by defining it as the systemic dependence on cheap and abundant energy.

Amory Lovins (1977) was a principal architect of the systemic dependence thesis. He challenged the key assumptions of postindustrialism—specifically, abundance, adaptation and efficiency—by arguing that the crisis was rooted in the values and socio-political structure inherent in the prevailing energy

system. According to Lovins, the structural architecture of the energy system constituted the real problem, and only by understanding the nature and implications of the institutional framework of energy could appropriate solutions be derived regarding energy security and independence.

Lovins proposed that the nation was at a crossroads, confronting a crucial choice between two mutually exclusive energy systems. One option he characterized as the "hard path," or the perpetuation of the current energy system dependent upon fossil fuels, supplemented by the rapid development of nuclear power and large-scale centralized organization. The other he termed the "soft path," meaning an energy basis founded upon conservation, renewable resources and comparatively small-scale technology systems and operations. Although he argued that the alternatives are not technologically incompatible, each engenders its own institutional framework that must be considered and adopted in its totality. The choice between energy systems should be identified as a choice not between technical devices, but rather between the socio-political structures and values upon which to organize society. At the current crossroads, he claimed an urgency to the nation's energy dilemma. Without prompt action, a deepening and entrenchment of the hard path would continue and serve to constrict the potential for the adoption of soft path alternatives.

> These two directions of development are mutually exclusive: the pattern of commitments of resources and time required for the hard energy path and the pervasive infrastructure that it accretes gradually make the soft path less and less attainable. That is, our two sets of choices compete not only in what they accomplish, but also in what they allow us to contemplate later. They are logistically competitive, institutionally incompatible, and culturally antithetical. (Lovins, 1977: 49)

As manifested in federal energy policy, the hard path is premised upon continued growth in energy consumption and the replacement of imported oil with new or expanded use of conventional sources. In order to ensure the viability of coal, gas, nuclear, and domestic oil, the modification of the mix of these energy inputs has relied upon price incentives through government regulation and subsidies. The hard path will be both maintained and defended upon the basis of the existing large-scale, capital-intensive energy infrastructure currently in place. Lovins projected that, in light of the decade's energy "crises," the system would pursue reforms. But these reforms would have the character of system maintenance and preservation. Such reforms would include enhanced energy efficiency attained through technical means, appropriate utilization of markets through non-interference with market pricing mechanisms, stricter end-use and environmental standards and, only if absolutely necessary, through altered behavior and lifestyle patterns. In the short term, however, Lovins proposed that the combination of energy prices based upon total costs and the application of technological capability to increase efficiency could sustain current levels of end-use energy consumption.

The soft path, alternatively, is characterized by renewable energy sources accessed through the use of technology that is flexible and diverse, and coordinates the quality, scale and distribution of energy with end-use purposes. Utilizing resources and technology appropriate to end-use needs reduces or removes the cost of unnecessary energy conversion and distribution, and minimizes the social costs effected by centralized systems. Wind, sun, water and waste would serve as the primary fuels for a soft energy system adapted to localized needs and control.

Lovins acknowledged that the transition from the hard to the soft path and from wasteful to efficient means would require intermediate measures comprising elements of each. Existing fossil fuels would be conserved as much as possible and reserves would be utilized only for narrowly defined uses such as petrochemical manufacture or as deemed essential in the event of emergency. Electricity cogeneration and other forms of conservation, the development of alternative liquid fuels, and the enhanced efficiency and use of coal would fuel the transitional stage and reduce dependence upon oil and gas.

Lovins proposed that although both the hard and soft paths must inevitably minimize the use of oil and gas and develop alternative energy sources, the soft path has lower capital and operating costs, reduced environmental impacts, and wider distribution of both technical and economic risks. While preferable for these reasons, the adoption of the soft path would, however, require broad-based institutional restructuring appropriate to pluralistic, diverse and dispersed small-scale energy networks. The transition from centralized to autonomous energy systems would shift the locus of decisionmaking to the individual and local level, thus necessitating numerous changes in the redistribution of control from central authorities to households and communities.

The choice between hard and soft energy paths rests upon "sociopolitics" and the identification of social values. Political actions must be undertaken to encourage responses consistent with "hard path" or "soft path" values. As illustrated by Lovins' proposed framework for the transitional stage, hard and soft technologies could coexist for a time. However, because each path represents different socio-political structures, ultimately, they are diametrically

opposed and a choice would have to be made. The choice, according to Lovins, was between local efficacy and centralized authority, between a myriad of decentralized appropriate energy technologies and a limited number of energy sources to fuel large systems, and between relative energy independence and a state of insecure dependency. Lovins proposed that as fossil fuel resources become more constrained and nuclear power more politically undesirable, eventually the soft path should triumph. The actual path that would be realized would depend upon choices about energy, political structures and the role of values.

Lovins' conceptualizations regarding the structural nature of the energy dilemma, the subsequent choices confronting society, and the inherent instability of the existing energy system were echoed by others during the post-embargo period. Calling into question not only the postindustrial principles of abundance, adaptation and efficiency, but also their relevance in describing and directing the energy situation and its future, an institutional perspective gained credence in defining the problem and proffering solutions.

Defining the energy crisis as the result of reliance upon irreplaceable resources, Barry Commoner (1979) proposed that the only resolution to the energy crisis would be the transition to a renewable energy system. Underscoring the link between energy and the economy, he argued that the only means to achieve economic stability was to resolve issues of energy.

> (T)he basic reason for the energy crisis is that nearly all the energy now used in the United States (and in the world) comes from nonrenewable sources. As a nonrenewable energy source is depleted, it becomes progressively more costly to produce, so that continued reliance on it means an unending escalation in price. This process has a powerful inflationary impact: it increases the cost of living, especially of poor people; it aggravates unemployment; it reduces the

> availability of capital. No economic system can withstand such pressures indefinitely; sooner or later the energy crisis *must* be solved. And this can be done only be replacing the present nonrenewable sources—oil, natural gas, coal, and uranium—with renewable ones, which are stable in cost. That is what a national energy policy must do if it is to solve the energy crisis, rather than delay it or make it worse...The real problem is whether it is possible to get there from here, and if so, how. The problem is one of transition. (Commoner, 1979: 49) (italics in original)

Just as Lovins proposed the imminence of a choice in the energy path, Commoner also presented the dimensions of an urgent decision between two alternatives. However, Commoner asserted that the choice was not between renewable and nonrenewable energy sources, but rather between the only two existing renewable possibilities: solar energy and breeder-based nuclear power. Stating that both choices are technically feasible and that both would involve grave economic, social and political consequences, each would engender different forms of organization, scale and control. Each would reflect different values and perceptions of national welfare. A choice must be made, for "the two routes are inherently, intractably, incompatible...We can take one route or the other, not both" (Commoner, 1979: 64).

According to Commoner, only the solar option can meet the needs of democratic society and promise environmental integrity. The choice between solar and nuclear-based society is a political and social, rather than technical, one.

> (T)he solar transition offers the nation a momentous opportunity, which...can rebuild the faltering economy. But it is beyond the reach of purely private governance. Society as a whole must be involved, for the solar transition is a great historic passage which only the people of the United States can decide to undertake. What stands in the way of that decision is neither technology nor economics, but politics—the politics of evasion, which, by denying that the problem

> exists, deprives the American people of the opportunity to solve it. (Commoner, 1979: 80)

John Byrne and Daniel Rich (1983) underscored the centrality of values and the element of choice in the determination of the energy future.

> (T)he evaluation of energy futures is essentially a problem of political economy, and the paramount criteria for choosing an energy future are, or ought to be, the likely consequences for how, by whom, and in whose interests the political economy of energy will be governed. (1983: 164)

Political and economic constraints, rather than existing technological capabilities, serve as the point of departure from which energy choices are identified and evaluated. Structural conditions of the past have shaped the current energy system, and have come to represent not only the "primary sources of inertia" (Byrne and Rich, 1983: 169) in redirecting the energy future, but the criteria upon which alternatives are judged. As long as the existing energy system and its attendant political economy continue to serve as the framework for envisioning the future, the illusion of control and stability will be perpetuated, effectively discounting possibilities that fall outside this structure. What must be addressed in determining the energy future is the structure of political economy and the social valuation that it reflects.

Lovins (1977), Commoner (1979), and Byrne and Rich (1983) stressed the structural nature of the energy problem and the political nature of the decisions and decisionmaking process required to overcome the constraints imposed by the existing energy system. While not conceding to the structural changes required for a stable energy future, even some elements of mainstream thinking adopted the view that significant reform was needed. The Energy Policy Project of the Ford

Foundation (1974), the Energy Project at the Harvard Business School (Stobaugh and Yergin, 1979), and Ross and Williams, using testimony before the U.S. Congress (1981), embraced the essence of the emerging structural diagnosis; namely, that the problems of the energy system lie in the social realm and choosing an energy future is a question of social values. All three works concluded with Lovins and other energy "radicals" that the goals of energy conservation and energy security needed to be paramount in America's choice of a new energy direction.

As stated by the Energy Policy Project of the Ford Foundation, "(t)he final decisions on energy related problems are based on value judgments" (1974: 10). The goals of energy policy, the Ford Foundation argued, must include not only the assurance of energy supply but the pursuit of social goals to protect the environment, safeguard the poor, minimize social and economic costs, and stabilize foreign relations. Energy conflicts in the social realm cannot be resolved by appeal to market decisions or the exercise of expertise, for "resolutions emerge through a messy process of...politics; and energy policy is a part of it" (1974: 11).

The Ford Foundation's report, *A Time to Choose*, argued that energy policy must assume a new direction if it is to accomplish the goals of economic growth without disruption of lifestyles, while also reducing growth in energy consumption in order to address social and national security issues. Conservation and the development of "unconventional" renewable energy supplies can address both of these goals, but will require restructuring of the energy system and realignment of private and public roles. Ultimately, such things can only occur as a result of political decisions.

A team of researchers at the Harvard Business School reached similar conclusions. Stating that "(t)he fundamental purpose of U.S. energy policy...should be to manage a transition from a world of cheap imported oil to a more balanced system of energy sources," Stobaugh and Yergin (1979: 271) proposed that enhanced energy security and the maintenance of economic growth require that the country shift from conventional energy sources to conservation and the development of solar energy.

> (I)t is time to set a meaningful national goal for conservation. At the very least, our aim should be zero energy growth for the 1980's; not just because our supplies might be limited to that but because meeting this goal through productive conservation is the best way to promote positive economic growth. This would not be zero energy growth *forced* upon us with all the negative consequences, but zero energy growth as a consciously managed policy aimed at enhancing economic growth—*productive conservation*. (Stobaugh and Yergin, 1979: 304) (italics in original)

In order to support the transition, market distortions must be eliminated to create an even playing field on which conservation and solar options can compete with conventional energy technologies.

Researchers from Princeton's Center for Energy and Environmental Studies and the University of Michigan's engineering college likewise endorsed the view that a government-funded energy transition was essential to America's future. Beginning with the statement that "(t)he United States has lost control over its energy system," Ross and Williams (1981: 1) indicted existing U.S. energy policy and societal perceptions of the energy crisis for their focus on extending energy supply through increasing resources, rather than examining energy conservation as a structural alternative.

> We do need new sources of energy, but the present emphasis on developing high-cost energy sources to support growing energy demands is fundamentally ill-conceived...Fundamental changes in energy policy are needed to break the present impasse. Our present policy, which is preoccupied with energy supplies, does not take into account the fact that supply expansion is only one way, and an increasingly ineffective way, of meeting energy needs. There are also vast opportunities for meeting these needs, at a lower cost to society, by saving energy through energy efficiency improvements...But to exploit these opportunities and raise saved energy to the status of energy supply, the nation and its energy users must stop conceiving of the energy crisis in terms of energy supply and consider instead the services that energy provides. (Ross and Williams, 1981: 2)

End-uses, and the means to provide the energy necessary for their achievement, should play a key role in reshaping the energy system. Ross and Williams proposed that conservation opportunities could produce decreases in total demand without harming the economy and could, in fact, result in improvement in overall productivity. Energy conservation could provide the means to realize economic goals, even when confronted by higher prices, by shifting capital resources and utilizing the savings to modernize industry. According to Ross and Williams, the development of an energy-conserving society depended upon the redirection of technological and social development via a political and economic climate conducive to innovation in end-use-oriented technologies and services. These authors, like the Ford Foundation and Harvard Business School, concluded that such a climate for energy conservation could only be created through political choice.

Thus, by the early 1980s, conservation and renewable energy options had undergone a kind of political rehabilitation: from the panaceas of anti-technologists, fringe environmental groups and leftist radicals to the preferred solutions of mainstream thinkers in industry and academia. Even the proposition that energy issues were fundamentally social and political seemed to have gathered

mainstream support. But the sense of urgency in addressing society-energy relations, which had emerged from two energy crises and the threat of war, was short-lived. The national understanding of energy problems was transformed from a sense of crisis to a belief that a necessary, and ultimately beneficial, technological transformation was underway. A revised postindustrial conception of the energy problem surfaced in the early 1980s, receiving strong political support from the market-based ideologies of the recently-elected Reagan administration.

Postindustrial Response to the Energy Crises

President Reagan, after entering office in 1981, again redirected the focus of national energy policy. The role of producers in the development of policy expanded and the supply of energy returned as the dominant priority. Oil prices were decontrolled domestically and greater exploration was promoted through increasing access to federal lands (Palumbo, 1988). As Middle Eastern oil prices declined during the early 1980s (U.S. Department of Energy, Energy Information Administration, 1999b), the postindustrial ideology of reliance on markets and technology appeared to be substantiated, and market ideals resurfaced as the foundation of national energy policy. The role of government, according to postindustrial revisionists, was to remove itself from the energy arena, allowing markets and technology to provide the solutions to energy issues.

David A. Stockman (1982), director of the U.S. Department of Management and Budget, proposed that the "energy professorate" and its followers among governmental and legislative activists had adopted and promoted false assumptions regarding the energy situation, which then created an "energy blitzkrieg" (1982: 10) of regulations, taxes, subsidies, and pricing policies. Based

on inaccurate premises, an elaborate structure of governmental activity and directives had undermined the entire energy system in the attempt to address issues that could find solution only through the machinations of the market. According to Stockman, the misunderstanding of the problem led to "solutions" which were doomed to be ineffective, while the answer was immediately apparent.

> In October 1973 a profound but straightforward event occurred that initiated a drastic reordering of the economic furniture of the entire world economy...This task of reordering of the worldwide capital stock was so far-reaching...that no computer model, think-tank seminar, international energy secretariat, Department of Energy or congressional subcommittee could hope to figure it out. It was a problem whose solution was tailor made almost exclusively for markets. (Stockman, 1982: 10-11)

Stockman argued that a fully integrated world petroleum market continued to exist and would endure, regardless of efforts to change that reality. Appropriate adjustment mechanisms were already in place, and the capital stock would adjust to altered prices without assistance. Dysfunctions in the system would only be evidenced when players did not act in accordance with their market role.

> (T)he world petroleum market works, even if we do not like its outcome in general or at any particular moment in time. Dogmatic insistence that it is rigid or rigged, artificial, and avoidable will not make it so. It will only encourage Congress to heap controls, entitlements, thermostat rules, wood-stove tax credits, and assorted other wasteful or coercive baggage on our domestic energy markets. To be sure, the long-run price and supply trends are worse than they would have to be in a totally enlightened world; and not every oil exporter behaves like a classic profit-maximizing firm. (Stockman, 1982: 15)

Stockman also challenged the hypothesis that resources were being depleted, which had given rise to unnecessary conservation efforts and insulted the nation's productive capabilities.

> If there is any good bet, it is that the technology will change well before the resources are extinguished...Of course the exhaustion the professors were talking about never had much to do with Mother Earth subsiding into empty reservoirs. The depletion they implicitly forecast was that of human intellect, economic institutions, and our capacity for technological imagination and innovation. I regret that they failed to make that distinction clear, because while my colleagues do not know what to believe about geology, they would never have swallowed such revisionism about free men and free institutions. (Stockman, 1982: 12)

Faith in technology, as a product of the market, would render appropriate responses and solutions to energy issues, and government efforts to direct the development of innovations in technology would not be effective in achieving the desired results. According to Stockman's thesis, although the "professors" offered impending scarcity and the threat to national security caused by overdependency as reasons for governmental action, neither addressed the fundamental distinction between the political and economic realms. Political issues should be resolved through the political system, and economic issues should be given to the workings of the marketplace.

Arthur B. Laffer (1982) echoed Stockman's assertions that, if left alone, the market would provide the best solutions to the nation's policy issues and that intervention only serves to make the nation worse off. Laffer proposed that energy problems are representative of the range of problems facing the country, indicating that the economic patterns exhibited and the solutions offered are the same in all arenas. Proposing that the economic redistribution perspective of policy during the

previous decade and a half had spawned a "new *demand* strategy or sort of contractionist perception" (1982: 143, italics in original), Laffer concluded that not only had interventionist policy denied the incentives that the system has to offer, but had created disastrous economic consequences. By ignoring the incentives inherent in the market structure, policy had contrived to make everyone worse off than if they had had the freedom to act in their own self-interest. According to Laffer, this "Robin Hood" strategy of taking from one to give to another resulted in deepening inequality as the costs of conducting business are increased for the former and reflected in the prices charged to the latter. Under these circumstances, everyone becomes worse off than they would have been had the intervention not occurred and had they been allowed to act in their own self-interest.

Self-interest, and the concerns of the consumer, provided the foundation for Roger Sant's "least-cost energy strategy" (1982), which emphasized the services that energy provides and the consumer's preference that such services are available for purchase at the least possible cost. Sant argued that by using the best available technology to provide the same energy benefits, the savings resulting from cost-effectiveness could provide vast market opportunities for further improvements in efficiency and enhanced savings. According to Sant, although government intervention, particularly price controls, had slowed the process of appropriate market adjustments and technological innovation in response to market cues, the economic dynamics were in place, were seeking a solution, and would not be stopped.

> (A)ll of the economic forces in the United States are heading toward a solution. I did not say the market is progressing toward a solution, but that all the economic forces that we can find are progressing toward an equilibrium in which this energy crunch all works out...If,

> since the embargo in 1973, we had done what the economics of energy indicated we should have done, we would probably be close to a solution right now. By solution, I means energy would not be an issue on which we need a conference or that it would not be something about which to worry. And even though we have not done what the economics would indicate we should have done, economic forces are still heading toward a natural solution. (Sant, 1982: 109)

Sant predicted that by the end of the decade, competition, new product opportunities, and choice would define the energy market, and would render services at costs no higher than current costs.

> What is needed for that happy result? Nothing. What is needed if we want it to happen by 1985 instead of 1990? It certainly is not government. Legislators ought to do everything they can to remove themselves from the scene, rather than try to provide more tax incentives and subsidies... (Sant, 1982: 114)

Sant was confident that, notwithstanding a decade of policy-inspired interference with the market, economic forces would eventually and inevitably provide the solution.

Sant, Laffer and Stockman all underscored the point that energy problems are not social or political questions, but rather issues of new technology needs and economic adaptation, both of which are best encouraged by allowing market mechanisms to operate unimpeded. According to this view, politics must be replaced by market forces, and artificial incentives and penalties must be discarded in favor of deregulation and the absence of control. Energy issues should be seen as economic and technical in nature, to be addressed by economic and technical means. Government must be removed from the energy system structure, for it constitutes not the solution to energy dilemmas, but rather the problem.

The Primacy of Energy Productivity to Economic Productivity and National Well-being

The market-based solution advocated by postindustrialists as the antidote to the failed interventionist policies of the 1970s was tied to the proposition that economic growth and national well-being were dependent upon markets and technology, not policy. But, according to postindustrial thinking, not just any technology or market would do; at least, not in the case of energy. Stockman, Sant, Laffer and others continued to underscore the importance of energy as an essential input to the modern economic engine.

One key expression of this postindustrial link between energy and well-being is found in the work of Dale Jorgenson (1984), who sought to empirically demonstrate the relationship between energy, modern technology, and productivity growth. Utilizing an econometric model of industrial sector productivity growth, Jorgenson assessed the impact of changing levels of energy inputs on national production. Within each sector, he compared the contributions of capital, labor, energy, and materials to national economic productivity. Taking into account substitutions of inputs due to relative price changes and exogenous technological change, he isolated the impact of each input on productivity growth for each sector. Thus, he was able to determine, for example, whether the relationship between productivity growth and energy was positive; that is, whether a specific sector's growth could be characterized as increasing as a result of the substitution of energy for other inputs.

Jorgenson found that in nineteen of the thirty-five industrial sectors, productivity increased as a result of higher shares of both electrical and nonelectrical energy use in production processes. That is, economic productivity increased when

the consumption of directly-combusted energy *and* electrical energy rose. The industries he identified as energy-using for both types of energy included the major sectors of an advanced economy: electrical and gas utilities; finance, insurance and real estate; communications; transportation; electrical machinery; and instruments. With only one exception (furniture), productivity growth was found to be strongly related to increased use of energy, either electrical or nonelectrical. Jorgenson concluded that recent technical change depended upon growth in the share of energy inputs and/or declines in the price of energy. Both factors were found to have spurred technical change: energy price reductions in twenty-seven of the thirty-five industries, and increases in energy inputs in twenty-eight of the same industries.

Jorgenson also argued that his analysis showed that the substitution of capital, materials, and labor for energy inputs following the price increases of the 1970s was associated with a slowdown in productivity growth during the period. Thus, a reduced level of energy intensity in production in most sectors and/or an increase in energy prices could be expected to lower productivity.

Jorgenson's analysis of the relationship between energy use and productivity growth emphasized the energy-using nature of the growing postindustrial economy. He encouraged the view that enhanced energy use translates into growth, and constraints on energy use promote productivity decline. The challenge in regard to energy then becomes how to match energy needs most efficiently in relation to the prevailing economic and technological forces. The answer, according to postindustrialism, is reliance upon markets. As expressed by Sant, President Gerald R. Ford's energy advisor, a market-led strategy provides the solution to meeting energy demands in a postindustrial economy. Market

adjustments will occur naturally, providing opportunities for technological innovations and improvements in efficiency that will provide energy services at the least cost. The answer lies in a commitment to unfettered markets and technology development. In Sant's mind, the dynamics of the market were unstoppable. Accordingly, he proposed that the only action to take was to "let the forces start turning; we're not going to be able to stop them" (Sant, 1982: 117).

The Electric Society

Postindustrial analysis forecast the transition in energy systems as one that is increasingly dependent upon electricity and less dependent upon the direct combustion of fossil fuels. This forecast reflected two basic premises of postindustrial thinking. First, it posited that the era of postindustrialism is fundamentally based on a transition from a heavy industry-based economy to one that is driven by advanced electronics, telecommunications, and other "high-technologies"—all of which are based exclusively upon electricity. Second, it advocated that electricity offers the advantage of allowing for a versatility of input fuels, thereby avoiding the bottlenecks that can occur when reliance is placed upon a single fuel type, as witnessed during the 1970s when certain industries relied heavily upon oil for their operations. In the new postindustrial order, all fuel options—renewable and nonrenewable—could be harnessed in support of economic growth via the use of advanced electrical systems.

The postindustrial forecasts corresponded closely with Jorgenson's analysis of the electricity-economy relationship (1984). Jorgenson had examined not only whether productivity growth is energy-using but, specifically, whether it is electricity-using. The role of electrification in productivity growth had previously

been defined through historical evidence that identified the electricity-using nature of recent innovations. Economic analysis had also shown that the decrease in the cost of electricity that resulted from thermal efficiency in generation had contributed to productivity growth.

Jorgenson found that technical change is electricity-using in nearly two-thirds of the major U.S. industrial sectors. Decreasing electricity prices were found to encourage technical change and, conversely, technical change could be shown to engender an increasing share of electricity input in the value of output when relative prices were held constant. Industrial sectors identified by Jorgenson in which productivity was linked to increased electrical energy use included: services; trade; finance, insurance and real estate; communications; instruments; and gas and electric utilities. While these findings parallel those for energy generally, it is significant to note that Jorgenson's work showed that nearly all of the "high-technology" sectors were electricity-using and their productivity was highly sensitive to electricity price changes. He concluded from this analysis that the leading sectors in the postindustrial economy are electricity-using and, in many instances, nonelectrical energy saving, which underscores the centrality of electricity to postindustrial society. Indeed, it suggests that *Postindustrial Society=Electric Society*.

Jorgenson's analysis supports the general recognition that electrification has played a key role in economic growth in the post-World War II era. Moreover, it supports the view that electricity intensity is strongly linked to postindustrial technical change. The results of his analysis nicely fit within the $E \times T = P$

relationship proposed by Leslie White, with the additional specification of electricity as the primary energy source.

Peter Navarro (1985) offered an historical and political analysis in the post-energy crisis period that reached essentially the same conclusions as Jorgenson. He pronounced the electric utility industry to be the energy cornerstone of the American economy, characterizing the promise of electricity as the "energy springboard for our future growth and prosperity" (1985: xxiii). According to Navarro, we live in an "increasingly high-tech, computerized and, not coincidentally, electrified world where word processors, computers, and the telecommunications network are quite literally America's central nervous system" (1985: 65). Navarro underscored the significance of electricity to growth and economic viability by pointing to the existence of a strong relationship between Gross National Product and growth in electricity demand. According to his conclusions, constraints on the expansion of electricity supply could only result in compromising economic viability, foreboding both the figurative and literal "dimming of America." The increasing adoption of electricity within the context of an unencumbered market, however, would promote not only the ability to "keep the lights on" but would ensure a fertile foundation for the effective operation of the market and continued economic growth.

Herman Kahn, William Brown, and Leon Martel (1976) concurred that electricity will dominate as the preferred form of end-use power.

> Two developments are likely to occur during the next 100 to 200 years which will prepare the way for what we think will emerge as a more or less steady state in energy production and distribution, regardless of which long-term energy sources become commercially dominant.

> There is little debate about the first—that most of the energy produced on a large scale will be in the form of electric power. Thus, most present concepts for major long-term energy sources (solar, geothermal, fusion) are based upon electric power production at central plants.
>
> The second major development is the prospective use of hydrogen as both a basic fuel to replace natural gas and as part of a general system to convert, store and/or transmit electric energy over long distances. (Kahn, Brown and Martel, 1976: 78)

Electricity will dominate in a world increasingly characterized by energy abundance. According to Kahn, Brown and Martel, although the path to abundant energy will not be smooth, due both to its vast technological scale and the amounts of capital involved, new mega-energy systems could potentially be in place within fifty years.

> The basic message is this: Except for temporary fluctuations caused by bad luck or poor management, the world need not worry about energy shortages or costs in the future. And energy abundance is probably the world's best insurance that the entire human population (even 15-20 billion) can be well cared for, at least physically, during many centuries to come. (Kahn, Brown and Martel, 1976: 78)

According to these authors, it was crucial that society recognize that "mankind's future well-being is intimately linked to the prospects for an abundant supply of energy at reasonable prices" (Kahn, Brown and Martel, 1976: 59).

Kahn, Brown and Martel concluded from the first energy crisis that an abundant energy future was not in jeopardy so long as society took steps to promote a sense of security, founded upon faith in technology and the functioning of the market. In response to the energy shortages and price increases, they proposed that prices would eventually adjust, new technology would render improvements in efficiency, and new energy sources would support a greater degree of stability and security. Three years later, during the second energy crisis, Kahn (1979) remained

optimistic that nearly unlimited and economical quantities of clean energy would be available in the coming years as the shift from fossil fuels to electricity continued and as sufficient research and development of new technologies delivered renewable and/or essentially inexhaustible energy supplies. However, according to Kahn, the productivity and growth needs of the "super-industrial society" demanded that technology development be allowed to proceed along its natural course. Interference in this process could serve only to prolong the transition and create unnecessary hardship (Kahn, 1979).

Kahn stressed this theme again in 1982, when he projected an imminent "boom" and revitalization of the U.S. economy. Proposing that the dynamics of the market would force a solution to the long-term threat of increasing prices, he projected that the coming boom would be fueled by increasing supplies of energy available at lower real prices, and that the energy situation would become increasingly stable. To a large extent, he justified his optimism on the observation that government had changed its role in energy issues, and had become part of the solution rather than the problem. "The government is now taking the 'best possible' remedial action—it is drastically reducing its involvement in energy matters" (Kahn, 1982: 131).

Kahn's view of energy in the postindustrial world (Kahn, Brown and Martel, 1976; Kahn, 1979; Kahn, 1982) was that it must be, and would be, abundant, would be based on electricity, and would serve the needs of society for centuries to come. All that is required is for society to accept the rational guidance of technological and market forces. An electric society, supported by an unimpeded

market and adequate technological research and development, could sustain social progress and usher in a new era of prosperity.

The Conservation/Solar Threat

Postindustrialists embraced the promise of the Electric Society and proposed that the Electric Society would bring about an era of prosperity. The pathway to the new era would not, however, be without conflict, principally due to the back-benching of the remaining anti-technologists, fringe environmental movements and leftist radicals who held steadfastly to the concept of conservation, supporting their views with projections of resource depletion and environmental degradation. Such concerns, prevalent during the 1970s, were a decade later decried by postindustrial advocates as being not only misdirected but also detrimental to the continued well-being and advance of society.

According to David Lilienthal (1980), growing energy consumption is essential, and efforts to suppress energy use would serve only to compromise the current functioning and future of society. Although efficiency in the use of resources was to be desired, calls for the conservation of resources and limited or no growth in consumption threatened the prosperity and standards of living already attained.

> Persistent and hopeful as we must be about conservation and the avoidance of waste, we must realistically take into account the established and cherished habits of energy use of the American people and the motorized dynamics of our entire economy. The fact is that major, across-the-board savings through conservation does not offer an easy way to offset the enormous gap in our energy budget...
>
> Desirable and indeed essential as conservation in the use of energy surely is, it is at best a short-term, in many cases a one-

> time remedy for energy needs in a country—or in a world—in which energy needs grow inexorably, with the growth of population, with the rise of aspirations that call for more and more energy. Proponents of energy conservation who have put it forward as *the answer* to the "energy crisis" invite the charge that this is an "elitist" doctrine and a form of the "no growth" concept. Viewed as a short-term measure, as a spur to efficiency and a campaign against waste, conservation has everything to be said for it. But to offer it as a basic social doctrine of "less is better" or as a slogan to rally opposition to nuclear energy expansion and the excesses of industrialization and "consumerism" will antagonize rather than persuade the general American public and a world in which poverty closely connected with energy shortages is endemic. (Lilienthal, 1980: 8) (italics in original)

Lilienthal proposed that the availability of energy, particularly electricity, creates a growing demand for energy use. American society is characterized by high energy consumption, and this fact should not be addressed defensively, for the necessity of maintaining a high standard of living, in his view, requires significant energy use. Accordingly, the "basic lesson of history" is that energy has assumed the role of replacing human labor, and the demand for and utilization of energy has grown in accordance with human goals and achievements (1980: 10). Reducing the availability of electricity, in particular, would severely damage national well-being, for "(e)lectricity means production, and production means jobs, income, security. Its loss could mean near chaos" (1980: 20).

> But if conservation is intended as the principal means of achieving American energy self sufficiency—as some assert—isn't this nothing more than a kind of isolationism in a particularly heartless form, an elitist disguise to mask putting a limit on total energy production, thereby slowing economic growth for those who need growth the most? In urging a conservation policy of "making do with less and less," we need to remember that most of the world's people have little or no energy to "conserve." (Lilienthal, 1980: 111)

Policy should be directed toward remedying the world's energy needs, recognizing that the energy problem is a global problem and that the United States has a moral responsibility to address this issue. Efforts should be directed toward the expansion of the energy system, rather than supporting misdirected attempts to resolve energy issues by curtailing the use of resources.

Walter Mead was even more blunt on this score. In a 1975 paper, he declared that, "to the far-out conservationist, (conservation) means locking up a resource" (1975: 72). Contrary to the free market pricing system for an efficient allocation of resources, this concept of conservation cedes control of decisionmaking regarding present versus future consumption to the government. Mead (1978) proposed that the efficient functioning of the price system is all that would be needed. He advised that a competitive economy, subject to a minimum of government interference, is the best institutional scheme found to date for the promotion of social progress. Left to its own devices, it would produce insignificant externalities that could be readily internalized. He further proposed that the price system, marked by individuals and firms acting in their own interest, optimizes the allocation of resources among competing uses and effectively serves the general welfare. Only in the event that one of the conditions for the efficient operation of the market cannot be met should government intervention be considered. In the energy system, in particular, the current problems could be traced to the long history of government intervention. Indeed, "there is widespread agreement among academic energy economists that government interference in the energy sector is the primary cause of the energy crisis" (Mead, 1978: 17). The combination of tax subsidies, oil import quotas, price controls, environmental

protection efforts and other policies created a situation in which the rationally efficient allocation of energy resources by markets was compromised to such a degree that social welfare was jeopardized.

Government policy efforts result in economic waste and social costs, as policy reflects a political response to the preferences of the dominant pressure groups, not an act undertaken in the interests of the general welfare.

> Politicians have been and presumably will continue to be responsive to the dominant political forces brought to bear on them...The oil interests have yielded their position of dominance to the environmentalists, to the consumer advocates, to organized labor, and to others. But it does not follow that the general welfare is served when political power shifts among interest groups. Future energy policy will most likely be a replay of the past. Only the beneficiary interest groups change. (Mead, 1978: 31)

Postindustrialists found a sympathetic ear with the election of Ronald Reagan as president of the United States in 1980. Reagan implemented a policy regime which "virtually abandoned alternative energy research" (Palumbo, 1988: 343) as inefficient and shifted control to the private sector. Among the first actions of his administration was to propose massive cuts in the federal research and development (R & D) budget for energy. From fiscal year (FY) 1981 to FY1983, the Reagan administration proposed an overall reduction of 44% for energy R & D efforts supported by the Department of Energy and 65% for such programs under the Environmental Protection Agency (Kash and Rycroft, 1985: 441). Further, these cuts were targeted to specific areas.

> Those proposals do not reflect the even greater structural changes in the approach to the financial support for energy. Under the Reagan program three energy sources would have suffered 80 percent of the total cut within the Department of Energy R & D budget. Those

> sources were fossil fuels—primarily coal—energy conservation, and solar power. (Kash and Rycroft, 1985: 441)

Congress did not accept the administration's proposed funding levels, which totaled $200.9 million for the three programs in FY1983. A total of $908.5 million was appropriated, an increase of 352.2% above the administration's proposals (Kash and Rycroft, 1985). As discussed above, David Stockman, director of the Office of Management and Budget and Reagan's principal domestic policy architect, served notice that conservation was the enemy and markets and technology were the nation's saviors.

By 1988, funding for conservation and renewables had shrunk to one-fifth its 1970s level. The least-cost energy strategy had been established; it meant almost no funding for conservation and renewables. The federal government did, however, provide support for the nuclear fast-breeder reactor and long-term research and development. While this version of the least-cost energy policy did not fully resemble the one Roger Sant outlined, it did possess the same ideology to "let the forces start turning" (Sant, 1982: 117).

Electric Paradise

The energy debates of the 1970s and early 1980s have now passed into history. Few politicians and other leaders take seriously issues of energy security and risk. A decade of stable energy prices, especially electricity prices, has silenced those who once sought to sound the alarm to American society about its energy future.

Only one theme of that period has survived into the present; namely, that an Electric Society exemplifies social progress. Coupled with the new communications technology, electricity has become the basis for the unfolding of the

new Electronic Society. This imagery of the combined foundation of electricity and information is perhaps most clearly articulated in current politics with the glorification of the "information superhighway" which proposes to substitute an electronic infrastructure for the nuts and bolts of industrial technology. Promising to replace hard labor with knowledge and, correspondingly, to create a paradise populated by a leisure class instead of a working class, the vision of Electronic Society clearly reflects Alfred Marshall's early hope that progress would "go on steadily, if slowly, till, by occupation at least, every man is a gentleman" (quoted in Bell, 1967a: 27).

The new society will be driven by the flow and exchange of information, which will depend on an electronic infrastructure capable of accommodating a range of communications technologies. Although still in its early stages, the framework of the information society is already in place.

> Today data, voice, image, and even full-motion video can be digitally encoded and sent across a variety of physical media: wires, fiber optics, microwaves, and satellites. Planning can now be based on the assumption that all information will be digital. (Johnson, 1991: 152)

Electronic Society will redefine the concepts of space, capital and markets, demanding flexibility in form and immediate responsiveness to changing dynamics.

> Information is the most fluid of resources, and fluidity is the hallmark of an economy in which the production and distribution of food, energy, goods, and services increasingly depend on symbolic exchange...Economies of the past, whether agricultural or industrial, were built around long-lasting structures. In place of these, we are laying the electronic basis for an accelerative kaleidoscopic economy capable of instantly reshuffling itself into new patterns... (Toffler, 1990: 128, 127)

The common denominator in the reconceptualization and restructuring of markets, forms of capital, and means of exchange has become electronic technology.

> The notion of the global information economy is no longer a forecast or a scenario; most economists would agree that the basis for wealth has changed subtly, profoundly, and irrevocably over the past three decades, due to the increasing linkages between financial transactions and global communication and computing systems. (Rheingold, 1991b: 367)

Not only are transactions and communication technologies linked, however; money and information are becoming increasingly interrelated as they assume the function of capital and are subject to the same methods of manipulation.

> As money becomes more like information, and information more like money, both are increasingly reduced to (and moved around by) electronic impulses. (Toffler, 1990: 112-113)

According to contemporary postindustrialists, the new economy leading the movement of social progress is global in scope, electronic in nature, and based on information and expert knowledge. Advanced economies will embody all of these characteristics which have become fundamental in the worldwide dynamic of wealth creation.

> The new system for making wealth consists of an expanding global network of markets, banks, production centers, and laboratories in instant communication with one another, constantly exchanging huge—and ever-increasing—flows of data, information and knowledge.
>
> This is the "fast" economy of tomorrow. It is this accelerative, dynamic new wealth-machine that is the source of economic advance. As such, it is the source of great power as well. To be de-coupled from it is to be excluded from the future. (Toffler, 1990: 399)

The global economy and the reduction of the means and elements of exchange to electronic information have led to reconceptualization of both the products of the market and its scope. Boundaries no longer exist as space is rendered irrelevant and constraints are eliminated.

> In a world where goods and services are increasingly represented in digital form, "mass-customized" to meet diverse preferences, and delivered via the network, traditional regulatory divisions, like national boundaries and market sectors, lose their meaning.
>
> The attributes that once described a nation's economy—what it exports and what it imports—no longer apply. As far as stock exchanges are concerned, it is clear that no material is being transported. Information is the new import and export, traveling at the speed of light across national boundaries, with no tariffs attached...Whereas once the market was a physical place where people had to meet in order to exchange goods, today's bartering takes place on electronic communications links, and corporate assets reside in databases. (Johnson, 1991: 172-173)

Geographically and temporally unimpeded, the electronic marketplace provides the forum for instantaneous global financial transactions, as the electronic village created by various media capabilities delivers access to worldwide information and events, making personal and social experiences more similar.

> As capital flows electronically across national borders, zipping back and forth from Zurich to Hong Kong, Hong Kong to Norway, Norway to Tokyo, Tokyo to Wall Street in milliseconds, information traces equally complex pathways. A change in U.S. T-bill rates or the yen-deutsche mark ratio is instantly known around the world, and the morning after the big event in Los Angeles, youngsters in Ho Chi Minh City discuss the latest Grammy winners. The mental borders of the state become as permeable as its financial frontiers. (Toffler, 1990: 364)

In the Electronic Society, the instantaneous availability of worldwide information has become a commonplace. In order to assure continuing participation in the global economy and society, the electronic superhighway must be as accessible as the physical roadways of the industrial era, providing entry at any point and by all persons. Everyone should be granted entry and this process should be encouraged. Toffler defined this imperative as the Law of Ubiquity.

> No nation can operate a 21st-century economy without a 21-century electronic infrastructure, embracing computers, data communications, and the other new media. This requires a population as familiar with this informational infrastructure as it is with cars, roads, highways, trains, and the transportation infrastructure of the smokestack period...(A)ccess to the media system, including computers, faxes, and advanced telecommunications, must be as free and easy as access is today to the transportation system. A key objective of those who want an advanced economy, therefore, should be to accelerate the workings of the Law of Ubiquity—that is, to make sure that all citizens, poor and rich alike, are guaranteed access to the widest possible range of media. (Toffler, 1990: 369)

Conclusion

The energy crises have largely faded into memory. Attempts in the 1970s to "fix the problems" of energy scarcity and insecurity have ceded to the reconceptualization of energy issues as problems of supply and dependence, to be resolved through the shift to electricity and the use of high-technology. Despite the protests of a number of scholars that the structures of political economy and social valuation must be addressed, that supply expansion is an ineffective means to address energy needs and that energy choices are political decisions, classical postindustrialism has embraced the three principles, as reformulated, and continues to proclaim that abundance, adaptation and efficiency are indeed the hallmarks of the

new age. Faith in technology, coupled with market solutions, will produce appropriate responses and resolve the apparent dilemmas in the energy system.

In the post-crisis era, the principles have been redefined to incorporate the circumstances of tenuous international relationships, rising costs and uncertain supplies. Energy abundance is no longer understood to mean simply plentiful energy, but rather has been defined as adequate, secure and uninterrupted flows of energy. This revised conceptualization focuses upon end-use availability, rather than strictly an abundance of inputs.

- Postindustrial society will increase its reliance on electricity because of its technological versatility. Technology intensity will substitute for traditional natural resource intensity.

Energy adaptation, earlier specifying that society should accommodate to the prevailing energy regime determined by technological and economic forces, was expanded to accommodate the need for adaptation in the energy system itself through energy diversity in the fuel mix, including the use of nuclear power.

- The fuel mix will change dramatically as the Electric Society makes full use of the complete range of energy options. Nuclear power, in particular, will produce cheap, abundant and, indeed, "eternal" energy.

Energy efficiency, in pre-crisis terms, meant economic efficiency or energy at the least cost. In the post-crisis conceptualization, efficiency also came to signify technological efficiency through technical improvements to reduce total requirements.

- Through sophisticated technology, the Electric Society will be technologically and economically more efficient. New high-technology industries, energy systems and social interactions will be less energy-intensive.

According to postindustrial advocates, the "crises" of the past will be overcome by acceleration of the shift to advanced electricity-based systems which are highly adaptable to a variety of fuels and locations. Electricity provides high quality energy that meets the needs of postindustrial society and the electronic infrastructure upon which it is founded. According to postindustrialists, end-use energy will still be abundant, utilizing new sources and new technologies. As the new regime of technology replaces the antiquated ideas of transportation, which relied upon movement through space, with electronic impulses that produce instant communication, efficiency will rise dramatically. No longer tied to the mechanical means necessary to create and transmit information, technology will allow for instantaneous access, reducing both time and physical requirements.

National economic productivity and well-being will continue to be dependent upon the productivity of energy use. Both electrical and non-electrical energy use have been claimed to increase productivity in the major sectors of the advanced economy, while constraints on energy use foretell a decline in productivity growth. Conservation or no growth in the use of energy is viewed as a threat to prosperity and high living standards. The postindustrial conclusion has been that efforts should be made to expand productive energy and allow prices to optimize the allocation of resources. A market-led strategy will encourage technological innovation and efficiency gains, producing a minimization of energy usage and costs.

The Electric Society envisioned by postindustrialists will be increasingly dependent upon electricity due to its versatility of inputs and the demands of high-technology. The leading sectors of the postindustrial economy are electricity-using

and productivity has been linked to growing electricity use. Electricity, then, is central to the ideal of postindustrial society. Coupled with communications technology, the electronic society is the common denominator in the restructuring of markets, forms of capital and means of exchange.

Chapter 5

POSTINDUSTRIAL PROPOSITIONS AND EMPIRICAL REALITY (I): ANALYSIS OF TRENDS IN THE URBAN SYSTEM

The urban crisis of the 1960s brought into the consciousness of the American public the plight of the nation's cities and their residents. The contradictions of poverty amid affluence, on the one hand, and central city deterioration juxtaposed with suburban growth, on the other, posed a serious challenge to postindustrial promises of enhanced social and material well-being. However, as discussed in Chapter 3, postindustrialism reconceived urban realities as the side effects of the processes of transformation to a new social order. Cities, as entities, were no longer significant in their own right. Rather, the national economy and society were to be valued and any particular "place" was relevant only in terms of its contribution to growth and national well-being.

The revised postindustrial premise that urban realities signified transformation, in tandem with the views that "all the United States is urban" (Peterson, 1985: 8) and that policies and concerns should be directed toward people rather than places (President's Commission, 1980a, 1980b; Baumol, 1981), has been used increasingly in the policy literature to doubt the relevance of the continuing contradiction of social inequality in the United States. "Urban" became "social" in the national policy context, as cities became incidental to the larger society. Postindustrialists espoused the view that, although cities were well-suited to the demands of the industrial era, no such linkage exists in the new "spaceless" order

characterized by services and information. Like all industrial social institutions, the future of cities was dependent upon their ability to either adapt or succumb to the technological, economic and demographic forces ushering in the postindustrial era.

In the aftermath of the urban crisis, the principles of postindustrialism redefined the path to progress. Efficiency and adaptation in the new conception of postindustrial progress continued to be the twin supports to the ultimate goal of abundance. However, "efficiency" was reconceived as the unencumbered operation of technological and economic forces, allowing for the best allocation of resources among competing ends. In the urban/social context, efficiency meant investment in areas that would contribute the most to national productivity. Innovations in management, organization and technology were expected that would lead to a new rationality in the pursuit and attainment of abundance. "Adaptation" was defined as the expected societal response to technoeconomic dictates. In the urban/social realm, adaptation would require the restructuring of social institutions to meet changing demands. At the individual level, as well, adaptation in terms of new skills, locations and employment structures would ensure viability in the coming society. Finally, "abundance," supported by efficiency and adaptation, meant an increasingly affluent society characterized by rising wealth and productivity in which living standards would be raised for all. Ever-increasing levels of comfort, well-being and security would mark the new era as widespread access to goods, information and opportunity would foster an increasingly egalitarian and democratic society.

This chapter will assess the validity of postindustrial theory in light of current social and urban phenomena. Empirical evidence appropriate to the

postindustrial propositions of abundance, adaptation and efficiency will be presented for the period 1967-1997. This thirty-year timeframe, which begins during the urban crisis and brings the analysis to the present, will allow the identification of broad trends in social and urban characteristics. Findings of the empirical analysis will then be examined in terms of the claims of postindustrial theory.

Urban/Social Abundance

Postindustrial theory has advanced a number of empirical propositions regarding the anticipated abundance of postindustrial society. In the urban/social context, the principle of abundance has been perceived in terms of material well-being, which will be attained throughout society, including its urban areas, as social reorganization occurs.

- In the near term, urban fortunes can be expected to falter. In the near and longer terms, national fortunes will improve and society, as a whole, including its current urban communities, will be better off.

National income will increase and all segments of society will evidence rising economic well-being. Society will be characterized by the production of services and information, growth in service employment and the percent of the labor force engaged in white-collar, professional and technical positions.

Empirical Findings

Postindustrial predictions of the "good health of society" (Banfield, 1974: 4), as indicated in overall economic growth, are indeed evidenced in the latter part of the twentieth century in the United States. From 1967-1997, real Gross Domestic Product (GDP), measured in constant 1992 dollars, more than doubled,

evidencing growth of 131.0% (from $3.1 trillion in 1967 to $7.3 trillion in 1997). Growth in GDP has surpassed increases in population, as indicated by growth of 71.4% in real GDP per capita (see Figure 5.1). Real disposable personal income per capita (also see Figure 5.1) has demonstrated similar improvement, evidencing growth of 74.6% from 1967-1997. Thus, in aggregate terms, the United States appears to be experiencing positive movement toward, as predicted, enhanced material well-being.[1]

Examination of income distributions, however, reveals that increasing levels of income are not shared proportionately throughout society.[2] As shown in Figure 5.2, nearly half (49.4%) of the total income accrued to households in 1997 was received by those in the top quintile of the income scale. More than one-fifth (21.7%) of total household income was received by the top five percent of households, while those in the lowest quintile on the income scale received only 3.6%. From 1967 to 1997, the share of household income received by the lowest

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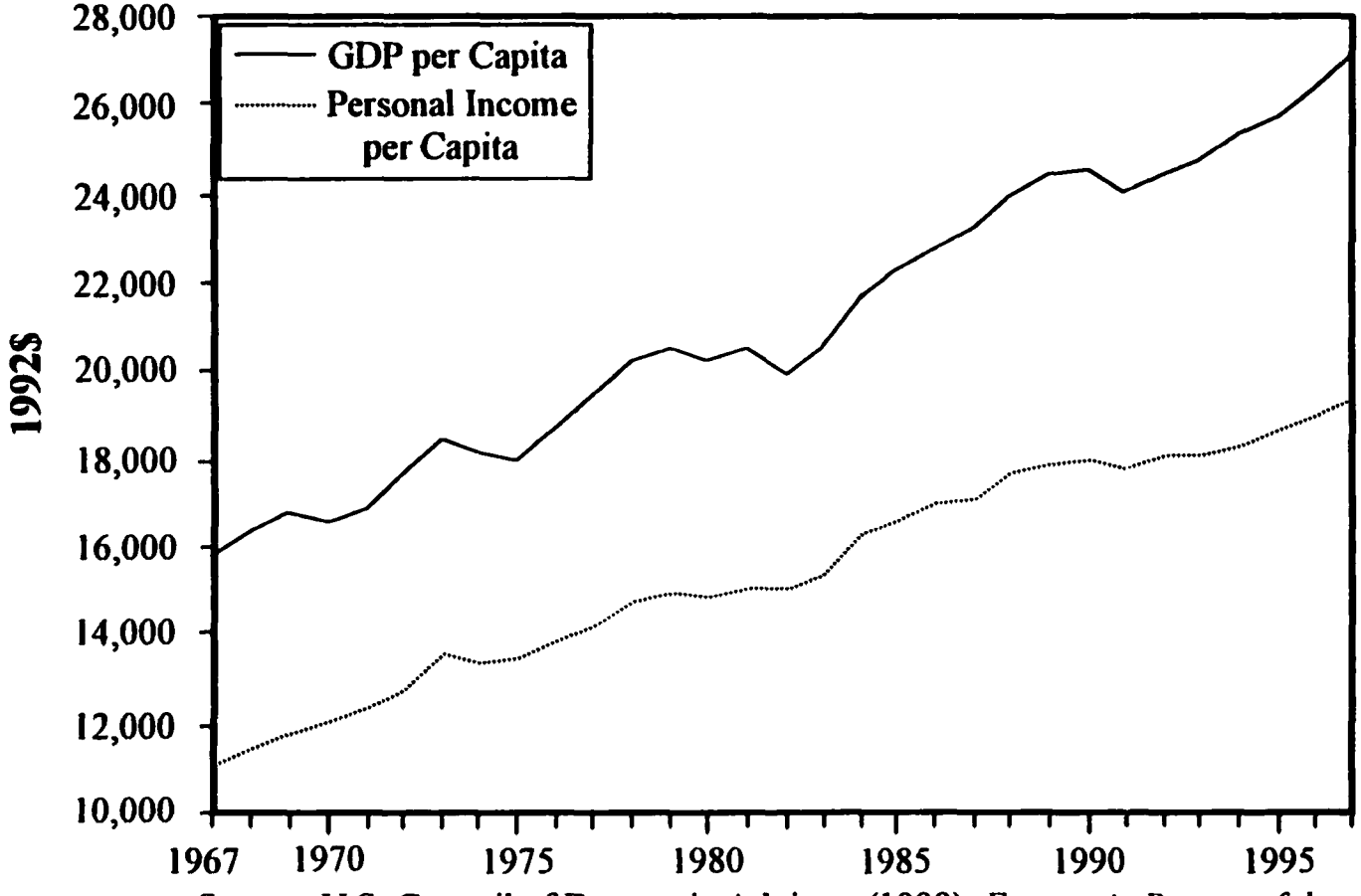
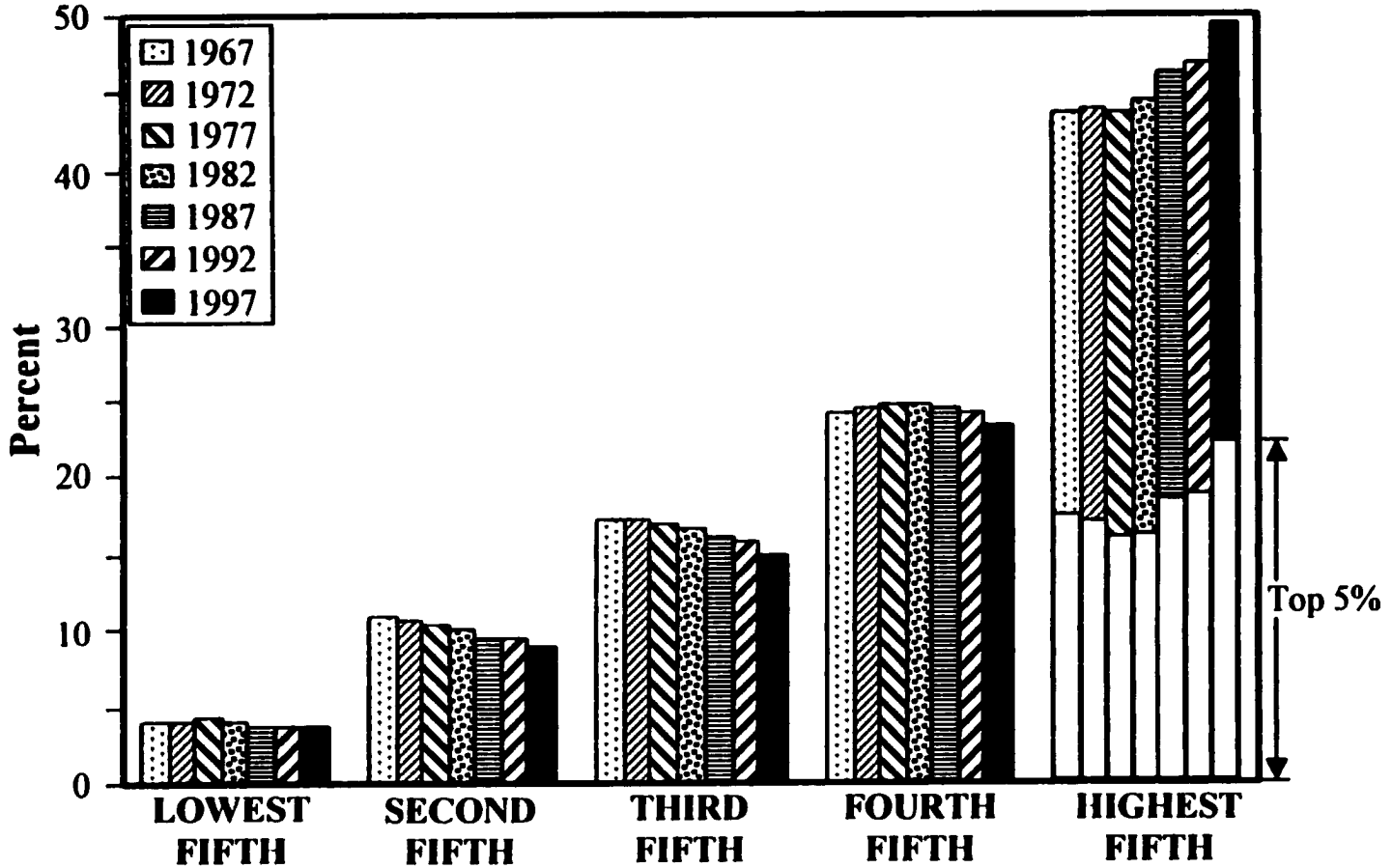
[1]The fluctuations in growth apparent in Figure 5.1, as well as in most of the subsequent figures, correspond closely with periods of recession in the national economy. According to the U.S. Department of Commerce, Bureau of the Census (1996a), recessionary peak/trough months during the years under study were as follows: December 1969/November 1970; November 1973/March 1975; January 1980/July 1980; July 1981/November 1982; and July 1990/March 1991.

[2]The following empirical evidence regarding income, wealth and poverty includes data for individuals, households or families as the unit of analysis. A "household" is defined as "all persons who occupy a housing unit," while a "family" is defined as a "group of two or more persons related by birth, marriage, or adoption who reside together" (U.S. Department of Commerce, Bureau of the Census, 1996a: A-1). Thus, a "family" is also defined as a "household," but a "household" is not necessarily also a "family." This distinction is important as family and household data are not directly comparable.



Source: U.S. Council of Economic Advisers (1999), *Economic Report of the President.*

Figure 5.1 U.S. Gross Domestic Product per Capita and Disposable Personal Income per Capita: 1967-1997 (1992$)



Source: U.S. Department of Commerce, Bureau of the Census (1998), *Measuring 50 Years of Economic Change*, Current Population Report P60-203.

Figure 5.2 Distribution of Aggregate Income in the United States: 1967-1997 (%)

quintile has demonstrated first growth and then decline, rising from 4.0% in 1967 to 4.4% from 1974-1977, returning to 4.0% by 1985, and declining thereafter. In 1997, as in 1993 and 1994, this quintile accrued only 3.6% of total income, the lowest rate evidenced during the thirty-year period. Similarly, those in the second and third quintiles on the income scale received their lowest share of total income in 1997 (8.9% and 15.0%, respectively). The share of income received by the fourth quintile of households peaked in 1981 at 25.0%, evidenced a pattern of decline in subsequent years, and fell to its lowest rate, 23.2%, in 1997. As these income groups have experienced lessening proportions of total income, the top quintile has accrued commensurate shares, with steady growth from a "low" of 42.8% in 1968 to the high of 49.4% evidenced in 1997.

Income disparities are perhaps most starkly portrayed in the comparison of the highest income earners with other groups. The top five percent has consistently, from 1967-1997, received more total income than that earned by the lowest 40%, represented by the lowest and second quintiles. Even more startling is the pattern of income growth of the top one percent of the family income distribution. According to the Economic Policy Institute (1995), during the 1980s, the income of the highest one percent grew by 62.9%, which represented 53.2% of the total income growth among all families. Concurrently, the bottom 60% of families experienced decline.

> Such uneven growth led to a substantial increase in the wealthiest families' share of total income...and equally dramatic losses for everyone else, thus reversing the entire post-war trend toward lessening inequality. (Economic Policy Institute, 1995: 2)

Although the level of inequality is lessened when income is measured more broadly, the pattern of disparity remains.

> (R)esearch in this area has shown that the distribution of income is more equal under a broadened definition of income that takes account of the effects of taxes and noncash benefits...Nonetheless, while the levels of inequality are lower, this alternative perspective does not change the picture of increasing income inequality. (Weinberg, 1996: 3)

A general indicator of income inequality, the Gini index[3] (see Figure 5.3), dramatically illustrates the growing inequality of income in the United States from 1967 to 1997. During this time period, 1968 evidenced the lowest level of income disparity, with a Gini index of 0.388. The inequality of the 1980s and 1990s is not only markedly higher than in previous years, but is demonstrating significant and rapid growth. By 1997, the Gini index reached 0.459, the highest level in thirty years. As evident in Figure 5.3, income inequality fluctuated from 1967 through the mid-1970s, when it began a steady and increasing pattern of growth.

Danziger and Gottschalk (1995) emphasized that, during the 1950s and 1960s, all income groups benefited from rapid economic growth, and small decreases in inequality occurred. However, the patterns of the past two decades contrast sharply with those of the preceding period. Characterized by both rising

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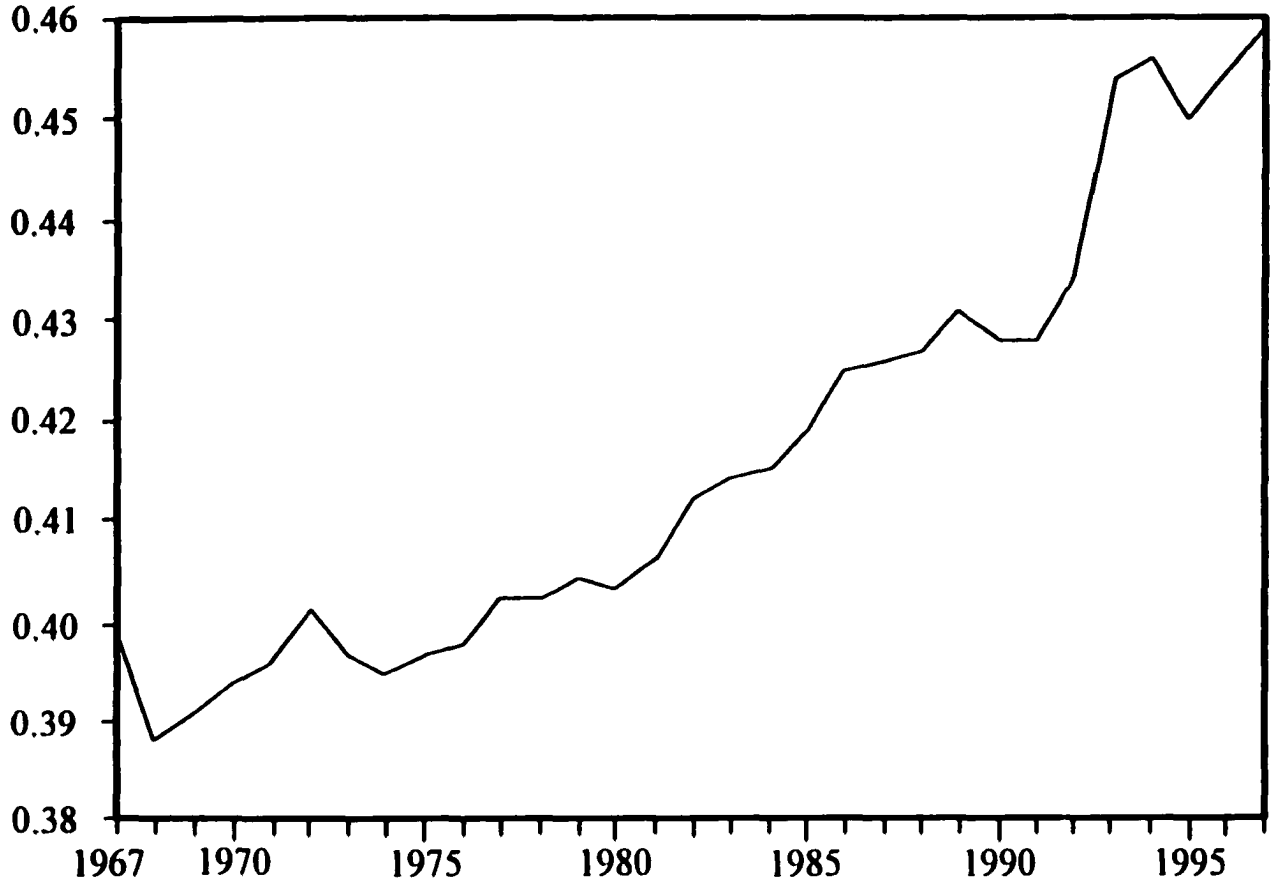
[3]The Gini index ranges in value from 0.0, when every economic unit (e.g., household or family) has the same income, to 1.0, when one unit has all the income (U.S. Department of Commerce, Bureau of the Census, 1998b). Increasing Gini values, therefore, represent increasing levels of income inequality.



Source: U.S. Department of Commerce, Bureau of the Census (1998), *Measuring 50 Years of Economic Change*, Current Population Report P60-203.

Figure 5.3 U.S. Gini Index: 1967-1997

family incomes and growing inequality, they described the late 1970s and 1980s as a "historical anomaly" (1995: 52) of the postwar era, indicating that nearly all of the rise in inequality occurred during these years.

> The contrasts between the two economic eras—the rising tides of the post-World War II economic boom and the slow growth and uneven tides of the past two decades—first emerged after the 1973 oil embargo. The resulting price shock and the recession of 1974-1975 marked the beginning of a decade of both high unemployment and high inflation. For most Americans the steady postwar improvement in living standards came to an end. (Danziger and Gottschalk, 1995: 4)

Prior to the mid-1970s, patterns of income inequality fluctuated with the state of the economy, rising during recessions and declining through periods of recovery. According to Danziger and Gottschalk (1995), from the mid-1970s onward, income inequality has been deepening, despite the trends of the national economy.

Patterns of wealth[4] inequality are even more accentuated than those of income distribution and mirror a reversal of trends beginning in the 1980s.

> The growing divergence evident in income distribution is even starker in wealth distribution. Equalizing trends of the 1930s-1970s reversed sharply in the 1980s. The gap between haves and have-nots is greater now than at any time since 1929. (Wolff, 1995: 2)

From 1983-1989, nearly all of the absolute gains in wealth accrued to the highest 20% of wealth holders, and the share of the top 1% increased by 5% while the

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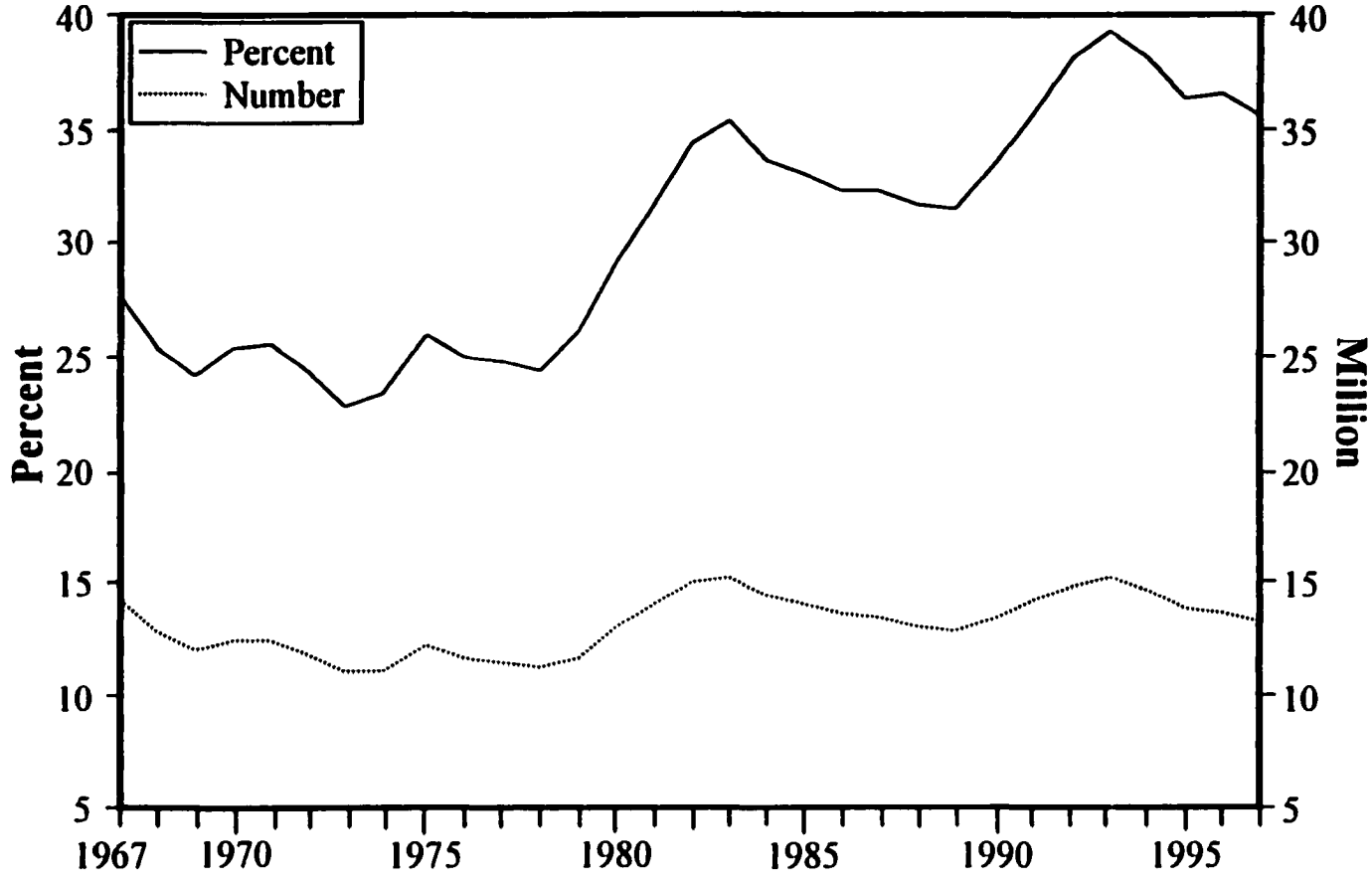
[4]Wealth is defined as the sum of the "current value of all the assets a household owns—financial wealth such as bank accounts, stocks, bonds, life insurance, savings, mutual fund shares; houses and unincorporated businesses; consumer durables like cars and major appliances; and the value of pension rights—and subtracting liabilities—consumer debt, mortgage balances, other outstanding debt" (Wolff, 1995b: 1).

wealth of the bottom 40% demonstrated an absolute decline (Wolff, 1995). This trend has continued into the 1990s.

> The distribution of wealth is even more concentrated at the top than is the distribution of income, and wealth inequality has grown worse in the 1990s. Between 1989 and 1997...the share of wealth held by the top 1% of households grew from 37.4% of the national total to 39.1%. Over the same period, the share of all wealth held by families in the middle fifth of the population fell from 4.8% to 4.4%. What is even more disturbing is that, after adjusting for inflation, the value of this middle group's wealth holdings actually fell between 1989 and 1997, due primarily to a rise in indebtedness. Between 1989 and 1995...the share of households with zero or negative wealth...increased from 15.5% to 18.5% of all households. (Mishel, Bernstein, and Schmitt, 1999: 8-9)

Postindustrial theory would counter that, despite increasing disparities among groups in terms of income and wealth, the absolute material well-being within groups of Americans has risen in the past quarter-century. This, however, can be readily disputed. As shown in Figure 5.4, the poverty rate[5] has evidenced fluctuations in periods of growth and decline from 1967-1997. From a percentage of population below the poverty level of 14.2% in 1967, this rate showed a general pattern of decline until 1973, when the poverty rate attained its lowest level during the 1967-1997 period (11.1%). The decade of the 1970s exhibited the lowest levels

[5]The poverty rate is defined as the proportion of persons below the poverty level compared with the total population. The U.S. Department of Commerce, Bureau of the Census (1998a), has established poverty thresholds based on family size, which are adjusted annually by the same percentage as the average Consumer Price Index. The total income of a family or individual is compared with the appropriate poverty threshold to determine poverty status. If a total family income is below the threshold, both the family and its individual members are included in the respective poverty statistics.



Source: U.S. Department of Commerce, Bureau of the Census (1998), *Measuring 50 Years of Economic Change*, Current Population Report P60-203.

Figure 5.4 Percent and Number of Persons below Poverty Level in the United States: 1967-1997 (%, million)

of poverty during the period and these rates have not been attained since that time. Although somewhat erratic, the poverty rate rose again, overall, for the next ten years, reaching 15.2% in 1983, then declined until 1989 (12.8%), at which time the pattern of growth resumed. By 1993, the poverty rate had reached 15.1%, demonstrating that despite overall growth in the economy, a significant proportion of persons continued to live in poverty. As of 1997, the poverty rate had again declined to 13.3%. Throughout the period, more than one of every ten persons in the nation was determined to have income below the poverty level.

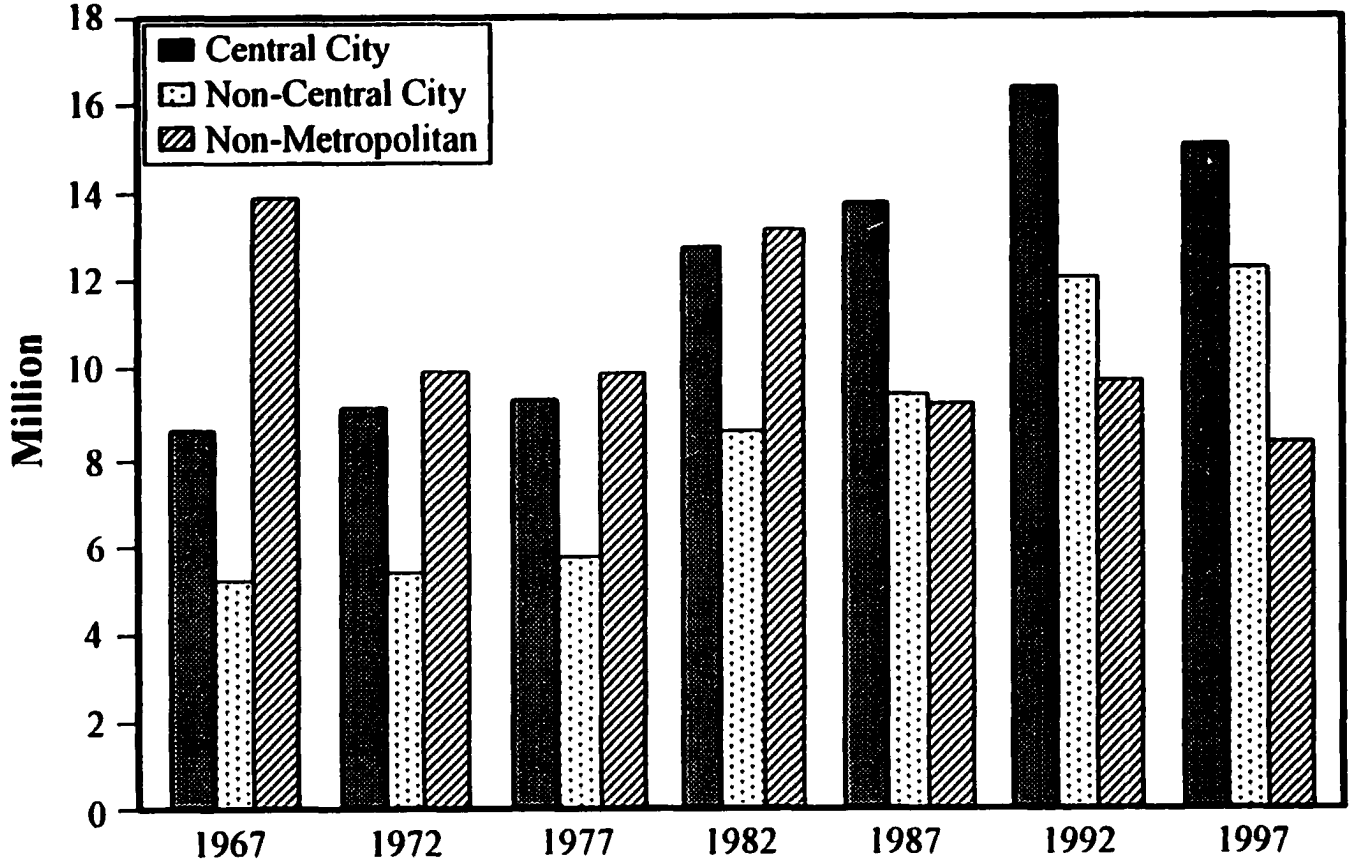
In assessing the economic well-being of society, it is important to examine overall trends within the framework of a common denominator, such as percentages. However, in very real terms, the absolute number of persons in poverty is a telling indicator of the extent of well-being. As shown in Figure 5.4, although the percentage of persons below the poverty level remained within a 5% margin, the total numbers of poor have increased significantly. In 1997, the number of persons below the poverty level totaled 35.6 million, in contrast to 27.8 million in 1967. Overall, the absolute number of poor increased by 7.8 million persons, an increase of 28.1%. During the late 1960s and early 1970s, the absolute number of persons below poverty decreased, reaching a low of 23.0 million in 1973. The size of this population maintained relatively low levels until the late 1970s, only to grow significantly again from 1979-1983 and 1990-1993. By 1993, 39.3 million persons in the United States had income below the poverty level, the highest number attained during the thirty-year period.

Thus, three decades of postindustrial development have yet to reduce poverty, and the absolute number of American poor has grown steadily. In this

respect, the argument that national income has grown is deceiving. The rise in national income, including per capita income, is actually a reflection not of broad economic improvement throughout society, but a pattern of improvement in the incomes of a small segment that is so significant as to lift the national figure.

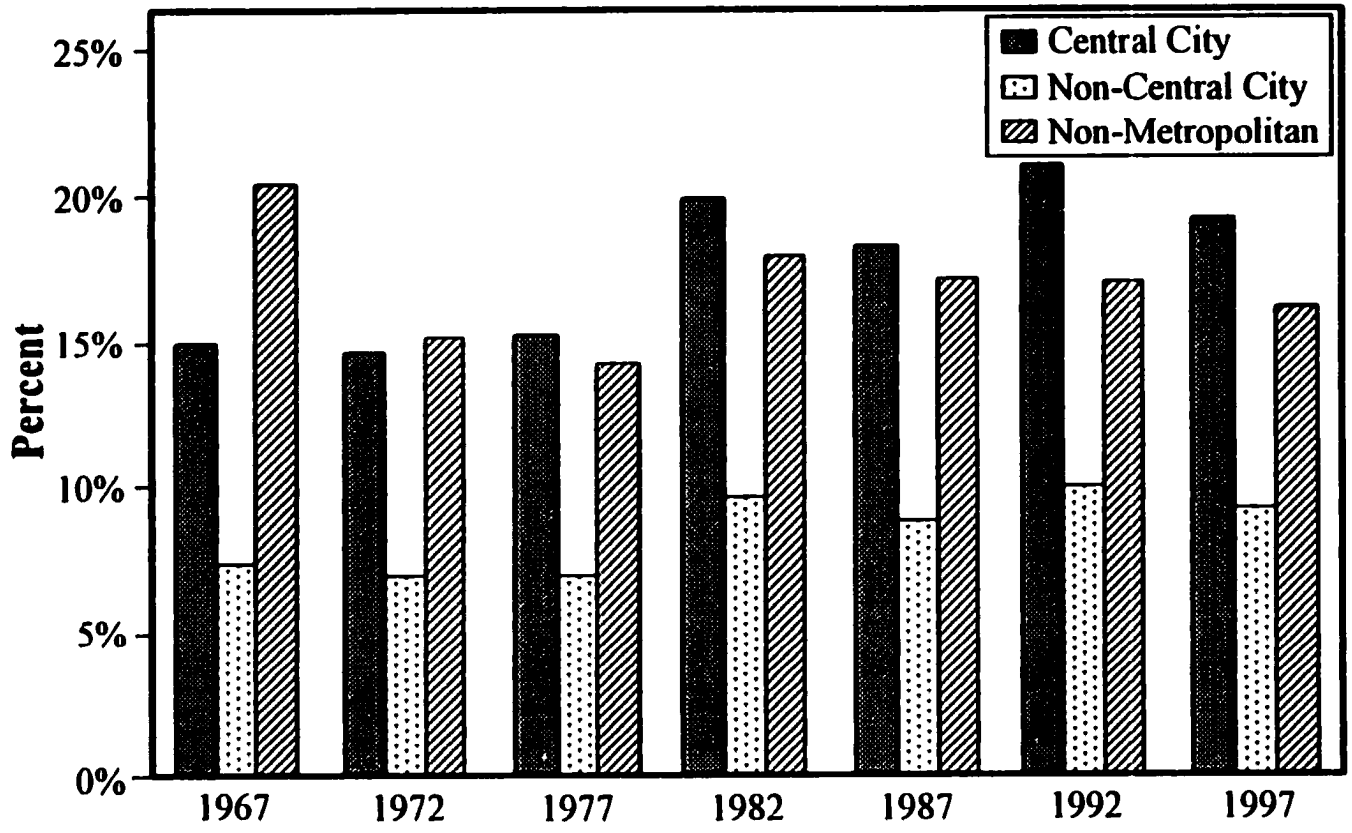
Of particular significance to the examination of postindustrial change in the urban system is the geographic distribution of the poor. As shown in Figure 5.5, the historic pattern of concentration of the poor in rural areas has been reversed. Although erratic, the total number of poor persons residing in non-metropolitan areas has demonstrated absolute decline over the thirty-year period and, by 1985, the poor population of central cities exceeded that of non-metropolitan areas. From 1967 to 1997, the total number of poor residing in central cities increased by 74.4% (from 8.6 million in 1967 to 15.0 million in 1997). Although evidencing much lower levels, the population below the poverty level has also risen dramatically in suburban areas, increasing by 136.4% (from 5.2 million in 1967 to 12.3 million in 1997). This growth in absolute numbers of the suburban poor, however, constitutes a much smaller percentage of the total population of suburban areas, as shown in Figure 5.6. The percentage of suburban poor did evidence growth during the period, from 7.5% in 1967 to 9.0% in 1997. In contrast, however, within central cities, the proportion of poor increased from 15.0% in 1967 to 18.8% in 1997. Nearly reversing positions, the proportion of poor in non-metropolitan areas declined from 20.2% in 1967 to 15.9% in 1997.

During the thirty years from 1967-1997, a shift in the geographic concentration of poverty is clearly evident. In terms of both absolute numbers and percentages of the total population, the poor can no longer be characterized as rural,



Source: U.S. Department of Commerce, Bureau of the Census (1999), *Historical Poverty Tables.*

Figure 5.5 Number of Persons below Poverty Level by Residence in the United States: 1967-1997 (million)



Source: U.S. Department of Commerce, Bureau of the Census (1999), *Historical Poverty Tables.*

Figure 5.6 Percent of Persons below Poverty Level by Residence in the United States: 1967-1997 (%)

but rather as increasingly urban, and concentrated in central cities. In 1976, the percentage of the total population in central cities defined as below the poverty level began to rise above the proportion of poor residents in non-metropolitan areas, and this percentage has remained higher throughout the rest of the period. By 1985, the total number of poor in central cities exceeded the total in non-metropolitan areas, and by 1987, the absolute number of poor in suburban areas also surpassed the number in non-metropolitan areas. In 1997, of the nation's 35.6 million persons in poverty, 23.3% (8.3 million) resided in non-metropolitan areas, 34.4% (12.3 million) in metropolitan areas outside central cities, and 42.2% (15.0 million) in central cities.

Postindustrial Contradictions

The urban and inequality trends evidenced in the contemporary United States support the conclusion that postindustrial theory's proposition of abundance is not borne out as a societal phenomenon. National material well-being, in terms of the economic status of most of the nation's citizens, has not improved, as only an elite few and the top of the hierarchy of the American economy have reaped the benefits of growth. Income and wealth inequality have deepened and the numbers of low-income persons have expanded. The poor are increasingly concentrated in central cities, although poverty status characterizes growing numbers of individuals and families in suburban areas as well.

Postindustrialists would argue that society is still in the process of transition to a new state and a new equilibrium. However, worsening conditions for the majority for nearly a third of a century point not to progress but, in very real terms, to neglect and abandonment. In this regard, the postindustrial experience is

not new. It is very much like the experience of the industrial era in the United States.

Urban/Social Adaptation

Until the 1970s, the post-World War II United States evidenced growth in national income, the expansion of the middle class, increases in the standard of living, and geographic growth and dispersal. The growth of the suburbs, the development of new cities, and the decline of central cities have been widely cited by postindustrialists as evidence that the transformation to a postindustrial society was underway. In response to the urban crisis of the 1960s, postindustrialists argued that dislocations were an inevitable byproduct of the process of transition, but that over time, institutional structures would realign with the larger forces defining society to move the nation into a future marked by social stability. The role of society was seen by postindustrialists to be one of fostering these emerging arrangements, leading to a new equilibrium.

According to the adaptation principle, the negative impacts of transition will be lessened as society and its urban areas adjust to the postindustrial economy.

- The more adaptive a society is to the postindustrial, post-urban trends—to a service economy and information society—the lower the transition costs. This is especially true for urban communities.

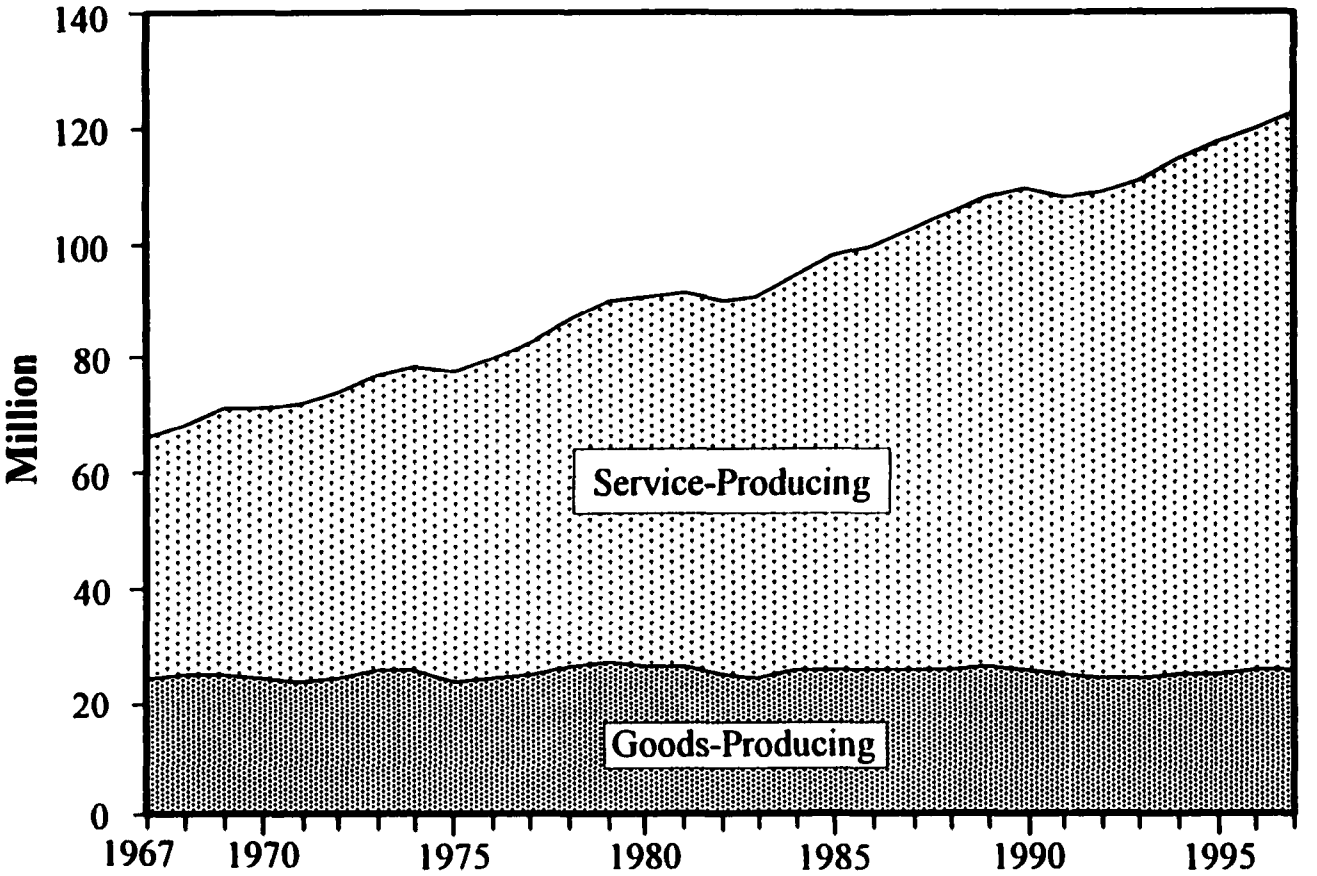
Postindustrial theory has advanced a number of empirical propositions in terms of social and urban adaptation to technological and economic conditions. Postindustrial society will be characterized by the growth of service and information jobs and the demand for educated "knowledge" workers. Job security and compensation will be enhanced in an increasingly productive economy, and social and economic

disparities, most notably evident in urban areas, will decline. Overall social well-being will rise.

Empirical Findings

Two of the hallmarks of postindustrial society are the shift from manufacturing to services as the basis of the economy and the growth of the professional and technical class. The type of job growth during the 1967-1997 period indisputably reflects a sectoral shift in the labor market, as increases in the number of jobs occurred almost totally in the service sector (see Figure 5.7). The total number of service jobs increased by 130.0% from 1967-1997, and employment in the service sector, as a proportion of the total, grew from 64.6% to 79.7%. Concurrently, the number of manufacturing jobs grew, but slightly, during the period, demonstrating an increase of 7.0% from 1967-1997. As a percentage of total employment, jobs in the goods-producing sector declined from 35.4% in 1967 to 20.3% in 1997. While the structure of job growth portrays one aspect of the shift from manufacturing to services, adaptation has engendered more than sectoral shifts. Adaptation has exacted significant changes in the structure of labor force participation and its compensation.

According to Weinberg (1996), changes in the labor market have contributed to increases in income inequality. The distribution of wages has become more unequal as more educated and highly skilled workers at the top have achieved real wage gains, while those at the bottom have experienced losses in real wages. The 1995 *Economic Report of the President* (U.S. Council of Economic Advisers, 1995), explained that not only was there slow growth in average real compensation between 1973 and 1993; there was uneven distribution of gains in compensation, as



Source: U.S. Council of Economic Advisers (1999), *Economic Report of the President.*

Figure 5.7 Employees by Economic Sector in the United States: 1967-1997 (million)

income growth was stagnant in the middle of the income distribution and declined at the lower end of the range. Overall, the median real hourly wage declined by six percent and median family income grew by only 0.2%. The relative demand for workers with lower levels of skills and education has dropped, reflecting a movement in employment away from traditionally high-wage jobs available for blue-collar workers in the manufacturing sector, to employment in services that is low-wage in many sectors, including retail trade, and has high-wage jobs primarily available only to college graduates.

> It is becoming increasingly difficult for those without higher education to earn enough to support a traditional middle-class standard of living. Increasingly...a high school education is not enough. Fewer high-wage jobs remain for high school graduates, and even many workers with college educations face the prospect of stagnant wages. This is a fundamental change in the economy. (U.S. Council of Economic Advisers, 1995: 183)

More significantly, within industries, labor demands have shifted generally toward lower levels of compensation. Although varying levels of decrease were identified according to educational attainment, with those less educated experiencing greater losses, wages were also found to be more disparate among those of similar backgrounds.

> Wage dispersion also increased within demographic and skill groups. The wages of individuals of the same age, education, and sex, working in the same industry and occupation, were more unequal in the early 1990s than 20 years earlier. (U.S. Council of Economic Advisers, 1995: 174)

The Council concluded that the employment structure has altered significantly, favoring an increasingly smaller elite.

Bluestone and Rose (1997) examined several aspects of the changing employment structure, finding that the fastest growing occupations are computer-service technicians, legal assistants, computer systems analysts and programmers and electrical engineers, but this growth results from a small base, in contrast to large absolute growth in lower-skilled and lower-paid jobs. "Thus the reality of the new service economy entails a great many low-paying jobs and a much smaller layer of high-paying ones" (1997: 72).

Increasingly, families have expanded their work effort by working more hours to offset the impact of declining or stagnant wages. Such efforts, however, have not been rewarded by rising living standards, particularly for families headed by workers without a college degree.

> (T)he enormous increase in work effort over the past 20 years has allowed families to maintain their old standard of living—but almost nothing more. For families headed by high school dropouts, the situation is the most dismal. Between 1973 and 1988, such families increased their annual work effort by nearly 12 percent yet ended up with 8 percent less annual income. For families headed by high school graduates or some college, work effort was up by 16 to 17.4 percent, producing less than a 4 percent increase in total earnings. These families are trapped in an *Alice in Wonderland* world, running faster and faster just to stay in the same place. (Bluestone and Rose, 1997: 10)

At the same time that the emphasis of the job market has shifted from goods to services production, several changes have also been evidenced in the characteristics of labor force participation. Significant to the shift to a service-oriented economy is the growth of part-time and temporary employment. Distinct from the traditional employment status of full-time permanent workers, common to an economy based upon manufacturing, the number of part-time workers and

nontraditional employment arrangements has increased dramatically with the growth of retail trade and services.

According to Bluestone and Harrison (1988), from 1970-1984, the payrolls of agencies providing temporary services grew at twice the rate of Gross National Product. From 1980-1985, contingent labor, defined as leased, temporary, involuntary part-time, subcontracted or home workers, grew from eight to eighteen million, and constituted 17% of the workforce. If voluntary part-time workers are included, Bluestone and Harrison estimated that one-quarter of the 1985 workforce would be contingent. Such status allows the reduction of wages and benefits. In an updated analysis of this issue, Bluestone and Rose (1997) point out that in 1995 the total number of contingent workers, meaning those with nontraditional employment status, approximated 35 million, or 28% of the civilian labor force. About 23 million of those, or 18% of the total workforce, were part-time. Growing much faster than each of these segments is the temporary workforce which, from 1982-1995, more than tripled, increasing to 1.4 million workers (Bluestone and Rose, 1997). The number of self-employed and contract workers is also growing rapidly, estimated by the U.S. General Accounting Office to have been increasing at more than 13% per year in the late 1980s and numbering 9.5 million by 1988 (U.S. Department of Labor, Bureau of Labor Statistics, 1996b).

Defining contingent jobs as those that are structured to last only a limited period of time, the Bureau of Labor Statistics (U.S. Department of Labor, Bureau of Labor Statistics, 1995) estimated that between 2.2%-4.9% of total employed persons (or 2.7-6.0 million workers) are in temporary work situations

where there is no implicit or explicit contract for ongoing employment.[6] Contingent workers comprised 3.4%-7.5% of service workers and were concentrated in professional, service, administrative support, and operator, fabricator and laborer occupations. In contrast to noncontingent workers, those with contingent status were more than twice as likely to be ages 16-24 and slightly more likely to be female or black. Part-time workers constituted a disproportionately large share of contingent workers, although only one of every ten part-time workers was contingent. Importantly, the Bureau of Labor Statistics (U.S. Department of Labor, Bureau of Labor Statistics, 1995) found that the majority (with estimates ranging from 55.8%-64.1%) of contingent workers preferred to have permanent jobs.

The study (U.S. Department of Labor, Bureau of Labor Statistics, 1995) also examined the incidence of alternative employment arrangements. Of the total labor force in February 1995, 6.7% were independent contractors, 1.7% were "on-call" workers, 1.0% worked through temporary help agencies, and 0.5% worked for contract firms that provided the worker's services at the contracting firm's worksite. Thus, nearly 10% of the U.S. workforce works without any ongoing commitment for employment.

Part-time employment has also increased dramatically. In 1995, more than one of every five persons who worked during the year (21.3%) worked on a

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[6]The wide range of estimates is due to the use of three different definitions of contingency. At the narrowest, an estimate encompasses only wage and salary workers who had worked at their job less than one year and expected that the job would last less than one year. A second includes the self-employed and independent contractors within the same timeframes, as well as temporary and contract workers based on their tenure with the client. A third definition includes all of the above with expanded time parameters.

part-time basis, defined as less than 35 hours per week (U.S. Department of Labor, Bureau of Labor Statistics, 1996b).[7] Commonly defined as a two-tiered wage structure which allows employees doing the same work to be paid differently (Bluestone and Harrison, 1988), many corporations have created a system characterized by a declining core of permanent full-time workers, supported by an expanding peripheral pool of part-time or contingent workers (Rifkin, 1995).

> At many companies, an upper tier of full-time "core" workers enjoys the best combination of pay, benefits, hours and job security that a company can offer. Below them is a second tier of less valued part-time, temporary and contract workers who, in addition to being less expensive, can be discharged more easily, giving corporate managers the flexibility that they say is essential to compete in an increasingly global economy. (Uchitelle, 1997: 2)

Part-time workers earn, on average, 20-40% less income than full-time workers doing comparable work (Rifkin, 1995). In terms of benefits, less than 25% of part-time employees receive health care coverage (in contrast to 88% of full-time workers) and, unlike 48.5% of full-time workers, only 16.3% of part-time employees are covered by a pension plan (Rifkin, 1995). The percentage of these workers who wanted to be employed full-time but were unable to find such employment was 29%, a substantial increase from 19% in 1973 (Bluestone and Rose, 1997).

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[7]Karoly (1993) has pointed out that there are numerous methods to define employment status. For example, due to cyclical changes in the economy, even workers who are employed full-time on the basis of number of hours per week may not be employed year-round. From 1967-1987, the percentage of workers who worked full-time year-round (defined as working 35 or more hours per week and 50 or more weeks per year), ranged from 54%-60%.

As dramatically illustrated by the Teamsters' strike against United Parcel Service (UPS) in August 1997, there is a significant level of dissatisfaction with these arrangements. At the time of the strike, 10,000 part-time employees worked thirty-five hours or more each week, but received wages only half that of full-time rates (Cable News Network, 1997). According to the New York Times (Uchitelle, 1997), full-time UPS employees earned close to $20 per hour. In contrast, part-time workers were paid only $9 per hour.

> (T)he strike of 185,000 UPS workers...is a billboard reminder of how far the country has moved toward two tiers of jobs, one of them with much higher pay and more benefits than the other. Part-timers, temporary workers and contract workers populate much of the bottom tier. (Uchitelle, 1997: 1)

According to Bluestone and Harrison (1988), the mix of jobs and working conditions that has been created has exacerbated tendencies toward social and economic polarization. Racial and gender divisions continue, as non-whites, women and immigrants fill the bulk of the "hourglass" economy.

> (L)ow wage employment rose sharply among workers of color beginning around 1979, after more than a decade-and-a-half of improvement. Indeed, virtually all of the improvement experienced by black, Hispanic, and Asian workers between 1973 and 1979 disappeared in the 1980s. (Bluestone and Harrison, 1988: 126-127)

Burtless and Mishel (1995) examined the proportion and characteristics of the workforce earning poverty level wages, finding that the highest incidence of wages at or below the poverty level was experienced by women and minorities. While 37.2% of women versus 25.8% of men in 1991 had poverty level wages, the largest growth in low wage work since 1979 has occurred among minority men. In

1991, 38.6% of black men and 43.7% of Hispanic men earned wages at or below the poverty level, in contrast to 25.1% and 26.6%, respectively, in 1979. The proportion of low wage workers among minority women also grew, although at lower rates than those of minority men. However, minority women experienced higher rates of poverty level wages than their male counterparts, with 43.6% of black women and 49.4% of Hispanic women earning wages at or below the poverty level in 1991. In contrast, 35.1% of white women and 21.9% of white men earned income in this range.

Social and economic polarization is also starkly apparent in the emerging dual class structure in "revitalized" cities where the upper class controls and coordinates global corporations and corporate services, and the lower class works to provide services to the upper (Bluestone and Harrison, 1988).

> The revitalization of downtown did create millions of new jobs nationwide. The high-profile jobs being created within the revitalized urban centers are overwhelmingly connected directly to the restructured economy...At the same time, inside and around the office towers...millions of new workers serve as chambermaids and waiters, bartenders and janitors.
>
> ...The high cost of living in cities containing corporate headquarters requires that professional households include more than one wage earner in order to sustain a middle-class lifestyle. This, in turn, forces this new labor aristocracy to consume more and more of the services that workers in an earlier generation would have produced for themselves. The provision of these services to the office workers becomes the major activity for the rest of the city. (Bluestone and Harrison, 1988:69 70) (italics in original)

Cities are less and less places of community and public discourse and more and more contrivances of human organization to serve the highly specialized needs of corporate America.

Instead of adaptation as a positive, socially and economically progressive process, the United States is increasingly characterized as a temporary society, one in which job insecurity spreads, wages decline and education is little solution to either problem. Meeting basic needs continues to be a struggle for some, as more than one-quarter (25.9%) of the poor were members of families that were unable to meet their rent or mortgage payments at some point during 1992 and 14.8% reported having days without food during the previous month (Short and Shea, 1995: 2). Claims of social well-being are hardly substantiated when a number of society's members continue to experience difficulty in providing the essentials of subsistence.

The overall social effects of the new society have been examined by Fordham University's Institute for Innovation in Social Policy (1995) for the years 1970-1993. Sixteen social problems[8] were combined into a single index of social health in order to examine the relative social well-being of the United States over time. As shown in figure 5.8, the index of social health and well-being declined dramatically in 1975, and has remained at remarkably low levels ever since. The eight problems identified as worsening in 1993 included drug abuse, homicide, child abuse, children in poverty, health insurance coverage, average weekly earnings, out of pocket health costs for those over 65, and the gap between rich and poor. The last six of the eight reached their worst recorded levels in 1993.

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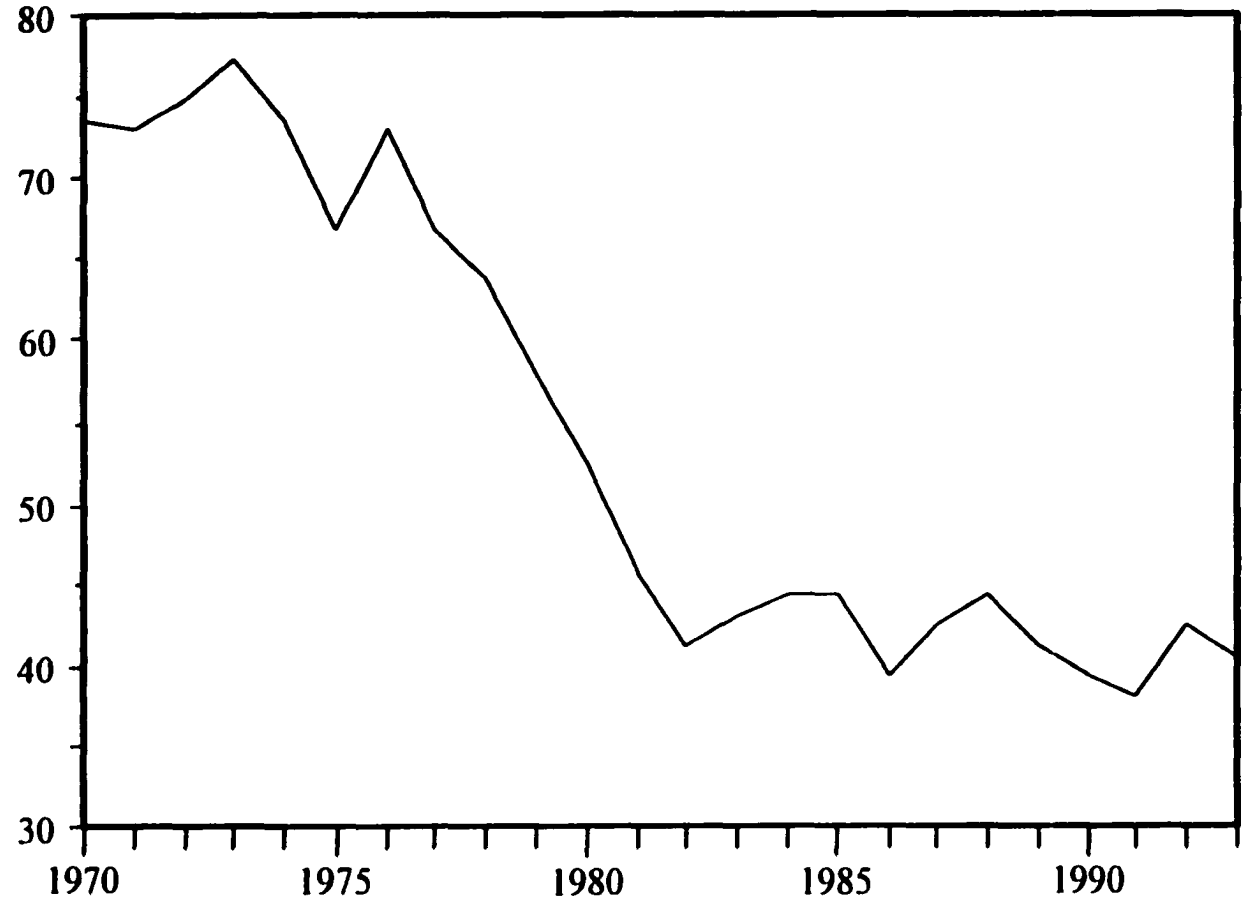
[8] The social problems included in the index include: infant mortality, child abuse, children in poverty, teen suicide, drug abuse, high school drop-outs, unemployment, average weekly earnings, health insurance coverage, poverty among those over 65, out of pocket health costs for those over 65, homicides, alcohol-related traffic fatalities, food stamp coverage, access to affordable housing, and the gap between rich and poor.



Source: Fordham Institute for Innovation in Social Policy (1995), *Index of Social Health: Monitoring the Social Well-Being of the Nation.*

Figure 5.8 Index of U.S. Social Health: 1970-1993

Postindustrial theory has embraced a vision of an electronic society and a notable and rapid entrance of computer technology has been evidenced not only in workplace settings, but also in the personal lives of many Americans as well. Personal computer ownership increased by 51.9%, modem ownership by 139.1% and e-mail access by 397.1% from 1994-1997 (U.S. Department of Commerce, National Telecommunications and Information Administration, 1998: 2). In spite of this growth in accessibility, however, the "digital divide" in America is widening.

> Despite this significant growth in computer ownership and usage overall, the growth has occurred to a greater extent within some income levels, demographic groups, and geographic areas, than in others. In fact, the "digital divide" between certain groups of Americans has *increased* between 1994 and 1997 so that there is now an even greater disparity in penetration levels among some groups. There is a widening gap, for example, between those at upper and lower income levels. Additionally, even though all racial groups now own more computers than they did in 1994, Blacks and Hispanics now lag *even further behind* Whites in their levels of PC-ownership and on-line access. (U.S. Department of Commerce, National Telecommunications and Information Administration, 1998: 2) (italics in original)

Although the emergence of computer capabilities in the home is still a rather recent phenomenon, again, the pattern is one of disparity in access and increasing, rather than decreasing, polarization.

Postindustrial Contradictions

Adaptation to technological and economic structures has meant, for much of the American populace, uneven gains in income distribution, expanded work effort without an increase in living standards, and lower skill demands which yield low levels of compensation. Part-time, temporary and contingent workers comprise an increasing segment of the labor market, and many do not receive

employment benefits. Polarization characterizes many of the manifestations of adaptation, evidenced by the two-tiered wage structure, uneven income gains and racial and gender divisions in compensation. Socially and economically, cities are the home to two very separate and distinct strata of society. Overall social health has declined and significant numbers of persons and families face difficulties in meeting basic human needs. Even among those who have entered the electronic age, the "digital divide" is widening between income and racial groups. Adaptation, for most, has meant adjusting to lower security, precarious levels of living standards, and growing divergence between themselves and the elite and there is no evidence to date that indicates a reversal of these trends.

Urban/Social Efficiency

One of the cornerstones of postindustrial thinking is that national well-being, defined in economic terms, is the primary criterion for assessing the progress of society. In order to maintain global competitiveness, efforts should be directed toward technological advance and economic efficiency. Efficiency in the late twentieth century means essentially eschewing a specific urban focus in favor of national and even international economic goals. Urban futures, then, are tied to broader national and international goals of productivity.

- Postindustrial technology will lead to a new efficiency revolution that will advance society as it moves beyond its current urban-industrial form. Technology-led efficiency gains will offset any short-term costs to urban communities.

For over two decades, media attention and academic research have addressed phenomena associated with the restructuring of capitalist industrial economies and

the changing scale of economic relations. "Global competition," the "international division of labor," "deindustrialization," "reindustrialization," the "mobility of capital"—all denote a shifting emphasis in the nature and/or structure of production. Postindustrialists have argued that restructuring signals movement toward a postindustrial society that is increasingly more efficient and productive. In empirical terms, the principle of efficiency means that productivity will rise as a result of technological and economic efficiency. Urban areas will respond to market forces and eventually attain a new equilibrium through the realization of postindustrial forms and functions.

Empirical Findings

According to the U.S. Council of Economic Advisers (1997), between 1960 and 1973, productivity growth in nonfarm businesses in the United States averaged an annual 2.8%. However, since the early 1970s, productivity growth has slowed, with an annual average of 1.1% from 1973-1995 (1997: 28-29). Defining the sources of economic growth as increases in physical capital, improvements in human capital and increases in the overall efficiency of the economy, determined by the amount of output per unit of input, the Council examined each source for its contribution to the slowdown in productivity. The Council concluded that reduced growth of inputs, in terms of both physical and human capital, is not a major source of the slowdown. The growth in the capital-labor ratio has slowed since 1973, but this accounts for only one-tenth of the approximately two percent decrease in productivity growth. Since the 1950s and 1960s, the rate of increase of human capital, measured by the education and experience of workers, has risen, accounting for not only a larger share of productivity growth (27% from 1973-1994, in contrast

to 3% from 1960-1973) but also an expanded absolute amount (0.3% and 0.1% during the periods 1973-1994 and 1960-1973, respectively). The Council concluded that "almost the entire slowdown is attributable to a decrease in multifactor productivity growth, that is, the efficiency with which capital and labor are used" (U.S. Council of Economic Advisers, 1997: 30). The Economic Policy Institute echoed this conclusion.

> (P)roductivity growth has been slower since 1973, and there is no evidence of any acceleration in the 1980s or 1990s. Throughout the 1979-95 period, productivity output per hour has been growing a steady 1% per year, while multifactor productivity growth (a measure of output growth due to a more efficient use of labor and capital together) has been miserably low. This is strong evidence, in terms of fundamental efficiency, that the economy has not become better able to generate faster growth. (Economic Policy Institute, 1996a: 6)

Baker and Mishel (1995) proposed that profitability in the 1990s has resulted not from productivity growth or efficiency but rather from cost restructuring which has redistributed income from labor to the owners of capital.

> (H)igher profitability has not been associated with any noticeable surge in productivity growth or gains in efficiency. Productivity growth in the current recovery has been about the same as its 1970s and 1980s trend rate. There also has been no acceleration of investment growth, as investment as a share of output has reached historically low levels. In short, this upturn in profitability has greatly benefited the owners of capital, without creating social gains in the form of accelerated growth in efficiency or productive capital. (Baker and Mishel, 1995: 4)

Thus, the efficiency claims of postindustrialists are unfounded as the actual performance of the U.S. economy in the postindustrial era has been one of reduced productivity. To date, there is no evidence to suggest that this trend toward lower productivity will reverse.

Postindustrialists have argued that the viability or decline of urban areas would be determined by their ability to respond to the technological, economic and demographic forces driving the new economy. Those that could define appropriate roles would be enabled to participate in the economic order of the postindustrial age. Although the Committee on National Urban Policy (1983) proposed that a new hierarchy of places has emerged to fulfill new functions, and numerous postindustrial advocates have proposed that the processes of change would lead to the establishment of a new urban equilibrium, a significant aspect of postwar spatial and economic development has been neglected. Markusen et al. (1991) have explored the dynamics of the military-industrial complex and how it has shaped the economic and geographic landscape of the United States. Markusen et al. demonstrated that the new urban equilibrium is actually another form of what Seymour Melman (1970) called "pentagon capitalism." Against the rosy picture of dynamic markets and fast-changing technology to serve societal needs, Markusen and her colleagues have empirically established that the so-called "high-tech" postindustrial economy is, in fact, largely based on old-fashioned development by subsidy.

> During and after World War II, in a way that was never before true, defense spending became a major determinant of economic prosperity or decay. Whole new industries, and a set of predominantly defense-dependent firms, were bred in lock step with the new, permanent bureau in charge of military matters—the Department of Defense. Pentagon dollars created industrial complexes in California orchards, in Arizona and New Mexico deserts, on Utah salt flats, in the Rocky Mountains of Colorado, and in Florida swamps. The lack of these dollars helped create industrial wastelands in cities that had once been the industrial core of America. (Markusen et al., 1991: 3)

The economic and social effects of this development have been significant.

> The gunbelt is a major—the major—phenomenon in the contemporary economic map of America. It consists of a new set of industrial locales that contain a wholly new set of industries and firms whose major preoccupation has been producing high-tech weaponry for the cold war. (Markusen et al., 1991: 8)

The rise of the "gunbelt," which roughly follows the perimeter of the country, has produced a culture and economic climate quite different from those that characterized industrial cities. Moreover, the gunbelt is not different from its industrial predecessor in producing segregated development that benefits a few at the expense of the many. The government has become the market, the innovator of research and development, and the financier of support structures, which include the provision of land, infrastructure and relocation assistance to create a professional and technical labor pool to staff the high-tech industries it has spawned. In these respects, the gunbelt has the hallmarks of sheltered development for special interests that were true of the industrial era. As commercial industries have faced tougher competition in the international arena, "for many firms defense contracting has become a cozy alternative to the rough-and-tumble of the marketplace" (Markusen et al., 1991: 248).

Not only has the growth of the gunbelt fostered selective urban development and resettlement patterns, it has exacerbated and extended segregation by class and race. Disproportionately, the high-tech industries which characterize the gunbelt are staffed by well-educated white-collar white males, leaving the underclass and displaced blue-collar workers in the industrial heartland with shrinking or inferior prospects of employment. According to Markusen et al., this spatial and economic restructuring resulted not from the passive attributes of places or the conditions of markets, but rather from the deliberate efforts of many

participants. "The rise of the gunbelt was not accidental...It is the product of considerable human effort" (1991: 230).

Postindustrial Contradictions

Postindustrial claims of efficiency have been found to be unsubstantiated. Productivity growth since the 1970s has slowed due to a decline in multifactor productivity growth, meaning the efficiency of the use of capital and labor. Profitability has resulted not from growth in efficiency or productive capital, but rather from cost restructuring. Urban areas have essentially been prevented from competing in the marketplace due to the significant presence of the military-industrial complex in determining urban development and resettlement patterns. What has resulted from the removal of the "level playing field" of the market is uneconomically-based disadvantage for many existing cities through the subsidization and support of, for the most part, newly-created cities and communities. Not only is this selective urban development marked by segregation in geography, class and race; it defies the principle of efficiency itself.

Conclusion

As the U.S. economy has shifted from manufacturing to services and from a largely domestic basis to the international economic arena, international competition and falling profit rates in the 1970s led to new strategies at the corporate level. Although this "cost-effective restructuring" has been seen by many as the successful adaptation to the demands of global competition, corporate warfare has exacted a high toll on labor and American society in general.

> (T)he war has resulted in many casualties. It has changed the economic landscape of America and it has shaken the very

> foundations of the economic security of millions of families. What has emerged may be a "post-industrial society." But if so, it appears to be a terrain much bleaker than that first described by Daniel Bell more than a decade ago. It is a society in which firms have been merged and acquired, downsized, deindustrialized, multinationalized, automated, streamlined, and restructured. In the process, the rich have gotten richer; the poor poorer, and life for the middle class more and more precarious. (Bluestone and Harrison, 1988: 22)

The claims of postindustrialists that the increase of national income would create gains throughout society, the labor force would increasingly be characterized by white-collar professional and technical staff and that job security and compensation would be enhanced have been contradicted by the evidence. While aggregate national income has risen, the gains have been unequally distributed, resulting in advance for only the top few. Professional and technical jobs have increased, but the bulk of employment lies within the lowest rungs of the income scale. Social and economic polarization have been exacerbated, rather than remedied, and the "good health of society" (Banfield, 1974: 4), in terms of employment opportunities and conditions of overall social health, has deteriorated. Claims that productivity will rise as a result of technological and economic efficiency have not been borne out as evidenced by declines in multifactor productivity growth. Although postindustrialism has challenged existing cities to find a new equilibrium through competition in the market, subsidized and targeted development has essentially removed that possibility. In sum, the postindustrial prescription for an abundant, adaptive and efficient society has not led to enhanced well-being and security, but rather to increased vulnerability and hardship.

> The changes in the economy have been "all pain, no gain"...the factors causing the pain of greater dislocation, economic vulnerability, and falling wages do not seem to be making a better

> economy or generating a "payoff" that could potentially be redistributed to help the losers. Rather, there seems to be a large-scale redistribution of power, wealth, and income that has failed to lead to or be associated with improved economic efficiency, capital accumulation, or competitiveness...(I)t is not possible to know whether there is a payoff awaiting us in the future. Nevertheless, one expects that a large future payoff would have provided some initial, observable downpayment this far along in the process, but there is none anywhere in sight. (Economic Policy Institute, 1996a: 6-7)

Three decades of postindustrial "development" have served to accelerate the devaluation of the nation's people and the places in which they live. Those "left behind" in the 1960s have been left even further behind as the century comes to a close.

Chapter 6

POSTINDUSTRIAL PROPOSITIONS AND EMPIRICAL REALITY (II): ANALYSIS OF TRENDS IN THE ENERGY SYSTEM

As with the urban crisis in the 1960s, the energy crises in the 1970s challenged postindustrial theory by presenting what appeared to be contradictory evidence to postindustrial visions of the coming society. Again, however, the principles of abundance, adaptation and efficiency were reconceptualized, incorporating the current realities of tenuous international relationships, uncertain supplies, and escalating costs. In the pre-crisis era, energy abundance literally meant plentiful energy, energy adaptation was defined as social acceptance of the prevailing energy inputs and technology and energy efficiency was understood to mean primarily economic efficiency or energy at the lowest cost. In the post-crisis period, however, abundant energy became synonymous with adequate, secure and uninterrupted flows of energy. Adaptation came to signify recognition of the energy situation within the energy system itself, calling for fuel diversity as well as social acceptance of the new energy regime. The principle of efficiency was expanded from merely an economic cost calculation to one which embraced technological efficiency, or the reduction of total energy requirements through technological improvements in energy use. Although postindustrialists continued to proclaim that, in the long-term, energy issues would be resolved through technological means and eternal resources, strategies were promoted to manage the transition and assure supplies in the short-term. Energy autonomy through the diversification of fuels,

greater reliance upon indigenous resources, and technological innovations to reduce energy demand and allow for a greater range of fuel inputs was offered as the solution to the energy problems that plagued the United States during the 1970s.

Underlying the new understanding of postindustrial principles, however, is the consistent and long-standing ideology of markets and technology. Recognition of the intervention of political forces only served to strengthen the conviction that the best solution to energy issues is to allow the market to perform its functions of fostering competition, new opportunities and choice. In the post-crisis era, abundant energy continued to be seen as essential to productivity and economic well-being, but abundance was conceived in terms of end-use availability rather than as inputs, per se. The emerging postindustrial society marked by despatialization, mobility, and the advance of technology and the economy called for new sources and technologies which would offer the same energy benefits, while restructuring the energy system to meet the needs of a high-tech economy based on information.

Essential to the operationalization of the three principles, as reconceived, and the actualization of the new economy is the promotion, adoption and ever-increasing use of electricity as the primary form of end-use power. Long-recognized as the hallmark of postindustrial development, electricity has been offered as not only the foundation of the emerging economy based upon services and information, but as ensuring security, diversity in fuel sources and steady supplies to support new social structures. According to postindustrialists, electricity, in conjunction with technology and markets, became the panacea for the resolution of the nation's energy issues and the forward march of progress.

This chapter will address the validity of postindustrial theory as a framework for understanding current phenomena in the energy arena. For each principle, empirical evidence relevant to the energy system will be presented. The majority of the data presented will encompass the thirty-year period from 1967-1996, providing an adequate time span for the analysis of postindustrial trends and a range that includes years before, during and after the energy crises. Findings of this analysis will then be assessed in terms of the validity of postindustrial theory as a conceptual framework for understanding current empirical realities.

Energy Abundance

While the U.S. economy and society had, throughout its development, relied upon abundant, low-cost energy (Melosi, 1992), the energy supply crises of the 1970s precluded continued reliance on this simple abundance formula. Postindustrialists, as noted in Chapter 4, recognized the necessity of reconceiving energy-society relationships. In the wake of the oil shortages in the 1970s, U.S. technology, markets and policies defined the nation's energy problems in terms of dependence on supply from politically volatile regions of the world, particularly the Middle East. Within this framework, the solution to energy issues became defined as increased energy autonomy. The accelerated development of the electricity system which, due to its technological characteristics, offered flexibility in the use of alternative fuels and was seen as relatively invulnerable to outside influences, became the hallmark of the nation's "Project Independence" strategy. This theme has remained constant since the early 1980s in national policy, and the major trends in technology and energy markets have likewise been focused on the electricity system.

In the post-crisis Electric Society, more energy—the simple definition of energy abundance—was no longer appropriate as a principle to guide national development. Instead, abundance had become transformed into an idea of secure, uninterrupted flows of energy with the flexibility in fuel choice to assure economic, if no longer "cheap," energy options. Increased reliance on the market was heralded as the means to both ensure energy at the "least cost" (Sant, 1982) and to encourage technological innovations to increase energy efficiency.

- Postindustrial society will increase its reliance on electricity because of its technological versatility. Technology intensity will substitute for traditional natural resource intensity.

The United States did not abandon the ideal of high-energy society. Rather, the concept was elaborated to include dimensions of energy security and diversity. The electricity system was perfectly suited to serve as the institutional basis for the social pursuit of the new high-energy vision. Far from surrendering to a reality of less, as some had demanded (e.g., Meadows et al., 1974), the United States maintained a growing energy appetite overall, despite two "crises" of limited supply and high prices. In empirical terms, postindustrialists projected that technology will lead to reductions in the use of primary energy and that electricity will dominate as the primary form of end-use power. Dependence upon industrial era fossil fuels, including petroleum and coal, are expected to diminish in the new energy system. Reductions in these fuels will then lead to enhanced levels of energy security and autonomy.

Empirical Findings

As shown in Figure 6.1, the effects of the energy crises of 1973-1974 and 1978-1979 are clearly apparent in total energy consumption trends. Despite these two periods of decline, however, total primary energy consumption[1] in the United States increased during the period 1967-1996, evidencing net growth of 62.2%. Consumption climbed steeply from 1967 to 1973, declined through 1975, and resumed growth through 1979. Overall consumption then decreased again each year through 1983. The period 1984-1996 demonstrated steady growth in the nation's total energy consumption pattern.

Analysis by sector reveals that, although differing in degree, residential, commercial, industrial, and transportation energy consumption increased overall during the period 1967-1996. The industrial sector evidenced the lowest level of growth during this period, with a net increase of 37.5%. Overall energy consumption growth in the residential and transportation sectors from 1967-1996 were 69.9% and 79.1%, respectively. The commercial sector witnessed the highest rate of expansion in energy usage, more than doubling during the period, with an increase of 107.7%.

These growth patterns reflect the degree of responsiveness to changing energy conditions evidenced by each sector. Total energy consumption declined in all sectors from 1973-1974 and 1979-1980. The industrial sector, lowest in terms of overall growth rate, yet highest in terms of actual levels of consumption,

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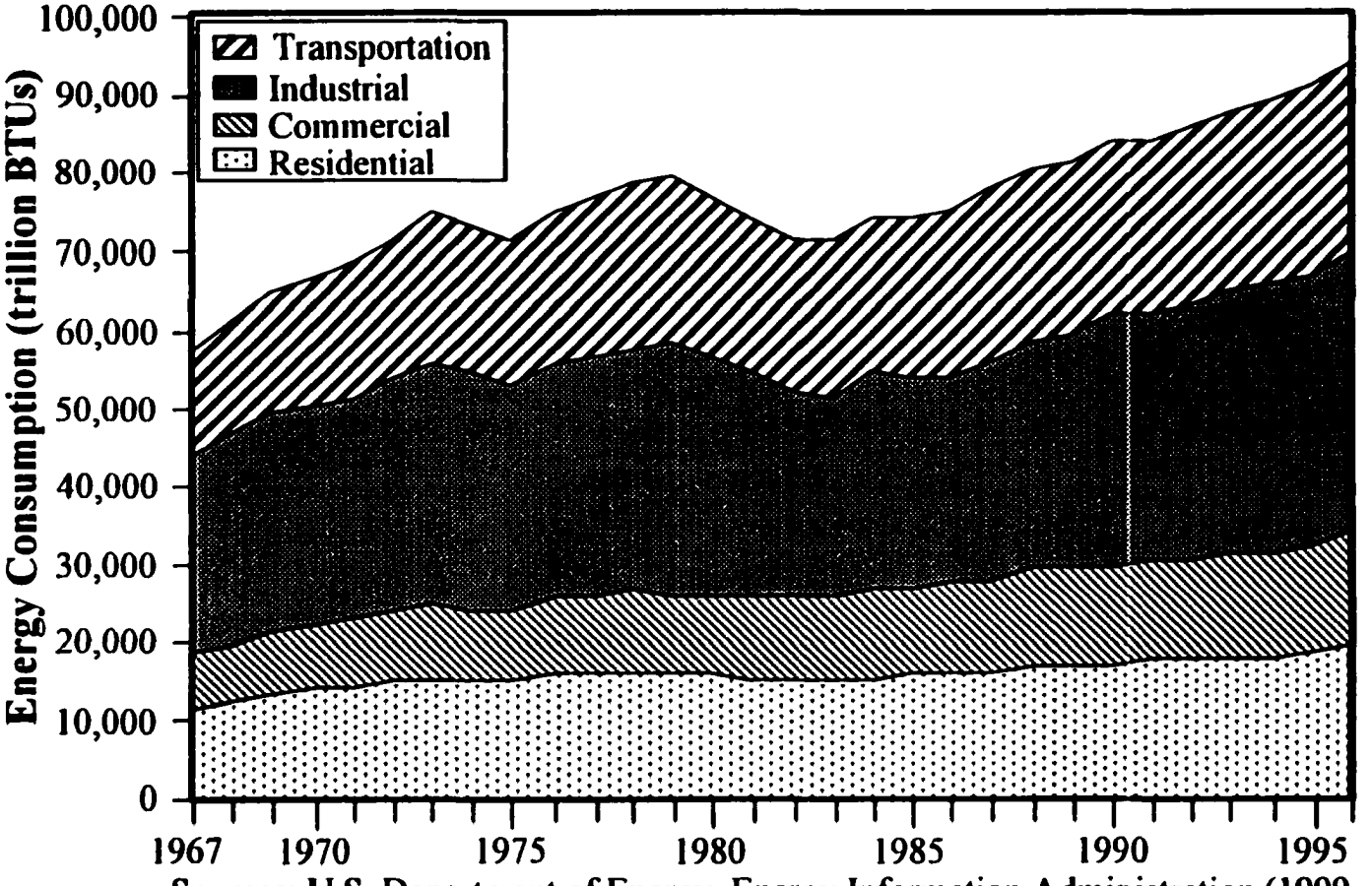
[1]Primary energy consumption includes fuel inputs, electricity sales and the losses that occur through the conversion, transmission and distribution of electricity. This measure of energy consumption allows for consistent and direct comparisons between sectors and the total economy.



Sources: U.S. Department of Energy, Energy Information Administration (1999, 1997, and 1991), *State Energy Data Report: Consumption Estimates.*

Figure 6.1 Total U.S. Energy Consumption by Sector: 1967-1996 (trillion BTUs)

experienced the most radical fluctuations in trends of expansion and constriction in energy use. The transportation and residential sectors demonstrated basically the same patterns of consumption, although the extent of change was muted in comparison. Responsiveness to the effects of the energy crises in the commercial sector was negligible, showing only very slight and very short-term declines.

In general, it can be concluded from the foregoing that total energy consumption rates have mirrored, in the short-term, the changing energy conditions presented by the energy crises. Consumption decreased during the crisis periods, and patterns of growth in energy usage resumed once prices and supplies stabilized. The most significant levels of decline in total energy usage occurred in the industrial sector, with relatively smaller decreases in the residential and transportation sectors. Evidence from the commercial sector during the 1967-1996 period indicates that it has assumed a nearly linear growth pattern that is relatively insensitive to issues of supply and/or price.

Although total energy consumption growth was rather modest during this period, rapid expansion in the use of electricity is clearly evident. [2] An examination of patterns of total U.S. electricity consumption and growth from 1967-1996 reveals that the use of electricity grew by 156.0% for the period as a whole. Increases in total electricity use were evidenced in all years, with the exceptions of

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[2]Unless otherwise noted, electricity consumption data represents total electricity, or the sum of sales and losses, in order to accurately portray the relationship between electricity and total primary energy consumption, and between electricity and non-electrical energy use. In a later section, electricity losses will be considered separately.

1982 and 1992 (see Figure 6.2).[3] Over the thirty-year period, the highest level of growth occurred in the commercial sector, where electricity consumption more than tripled, increasing by 228.2%. Electricity use also significantly expanded in the residential and industrial sectors, by 189.1% and 92.9%, respectively. While the industrial sector evidenced periods of growth and decline in electricity use, both the residential and commercial sectors experienced relatively linear growth patterns.

In contrast to the marked and almost continuous growth in the consumption of electricity, total nonelectrical energy use[4] experienced radical fluctuations in growth and decline (see Figure 6.3), bearing witness, in large measure, to the disruptions created by the energy crises and the state of the economy. Decreases were evidenced in each of the sectors in 1974, 1980 and 1981, and total non-electrical energy consumption declined in 1974, 1975, 1980, 1981, 1982, 1983, 1985, and 1991. Total non-electrical energy use grew by only 35.6% from 1967-1996. Virtually all of this growth occurred in the transportation and industrial sectors, which increased consumption levels by 79.2% and 22.1%, respectively. Growth in consumption of less than ten percent was evidenced in both the residential and commercial sectors (4.8% and 8.3%, respectively).

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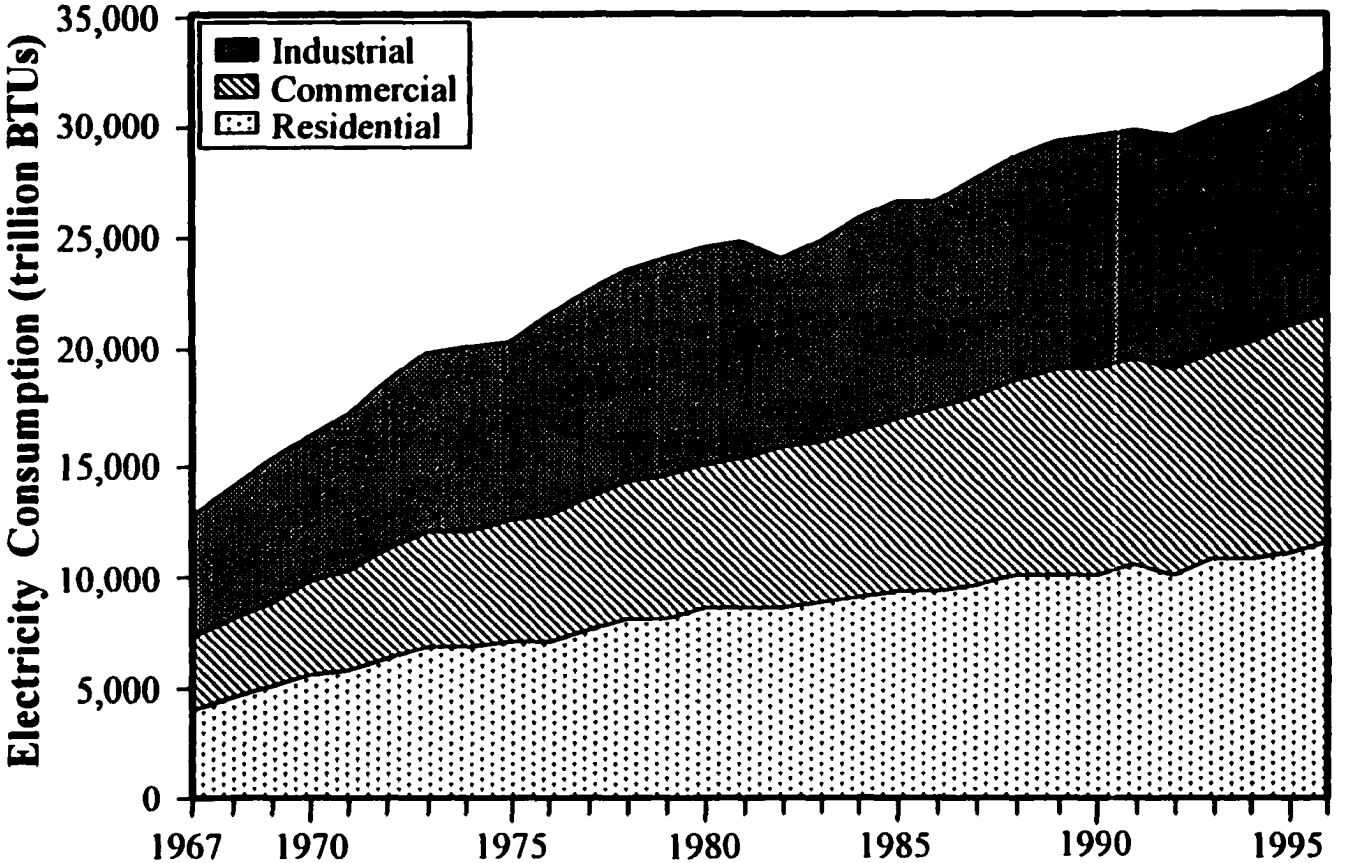
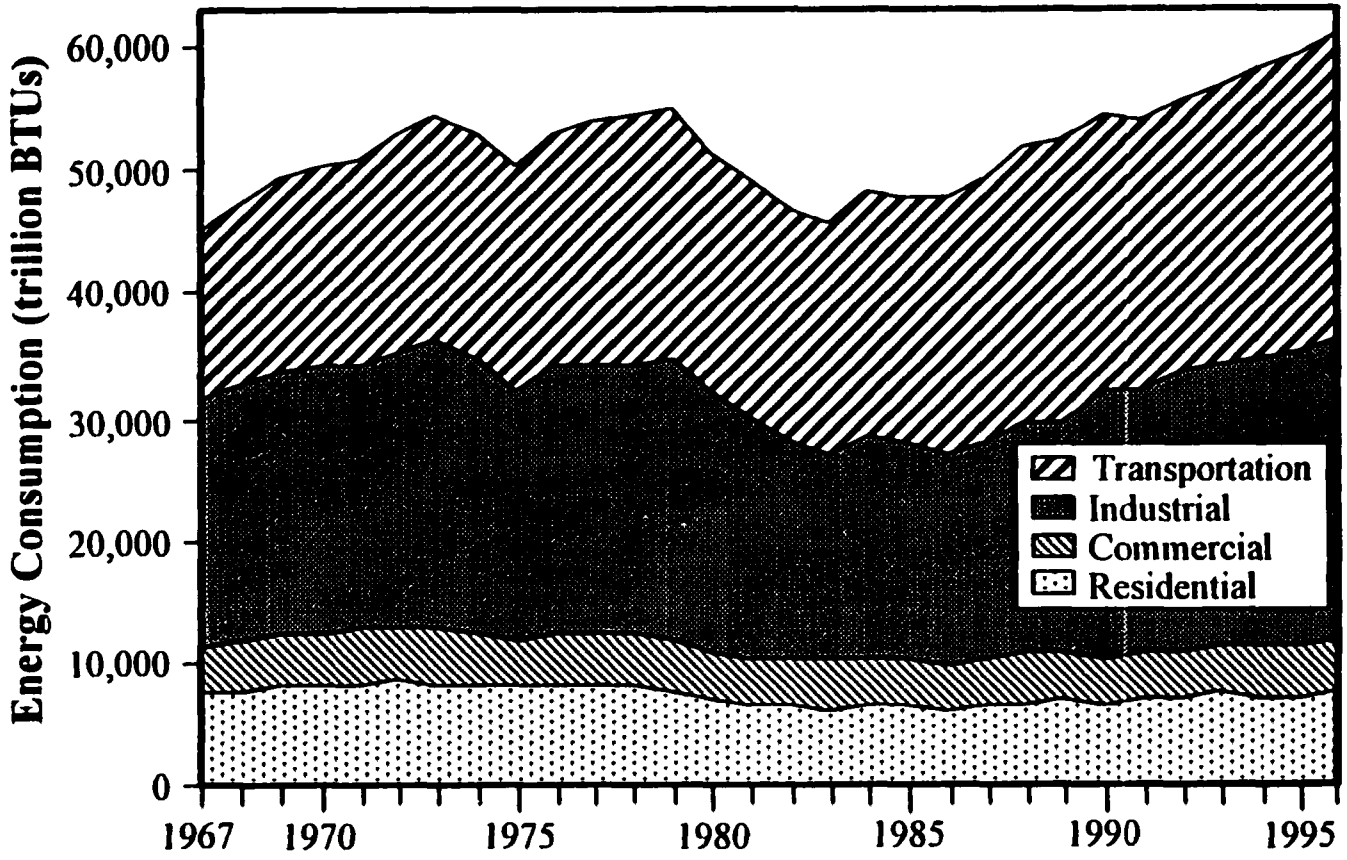
[3]The transportation sector is not included in this figure or in any of the following figures representing electricity use, as electricity constitutes only a minute proportion of total energy consumption in this sector (0.1%-0.2% in all years under study). Electricity utilized in this sector is, however, included in the U.S. total. It should also be noted that, although the transportation sector is heavily dependent upon petroleum as its primary energy source, the use of electricity increased by 33.1% from 1967-1996.

[4]Nonelectrical energy sources include coal, natural gas and petroleum.



Sources: U.S. Department of Energy, Energy Information Administration (1999, 1997, and 1991), *State Energy Data Report: Consumption Estimates.*

Figure 6.2 Total U.S. Electricity Consumption by Sector: 1967-1996 (trillion BTUs)



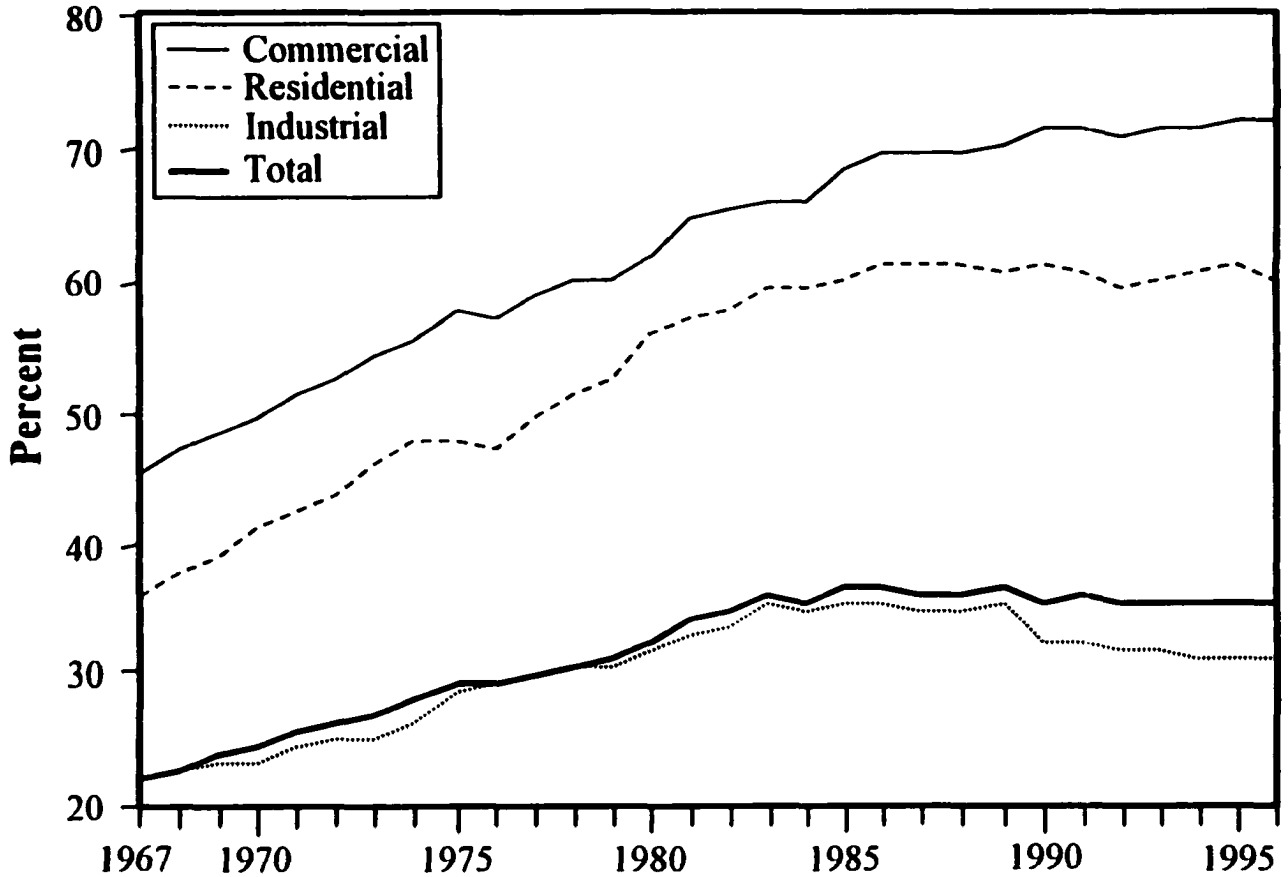
Sources: U.S. Department of Energy, Energy Information Administration (1999, 1997, and 1991), *State Energy Data Report: Consumption Estimates.*

Figure 6.3 Total U.S. Non-Electric Energy Consumption by Sector: 1967-1996 (trillion BTUs)

It is clear from the foregoing that, for all purposes other than mobility, American society and economy have been shifting to an increased and increasing reliance upon electricity as the primary source of power (see Figure 6.4). Although electricity met less than one-quarter of the nation's total energy needs in 1967 (22.1%), by 1996 electricity was the source of more than one-third of national total energy consumption (34.8%). When transportation is excluded from the total, the share of electricity consumed in the United States for all other uses increased from 28.9% in 1967 to nearly one-half (47.3%) in 1996. By 1996, more than seven of every ten units of energy used in the commercial sector were in the form of electricity (71.4%, compared with 45.2% in 1967). In the residential sector, electricity constituted 35.3% of total energy consumption in 1967, growing to 60.1% in 1996. In the industrial sector as well, electricity comprised increasing shares of total energy use, from 21.8% in 1967 to 30.5% in 1996.

Postindustrial Contradictions

Overall, data from the period 1967-1996 reveal a significant and steady shift to electricity as the primary energy source. Total energy consumption has increased as well, despite patterns of both positive and negative growth in response to the changing energy conditions precipitated by the crises of the 1970s. The overall trend is one of expansion; once each crisis was overcome, increasing consumption patterns resumed. Contrary to postindustrial thinking, responses to market signals, which were to form the basis of energy policy in the postindustrial era, have been least evident in the commercial sector, which constitutes the foundation of postindustrial society. Most responsive to market conditions, as



Sources: U.S. Department of Energy, Energy Information Administration (1999, 1997, and 1991), *State Energy Data Report: Consumption Estimates.*

Figure 6.4 Electricity as a Percent of U.S. Total Energy Consumption by Sector: 1967-1996

evidenced by the energy crises of the 1970s, has been the industrial sector which characterized the economy of the preceding era.

The energy consumption patterns evidenced from 1967-1996 belie the proposition that energy use will be moderated through enhanced technological efficiency and market forces. Total energy consumption during this thirty-year period increased by 62.6%. Most significant in terms of increased consumption are the data regarding the commercial sector and the use of electricity throughout the economy. Commercial sector energy use grew by 107.7%. Nearly all of this growth (95.8%) resulted from increasing use of electricity which, as a commercial energy source, increased by 228.2%. Electricity use throughout the total economy grew by 156.0%.

To some extent, rising dependence upon electricity for end-use power and increasing demands in the commercial sector (the largest growth area in the economy) fulfill the predictions of postindustrial theory and are therefore to be expected. However, the patterns of consumption challenge the postindustrial proposition that abundance in the traditional sense is an industrial era ideal. In the postindustrial context, abundance means that the market will minimize both the cost of energy and the total amount of energy required to perform societal functions. Although it is purported that adequate supplies will be available, this was to be accomplished through flexibility in fuel choice and increased energy autonomy.[5]

According to the Energy Information Administration, however, demand for petroleum continues to increase, and "demand growth in 1999 should noticeably

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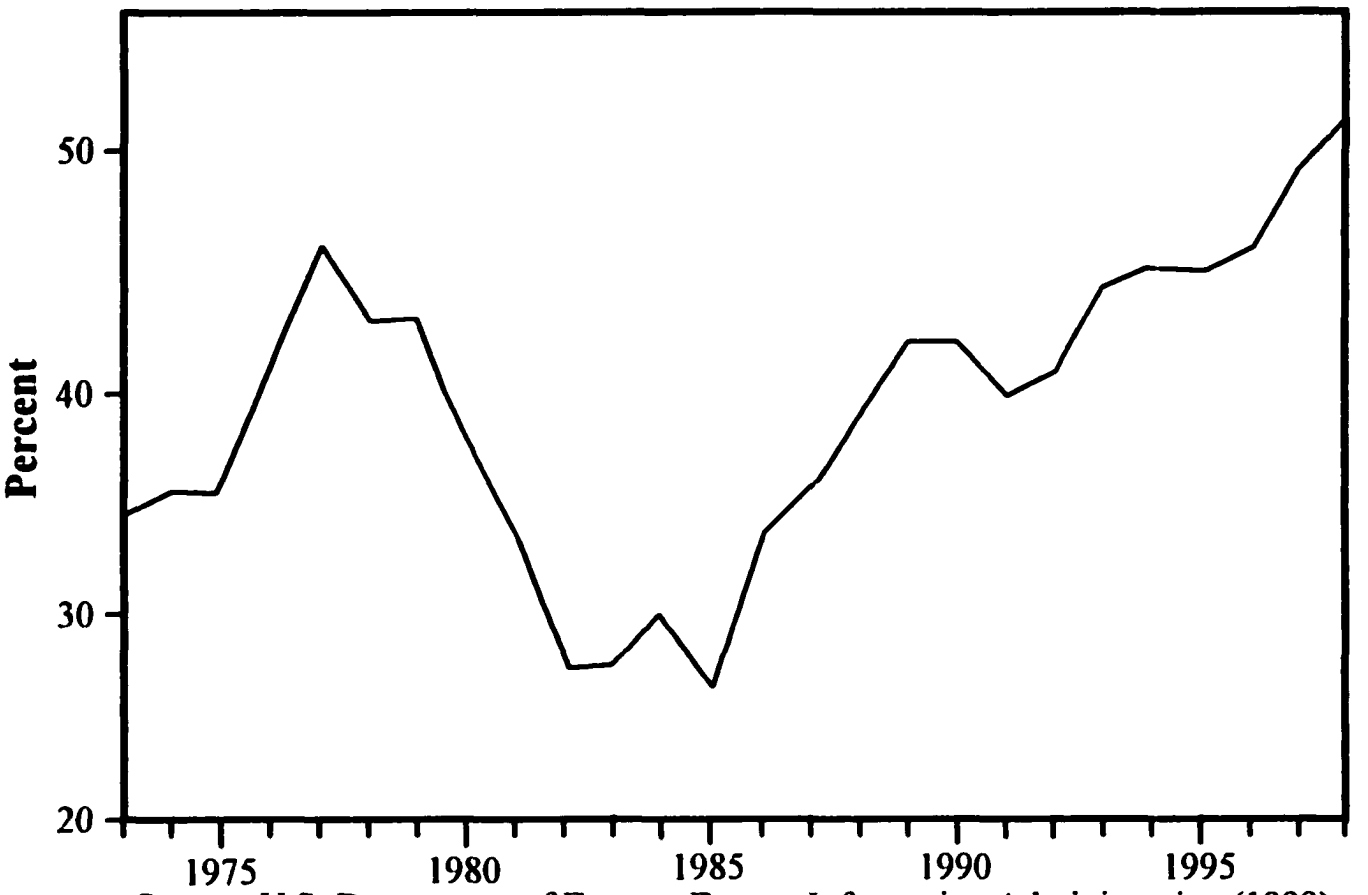
[5]Energy autonomy and flexibility in fuel choice are addressed at length in the following section regarding energy adaptation.

exceed that in 1998" (U.S. Department of Energy, Energy Information Administration, 1999c: 3). Further, not only is dependence growing, petroleum increases are supplied extensively by non-domestic sources (see Figure 6.5). "(W)e still see almost 52 percent of total U.S. petroleum demand being met by net imports of crude oil and finished petroleum products in 1999. Import dependence may reach 53.6 percent in 2000" (U.S. Department of Energy, Energy Information Administration, 1999c: 5). Despite evidencing periods of rapid growth and sharp decline, petroleum imports have increased, overall, by 290.2% from 1967 to 1997 (U.S. Department of Energy, Energy Information Administration, 1998a). As imports now meet more than half of U.S. petroleum demand and are expected to grow, the concept of energy autonomy is becoming even further out of reach.

In response, postindustrialists would argue that the electricity system, long identified as the foundation of the new society, would deliver a new era of energy security and diversity. Despite these promises, however, the United States continues to rely upon industrial era fossil fuels as energy inputs. This dependence exacerbates several fundamental issues. According to the National Energy Policy Plan (U.S. Department of Energy, 1995), from 1975-1994, the United States nearly doubled its use of coal to generate electricity (from 8.8 quadrillion British Thermal Units in 1975 to 16.9 quads in 1994), increasing from 43.1% of total primary energy inputs to 54.7%. While the growing reliance upon this indigenous resource indicates a step toward greater energy security, it magnifies environmental problems that are associated with its use. Coal produces more carbon dioxide emissions than other fossil fuels per kilowatt hour of electricity generated (U.S. Department of Energy, Energy Information Administration, 1998c). The generation of electricity



Source: U.S. Department of Energy, Energy Information Administration (1999) *Monthly Energy Review.*

Figure 6.5 Net Petroleum Imports as a Percent of Total U.S. Petroleum Consumption: 1973-1998

has also demonstrated an increasing reliance upon nuclear power, which presents another kind of environmental issue. The United States has, from 1975-1994, more than tripled (257.9%) its dependence upon nuclear power as a primary energy source. Nuclear energy grew from 9.3% of total inputs in 1975 to 22.0% in 1994 (U.S. Department of Energy, 1995). Although postindustrialists would argue that this is a move toward utilizing "eternal" energy sources, the issues of radioactive waste disposal and national security have yet to be addressed. Growing reliance upon nuclear energy poses significant environmental, social and security threats to American society. Nuclear dependence, in conjunction with expanding levels of oil imports and the accelerated dissipation of energy resources in the form of electricity losses, contradict the fundamental postindustrial premise of secure, uninterrupted flows of energy.

Energy Adaptation

The energy crises of the 1970s led to the recognition and acknowledgment that the energy system is not invulnerable to dislocation and interruption. As discussed above, energy security became a central concern in a nation faced with uncertain supplies and rapidly increasing prices. The principle of adaptation, long invoked by postindustrialists as the appropriate social response to the processes involved in creating abundance, was explicitly linked to the energy system. In the post-crisis energy context, conceptualizations of adaptation were articulated beyond the more simplistic view of the societal acceptance of the prevailing energy inputs and technology. Adaptation came to mean, increasingly, allowing market forces and technology to pursue their own course, thus fostering appropriate or "natural" responses and adjustments to changing energy conditions

within the energy system itself. As issues of energy security, supply and costs loomed large, fuel diversity, flexibility in fuel choice and deregulation became identified as the technological and economic tools by which society could adapt, thus fostering an environment congenial to overall technological growth and productivity. As with the abundance proposition, increasing reliance upon electricity was promoted not only as addressing the need for a multiplicity of possible energy inputs, but also as providing the technological capability to deliver an energy system that would support the demands and the potential of the emerging high-tech and non-location-specific society.

- The fuel mix will change dramatically as the Electric Society makes full use of the complete range of energy options. Nuclear power, in particular, will produce cheap, abundant and, indeed, "eternal" energy.

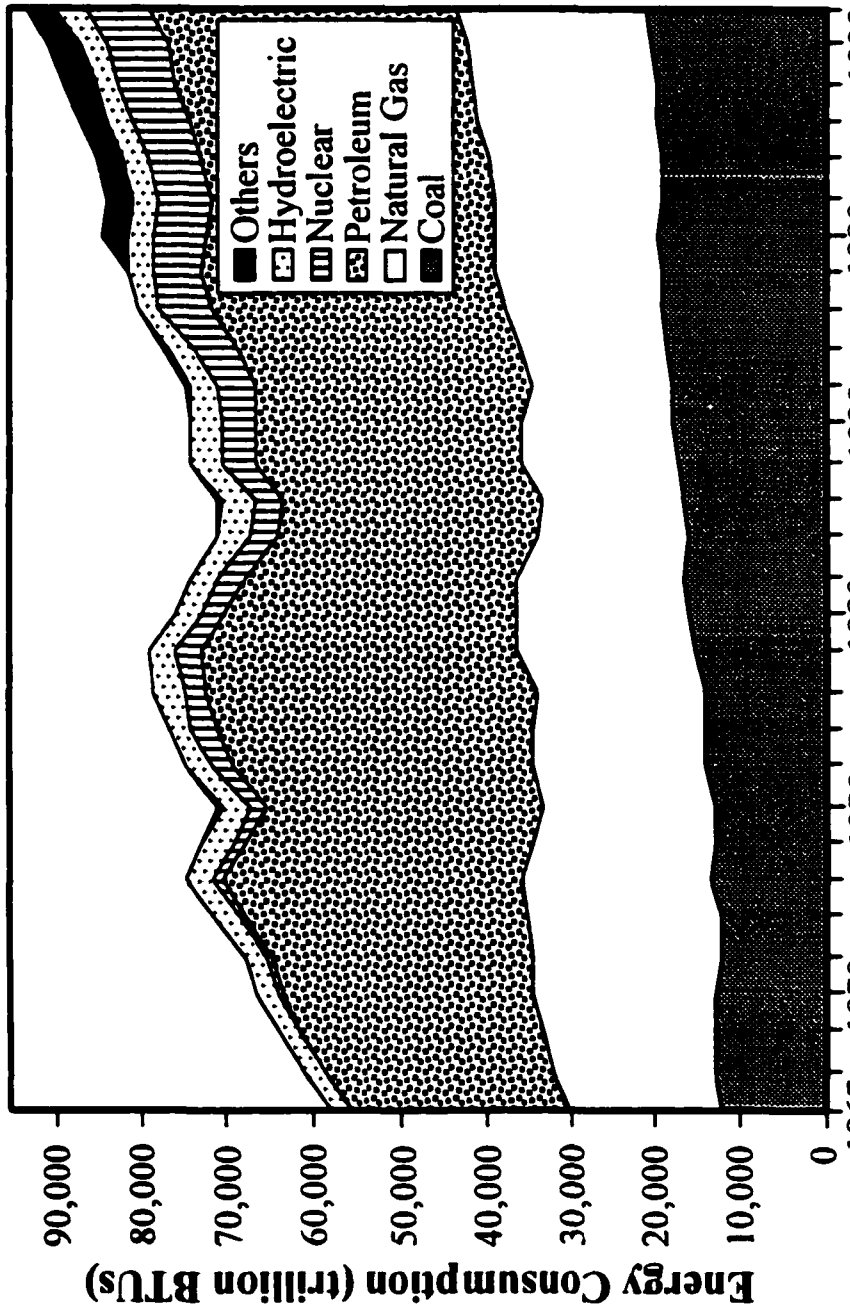
In the postindustrial energy context, adaptation assumes both technological and spatial dimensions. Spatial adaptation, according to postindustrialists, occurs as society relies upon electricity to support telecommunications, promoted as the primary means of interaction. Electricity can be "wheeled" from one region to another, thus supplying needed energy at any location. In an information economy, electronic links form the basis of interaction, allowing the enhanced utilization of communication technologies in lieu of resource and spatially-intensive activities such as transportation, thus lowering energy demands for physical movement from place to place. The electric and telecommunications grids are seen, in general, as a key means for lowering the resource and spatial requirements of development.

Empirical propositions can be derived from the postindustrial understanding of adaptation. Postindustrialists have proposed that the Electric

Society will be characterized by alterations in the sources and mix of primary energy and that the use of fossil fuels will decline. Electric utilities will also demonstrate these changes as technology introduces new means for electricity generation. Nuclear power will be embraced as a high-tech means to provide nearly inexhaustible energy. The flexibility of electricity will support the substitution of activities, such as the growing use of communications in lieu of transportation. Uninterrupted supplies will be assured through reliance upon electricity, and new inputs for its production will yield a decline in negative environmental impacts.

Empirical Findings

As noted in the foregoing section regarding abundance, electricity use has increased substantially from 1967-1996 and has become a significant source of end-use power for all non-transportation-related activities. Despite this change in end-use energy form, however, coal, natural gas and petroleum have continued to provide the bases for the nation's energy consumption, accounting for, at minimum, seventeen of every twenty units (84.6%) of energy consumed (see Figure 6.6). Approximately two-fifths of the nation's energy from 1967 to 1996 has been provided in the form of petroleum, approximately one-fourth or more in the form of natural gas and more than one-fifth by coal. Although the nation continues to rely primarily upon fossil fuels, nuclear has made a notable impact. Despite the problems experienced by utilities and the social and environmental issues associated with nuclear energy, nuclear constituted a small, but increasing, percentage of the nation's total energy use, growing from 0.2% in 1967 to 7.7% by 1996 (see Figure



Sources: U.S. Department of Energy, Energy Information Administration (1999, 1997, and 1991), *State Energy Data Report: Consumption Estimates.*

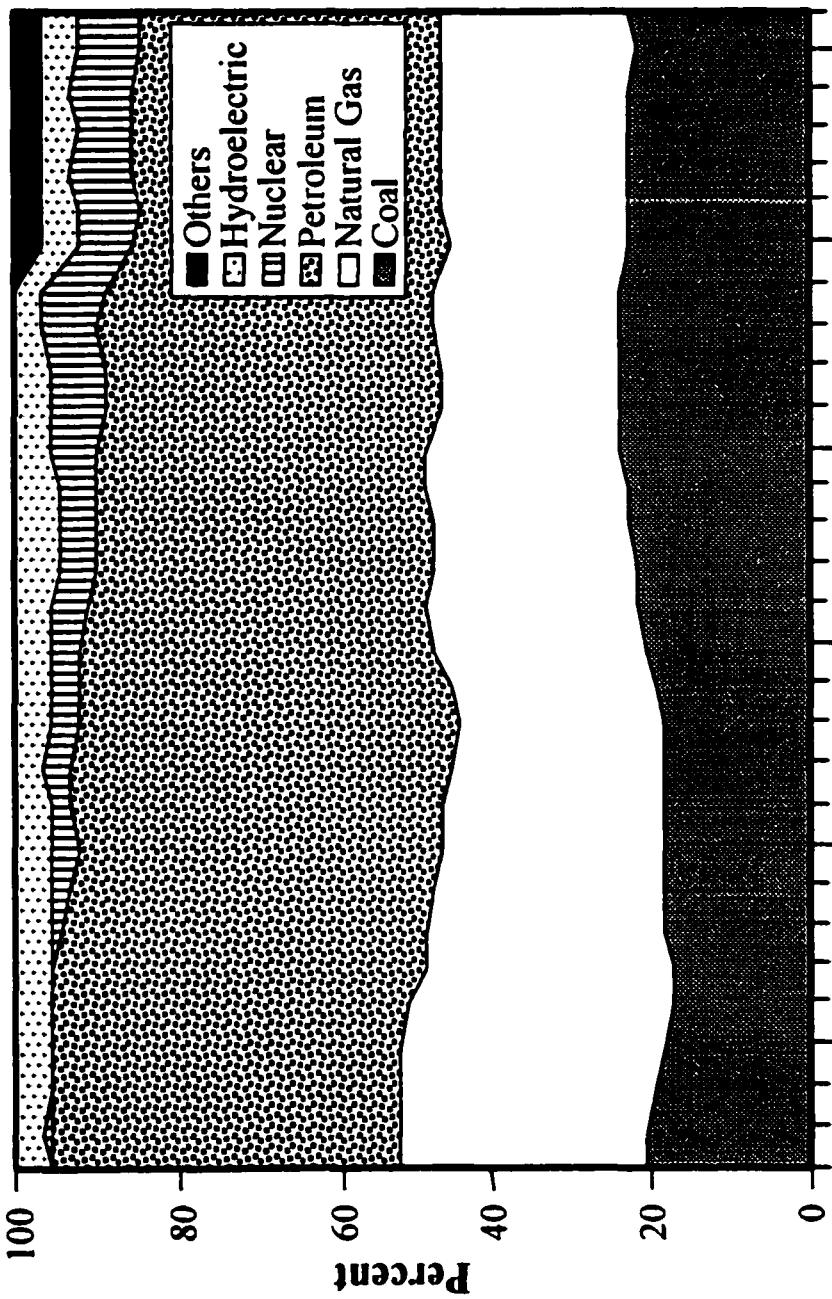
Figure 6.6 U.S. Energy Consumption by Source: 1967-1996 (trillion BTUs)

6.7).[6] Nuclear provided 88.5 trillion British Thermal Units (BTUs) of total energy consumption in 1967, rising to 7167.6 trillion BTUs by 1996. While the total consumption of petroleum increased by 41.9%, its share of the nation's total energy consumption declined from 43.9% in 1967 to 38.4% in 1996. Similarly, the total use of natural gas increased by 25.8% overall, while its proportion of the total energy mix constituted 31.2% in 1967 and 24.2% in 1996. The use of coal increased by 72.2%, with its share of the total energy mix increasingly slightly from 20.7% in 1967 to 22.0% in 1996.

Analysis of the mix of fuels in U.S. society reveals that fossil fuel energy, in the forms of petroleum, natural gas and coal, continues to supply the vast majority of the nation's energy needs. Fossil energy accounted for 95.8% of total energy used in 1967 and 84.6% in 1996. The thirty-year difference is explained by the growth in nuclear power during the period and the inclusion of non-electric utility use of renewable sources in the statistics after 1990, which contributed 3.6% of total energy consumption by 1996.

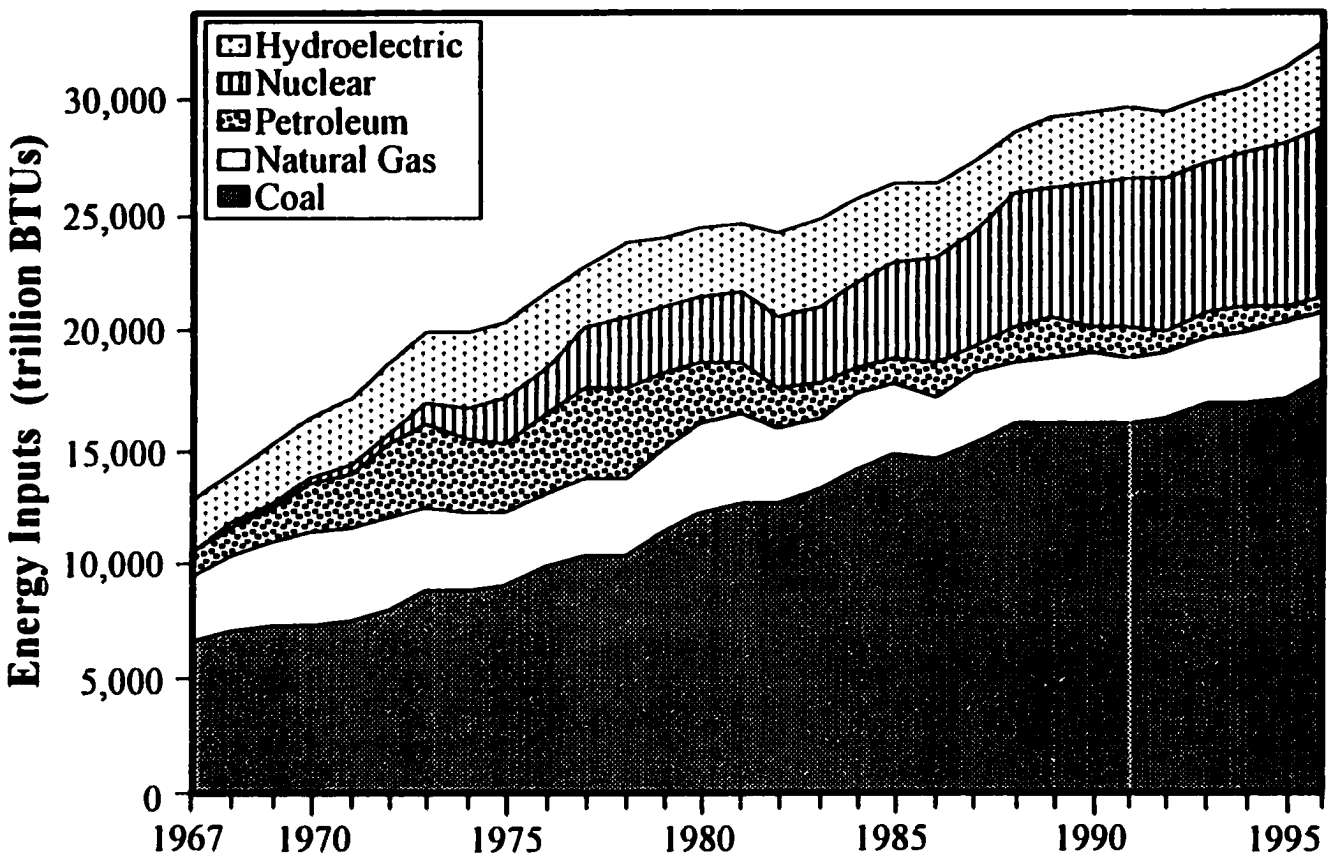
Inputs to electric utilities have increased by 155.9% from 1967-1996 and, again, fossil fuels dominate (see Figure 6.8). The use of coal has increased by 178.7%, while the inputs of petroleum and natural gas have decreased (by 28.3% and 2.7%, respectively). Clearly apparent in the examination of electricity inputs is the growth of nuclear power, which increased from 88.5 trillion BTUs to 7167.6 trillion BTUs over the three decades. Figure 6.9 depicts the share of each input as a percent of the total. Nuclear grew from 0.7% in 1967 to 22.0% in 1996. Coal

[6]A discontinuity in the share of resources between 1989 and 1990 will be noted in due to the increased coverage of non-electric utility use of renewable energy beginning in 1990.



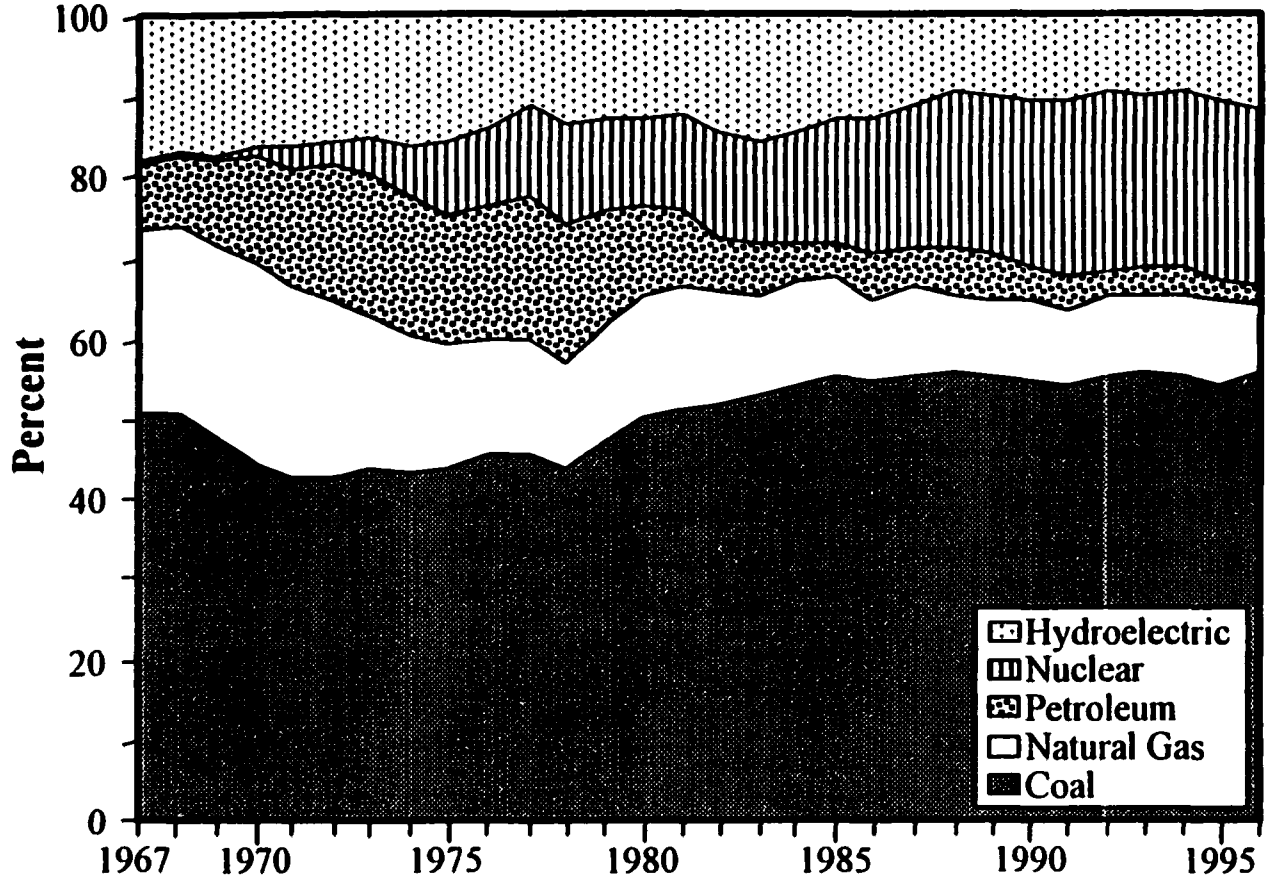
Sources: U.S. Department of Energy, Energy Information Administration (1999, 1997, and 1991), *State Energy Data Report: Consumption Estimates.*

Figure 6.7 Percent of Total U.S. Energy Consumption by Source: 1967-1996



Sources: U.S. Department of Energy, Energy Information Administration (1999, 1997, and 1991), *State Energy Data Report: Consumption Estimates.*

Figure 6.8 Energy Inputs at U.S. Electric Utilities by Source: 1967-1996 (trillion BTUs)



Sources: U.S. Department of Energy, Energy Information Administration (1999, 1997, and 1991), *State Energy Data Report: Consumption Estimates.*

Figure 6.9 Percent of Total Energy Inputs at U.S. Electric Utilities by Source: 1967-1996

constituted more than half of inputs throughout the period (50.7% in 1967 and 55.2% in 1996), and natural gas and petroleum both declined in their proportion of the total, from 22.4% and 7.9%, respectively, in 1967 to 8.5% and 2.2% in 1996. The share of hydroelectric power also declined from 18.2% in 1967 to 11.4% in 1996. The declining use of petroleum and natural gas and the growth in the use of nuclear reflect a shift in the composition of the fuel mix for electricity generation although coal clearly has been, and continues to be, the dominant input.

Despite the growth in nuclear power in recent years, however, the nuclear experience is expected to be short-lived. Projections by the Energy Information Administration in the U.S. Department of Energy are that nuclear will decline significantly during the next two decades and will resume a much smaller role.

> Nuclear power in the United States grew rapidly after 1973, when only 83 billion kWh of nuclear power was produced. By 1996, nuclear power had grown more than 8-fold, with 110 nuclear power units generating a record 675 billion kilowatthours of electricity. This rapid growth in nuclear power generation, however, obscures serious underlying problems in the U.S. nuclear industry. After 1974, many planned units were canceled, and since 1977, there have been no orders for any new nuclear units, and none are currently planned...
>
> The long-term (through 2020) nuclear power outlook in the United States is for nuclear capacity to decline sharply, with no new nuclear units expected to come on-line during the forecast timeframe. By 2020, around half of current U.S. nuclear power capacity is expected to be taken out of service, reducing the share of nuclear power in the U.S. electric generating mix to only 7% (from 18% at present). (U.S. Department of Energy, Energy Information Administration, 1999d: 14)

The U.S. experience with nuclear power has not lived up to expectations. The nuclear accident at Three Mile Island in 1979, followed in 1986 by the reactor explosion at Chernobyl in the Soviet Ukraine, underscored the risks of nuclear technology. Financial difficulties of utilities in the 1970s and 1980s left standing numerous nuclear plants in various stages of construction. Some postindustrialists continued, however, to promote nuclear energy (most notably Alvin Weinberg, 1980, 1988; Harold Agnew, 1983; and David Lilienthal, 1980), proposing a second nuclear era.

Postindustrial Contradictions

The claim of postindustrialists that greater energy diversity would be realized has been shown to be highly questionable in the current context. An examination of energy consumption data has revealed that the mix of fuels continues to be primarily dependent upon fossil fuels in the postindustrial era. In fact, there is little discernible difference, other than the emergence and anticipated retraction of nuclear power, between the primary energy sources used in the American industrial period of the twentieth century and its postindustrial successor. Not only has diversity not occurred, however; the enhanced energy security which it was purported to occasion has been more than compromised, it has been weakened. As noted in the discussion of energy abundance, oil imports have been rising to unprecedented levels, rendering security increasingly questionable.

Another contradiction to the postindustrial vision is contained in the analysis of these energy consumption patterns. Postindustrialists have claimed that communication technologies would substitute, to at least some degree, for resource-intensive activities and practices, including transportation. Energy consumption

data, however, contradict this proposition. The significant level of growth in energy consumption in the transportation sector, 79.1% from 1967-1996, was also notably higher than the increase in overall national energy consumption (62.2%) during this period. In other words, energy use for transportation expanded at a faster rate than that evidenced to perform all societal functions combined. More, not less, energy is being committed to purposes of mobility, leading to the conclusion that adaptation has not been evidenced in terms of moderating certain energy-consuming practices. Rather, such activities appear to be additive in nature, as new technologies do not promote the substitution of means, serving only to enhance the range of possibilities.

In technological terms, postindustrialists have promised a more sophisticated and adaptive energy system. The increasing reliance upon electricity has indeed ushered in new, more advanced and complex technology. This includes not only the technology utilized to generate electricity, but also the development of a vast interconnected grid system which essentially links all areas within the continental United States into gigantic power pools. While this interdependent system, capable of providing access to electricity at virtually any location, has been seen as not only a technological symbol of the postindustrial age but also as a basic requirement for the realization of the electronic society, this system engenders numerous social, political, economic and spatial problems. It is inherently monopolistic, both technologically and organizationally, relying upon large-scale centralized power plants which, even with deregulation of the electric utility industry, are linked through an interconnected and interdependent transmission and distribution system. Its monopolistic character is complemented by a highly technocratic orientation in decisionmaking. Together, these features of the electrical

system mean that it typically must be governed politically outside of the normal democratic process and that market mechanisms, by themselves, must be relied upon to assure least-cost economic performance. This massive system requires extensive back-up equipment and system redundancies in order to meet fluctuating levels of demand and assure uninterrupted power services. However, the system is vulnerable by its very structure, as failure in any one component can have widespread negative consequences. Lovins and Lovins have characterized this phenomenon as "brittle power," and described its inherent fragility.

> The United States has for decades been undermining the foundations of its own strength. It has gradually built up an energy system prone to sudden, massive failures with catastrophic consequences.
>
> The energy that runs America is brittle—easily shattered by accident or malice...A brief faltering of our energy pulse can reveal—sometimes as fatally as to astronauts in a spacecraft—the hidden brittleness of our interdependent, urbanized society. Yet that continuous electrical supply now depends on many large and precise machines, rotating in exact synchrony across half a continent, and strung together by an easily severed network of aerial arteries whose failure is instantly disruptive. The size, complexity, pattern, and control structure of these electrical machines make them inherently vulnerable to large-scale failures...Our reliance on these delicately poised energy systems has unwittingly put at risk our whole way of life. (Lovins and Lovins, 1982: 1)

The "brittleness" or vulnerability of the electric grid has recently been demonstrated in two blackouts with far-reaching consequences. On July 2, 1996, fifteen western states and parts of Canada and Mexico lost power when a transmission line in southeastern Idaho short-circuited, causing a domino effect. Two million people were affected by the outage. The cause of the short-circuit was initially identified as electricity jumping from the line to a tree that was too close

(Cable News Network, 1996a) and later explained as a result of a tree falling onto the line (Cable News Network, 1996c). Less than six weeks later, on August 10, 1996, another blackout occurred on the Pacific Intertie, the grid system that moves power from the Northwest to the Southwest United States. Due to high temperatures and subsequent high electricity demands, utilities in California transferred so much power from the Pacific Northwest that a 500,000-volt transmission line was overheated. The line then sagged into tall trees and shut itself off, passing the energy load to the rest of the system. The overloaded grid knocked out the four main power lines that send electricity elsewhere, creating a domino effect as the grid's safety systems broke the connections between utilities (Cable News Network, 1996b). Ten western states and over four million people were affected. These events underscore not only the fragility of the electric power system, but highlight the centrality of electricity in the functioning of society. In the words of Charles Curtis, Deputy Energy Secretary,

> I think this is a rude reminder of how critically dependent we are, particularly on electric power. And how important it is, not only to the functioning of our economy, but our daily lives. And the loss of power is not only an inconvenience for people, it can, in fact, be life threatening... (quoted in Cable News Network, 1996d)

Thus, postindustrial American society has come to rely upon an energy system in which a falling tree has the capability to blackout an area nearly one-third the size of the continental United States.

The vast electrical grid has supported and furthered other phenomena, most notably spatial decentralization. Postindustrial predictions regarding the spatial dimensions of energy adaptation assume that accessibility to electricity will foster a decrease in the utilization of resource-intensive activities such as transportation as

communication technologies assume some of these functions through providing a different means of access. Further, access through the electric and telecommunications grids will remove the impediments of space, as face-to-face interaction becomes increasingly unnecessary. What has not been considered, however, is what would actually happen in physical space. Migration and relocation, made possible by widespread access to electricity, have exacerbated conditions of sprawl, which in turn has encouraged the enhanced use of transportation energy. As noted above, the use of transportation energy has increased at a rapid pace, belying the proposition that the use of this resource would diminish.

The continuing reliance upon industrial-era fossil fuels creates problems in other respects as well, most notably in the environmental impacts of combustion. Eighty-two percent of U.S. greenhouse gas emissions, and more than 98% of U.S. carbon dioxide emissions, are generated by the combustion of fossil fuels (U.S. Department of Energy, Energy Information Administration, 1998c, 1998d). Overall, greenhouse gas emissions in the United States increased by approximately 10% from 1990 to 1997. The compounded annual rate of growth in emissions, 1.3%, exceeded the 1.1% growth rate of population (U.S. Department of Energy, Energy Information Administration, 1998d). Examination of carbon dioxide emissions by sector reveals that the highest increase from 1990-1997, 14.7%, was demonstrated by the commercial sector. In contrast, carbon dioxide emissions grew by 6.3% in the industrial sector (U.S. Department of Energy, Energy Information Administration, 1998c). Thus, the sector purported to be in the forefront of

postindustrial development has become the leader in its rate of exacerbating environmental problems.

Energy Efficiency

Just as the energy crises of the 1970s precipitated reconceptualization of the principles of abundance and adaptation, the principle of efficiency also underwent change. In the pre-crisis period, energy was seen to be both plentiful and cheap, and "efficiency" in relation to energy was largely understood to mean economic efficiency, or energy at the least cost. In the wake of the energy crises, as many called for the curtailment of energy use, postindustrialists held to their convictions that energy supply must be assured. However, most postindustrialists were ready to concede that modern society may have to learn how to do more with less energy, at least until such time as technology could render a solution. Thus, the earlier abundance-based definition of efficiency was not relinquished, but rather redefined to accommodate possible energy constraints in the short-term. The postindustrial response was to focus upon maintaining end-use availability while incorporating technological improvements which could realize the "more-with-less" revised definition of efficiency. Postindustrialists of the 1980s and 1990s remained consistent in their support of the market as the only appropriate means to discover higher technological efficiencies. The best method for dealing with issues of uncertain supplies and increasing prices, they argued, continued to be reliance upon market forces to allocate resources and foster technological innovation in the use of energy.

- Through sophisticated technology, the Electric Society will be technologically and economically more efficient. New high-

technology industries, energy systems and social interactions will be less energy-intensive.

The signal indicator of postindustrialism is found in economic activity, from a preponderance of industrial manufacturing to an economy based upon information and professional and service-related activities. According to postindustrialists, the intensity of energy use will decrease as energy-intensive manufacturing activities diminish. The assumption is that this shift is necessarily accompanied by a change in energy structure that relies increasingly upon electricity, which supports the activities of the modern technological era. Thus, the shift to electricity is simultaneously representative of advanced technological development and greater social productivity. As demonstrated in the above discussion of abundance, there has indeed been substantial growth in the use of electricity. The social productivity of energy, or energy efficiency, can be conceived as a reduction in the use of energy per unit of human activity. In empirical terms, postindustrialism claims that the intensity of energy use should demonstrate decline. As the leading sector of the economy, the commercial sector will exhibit gains in energy savings and declines in energy intensity.

Empirical Findings

Several studies have been conducted in recent years regarding the efficiency of energy use. As pointed out in a study by the Energy Information Administration of the U.S. Department of Energy (1995), the concept of energy efficiency is commonly used in a qualitative sense, referring to decreases in energy intensity and/or reflecting less energy use due to, for example, conservation efforts or behavioral changes. According to the Energy Information Administration, in a

strict sense, energy efficiency is a technological concept related to the amount of energy used to perform a particular activity by a specific means.

> Energy efficiency...may refer to the relative thrift or extravagance with which energy inputs are used to provide services...To be energy efficient per se is to provide services with an energy input that is small relative to a fixed standard or normal input. (U.S. Department of Energy, Energy Information Administration, 1995: 3)

As it is not feasible to measure, on a broad scale, the actual efficiency of energy use, analyses of efficiency rely upon measures of energy intensity, or the energy use rate. The following discussion, therefore, as well as the studies examined, addresses primarily issues of energy intensity. It should also be noted that a number of factors have contributed to changes in energy use which include, significantly, technological improvements, structural changes in economic activity, behavioral modifications and other conservation efforts, and fluctuations in both the weather and the economy. While the potential impacts of these factors should be kept in mind in analyses of change in energy intensity, few studies that incorporate these considerations have been conducted on a comprehensive scale. In the present context, it will suffice to identify the performance of the various sectors and the economy in regard to overall trends in energy use and intensity.

According to the National Energy Policy Plan (U.S. Department of Energy, 1995), since the late 1970s, most end-use sectors have become more energy efficient. Industrial energy intensity, measured as energy use per dollar of industrial Gross Domestic Product, has shown significant decline. The energy intensity of commercial buildings, calculated as energy use per square foot of floorspace, has also demonstrated improvement, but it is much more modest. Although intensity has declined in both sectors, these findings contradict the postindustrial argument

that the energy-intensive industrial base will be replaced by a more efficient service economy. In reality, the evidence points to less progress in energy efficiency, defined as the inverse of the ratio of energy inputs per unit of human activity, in the commercial sector compared with its industrial counterpart.

The Office of Policy in the U.S. Department of Energy (1995) examined energy intensity and energy savings trends from 1972-1991, utilizing primary energy[7] to calculate savings and delivered energy for detailed end-use analysis. Energy intensity was measured by dividing end-use energy consumption by an appropriate measure of activity; e.g., consumption in the U.S. economy was divided by Gross Domestic Product (GDP). Energy savings were then defined as the difference between actual consumption in a given year and the level that would have been evidenced if energy intensity had remained at its 1972 value. Economy-wide, as well as sectoral, intensities and savings were calculated. The Office of Policy concluded that U.S. energy consumption is currently lower than it would have been had energy intensities not changed after the oil price shocks of the 1970s. Indeed, rising energy prices were identified as a major determinant of lowered energy demands through either curtailment of use or improvements in efficiency. The converse was also found to be substantiated; that lower prices will slow or reverse efficiency improvements. In comparing actual use and price with trended energy use, the Office of Policy determined that deviations from the trend were widened when prices were high in 1973-1974 and in 1979-1980, resulting in reduced energy use. As prices lowered, efficiency efforts followed suit.

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[7]As defined in this study, primary energy includes fuel inputs, electricity, and the conversion, transmission and distribution losses that result when electricity is produced. This definition is equivalent to the term "total energy" used previously.

> The sharp drop in oil and other energy prices that began in 1986 has slowed energy-efficiency improvements. After this most recent price decline, energy consumption appears to more closely follow overall economic activity as measured by GDP. Continued increases in savings occur largely as a result of growth in the economy. (U.S. Department of Energy, Office of Policy, 1995: 3)

Factors other than price, however, mitigate the decline in energy savings that would be anticipated at times of declining costs. These include consumer preferences for more efficient houses, cars and appliances; technological developments which reduce the cost of energy efficient purchases, making such purchases more attractive to buyers; and other factors such as environmental concerns.

The Office of Policy also examined the relative contributions to primary energy savings evidenced in 1991, compared with each sector's 1972 consumption patterns, and determined that savings were not proportional by sector. Although in 1972 the commercial sector accounted for 13% of total U.S. energy consumption, its 1991 contribution to savings equaled only 4%. In contrast, the industrial sector, which accounted for 42% of total energy use in 1972, contributed 57% to 1991 savings (U.S. Department of Energy, Office of Policy, 1995: 9). In part, the differences in savings are attributed to differing levels in the use of electricity. Although increased efficiencies in electric utility generation and transmission have occurred, "the rapid growth in electricity consumption in the commercial sector had the greatest single contribution to reducing primary energy savings over the 1972-91 period" (U.S. Department of Energy, Office of Policy, 1995: 10). Further analysis of delivered energy[8] revealed that savings in the commercial sector are largely

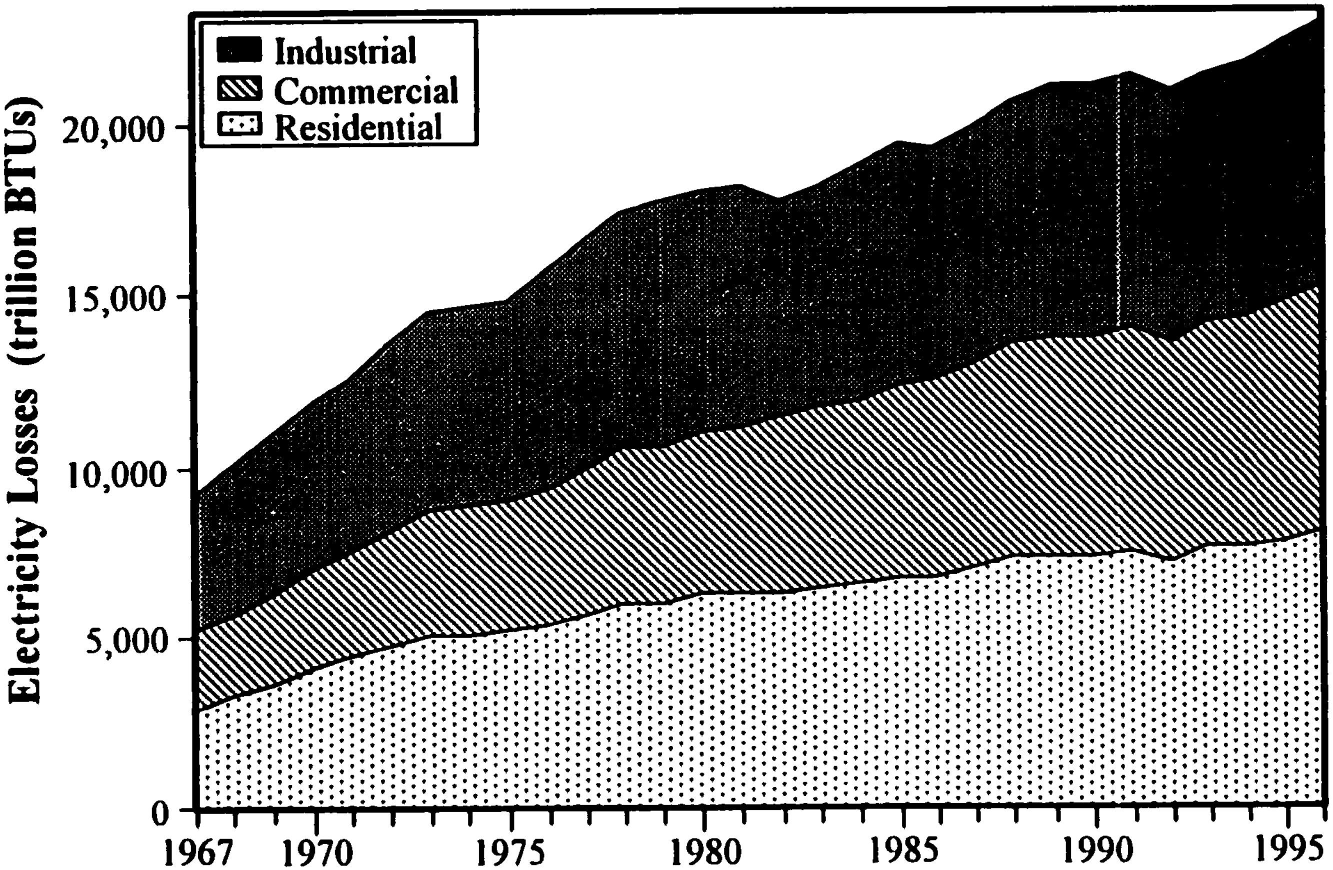
[8]As defined in this study, "delivered energy" is that which is available for final use. This measurement excludes electricity losses through generation, transmission and distribution.

attributable to efficiency improvements in space heating and non-space conditioning natural gas and fuel oil consumption. Industrial energy savings have occurred primarily due to declines in energy intensity and changes in the composition of industry. Overall, the commercial sector has not evidenced energy savings to the same degree as the industrial sector.

> Comparing end-use sectors, based upon either total savings or delivered energy savings, the industrial sector made the greatest progress in energy savings over the period. The commercial sector made the least progress. (U.S. Department of Energy, Office of Policy, 1995: 10)

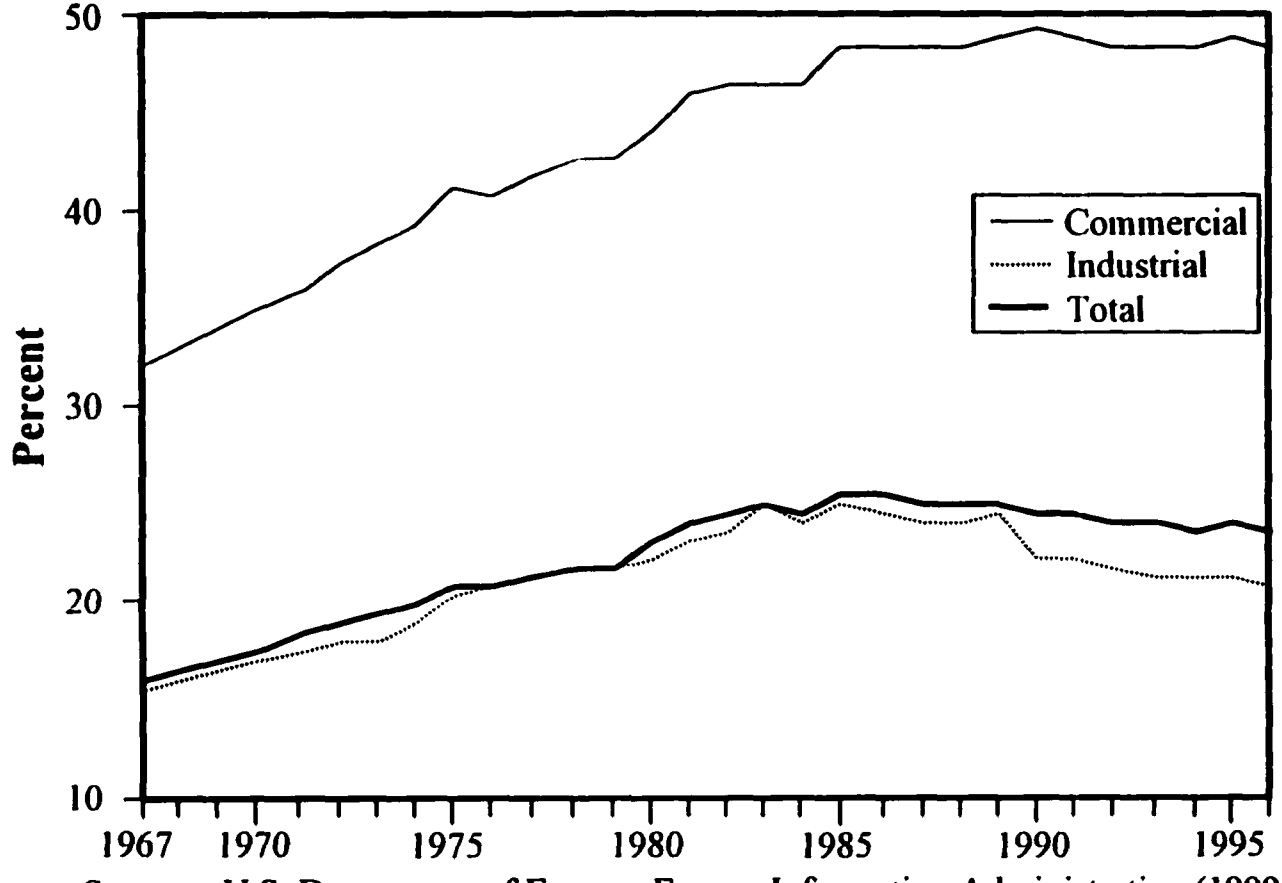
The heightened intensity and wastefulness of energy use that characterizes the expanding electricity system has not been addressed in postindustrial discussions of energy efficiency. Increasing shares of electricity are associated with higher energy requirements, as more than two-thirds of total electricity is dissipated in the processes of generation, transmission and distribution. As portrayed in Figure 6.10, U.S. electricity losses increased by 145.1% from 1967-1996. Growth in electricity losses has been most pronounced in the commercial sector, where losses more than tripled, increasing by 214.3%. Although evidencing significant growth, the expansion of losses in the industrial sector was markedly lower (84.8%) than that of its commercial counterpart.

As shown in Figure 6.11, nearly one-quarter (23.5%) of all energy consumed in the United States in 1996 was expended in the form of electricity losses; in other words, almost one in every four units of energy was not used for productive purposes. Among the major electricity-using sectors (e.g., residential, commercial and industrial), the percentage of aggregate losses rises to 31.9%.



Sources: U.S. Department of Energy, Energy Information Administration (1999, 1997, and 1991), *State Energy Data Report: Consumption Estimates.*

Figure 6.10 U.S. Electricity Losses by Sector: 1967-1996 (trillion BTUs)



Sources: U.S. Department of Energy, Energy Information Administration (1999, 1997, and 1991), *State Energy Data Report: Consumption Estimates.*

Figure 6.11 Electricity Losses as a Percent of Total U.S. Consumption: Total and Commercial and Industrial Sectors, 1967-1996

While the percentage in the industrial sector was approximately one-fifth (20.6%) of total industrial energy use in 1996, the commercial sector consumed almost one-half (48.2%) of total commercial energy in the form of losses. From 1967-1996, electricity losses as a percentage of total energy have steadily increased in both sectors and in the economy as a whole. It is significant to note, however, that the rate of increase differs substantially. Losses as a percentage of total U.S. energy use increased from 15.6% in 1967 to 23.5% in 1996, for a total difference of 7.9 percentage points. In contrast, losses in the industrial sector increased by 5.2 percentage points (from 15.4% in 1967 to 20.6% in 1996), while the commercial sector evidenced an increase in the proportion of losses to total energy consumed of 16.3 (from 31.9% in 1967 to 48.2% in 1996). Not only do losses constitute a higher percentage of energy consumed in the commercial sector than in either the industrial sector or the economy as a whole, but the rate of growth is higher as well. From the foregoing, it is clear that the commercial sector, identified as the leader in postindustrial society, has contributed the most to electricity losses and, thus, inefficiency, while industry has contributed the least.

Postindustrial Contradictions

Overall, empirical analysis of postindustrial predictions of enhanced technological efficiencies have, in fact, been substantiated to some extent in recent years. However, the anticipated declines in energy intensity, purported to arise from the substitution of new industries for energy-intensive manufacturing, are far from realized. In actuality, the industrial sector has evidenced the greatest degree of reduction in intensities, while the commercial sector has contributed relatively little to energy savings. As stated by the Office of Policy in the U.S. Department of

Energy (1995), the commercial sector's reliance upon electricity is the greatest single factor inhibiting energy reductions. Given the growth in both the commercial sector and the use of electricity, it is anticipated that further development will only exacerbate current energy intensity trends. The shift to electricity evidences greater, not less, energy consumption and represents the promulgation and expansion of inefficient energy generation, transmission and use. In short, the United States is pursuing the most inefficient energy system to date, and building an energy infrastructure built upon waste.

The substitution of new industries for old was purported to decrease energy use and the externalities of fossil fuel combustion (Toffler, 1980; Kahn, 1979). Growing dependence on electricity exacerbates inefficiency, while transferring dirty industrial technology overseas only displaces the problems to other areas of the world. On a global scale, the issue has not been resolved, but rather relocated.

Overall growth in the consumption of energy may eventually moderate. This is less important, however, than trends in long-term energy efficiency. In an age of fluctuating prices and uncertain supplies, postindustrialists have argued that energy problems will be resolved through technological and economic means. Economic forces, seeking an efficient allocation of resources, will prompt technological innovations to decrease usage while providing the same level of benefits. Continued reliance upon electricity, however, is not leading the nation to a more efficient energy base when nearly one-fourth (23.5%) of total national energy is lost to the processes of production and distribution.

Conclusion

The energy crises of the 1970s precipitated the reexamination and reformulation of postindustrial principles regarding energy. Armed with a more textured conceptualization and a strengthened commitment to technology and markets, postindustrial theory articulated what was to take the place of urban industrial society and the energy system that sustained it. American society had to relearn the concept of abundance; abundant energy was to be understood as not necessarily cheap energy but rather as secure and uninterrupted energy of the right kind. Adaptation in the energy system would be evidenced in a diversity of fuels, and efficiency was to be embodied in a new regime in which technology assured the availability of end-use energy and a reduction in the use of resources.

Postindustrial society was to be built upon an electronic, information-rich foundation in which the concept of space was redefined as digital information communicated though electronic networks, replacing antiquated ideas of transportation and the need for physical interaction. The inflexible technologies and forms of spatial organization which characterized the industrial era would be rendered obsolete by a different economic base and the widespread availability of high quality energy. This energy would take the form of electricity, and would both define and support the infrastructure of postindustrial society in its quest for economic growth and productivity.

In the energy history of 1967-1996, there is one unambiguous trend that postindustrialists accurately projected; namely, the shift toward an increasingly electricity-based society and economy. Electricity consumption has been growing rapidly throughout the economy and at rates that exceed those of overall national energy use. While postindustrialists can be credited with forecasting the shift to

electricity, the problem with this prediction is that it left undiscussed the implications of this growing reliance. Most important is that Electric Society continues to be a high-energy society. The United States has not abandoned the high-energy ideal, despite gains in the technological efficiency of energy use. Indeed, technological efficiency in the current U.S. economy has assumed an additive function, enabling an increase in the range and forms of activities rather than engendering the substitution of one activity for another.

Neither has the postindustrial Electric Society addressed the issues of security, diversity or waste. Electricity has not reduced requirements for foreign oil; rather, through fostering despatialization, electricity has contributed to the continuing demand for oil and the increase in imports, retaining the issues associated with industrial era fossil fuel dependence. While postindustrialists would argue that technological advance will address the issues of energy diversity and security in the longer-term, there is very little evidence to date that renewable and/or non-fossil energy has made a significant entrance into the energy structure. Finally, the growth in electricity demands that a higher percentage of the nation's energy use occur in the form of energy losses, meaning that a growing commitment to electricity is also a commitment to increasing levels of waste. In fact, the assumption that increased electricity use will be more efficient is inherently contradictory.

The energy crises of the 1970s, just as the urban crisis in the preceding decade, have faded into distant memory. Except during the period of the Gulf War, national concern regarding energy has been almost nonexistent for nearly two decades. Yet the electricity-based energy system is just as untenable, if not worse,

than the energy structures which caused widespread panic in the 1970s. The current energy system is characterized by intensive energy use, large-scale operation and organization, and growing dependence upon a single end-use form, rendering the foundation of Electric Society increasingly fragile.

Chapter 7

CONCLUSION

We, as a society, have been told by postindustrial theory that the world is changing; that it has become a fundamentally different place in the past half-century or so with new institutional structures, new forms of relationships, new means of accomplishing tasks and new ways of thinking and understanding our world. Postindustrial proponents have further proclaimed that these altered social dynamics signify progress in the human endeavor; that society is taking a step up on the ladder of civilization, not only growing more "developed" as a society, but becoming ever further removed from our predecessors and their primitive ways. The key to this advancement is purported to be technology, which has served as the vehicle for this transformation and given us "capabilities that have previously been reserved for gods or magicians" (Kahn, 1979: 21).

This dissertation has examined postindustrial theory by identifying and defining the three principles—abundance, adaptation and efficiency—which form its characterology. The urban/social and energy systems have been utilized as the framework from which to examine postindustrialism. Both of these systems have posed major challenges to the theory during the latter half of the twentieth century and precipitated its reconceptualization. The urban crisis of the 1960s and the energy crises of the 1970s called into question the efficacy and the validity of postindustrial theory in explaining and predicting social phenomena. Both were reconceptualized by postindustrialism as the "growing pains" of the process of

movement toward a new state, and both have faded from the realm of current public discourse. It is my contention, based on the evidence presented in this dissertation, that issues in the urban/social and energy realms have not only persisted but have been exacerbated in the intervening years of "development." Postindustrial theory has been found to be lacking as a conceptual construct for either understanding current social conditions or serving as a guide to a more positive future.

This chapter will first provide a brief overview of the premises of postindustrial theory. The key findings of the empirical analysis, both in urban/social and energy terms, will then be discussed within the context of the three principles. Finally, conclusions of the dissertation are presented that challenge the future orientation, technological fascination and quantitative focus that underlie not only postindustrial theory but social science itself.

Overview of Postindustrial Theory

Postindustrial theory is a technoeconomic understanding of social change. It embraces technology as the means by which society will make progress, while recognizing that social institutions interact with technological systems in the creation of the future. Postindustrial theory argues that society is in a period of transformation from the old industrial order to new social forms and functions. While the specific configurations of society continue to be somewhat vague, postindustrialists propose that, if certain conditions are met and decisions are made within the prescribed theoretical and technoeconomic frameworks, society will navigate the transition to a new, higher state of development.

As society moves from the old industrial order to new postindustrial configurations, it will shift from the production of goods, or manufacturing, to the

production of services and information. The emphasis will not be on the making of physical "things" but rather on generating ideas and data and providing services. In this new society, the labor force will change from primarily blue-collar industrial workers to white-collar professional and technical workers. Similarly, the knowledge base will shift from empirical to theoretical in nature as society increasingly deals with concepts rather than tangible objects.

Physical space, therefore, is no longer primary in human interactions. Economic and political space, which may or may not coincide with geography, form the basis of societal relationships. The best example of this "delocalization" is cyberspace, or the realm of information technology networks. Cyberspace exists anywhere there is hardware to support it, yet it has no identifiable location in the physical realm. The scale of this new society, then, can no longer be considered to be local but is rather national or international. Interactions, concerns and allegiances should extend well beyond place-based neighborhoods, cities and states as individuals consider themselves to be part of the larger society, or the national and international communities. In this new society, the limited and "dirty" fossil fuels of the industrial era will be replaced by plentiful and clean energy in the form of electricity which will also support new economic activities.

Postindustrial Principles Revisited

Postindustrial theory is founded upon three primary principles which are claimed by its proponents to both characterize the transition and guide social action as society moves toward the future. Abundance, adaptation, and efficiency have been examined in the urban and energy realms through the derivation of propositions which have been empirically tested.

Abundance

Postindustrial theory is, first and foremost, a theory of social progress founded upon abundance. "More is better" and "growth is good" are the rallying cries of those who adopt the view that society will evidence progress through ever-expanding wealth and productivity, resulting in increasing levels of comfort, well-being and security. In the urban arena, the principle of abundance can be stated as follows.

- In the near term, urban fortunes can be expected to falter. In the near and longer terms, national fortunes will improve and society, as a whole, including its current urban communities, will be better off.

According to this proposition, the well-being of society, in both general and urban terms, is projected to rise. Apparently substantiating the postindustrial abundance proposition, in both aggregate and per capita terms, real Gross Domestic Product and disposable personal income have risen from 1967-1997 (U.S. Council of Economic Advisers, 1999). However, examination of the distribution of aggregate income demonstrates that increasing wealth and well-being are enjoyed by a small minority. The share of income accrued by most of the population has been worsening over time, as the rich continue to get richer and not just the poor, but also the middle class, are losing ground. The only group that has enjoyed growth in its share is the top 5% of households. By 1997, of the total income generated, nearly half went to those in the top one-fifth of the income scale and more than one-fifth of all income was received by the top 5% (U.S. Department of Commerce, Bureau of the Census, 1998a). Further, this 5% of households had greater income than the aggregate income of the 40% at the bottom of the income range (U.S.

Department of Commerce, Bureau of the Census, 1998a; Economic Policy Institute, 1995). The Gini index also shows that income inequality in the United States has increased greatly since the late 1970s, reversing the trends apparent in the 1950s and 1960s. The 1990s have brought the highest levels of inequality over the thirty-year period (U.S. Department of Commerce, Bureau of the Census, 1998a).

Postindustrialists would argue that, although there is growing disparity among groups over time, all groups have benefited in absolute terms. Poverty indicators, however, contradict this argument. The percent of persons below the poverty level has remained fairly constant for three decades attributable, at least in part, to revised definitions of poverty thresholds over the time period. While it is important to look at rates or percentages, the evidence is even more compelling when total numbers are examined. The number of persons considered to be below poverty level declined during the early part of the period, falling from 27.8 million persons in 1967 to 23.0 million in 1973. By 1997, however, the number of persons below the poverty level had demonstrated significant increase, reaching 35.6 million (U.S. Department of Commerce, Bureau of the Census, 1998a). Thus, the number of poor Americans has experienced growth of 28% over 30 years. In contrast to earlier patterns of the concentration of poor in rural areas, low-income persons are increasingly located in urban areas, and central cities currently contain the highest numbers of persons below poverty. This trend has increased over time, and suburban areas have also begun to evidence an increasing share in the number of poor (U.S. Department of Commerce, Bureau of the Census, 1999).

This evidence points to the conclusion that society as a whole, and particularly urban populations, is decidedly *not* better off. There is no evidence to

date that this situation is reversing. Rather, conditions of inequality have only been exacerbated over time, and what once were typically "urban problems" have become part of a national trend. Three decades of postindustrial development have not reduced poverty and the rise in national income reflects improvement for those at the top of the scale to the extent that aggregate national data has risen.

In the energy system, the evidence is strikingly similar. The energy abundance proposition entails not only increasing levels of end-use energy, but also consumption of a particular kind of energy. In the energy arena, the principle of abundance can be stated as follows.

- Postindustrial society will increase its reliance on electricity because of its technological versatility. Technology intensity will substitute for traditional natural resource intensity.

The postindustrial energy abundance proposition claims that abundant energy will remain a core element of social progress. However, according to proponents, the simplistic formula of "more is better" has been refined to "more sophisticated is better," thus incorporating technology into the equation. In the postindustrial society, this means greater reliance on electricity because of its versatility, security and greater dependence on technology to supply adequate end-use energy. Environmentally, a more benign energy future will be secured by postindustrial society as it substitutes technology for traditional natural resource intensity.

As a percentage of total energy use, the shift to electricity is striking. More than one-third (34.8%) of total energy consumed in the United States by 1996 was in the form of electricity (U.S. Department of Energy, Energy Information

Administration, 1999a).[1] In contrast, electricity constituted less than one-fourth (22.1%) of the nation's energy use in 1967 (U.S. Department of Energy, Energy Information Administration, 1991). For all purposes other than mobility, electricity comprises an increasing share of energy use in the U.S. society and economy. Excluding the transportation sector, the share of electricity consumed for all other societal activities rose from 28.9% in 1967 to nearly one-half (47.3%) in 1996 (U.S. Department of Energy, Energy Information Administration, 1991, 1997, 1999a).

The increasing use of electricity, however, does not reflect a substitution of electric power for the use of other resources. With the exception of the periods of crisis in 1973-1974 and 1978-1979, growth in total national energy consumption has continued unabated, evidencing ongoing reliance on other energy sources, particularly fossil fuels (U.S. Department of Energy, Energy Information Administration, 1991, 1997, 1999a). The use of these resources is fraught with environmental compromise, and the consumption of petroleum, in particular, carries significant energy security implications as well. Petroleum alone currently supplies about two-fifths of U.S. energy demands (U.S. Department of Energy, Energy Information Administration, 1999a), and growth is expected to continue (U.S. Department of Energy, Energy Information Administration, 1999c). Currently, over half of the petroleum consumed is imported (U.S. Department of Energy, Energy Information Administration, 1999c), threatening the nation's energy security through this ongoing dependence. In environmental terms, fossil fuel use raises several issues. Eighty-two percent of U.S. greenhouse gas emissions, and more than 98% of U.S. carbon dioxide emissions, are generated by the combustion of

[1] Unless otherwise noted, electricity data represent the sum of sales and losses.

fossil fuels (U.S. Department of Energy, Energy Information Administration, 1998c, 1998d). Coal produces significantly higher carbon dioxide emissions in the generation of electricity than other fossil fuels (U.S. Department of Energy, Energy Information Administration, 1998c) and, as an input in the production of electricity, the use of coal has doubled, currently providing over half of total inputs (U.S. Department of Energy, Energy Information Administration, 1999a).

Empirical analysis of the postindustrial abundance proposition reveals that a more benign energy future has neither been secured nor is indicated based on current configurations. Reliance on fossil fuels has not decreased as the growth in electricity has occurred. Rather, growth in the use of these resources persists, and the "more sophisticated" technology of electricity production and use continues to rely on industrial era fossil fuels. As the postindustrial energy system has unfolded, environmental viability has become increasingly jeopardized and energy security has become even further out of reach.

In both energy and urban terms, empirical evidence negates the increasing security and well-being promised by the postindustrial principle of abundance. Income inequality and the number of persons in poverty, both demonstrating improvement until the 1970s, have worsened, and growing numbers of persons are moving down the income scale relative to society as a whole. Environmental well-being and national security are increasingly compromised by patterns of energy supply and use. In short, the postindustrial era has delivered not abundance, but rather growing vulnerability for the nation and its inhabitants.

Adaptation

The principle of adaptation prescribes the social response to technological and economic forces. Social systems, according to postindustrialism, must adapt to technological and economic dynamics in order to support the attainment of an abundant society. In the urban context, the adaptation principle defines both the role and the expected outcome of social responses to change. Urban communities will evidence progress as equilibrium is attained within new social structures.

- The more adaptive a society is to the postindustrial, post-urban trends—to a service economy and information society—the lower the transition costs. This is especially true for urban communities.

Employment patterns in the service economy demonstrate that employment has shifted to services and information, as predicted, with a high level of growth in this sector. Goods-producing, or manufacturing, jobs have remained relatively constant over the thirty years (U.S. Council of Economic Advisers, 1999). Postindustrial projections describe a nation of professional and technical workers, and there is a small but growing segment of the labor market in this class. However, the shift to services has largely replaced industrial era skilled blue-collar jobs with minimum or low-wage service jobs (Bluestone and Rose, 1997), effectively bifurcating the middle class. Real income growth has been stagnant in the middle range and has declined at the lower levels (U.S. Council of Economic Advisers, 1995; Burtless and Mishel, 1995). Even in so-called revitalized cities, the preponderance of jobs created is not high-tech professional jobs, but rather low-level, low-paying service jobs (Bluestone and Harrison, 1998). Further, the nature

of employment has changed, and is now characterized by growing numbers of part-time, temporary, and non-standard jobs (U.S. Department of Labor, Bureau of Labor Statistics, 1995, 1996b; Bluestone and Harrison, 1998) which traditionally pay less than full-time permanent employment (Weinberg, 1996: Bluestone and Rose, 1997) and often do not provide employee benefits (Rifkin, 1995; Uchitelle, 1997).

In terms of the overall social effects of the new society, the index of social health compiled by Fordham University's Institute for Social Innovation (1995) for the years 1970-1993 demonstrated a dramatic decline in social well-being in 1975, and has remained at remarkably low levels ever since. Six of the eight problems identified as worsening in 1993, including children in poverty and the gap between rich and poor, reached their worst recorded level that year.

The postindustrial proposition that transition costs would be lowered as society and urban communities adapt has been found to be untrue. Adaptation to the service and information economy has exacted far-reaching costs in the form of social conditions that are worsening over time. The status of overall social health, job stability, employment security and compensation, and the dynamics of urban job growth in the postindustrial period all point to a decline in well-being and an increase in transition costs by the majority of the population.

In the energy arena, the adaptation principle projects that technology will enable the energy system to be far more adaptive to resource constraints through the use of a variety of resources and development of "eternal" energy.

- The fuel mix will change dramatically as the Electric Society makes full use of the complete range of energy options. Nuclear power, in particular, will produce cheap, abundant and, indeed, "eternal" energy.

Examination of the mix of resources consumed in the United States clearly demonstrates that the nation remains heavily dependent upon fossil fuels as a percentage of overall energy use. Fossil fuels currently provide about 85% of total energy consumed (U.S. Department of Energy, Energy Information Administration, 1999a). The entrance of other sources through the 1990s has been quite limited, and little change in the diversity of the fuel mix has been evidenced.

The shift to electricity was heralded as the means to address the need for a multiplicity of inputs and to provide the technological basis for the emerging high-tech and non-location-specific society. As addressed above, the generation of electricity in the postindustrial society continues to rely heavily upon industrial era fossil fuels. For a period of time, however, nuclear power was embraced as the technologically-sophisticated means to power the Electric Society. Nuclear power has made an entrance into the energy mix, but there have been extensive problems in terms of widespread adoption and the nuclear presence is expected to be short-lived. No new orders have been placed for nuclear plants since 1977 and no new facilities have been planned. Almost half of nuclear capacity is expected to be taken out of service during the first two decades of the new century (U.S. Department of Energy, Energy Information Administration, 1999d).

There are currently no new energy sources anticipated to significantly alter the energy mix. What can be predicted is continuing reliance upon fossil fuels and the use of electricity. Electricity, however, contains its own uncertainties. The interconnectivity of the electric power grid system introduces vulnerability, as supply interruptions at one location can result in widespread power outages.

Adaptation in the energy system has been, at best, negligible. The fuel mix has not altered significantly, nuclear power is not a viable resource in the foreseeable future, and the electricity system on which American society is becoming increasingly dependent is easily disrupted. As discussed in regard to energy abundance, a notable substitution of activities, such as communication in lieu of transportation, has not occurred. The nation continues to be heavily dependent upon petroleum, relying upon foreign sources for over half of the total consumed.

In both the urban and energy arenas, adaptation has resulted in detrimental effects and tenuous relationships. Urban adaptation has involved a decline in social and individual well-being as social health falters and the prospects for personal economic security are undermined. Energy adaptation is, essentially, a magnification of industrial era patterns, demonstrating growing use of the same resources, the expansion of an electricity system that is fragile, and increasing supply insecurity. Postindustrial adaptation has levied significant costs to the nation's people, environment, and security and has produced rising vulnerability and uncertainty.

Efficiency

Efficiency, in the postindustrial context, means the minimization of costs and the maximization of benefits, or using the most productive means, both technologically and economically. In urban terms, the principle can be stated as follows.

- Postindustrial technology will lead to a new efficiency revolution that will advance society as it moves beyond its current urban-industrial form. Technology-led efficiency gains will offset any short-term costs to urban communities.

Postindustrialists have argued that the viability of cities will be determined by their ability to respond to the technological, economic and demographic forces that are shaping the new economy. Economic restructuring has altered the scale of activities from local to national or international in nature and, according to postindustrialism, national well-being is determined by the overall performance of the economy. Urban areas, per se, are significant only in terms of their contribution to aggregate productivity, and the national economy is thus the gauge for "urban" efficiency. National multifactor productivity growth, or the efficiency with which capital and labor are used, however, has slowed since 1973 and there is no indication that this trend will reverse (U.S. Council of Economic Advisers, 1997).

Contrary to the postindustrial edict that the operation of the market should determine areas of growth, a very prominent factor in postwar development has been the military-industrial complex which, through targeted development and investment, has created metropolises in deserts and wastelands in the former industrial centers. Sponsored by the federal government, and in partnership with private sector defense industries, the "gunbelt" (Markusen et al., 1991) has produced segregated enclaves of development for high-tech industries. This spatial and economic restructuring did not result from the workings of the market, but rather from the very deliberate efforts of many individuals and organizations. The high-tech postindustrial economy, then, is largely based on old-fashioned development by subsidy, with other areas finding it increasingly difficult to compete.

The postindustrial proposition that a new efficiency revolution is underway has been unsubstantiated. An efficient society should be characterized by high levels of productivity. However, productivity has been found to be declining, rather than increasing, in the final quarter of the twentieth century. The urban landscape, or the "map" of the distribution of population and socioeconomic activities, has not been determined by economic and technological forces in search of efficiency, but rather by the actions of persons and organizations with military and political purposes. This targeted development has crippled existing urban areas in their ability to compete in the national market and to establish a niche in the new economy.

The evidence regarding efficiency in the energy context is no more compelling in support of postindustrialism than that regarding the urban arena. The postindustrial proposition of efficiency can be stated, in energy terms, as follows.

- Through sophisticated technology, the Electric Society will be technologically and economically more efficient. New high-technology industries, energy systems and social interactions will be less energy-intensive.

The Electric Society is purported to be a far more efficient society, both technologically and economically. Through sophisticated technology, energy will be efficiently managed to balance resource costs with social needs. Postindustrial society will spur technology competition to realize the most efficient energy demand-supply balance, while also encouraging the rapid development of new high-technology industries which will be less energy-intensive.

The postindustrial proposition of energy efficiency is contradicted by its own claims. The processes of generation, transmission and distribution of

electricity are inherently energy-intensive, requiring approximately three units of energy inputs to yield one unit of productive energy. In this sense alone, the Electric Society is intrinsically inefficient.

Almost one-quarter of total energy consumed in the United States in 1997 was expended in the form of electricity losses. When only the major electricity-using sectors are considered—commercial, industrial and residential—the percentage rises to nearly one-third. In the industrial sector, losses amounted to about one-fifth of total consumption. In contrast, losses constituted nearly half of total energy consumption in the commercial sector (U.S. Department of Energy, Energy Information Administration, 1991, 1997, 1999a). The so-called leading sector of postindustrial society, heavily dependent upon electricity, is clearly also the leader in the inefficiency of energy use.

The commercial sector's reliance upon electricity is the greatest single factor inhibiting energy reductions in this area of the economy (U.S. Department of Energy, Office of Policy, 1995). Not surprisingly, during the period of observation, contributions to overall energy savings by the commercial sector have been minimal, while savings generated in the industrial sector have been significant (U.S. Department of Energy, Office of Policy, 1995).

Thus, the conclusion regarding the energy efficiency proposition is that the Electric Society is not more efficient. The sophisticated technology employed by the electricity system is not only inherently inefficient but, as identified above, is also subject to sudden and wide-ranging disruption. Further, the development of new high-technology industries in the postindustrial service sector are not less

energy-intensive than the industrial manufacturing activities they are supposed to replace.

In both urban and energy terms, claims of efficiency have not been supported. Economic productivity has declined and development patterns, to a notable extent, have been determined not by market operations but rather by subsidy. A society based upon electricity incorporates inefficiency in its very definition and exacerbates that inefficiency through widespread use in its leading sector. Sophisticated technology, in both the urban and energy arenas, has neither produced efficiency nor contributed to the well-being of society. Instead, technology has created the conditions for vulnerability, as enhanced productivity has not been realized in either the economy or the energy system.

Summary of Findings

The principles of postindustrialism have promoted one view of social change, while examination of empirical data provides another. In the urban and social arena, abundance has been realized by only a few at the expense of the many as income and wealth become increasingly concentrated and poverty is institutionalized. Social adaptation, for the many, has resulted in widening disparity in socioeconomic circumstances and has entailed working more and earning less in jobs that yield lower levels of security and employment benefits. Social health, overall, has declined. Efficiency has exacerbated social polarization through targeted development, and has not brought about higher productivity. In sum, the indicators of postindustrial social change show no evidence of improvement to the present and no signs of amelioration are apparent for the foreseeable future.

In the energy history of the past three decades, it is clear that postindustrial predictions of change in the energy system have not been borne out. The one exception is that the shift has indeed been made to dependence upon electricity as the primary form of end-use power. There is little evidence to support claims of energy diversity in a nation that continues to consume vast quantities of fossil fuels. Neither can claims of security be substantiated, as evidenced by the ongoing and growing import of petroleum. Finally, electricity, both the symbol and support of the new society, is inherently and indisputably inefficient.

The predictions of postindustrial theory in the urban and energy contexts have been determined to be largely unsubstantiated through empirical analysis. With the exceptions of growth in national income, the emergence of a service economy and the shift to electricity as the primary form of end-use power, postindustrial theory has failed to capture the dynamics of current urban and energy realities in the United States during the final third of the twentieth century.

Conclusion

Contemporary American society is characterized by rising disparity in the distribution of the fruits of "progress," an increasingly tenuous foothold for the well-being and security of its citizens, and growing fragility in its relationship with the environment and the structure of its resource use. How can these conditions be reconciled with grand pronouncements of movement toward beneficent social change? The answer lies in the form and substance of the analysis and the assumptions of the analyst. Postindustrialism focuses upon broad trends, having internalized the notion that localism should be replaced by nationalism (President's Commission, 1980b) and adopted the view that macro-level data capture the essence

of current circumstances. When the theory does provide details, it tends to be animated by three general hypotheses or principles. Yet, a careful empirical analysis shows that these principles are at best insubstantial and, in many cases, are simply wrong.

It is my contention that postindustrial theory is less an explanation of contemporary social change and an outline for the future than a presumption that change is progressive. This presumption is made to appear empirical by appeals to broad trends and selected economic indicators regarding social and technological dynamics.

> For most of the U.S. population, incomes have stagnated or declined for fifteen years along with working conditions and job security, continuing through economic recovery, an unprecedented phenomenon. Inequality has reached levels unknown for seventy years...The United States has the highest level of child poverty of any industrial society, followed by the rest of the English-speaking world. So the record continues through the familiar list of third world maladies. Meanwhile the business press cannot find adjectives exuberant enough to describe the "dazzling" and "stupendous" profit growth, though admittedly the rich face problems too: a headline in *Business Week* announces "The Problem Now: What to Do with All That Cash," as "surging profits" are "overflowing the coffers of Corporate America," and dividends are booming. (Chomsky, 1999: 28)

Only those trends are accepted that are consistent with postindustrial presumptions, and the underlying implications and empirical manifestations are neither critically analyzed nor explained. Those trends that support postindustrial pronouncements of well-being are glorified as indicative of "progress," while the present reality of day-to-day life for many in this "advanced" country is patently ignored.

Postindustrialism is, at base, a theory about the future. This future-orientation is then utilized to exempt current circumstances and dislocations from the

range of critical social assessment. How can one assess promises of a future that has not yet arrived? Yet this theory, which has been adopted in the realm of public discourse and has served as the basis for public policy, should be subject to scrutiny. Society is being asked to have faith in technology, to embrace postindustrialism's optimism regarding social advance and the resolution of existing problems and to accept that a technological and economic framework will lead to a desirable future. However, as the evidence presented here indicates, the period of "transition" is the period of most rapid increase in inequality, decrease in social health and growth in trends of unsustainable resource use that places the American lifestyle eight to ten times beyond the carrying capacity of the earth (Byrne, Wang, Lee and Kim, 1998). Appeals to "growing pains" and "transition" are put forward by postindustrialists as justifications for the very real costs and problems being evidenced and to discount attempts at analysis. However, three decades of postindustrial "development" should provide some indication of movement in a positive direction that extends beyond a small elite of society and provides at least a glimmer of hope that postindustrial promises may be realized.

Given its empirical failures and questionable theoretical assumptions, it is logical to ask how postindustrial theory has maintained its prominence. This question goes to the core of the basic beliefs, values and paradigm features of social science which share the technological optimism and the concept that "growth is good" that are fundamental to postindustrialism. Social science itself is enamored with visions of quantity and is characterized by a pervasive optimism regarding growth and quantification.

> Quantitative production has become, for our mass-minded contemporaries, the only imperative goal: they value quantification

> without qualification. In physical energy, in industrial productivity, in invention, in knowledge, in population the same vacuous expansions and explosions prevail. As these activities increase in volume and in tempo, they move further and further away from any humanly desirable objectives. (Mumford, 1961: 570)

This optimism regarding growth, coupled with futurism, denies the present tense and frames the discussion in a mystical future. Postindustrial theory has remained powerful because its quantitative and technological orientation is endorsed within social science. In order to fully expose postindustrialism, therefore, not only must the three core beliefs be challenged, but the paradigm of social science as well.

I believe that we must, as thinking members of humanity, critically evaluate the thesis of technological and economic "progress" and the future orientation. It is imperative that we challenge the assertion of "automatic destiny" (Noble, 1983c: 87) that permeates the faith that technology will lead us to a desirable future. What is needed is a theory of political economy that can explain the conditions of inequality in conjunction with economic growth and decreasing social health with increasing technological capacity. Politics and social values must be included in the evaluation of the present and in identifying not only a desirable future but also the means to realize it. We must address the contradictions of the mainstream theory and challenge its dominance.

> (I)f workers have begun to smash the physical machinery of domination, so responsible intellectuals must begin deliberately to smash the mental machinery of domination. They must strive to overcome—in themselves as well as in others—the collective fear of being human and free now reified and ratified in fixed ideas and solid-state circuitry. To do this, they must champion a new common sense that insists without compromise upon the primacy of people's lives over the strange and estranging myths of automatic destiny. The intellectual task is one of recovery, reclamation, and reminders: of who and what we are and of what is being lost. If people are to be

> encouraged in what they already partially see...intellectuals must affirm outright, without qualification or hesitation: progress is a lie. Only then will more people be able to think, say, and act upon what they already know, without fear of isolation, ridicule, or repression. Responsible intellectuals, in short, must struggle in their own realm to gain legitimacy for...resistance to progress. They must change the terms of debate and extend the range of respectable discourse... (Noble, 1983c: 87)

Postindustrial theory has endorsed a framework of social change that is wasteful, unsustainable and vulnerable. The urban and energy contradictions of postindustrialism expose the dilemmas posed by the adoption of a technoeconomic theory of social change. We, as a society, must seek and find an understanding of progress that embraces the issues of equity, sustainability and social justice. Such an understanding must incorporate the dynamics of politics and social valuation and be rooted in the present tense. To get beyond our current state, truly beyond it, we must challenge the mainstream technoeconomic theory of postindustrialism, give voice to the critical nature of the realities that surround us, and gain legitimacy for an understanding of social progress and change that recognizes and begins with the centrality of people's lives and the quest for quality in the human endeavor.

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