

RESOURCE TRANSFORMATION IN
SQUATTER HOUSEHOLDS--
TESTING A SYSTEM MODEL OF URBANISM

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For Linda and Alana May

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ABSTRACT

This study explores the utility of entropy concepts in the understanding of urban social organizations and, in particular, the survival of squatter households in Rio de Janeiro, Brazil.

The study develops a fresh perspective on squatter households in order to take into account the broad-ranging resources squatters must use, given the social and economic adversities and the uncertainties surrounding the flows of income and legal tenure. Special attention is given to the resources of personal energies (effort or time) and personal knowledge. What I call the transformational perspective is based on system theory and, more particularly, the concepts of entropy as expressed in the Second Law of Thermodynamics and information theory. In this perspective, squatter households are seen to combine personal energies, personal knowledge, and many other resources so as to change the form of resources into new and more useful forms, often, but not always, with increased capital value.

Qualitative case descriptions and quantitative data gathered from a survey of 59 households in two small favelas are analyzed to illustrate and explore this perspective at both the household and favela levels. Two groups of households are identified based on evidence of capital investment. Analysis shows that households which invest may be distinguished from those which do not by a higher frequency of contacts and greater use of kin in their social networks of exchange; by patterns of spending which reveal a preference for more efficient foods (inexpensive proteins); by the greater longevity of jobs; and by the composition of household membership which minimizes, more than in noninvesting households, the number of nonproductive members. Underlying each of these patterns is a logic of reducing uncertainty by increasing and making use of personal knowledge so that personal energies are conserved and spent wisely.

Seen at the level of the favela, the traits of investing households are magnified in self-reinforcing ways so as to make further

investments progressively more attractive.

The work concludes with both a critique of the transformational concepts and a set of fresh insights afforded by this perspective on such matters as the mechanics of urban growth, the need for and a description of a new measure of value, the importance of time in the lives of the poor, the value and limitations of self-help, and the strategic importance for households of reducing uncertainty.

Dr. Lloyd Rodwin, Ford International Professor
Thesis Supervisor

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RESOURCE TRANSFORMATIONS IN SQUATTER HOUSEHOLDS--
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CHAPTER I

TOWARD A TRANSFORMATIONAL MODEL OF URBANISM

Social scientists, journalists, and novelists have reported many instances in which poor urban squatters in developing countries somehow make do or even prosper despite the uncertainties of illegal tenure and limited purchasing power. However suspect the source, and not representative of squatter work patterns, the diary of Carolina Maria de Jesus records numerous examples in which seemingly inconsequential resources like discarded newspaper, tin cans, and bottles are exchanged for cash or some other useful commodity or service (de Jesus, 1962). The feats recorded by Carolina Maria are repeated innumerable times every day by low-income urban residents. Moreover, some of the value that is created--as well as value created by wage labor--is converted into investments in housing and infrastructural facilities such as water, power, sewer lines, and other facilities.

On the surface, Carolina Maria's trading is a straightforward act of material exchange, yet the simple act of exchange masks many intricacies of city ways important to the securing of value. Personal effort and knowledge are organized and deployed so as to offset adversities of the urban environment of squatters and make investment possible. The energies of urban squatters are combined with a wide range of knowledge of the city so that someone like Carolina Maria is not only able to find materials, but also to find a buyer, or know of several buyers, to formulate a set of values by which to evaluate the worth of unpriced resources, and strategically, to convert resources into new forms of value.

The work that follows explores the usefulness of a living system paradigm as defined in Meier (1962), von Bertalanffy (1968b), and below. In this paradigm the concepts of entropy, in both an informational sense and a thermodynamic sense, form a frame of reference which helps to see and understand how personal energies and personal knowledge are used in squatter households to achieve resource conversions under conditions of adversity and uncertainty. Although much is known about the formal and informal modes of survival by squatters and the urban poor, little attention has been given to the manner in which the various forms of personal energies and personal knowledge are combined and reordered by squatters in relation to environmental adversities. This exploration shows that the living system paradigm makes possible certain insights concerning the actions of individuals to order the urban environment, and how this ordering is able to offset pervasive uncertainties and risks so that investments may be made.

At the same time, it is difficult to reduce the living system paradigm to an operational form. In this and succeeding chapters, I shall propose definitions and intermediate concepts to form a transformational perspective on favela households in an effort to test the utility of this paradigm and to explore new measures of social organization. In this transformational perspective households are seen to manipulate various facets of their household systems-- household composition, sources of income, patterns of expenditures, and networks of exchange--in a coordinated manner, not merely to maintain their households. Squatter households also aim to reduce uncertainties engendered by their illegal status and other adversities,

while maximizing and expanding their more scarce personal energies. We shall see that several strategies are used to achieve these objectives. For some households, the strategy is to increase the capital value of their housing and facilities. For others, it is a matter of securing sources of future income. Only an unfortunate few must endeavor to keep from "going under."

Common to all households is the effort to cope with sources of variation affecting them such as irregular income, fluctuations in resource flows, natural calamities, and most of all for squatters, threatened official actions against their illegal settlements. In general, households aim to reduce sources of variation, or increase their capacity to deal with them, gradually making life more predictable. Sometimes households manage to shift a situation of uncertainty into a situation of risk, meaning that calculated investments may be made. Where no control can be exercised over various sources of variation, several alternative modes of coping are worked out with the conception that the more alternatives a household has, the better are its chances of survival. As households gain control over their environment, some become self-transforming. In one or more facets of their household system, households develop their ability to manipulate the urban environment, thereby securing resources and value.

Households share in the order-building of cities and contribute to forms of social order, defined as a state of affairs in which all possible variations are known, predictable, or at least knowable. The converse, "disorder," is characterized by randomness, a state of

affairs in which all possible variations are either unknown, unpredictable, or unknowable. Social systems, and squatters in cities, seek to generate order out of a chaotic world, although in most instances they will never be entirely free from disorder.

In the case of squatter households, the objective is not to demonstrate that squatter households or settlements are orderly. This has been previously documented. The point rather is to explore processes of ordering, which, in theory, are observable in all social systems. For instance, this perspective on squatters opens to view resource-, and especially energy-conserving and accumulating practices which accompany this orderliness. It will be suggested that squatter households economize on energy in a way reminiscent of Zipf's "least effort principle" (1949) as they generate informational resources.

In their efforts, squatters both contribute to and depend upon the complexities of the urban environment. The multiplicity of messages, energy forms, and materials that are exchanged in the city is not found in the countryside. The concurrent presence of this wide variety of resource forms, and the large number of ways and high rates at which resources change forms, are what set cities apart from rural places. The high density of interactions provides an environment rich in opportunities, ecological niches so to speak, in which people may fashion an array of survival strategies.

This model of households is built upon certain aspects of General System Theory, as described by von Bertalanffy (1968b), and their application in ecosystems theory. As explained below and in Chapter III, energy use in relation to order in open systems and the concepts of

entropy and negentropy are central in ecosystems theory. The question is how well this theory and these concepts synthesize the complexities of the urban environment, such as the varieties of resource forms, and how well the actions of squatters, who make use of both market and nonmarket modes of interaction, are taken into account.

The Second Law, or entropy law, has been invoked by a growing number of social scientists in discussing the creation and maintenance of social order (e.g., see Etzioni, 1968; Meier, 1962; 1974b; and Blackburn, 1973). Etzioni, for instance, puts forward rather uncritically the notion of "social entropy" as the opposite of social order whose "introduction and maintenance require continual effort" (1968:95). Meier's model of cities (1962; 1974b), reviewed in detail in Chapter III, is one in which urban organizing actions are seen, in part, as circumventing the physical limitations represented in the entropy law.

A chief objective of the present work is to discover the extent to which squatter actions and urbanism may be explained in terms of the entropy law. What are the advantages presented by this view, and what are its drawbacks and limitations? In many respects the model of squatter households explored below runs parallel to Meier's model of the city. This exploration, like the works of Etzioni and Meier, concerns itself not so much with the mechanics, even less with the measures of entropic decay, but rather with the social, and particularly, the ordering effects of countering entropic decay. Before proceeding in this exploration, a word of caution is in order.

Although I believe that a living system perspective can deepen our understanding of the organization of urban settings in general, and lead to insights into the organization and functioning of squatter households in particular, I should make clear how I intend to use the concepts of 'entropy,' 'negentropy,' and 'living' system. These terms are used heuristically. Their use does not, and should not, imply that it is possible, or even desirable, to calculate thermodynamic or informational entropy of cities or of any social organization. Nor should the term 'living system' imply biological imperatives to which households or cities inexorably conform. Rather, these terms are used to guide our understanding of ordering by urban actors who, in seeking self-interest, individually and collectively promote patterns of order arising from the fact that they all must operate under similar constraints. Among these constraints are the very real limitations of using real physical energies, that is, the constraints described by the Second Law. It is taken as axiomatic that actors seek to minimize efforts. Ordering the environment helps achieve this end. Thus, it is valid and useful to employ the living system paradigm and entropy concepts heuristically, and explore certain implications they suggest, as in the present case, the importance of energy and information in social organization.

A. Transformational Perspective and the Squatter Environment--

Definition of Terms

The first step in this exploration is to define key terms as precisely and unambiguously as possible. In the following sections, I shall construct a set of interrelated definitions, based on the Second Law, to form what I shall call a 'transformational perspective.' It is

recognized that many alternative definitions and relationships between terms are conceivable. The definitions used below are appropriate for this exploratory stage of analysis. They are intended to be faithful to the Second Law, though they are not intended to lead to a quantitative demonstration of the Law. At the same time, the terms reflect the most important aspects of energy use and ordering appropriate to everyday experience of squatters.

1. Entropy and negentropy. In the context of squatting the entropy concept expresses, in a general way, the constraining effects of adversity and uncertainty on squatter actions. Entropic effects are experienced by squatters as constraints in two interconnected ways. First, in an 'external' sense, entropy refers to the disordering influences in the squatter environment. Chief among these is the uncertainty engendered by illegal tenure. Squatters by definition are subject at any time to the dispossession of their homes and fixtures. But disordering influences also include poverty (although this is by no means a universal characteristic of squatters), natural calamity, and other adversities. Some adversities, to be discussed in greater detail in the following chapter, are disordering because they have a destructive effect on squatter efforts to build social and physical structures which have continuity, that is structures they can rely upon and trust. Effort must be exerted to overcome, offset, or somehow cope with disordering influences of 'external entropy.'

A second 'internal' type of entropic influence, more directly linked to the Second Law, is the physical limitation on personal energy expenditure of squatters. It is a limitation which applies to all

persons irrespective of individual idiosyncracies, perceptions, or purposes, even though the limitation is experienced differently by different people. Some people are more "energetic" than others; some emotional experiences are as exhausting as physical exertion. The point is that ultimately everyone is subject to metabolic limits. As well, poor health and poor nutrition can impede the ability of persons to carry out work. With luck a person might escape ill effects of poor health, as well as some of the 'external' entropic effects. Some persons and some classes of people for instance, have greater access to energy-driven tools or equipment such as appliances. But poor persons have to operate with a relatively limited energy supply, and all persons face an upper limit on their ability to exert effort. Thus, a premium is placed on energy conservation or efficiency.

The interconnection between these two types of entropic effects is that the effort of personal action--always subject to 'internal entropy'--is required to avoid, offset, or overcome disorder ('external entropy') in the environment. Personal energy must be spent to repair damage due to storms, for instance. Loss from fire or theft may represent setbacks, the recuperation from which requires personal effort. For squatters, the everpresent uncertainty concerning land tenure calls for overt and covert actions to hedge against the possibility of governmental action against them. In all of these areas, 'internal' entropic effects apply to personal actions taken to avoid loss, to rebuild, and to put things in order. Entropy of both the 'external' and 'internal' kinds require both the expenditure, and the conservation of effort.

The opposite of entropy for squatters is order or 'negentropy.' Entropy may be offset or overcome by making ones affairs more reliable, known, predictable, or routine. For instance, as we establish routines for handling our day-to-day concerns, we are able to direct our efforts to increasing numbers of concerns, and conceivably, to more productive areas. Order may be seen in two domains. One is the physical structures, such as housing, which have both a concrete and symbolic value. Second, and perhaps more important, order (negentropy) refers to the creation of social order--to the forging and maintenance of personal relationships, work arrangements, voluntary associational ties, and other forms of personal attachments which are predictable, and on which one may count for help in times of crisis. An ordered environment refers to both these physical and social aspects of squatter life. Thus in this perspective, squatters build order by reducing sources of variation in life. As they learn, some are able to offset the uncertainties of insecure tenure and other adversities. Resource mobilization and expenditures of energies are made more efficient. Less energy is wasted; unnecessary tasks are avoided.

2. Resources in the city. Squatters achieve their ordering effects through resource transformations. The definition of 'resources' follows Meier's usage (1974b). Resources consist of any identifiable thing in the environment from which something of value can be produced. The concept of resources thus includes, but goes beyond, customary categories such as land, labor, capital, and raw materials. Special attention will be given to informational and energetic aspects of

resources put to use by urban squatters and to the transformation (defined below) of these resources into different forms.

Definitions of information and energy are based on conventional technical usages. Technically, information is defined as any reduction of uncertainty. Energy is defined as the ability to do work. Information and energy are found in all resources. Rather than refer to a given resource simply as either information or energy, it is convenient to refer to the informational and energetic aspects of resources depending upon the context of discourse. 'Informational' and 'energetic aspects of resources' will thus be used when referring, respectively, to anything in the environment which has the ability to reduce uncertainty or to do work.

From the standpoint of squatters, informational aspects of resources are integrated as a part of personal knowledge, as varieties of observations and formal and informal learning (e.g., schooling and street wisdom) as well as private knowledge such as secrets. Energetic aspects of resources, in the squatter context, refers to any form of energy--fuel or electricity--which facilitates personal effort to do work measured in energetic units such as calories, or indirect measures, e.g., money. Households expend energy in labor to build shelter and infrastructures. Effort must also be expended to form or maintain personal relationships, which, in turn, are frequently an important source of further resources. Throughout the following discussion 'personal effort' is to be understood as a particular application of 'energetic aspects of resources' while 'personal knowledge' is seen as

a particular form of the 'informational aspects of resources' internalized in an actor.

It is important to recognize that different urban resources are accessible in different degrees for any particular actor. We may think of an array of resources arranged according to the degree of ease with which a resource may be acquired by a specific actor. At one end of the array are what might be called 'loosely coupled resources,' those which are easily obtainable. Although they are relatively easily obtained, they are often scattered and sometimes intermittent. Examples include resources available through idle neighborhood conversation, storefront TV broadcasts, second-hand newspapers, and the like. Sunshine may also be freely acquired for warming, drying, or gardening. These resources may be obtained at no, or minimal cost, i.e., at the very reduced effort needed to observe, interpret, and transport them, if and when they are encountered.

A second, intermediate category consists of resources which come at a higher cost in terms of money, effort, in-kind exchange, or even risk than those in the first category. In this second category, two types of resources may be identified. The first type are resources which are passed through social networks of exchange under assumed obligations of reciprocity. Resources in this category include gifts, some services, occasional foods, tips (of the informational sort), favors, and some labor such as child care. Also included is news of recognized value such as a job opening or a vacant house.

A second type in this intermediate category are those resources which are purchased, though they may sometimes be traded or stolen. These resources usually circulate through commercial channels such as stores, utility lines, markets, and the like. Included are foods, clothing, cooking fuels, electricity, newspapers, etc. Note that no attempt is made to subordinate relative value of resources gotten through social networks to those purchased in the marketplace. These two types of intermediate resources cover a wide range of resources whose values are conditioned by many factors.

At an opposite extreme to the easily obtained resources in the first category, are those resources 'tightly coupled' into structures. These are represented in sophisticated skills, techniques, and education. Examples include executive training, driving skills, or higher educational training, in, say, a medical science. These skills as resources are omnipresent but not readily available to squatters without an extraordinary investment in time, effort, or money.

It is evident that an increased effort representing an increase in expenditure of energy can lead to an increase in knowledge and vice versa. Energy must be spent to discover and learn new knowledge which expands the options and effectiveness of energy expended in later efforts. The concept of the "learning curve," for instance in self-help housing, reflects this interdependence. The curve traces a decrease in the energy needed to accomplish a given task as new skills are acquired. This mutual interdependence is an important factor in changing or transforming resources into different forms.

3. Resource transformations. 'Resource transformations' refers to the changing of resources from one form into another, qualitatively different form, or into an end product, which in some cases, may serve again as a resource. These changes are analogous to energy conversions in ecosystems. However, the term "transformations" is preferable to "conversions" because, with the importance of the informational aspects of resources in cities, more than just energy is changed. Meier has made the point that the "knowledge component of resource use has increased in quantity and significance over time" (1974b:12). Meier's "information-based" concept of resources gives an elastic quality to the urban resource inventory, a quality which intensifies as city size increases. Unlike energetic aspects, some informational aspects of resources may be expanded cheaply. The information-based concept of resources figures importantly in understanding squatter efforts to make do in an environment characterized by uncertainty. When householders learn that squatting in a given location is technically and politically feasible, uncertainty has been reduced and information created.

In some respects the concept of resource transformations is analogous to certain conventional notions of production. For instance, the "production possibilities curve" describes different ways two resources may be combined to produce a given product. Analogously, for a given task, different forms of information and energy may be combined in different ways. At one extreme, a task may be completed only with great effort by a novice, while at the other, a skilled craftsman can accomplish the same task with a minimum of effort.

Wasted effort is avoided. Also, more knowledge may turn up new alternatives or indicate that the task may be avoided altogether.

By definition, resource transformations involve the restructuring of resource forms. The informational aspects of relatively cheap, dispersed resource forms found by chance can be combined in new ways to create knowledge (as in "learning the ropes" of the city). Squatters may use discarded materials to build houses, thus applying their knowledge to efforts to create new value. Resources have changed form and are made into something useful with value.

B. Contributions of the Transformational Perspective

The chief objective of the present work is to explore the utility of seeing the ordering actions of squatter households as a response to the entropic effects of nature. The transformational perspective extends Meier's and other conventional views of urban growth, poses new questions, and in key areas challenges Meier's conclusions regarding urban policy and technology. At the same time, as we shall see, this perspective is subject to operational limitations. The quantification of key variables and the measurement of household transformations present serious difficulties. To solve these problems will require further research and new measures, as I will discuss in the closing chapter.

These measurement problems take root in the borrowing of theory. The ability of the transformational perspective, and, to a certain degree, any approach which aims to understand social phenomena by borrowing theory from the physical sciences, is limited intrinsically. Borrowing theory necessitates a certain amount of invention. In the

present case, very little in the way of intellectual experience and analytical tools is available to guide and test this inventing. One result is that measurement, even the simplest forms such as the making of typologies, is somewhat hazardous. The quantification of certain energies and forms of information, however, may be practical and may have merit in furthering our understanding of how resources are used, conserved, and invented in cities.

The transformational perspective is most useful as a synthesizing tool which helps to broaden our understanding of squatter household and urban organization. For instance, the perspective brings into view a logic of security which underlies squatter strategies. This logic is similar to the logic of continuity described by Marris in his Loss and Change (1975). For victims of loss--widows, for instance, and families relocated from their homes--maintaining ties with the past, a thread of continuity, gives meaning and security important for recovery from traumatic loss. Similarly, squatter households expend many resources seeking to make things more certain, that is to secure, for instance, employment, equipment, tenure, and value. Although the motivation for reducing uncertainty is not the same as Marris's "conservative impulse," appreciating the logic behind the need for certainty supports Marris's thesis and helps to make more effective policy concerning social change.

For instance, this perspective may broaden our understanding of the problems of uncertainty among groups affected by new policies or technologies. Uncertainty among potential users of new or so-called "appropriate technologies" for example, has been a source of difficulty encountered

in diffusion efforts (Marris, 1974; Jequier, 1976). Identifying the mechanisms squatters themselves employ to cope with uncertainties is an important step in resolving this problem.

The expansion of information to reduce uncertainty and to economize on the use of energetic aspects of resources bolsters the validity of the self-help approach to housing. The transformational perspective also suggests new policy approaches to counteract uncertainties, such as facilitating the flow of information and enhancing the abilities of squatters to assimilate informational aspects of resources. In this connection it is interesting to note that time takes on an importance in the lives of the under-, sub-, and unemployed, contrary to the claims of some economists (Linder, 1970). "Free time," is thought to be in ample supply for the urban poor. Considerations in the following discussion suggest that this view is inaccurate. Squatters, like wealthy businessmen over cocktails, gather information constantly, even during "free time" (e.g., see Machado da Silva, 1969).

Finally, the perspective is useful in relating the ordering actions of squatters to their use of energies in the urban ecosystem. Squatters constitute an important case illustrating the role of energy use generally in urban areas. Squatters create sources of conservation and efficiency, which, in a time of energy crisis and rapid urbanization, deserve further exploration.

C. Outline of Work

The following chapters test the transformational perspective in various ways. Chapter II discusses themes in the squatter literature which may be viewed as the empirical foundations of, and precedents

for, the approach taken in this work. This review of past work helps to identify the main elements of a transformational model of squatter households. Chapter III describes the theoretical rationale for the transformational perspective, and identifies key features of systems and ecosystems thinking, which may be related to the question of squatter transformations. Chapter IV returns to a more concrete level, seeking to define intermediate concepts linking the paradigm of 'living system' to the ordinary reality of squatter households. This chapter also introduces two of the four favelas¹ in Rio de Janeiro from which Anthony and Elizabeth Leeds gathered their data. (A description of the data and methods for gathering it appear in Chapter VII.) Chapters V and VI present case studies, qualitative descriptions of households based on the Leedses' empirical observations in two different favelas. These cases are used to further test and refine the the transformational perspective on squatter households.

Chapter VII shifts the mode of analysis suggesting how some of the "instrumental" variables identified in Chapter II and discussed in Chapters V and VI might be treated quantitatively as social indicators. This is followed by a discussion in Chapter VIII of some effects of household-context interaction, such as the development in some favelas of an elaborate "informational infrastructure." Chapter IX concludes this exploratory investigation by assessing the contributions and weaknesses of the transformational perspective, comparing it to conventional notions, drawing implications for policy, and suggesting areas for further research.

¹ Squatter settlements in Brazil. Hereafter, favela and other Portuguese and Spanish terms unless underlined will be treated as English words. Accent marks on personal names will be omitted.

CHAPTER II

TRANSFORMATIONAL THEMES IN THE LITERATURE--

The Question of Ordering

The substantial body of literature on the subject of squatters, and on the urban poor in general shows that changes of a qualitative and quantitative nature -- changes which I have called transformations -- are reported in many aspects of urban life. For instance, 'upward social mobility,' 'assimilation,' 'becoming political,' and a variety of other terms which I shall discuss shortly, describe processes which involve strategic manipulations, usually resulting in accumulation of some form of power or control which enable the urban poor, generally, and squatters in this case, to order and further manipulate their environment. Occasionally this power is expressed in a sophisticated, strategic submission to manipulations by others. Some scholars take the approach that such power is never fully achieved, or that there are severe limits on the extent to which certain marginal groups may exercise this power. Researchers have made use of a wide variety of approaches, methods, and analytical units to study these changes, the constraints on change, and the strategies to cope with constraints. Cases range from analysis of individual psychological tests (Mangin, 1970; Kemper, 1974) to the identification of conditions for politicizing the urban poor (Cornelius, 1975; Collier, 1976; and others). The qualitative and quantitative changes, analogous to or isomoprhic with transformations, involve ordering of different kinds. The objective of this exploration is to discover the forms, mechanisms, and motivations for this ordering.

This chapter examines the transformational perspective in the context of conventional views found in the literature. It will be shown that most, if not all, of the essential aspects of the processes of transformations have been studied at one time or another. Thus, the transformational perspective is not a radical departure from conventional views. Rather, the perspective broadens the theoretical basis for explanation (by including reference to the Second Law), and provides a way to tie together many aspects of squatter behavior usually treated piecemeal. Although the following review is selective, it is representative of the major trends of thought on squatters. In addition to identifying a number of themes and approaches found in the literature which are similar to, or the same as, the transformational perspective, the review identifies a number of weaknesses or gaps concerning the concepts of environment, resources, and ordering which weaken the explanatory power of customary approaches to urban studies. Such problems do not arise in, and in fact are avoided by, the transformational perspective.

Finally, two seminal models of squatter household behavior, those of J.F.C. Turner and A. Leeds, are reviewed because they give the most explicit attention to the aspects of squatter household behaviors most pertinent to the transformational view. These two models, seen in the framework of the "new home economics," serve as the basis for constructing a more general transformational model of households which incorporates the functions of production as but one aspect of transformations. The comparison of these models will provide the occasion to review the literature systematically to identify the most important environmental

constraints on squatter actions, as well as the most important instruments squatter households use to get around these constraints.

A. Major Themes and Common Approaches in the Literature

The literature on squatters, on the urban poor, and to some extent, on the field of urbanism in general, is replete with themes which are equivalent or analogous, although at different levels of abstraction, to household transformations. We have the terms 'security,' 'social mobility,' and 'occupational mobility,' 'social assimilation,' 'integration,' 'consolidation,' 'participation,' 'growth,' and 'development.' All signify qualitative or quantitative changes leading to increased ability to interact with other actors, to be identified and acknowledged, to make demands and be heard, to get access to resources, and to play a more important role in the control of resources. Perhaps more important, these qualitative changes also mean a decreased vulnerability to uncertainty and risks. This is not to say that "entropic influences" are ever overcome entirely. This can never be the case. But the stakes are reduced in relative terms. Moreover, many more alternatives are opened up and new potentialities brought to fruition.

I shall not attempt to discuss all of the many themes in the literature which have some transformational aspect to them. Rather, I shall show in general and particular ways that the transformational perspective is an extension of much of the work on squatters, and pertains, more generally, to what might be called developmental aspects of urban studies carried out over the past several decades.

I shall begin by observing that a few general themes, such as the problem of overcoming hurdles of various kinds, and more particularly of achieving "order" and "security," crosscut much of the literature on squatters. These themes reveal a common, nearly universal approach in which squatters, or the urban poor, migrants, slum residents, etc., are seen as caught up in a struggle to get around various constraints such as the tensions and insecurities engendered by discordant values, adverse circumstances, or discontinuous life experiences. These constraints may be translated into the 'entropic influences,' discussed earlier, to which I shall return at a later point in the chapter. We shall look in some detail at two perspectives on an approach to the study of squatters, commonly found in the literature, in which squatters are seen as attempting to avoid or circumvent constraining factors in their environment. These are the "marginality" and "mobility" perspectives, both of which I shall compare with the transformational view.

1. Major Themes. Virtually all of the literature on squatters, and much of the scholarly discussion on the nature of city and regional growth, speak of differences of one type or another--frequently differences in degree of organization or power--which demarcate one system or group from another, e.g., city from hinterland, migrants from native populations, squatters from, say, middle class. The differences separating these systems or groups are expressed in such terms as organization, security, monetary wealth, political power, social customs, information or knowledge, transport costs, physical distance, etc. Often such differences are seen as constraints which must be overcome, or at

least coped with, if disparities in wealth or power are to be evened out, or class differences bridged, or urban environments mastered by newcomers.

All of these systemic differences may be thought of in terms of entropic influences in the sense that this term has been defined above. That is, to be overcome, entropic factors all imply a drain on resources. Much of the literature on the urban poor deals with strategies for securing access to resources, or for allocating them, or for avoiding constraints. Although the problem is rarely stated the way I have posed it here, researchers everywhere set up research problems in terms of overcoming, offsetting, or getting around these differences.

At the same time, evidence of growth of various kinds is pervasive and unambiguous. We know that cities continue to grow at a rapid pace. Also, low-income, and especially squatter, settlements are growing in terms of population. Investments in housing facilities, in commerce, and in other goods and services reach into the millions (as reported, for example, in Leeds, 1973b; Hoenack, 1966; Peattie, 1974a, 1974b). Among proletarian groups we have evidence of vestigial foundations of "a Common Law" (Conn, 1969); grass roots political organizations which come or go, or perhaps more accurately, change forms in accordance with prevailing political climates (Collier, 1976; Leeds and Leeds, 1976); the emergence of squatter voluntary organizations such as home town clubs, samba schools, favela associations, and confederations.

These signs of growth are sometimes misread. Squatter settlements and cities have been seen inaccurately as menacing signs of imbalance.

It has been assumed (Goldrich, 1970) that political participation, for instance, will assume the formal modes customarily found in the "mainstream." Similarly, when squatter settlements take strange or unfamiliar forms they are misunderstood. At the same time, I do not take it for granted that low-income groups will necessarily prevail in achieving and consolidating gains. The point is that the above examples of growth are evidence of ordering actions and survival despite, and perhaps because of, extremely adverse circumstances.

In the case of squatter and low-income urban populations in Latin America, "disorder," and "insecurity" and their opposites are two important, representative themes which have run through several decades of literature. These ideas are salient in the early field reports by Bonilla (1961), Matos Mar (1961), Germani (1961), Pearse (1961), Patch (1961), Lewis (1958), Turner (1966), and others. Much was made of outward signs of disorganization in such matters as family and social life and housing arrangements. Bonilla, for instance, put Rio's squatters "on the wrong side of every standard index of social disorganization ..." (1961:5). Also, insecurity of income and tenure have caught the eye of nearly everyone studying squatters. Squatters' lives are said to be "intolerably insecure" (Mangin, 1973). Scholars debate whether urbanization has broken down traditional security systems, especially family ties (Turner, 1968; Lewis, 1965; Lomnitz, 1974) and also old norms (Cornelius, 1971).

Coping with disorder and searching for individual and personal forms of organization--what I have called 'negentropic' actions--is also a major area of interest in the study of migrants (Kemper, 1974;

Roberts, 1973), slum residents (Patch, 1961), transplanted squatters (Salmen, 1969; Rush, 1974) and the urban poor in general. A wide variety of mechanisms have been identified by which these disruptive influences are offset: compadrazgo, drinking partners, and network ties (Lomnitz, 1974; Silberstein, 1969; Leeds, 1969, 1973b, 1974; and others) and particularly property tenure (Matos Mar, 1961; Turner, 1966; Butterworth, 1967; Mangin, 1973). Also, overcoming disordering influences has been widely recognized as a significant, if not an indispensable, condition of squatter efforts to improve their situation as described, for instance, in Turner's term 'consolidation' (Turner, 1968).

2. Common approaches. Two pervasive approaches to the study of overcoming disorder (a term, by the way, that is rarely, if ever, operationally defined) are represented by the terms 'assimilation' and 'integration' (e.g., see Shannon and Shannon, 1967; Kemper, 1971). In certain respects, the orientation of the present work is in accord with the approach these terms represent. That is, both approaches are concerned to one degree or another with the adaptive responses of the poor as they cope with new situations, changing environmental circumstances, and shifting uncertainties. At the same time there are many, sometimes opposing, perspectives within this "assimilation-integration" approach. I will look briefly at two opposing perspectives--"marginality" and "mobility"--for purposes of exploring the points of overlap and departure between these conventional views and the transformational perspective.

Although 'marginality' as a concept in reference to squatters has been severely criticized (and correctly so, I think), I mention it because, as an intellectual tool, it contrasts with, and therefore helps to illustrate, the transformational view. Squatters have been described as groups who are, for various reasons, either unintegrated into, excluded from, or distant from the larger urban society (Pearse, 1961; Bonilla, 1961; Nelson, 1969; Quijano, 1973; Lomnitz, 1974). Economically, socially, and physically, squatters are said to be marginal in the sense that they do not participate in the "formal" labor market; they allegedly do not share the social customs, values, and beliefs of the "mainstream;" and geographically, they are sometimes located on the periphery of the city.

Peattie (1974a, 1974c), Leeds and Leeds (1976), Perlman (1971, 1976), and others, have shown the fallacy of these notions on a variety of grounds. It is not necessary to recapitulate all of their arguments here. It is sufficient to point out that, among many other problems, the marginalist perspective is not very productive intellectually. It does not, for instance, lead us to examine the kinds of ordering that may be taking place despite the adversities of being poor. Peattie, for instance, in speaking of labor markets and labor movements, observes that the concept of 'marginal' obscures the nature of, and potential for, "organizations present within this sector, their link to institutions of politics and the state, and the kinds of motives and aspirations which they structure for the participants..." (Peattie, 1974c:10). Thus, the marginality perspective camouflages the fact that ordering may be taking place at all.

The transformational perspective avoids this kind of bias without denying that the advantages of informal ordering may, in the case of the poor, for instance, sometimes be overwhelmed by social, economic, or political forces outside their control. At the same time, by focusing on the means to achieve ordering and the constraints against them, the transformational perspective suggests the kinds of order and processes of ordering that may be expected in the case of squatter and other urban residents.

A second, "mobility" perspective, in some respects opposite to the "marginalist" view, assumes that some form of ordering takes place, resulting in advancement or increased welfare. The idea of mobility reflects some of the essence of "negentropic transformations," in the sense that increased social power or occupational advancement reflect learning new employment skills, higher income, or some other measure of increased power to marshal resources. The transformational view seeks to generalize this notion of advancement by identifying common denominators -- information and energy -- which apply in a wide variety of settings (e.g., social, political, and economic) and activities (e.g., learning and house building).

At times, persons taking the mobility perspective look beyond, or rather through, the ordering process in its qualitative detail in the interests of measuring occupational, social, or geographic mobility (e.g., Balan, et al, 1973). On the other hand, Uzzell's study of the "cholofication" of Indian migrants to Lima (1972) is a good example of a mobility study which makes visible some of the mechanics of this process. Uzzell demonstrates how informational

constraints on new migrants are gradually decreased and mobility increased as migrants get to know their new environs and as they establish links with other actors. Uzzell invents some new and very useful concepts to describe this process. He also makes a useful interpretation of entropy and negentropy upon which this present transformational perspective has, in part, been built.

In sum, the "marginal" perspective tends to obscure or even ignore ordering activities of the urban poor and stresses the lack, or at least the difficulties, of "assimilation." A transformational view suggests a process of ordering that marginalists, perhaps, would fail to see. The "mobility" perspective, on the other hand, presumes some type of ordering, though in practice the qualitative details are not always scrutinized.

B. Some Conceptual Weaknesses in the Literature

The literature on squatters reveal a number of conceptual problems which weaken the explanatory power of conventional modes of analysis. A review of these problems will serve to point up part of the rationale for pursuing the transformational perspective. The concept of system-environment interaction, for instance, is sometimes neglected in the literature on squatters, so that an important mechanism of learning and change is overlooked. Another weakness is in the restrictiveness of the concept of environmental resources. Conventional studies frequently fail to appreciate the variety and complexity of urban resources. A third topic not systematically studied is that of motivation for ordering. This topic is overlooked or taken for granted, but important questions remain to be answered.

As for interactive effects, it is not unusual to encounter analyses of squatter and sometimes migrant groups in which the key question under study concerns only the absorption or rejection of squatters or migrants into a larger socio-economic unit, a neighborhood or city, for instance. The context, or environment, is treated as an unchanging backdrop into which squatters or migrants are seen gradually to blend (e.g., Bonilla, 1961; Kemper, 1974). These approaches miss some of the dynamic character of system-environment interaction which is the source of informal learning on the part of squatters. Analysis of this interaction is also important for understanding the particular forms squatter settlements take. The transformational perspective emphasizes this mutual causation process. This subject of environment-actor interaction is taken up in Chapter VIII with empirical data from households and favelas.

Uzzell has shown these interactive effects between migrants and communities (1972, 1974) as have Leeds and Leeds for communities and political systems (1976). Uzzell, for instance, shows how the interaction of migrants with their barrio environments gets transmitted via social networks to potential migrants, resulting in changes in both the barrios and the types of migrants who subsequently choose to settle there. Leeds and Leeds analyze the development and reinforcement of particular types of political interaction in Brazil, Peru, and Chile, according to the particular (national) political circumstances prevailing in the respective settings (Leeds and Leeds, 1976). Both Uzzell and the Leedses point to self-reinforcing qualitative changes--"cholofication" and political participation, respectively--which are

analogous to the transforming effects produced in both squatter households and the larger environment as a result of interaction.

A second area of weakness concerns the notion of urban environmental resources. This notion needs to be more carefully defined in order to account for the complexity of resource forms in the city and the actions taken by squatters to create entirely new resource forms. Although the term 'urban environment' customarily refers to the total context -- that is the social, economic, political, and physical setting in the city -- in practice it is not unusual to find that environment and resources are seen only from the standpoint of scarcity or constraint. Consider, for instance, "an environment structured adversely to the interests of squatters" (Perlman, 1976), or an environment which is "intolerably insecure" (Mangin, 1973), or an environment which is "discontinuous" (Roberts, 1973). Resources are something which actors struggle to control, acquire, distribute, or even, to use Lomnitz's term (1974: 153), "hunt and gather" to overcome adversities and build order. The transformational perspective acknowledges these constraints while giving attention to the means devised by squatters to create new resources. Our understanding of the urban environment and its resources must be further refined if we are to account more accurately for the many forms of value squatters create in the informal domain.

I have already made the distinction between urban and nonurban environments in terms of the concurrent presence of a wide variety of resources forms and the large number of ways and high rates at which resources change forms. Thus, the term environment, as it is used here, stresses the multiplicity of resources and the dynamic

character of the squatter-environment interactions. Meier's contrast between 'information-based' as opposed to 'depletion-based resources' illustrates the meaning of environmental resources important in the present study. 'Depletion-based resources', according to Meier (1974: 13), is a concept which reflects economic concerns for scarcity, sometimes found in literature (e.g., see Foster, 1965). 'Information-based resources,' on the other hand, refers to the knowledge aspects of resources which can be refined, extended, built upon, transformed, and communicated like recipes. Thus 'environment' and 'resource' in the transformational perspective have qualities of expandability.

A third problem area concerns the motivation for ordering. It is generally taken for granted that formal and informal forms of organization and ordering are somehow culturally normative or otherwise socially acceptable, politically necessary, or economically expedient. Marris and Roberts have scrutinized these assumptions questioning the nature of ordering. They have articulated important, additional socio-psychological dimensions in the making of order which are germane to the transformational view.

Marris has written insightfully on the importance of "continuity of meaning" for victims who have suffered great personal loss such as the death of a spouse or the loss of a home (1975). Victims of loss struggle to maintain attachments with the past, attachments which are crucial to bridge the gap created by the loss they have suffered. This struggle is a process of ordering. In the aftermath of loss, victims reorder their personal lives to remake attachments and pave the way for fundamental changes they must undergo to overcome their loss. The

evidence Marris cites suggests a logic of security which influences the actions and reactions of victims.

Roberts' study of Guatemala neighborhoods (1973) seems to confirm this idea and suggests that it may be extended to persons or groups threatened with loss, such as squatters. For Roberts, the recurring theme in his observations of urban residents, including squatters, was "the interaction between the 'disorganizing' impact of the city's demographic and economic growth and the 'reorganizing' activities of the urban population" (1973:14). Disorganizing influences create what Roberts calls a "discontinuous environment," meaning constantly changing situations analogous, on a larger scale, to the losses of which Marris speaks. In Roberts' words, households seek to reorganize, to maintain a degree of order so as to "reduce the risks and uncertainties of their environment" (1973:8). The transformational perspective builds on these insights. It stresses, perhaps more than is customary, the importance of security--that is, as defined in the previous chapter, the need to make things more certain--in the ordering actions of squatters.

The transformational perspective draws attention to the need to conserve scarce personal energies as opposed to expandable personal knowledge. Social orders of different kinds help to conserve on scarce resources, such as personal effort, which, in the squatter or proletarian environment of material scarcity, take on a special significance. Highly personal forms of order and the more formalized, institutional forms of order expedite work by reducing the chances of wasted effort, as Uzzell has demonstrated in the case of migrants in Lima (1972). Zipf has made a similar argument on a more general plane with his

'least effort principle' which I will discuss in greater detail in Chapter III. The transformational perspective provides some further insight into the mechanisms of "least effort," relating the need to conserve energies to the need for ordering the environment of squatters.

In sum, I have noted that certain themes in the literature on squatters reflect to some degree the main tenets in the transformational view. However, conventional treatment of urbanism and proletarians has overlooked important refinements concerning the nature of the urban environment, of resources, and of ordering. Sometimes these concepts are too narrowly defined, or they are not defined at all. Similar problems are detectable in the use of the concepts of social networks of exchange, as I shall show later. The solution to such shortcomings, contrary to Cornelius' remedy (1971), is not necessarily, or only, to be found in building a stronger empirical basis for theory, however important empirical work may be.

An additional, and frequently overlooked source of insight is what Bateson calls 'fundamentals' (1972), that is, established laws of nature. In science, according to Bateson, "...you start from two beginnings, each of which has its own kind of authority: the observations cannot be denied and the fundamentals must be fitted" (1972:xx-xxi). In the present work, 'fundamentals' refers to the entropy law and to ecosystems theory, both of which provide theoretical and logical remedies to the problems concerning "environment," "resources," and "ordering" noted in the squatter literature. These fundamentals are taken up in detail in Chapter III.

C. Models of Squatter Households

How do households get access to, utilize, and allocate resources to achieve their ends? The models of Turner and Leeds are the most germane to these question and therefore appropriate for guiding the application of transformational perspective to outline a transformational model of households. The chief aim of this section is to outline the most important aspects of household organization following the discussions of Leeds, Turner, and others, who see households as production units, and to express a more general (transformational) view, pointing to mechanisms by which households become self-transforming.

Although the roots of his model appeared earlier, the first concise discription of household decision-making in squatter households appeared in Turner (1968; see also 1972). In this model, the process of squatting is by implication similar to, or the same as, the urban settlement process generally (although Turner is ambiguous on this point). The settlement process consists of making a series of choices in which "amenity" (that is, equipment and furnishings), "location," and "ownership" are the main variables of the "dwelling environment." These elements are given shifting priorities as families move through different stages in their life cycles and as they gain experience in the city. In the early stages, when families first establish what Turner calls a "bridge-head" in the city, the importance of central location, especially near work and also near other sources of resources, is given top priority. The other elements of the dwelling environment are relegated to secondary importance. These priorities change as conditions change, for instance as wealth is acquired. As households consolidate their gains in the

city, the importance of proximity to central areas drops and the importance of ownership rises. In this hypothetical trajectory modern "amenities" eventually come to dominate the hierarchy of importance as households move to the outskirts of town.

Leeds extended Turner's notion of tradeoffs by broadening the range of variables considered in his "consumer orientation" to housing (1973b, 1974, with some elements appearing in Leeds, 1969). By viewing households as "income-aggregating firms," Leeds underscored the allocational aspects of householding. At the same time he lists the main categories of choice open to squatters, pointing out that priorities (expressed through weighting of various ends) change over time to maximize multiple objectives:

The weightings chosen depend on the state of the household corporation at the moment of decision, i.e., on the evolutionary state of the domestic cycle, the household's prior achievement, its assimilation in the city, and also on its level of income at a given time, as well as on contingencies that may affect it and its income level (Leeds, 1973b: 189-190).

The model then deals not just with housing, but with "the entire structure of householding: the making of economic, social, and cultural choices by a household firm..." (1973b:192).

In a later article (1974), which may be considered an extension of his model, Leeds enumerates different housing settlement types which may be considered alternatives for households. Leeds points out that the alternative chosen depends upon a large number of factors, all of which have yet to be understood in detail. The general outlines of these variables include perceptions and understandings by households of the urban system, including formal and informal institutions and networks. Also included are the particular stage in the domestic cycle and the

availability of capital. The hypothetical results of different weighting patterns are many possible circulation routes among housing settlement types for the urban poor.

For both Turner and Leeds, the model of household decision-making involves shifting priorities, movement through different arrangements for living, and taking advantage of specialized types of housing according to changing circumstances. Leeds has added further detail to the model. Leeds' elaboration of the types of housing and settlement, as well as conditions for selection, results in possible settlement behaviors considerably more complex than those pictured by Turner.

The models of Turner and Leeds coincide in many respects with the elements making up the "new home economics." Nerlove (1974) traces the roots of this new framework to Becker (1965) and Reid (1934) and summarizes the main elements in the framework. They are 1) an objective function which is defined in terms of "utilities" produced in the home rather than those found in the marketplace; 2) resource constraints, principally on time and also on nonwage income; 3) a "household technology" of production; and 4) a mechanism, i.e., labor market, for exchanging household resources, again principally time, for purchasable commodities on the market. These elements, as well as the models of Turner and Leeds, focus on households as producers, and not just consumers, although differences in emphasis and empirical content are apparent, as we shall see. Nevertheless, the framework is useful for comparing these models with the transformational perspective.

1. Objectives. As for the objective function, or one might say, the goals of households, it has already been suggested above that changing circumstances and uncertainties such as Leeds describes make multiple objectives a rational, if not unavoidable course for households. Such a description also fits Turner. His longitudinal view shows households evolving from squatment to middle class housing, suggesting changing objectives at least in the long run. The new home economists incorporate these circumstantial and temporal changes into a generalized aim of maximizing utilities. Their chief theoretical problem, however, concerns the description of utilities of more than one individual in the household. This is a problem outside the scope of this present inquiry.

At the same time, in the transformational perspective, households are seen as stressing different objectives than those Leeds and Turner emphasize. Households aim to reduce uncertainties of various kinds and to maintain value as they move through various stages of the domestic cycle. The transformational perspective is concerned less with particular forms of value secured at any given point in the domestic cycle, although there can be no doubt that strategies and value forms change as household conditions change. The case studies of households analyzed in later chapters will show such changes and differing strategies. Of more importance is the logic behind all strategies, a logic which seeks to increase order at all times. This objective may be compared with those of rural peasant householders in Brazil (Johnson, 1971) and elsewhere (Wharton, 1971).

2. Constraints. As for the constraints on reaching their objectives, Leeds and Turner lay emphasis on external contextual factors, building on a large body of empirical evidence. This contrasts with emphasis on "internal constraints" on time, for instance, stressed by the new home economics. Both these "internal" and "external" contextual factors I have referred to as 'entropic influences.' Researchers have made reference to a long list of such influences under a variety of terms. I will group them into four categories drawing upon the literature on Latin American urbanism generally, with particular reference and examples of squatter households in Brazil. These categories are: insecure tenure; low and or intermittent income, together with financial, and institutional, and class mechanisms (Leeds' "ancillary" mechanisms cited earlier) which reduce income or introduce uncertainties about income; possibilities of sudden loss from natural or human calamity; and bodily limitations on action ('internal' entropic influences).

Chief among the sources of uncertainty affecting squatter households is lack of legal tenure. Squatters by definition are illegal occupants of land. Enforcement of laws concerning squatters has varied greatly in Brazil as in other countries. This ambivalence is exemplified also in the covert support sometimes shown by government authorities toward squatters in Lima (Collier, 1976) and Brazil (Leeds and Leeds, 1976).

Although some eradications occurred in the 1940's, favela eradication and removal began in earnest in the sixties when low-cost housing for the masses became part of the national development strategy of Brazil. Favela residents were part of the intended clientele for this new housing (Leeds and Leeds, 1971).

The actual and threatened policy of removal intensified the climate of apprehension and distrust among favela residents. One favela resident I spoke with told of experiencing, in the early sixties, a sense of anxiety on occasions when unfamiliar or suspicious automobiles or persons would appear around the favela. Perlman (1976:31) speaks of the constant fear felt by some favela residents during this same period over the possibility of removal. The climate of apprehension was reflected in the defeat of the governor's candidate in the elections of 1965. Leeds attributes this defeat to the reaction of favela residents to the "initial removals and threats of further removals" (1971:29).

Insecurity of tenure interlocks with other factors of squatter life, particularly low levels of capital and the difficulties of maintaining regular flows of income. In general, squatters are not the poorest of households. Renters in slums are relatively more impoverished as a group, as Salmen points out for the case of Brazil (1969). Nor are squatters uniformly poor. Leeds finds a range "reaching even up to upper-middle and professional, bureaucratic, and business 'levels' in some of the larger and more evolved squatter settlements..." (1974:72-73). However, Perlman's random sample of 200 residents in each of three residential areas (two of these favelas) (1976:159), taken about the time Leeds conducted his studies in Rio, shows that 67% of the households were earning less than two "minimum salaries"¹ -- about half the amount,

¹According to Leeds: "Brazil's formal system of wages and salaries is organized around the notion of the minimum salary which is scheduled by the Ministry of Labor for the entire country, varying by region, according to actual or supposed productivity of labor" (1973b:190).

by Leeds' calculation, required for food, clothing, housing, education, transportation, and health for a family of four.

The point is not only that low incomes restrict amounts of goods and services available for purchase by the poor. What is equally important are the degrees of uncertainty introduced by having little, or possibly worse, intermittent income. Leeds identified a large number of means by which the controllers of strategic resources in society constrain the "choice set," or range of alternatives, open to squatters. These include:

hiring and firing systems; special hiring deals; firing just before the time at which job tenure becomes obligatory, resulting in loss of accumulated retirement and pension benefits; legalized repressions of persons (if proletarian) not carrying official work cards or picked up in the streets without identification (even if they have this at home); rents and rent extortion such as double rents; low accessibility of skilled training; high cost of education at all levels, especially payments for uniforms, books, school supplies; usually high cost of secondary education; legal reduction of wages in the form of sick-leave pay at seventy percent of minimum salary; nonpayment of benefits such as family allowance, overtime, and pay for unhealthy work; delayed payment of scheduled wage raises; housing-settlement division; breaking up of proletarian social networks by physical shifting of parts of housing-settlement areas; patron-client relations which maintain separateness of the two classes and keep the proletarian client in a network of obligation and co-optation backed by threats of sanction such as the patron's not helping out in time of crisis; and so on and on (Leeds, 1974:85).

These constraints may also be seen as part of the external entropic influences of which I spoke earlier. The conjoint effect of these restricted income possibilities and the ancillary means is to heighten uncertainty in squatter life by multiplying the number of possible sources of variation. The most rudimentary facets of day-to-day living are subject to uncertainties.

Yet another source, or sources, of variation which appear frequently in the literature are the possibilities of upset or loss due to natural disasters, such as fire, flood, or storm, and also human-induced crises or problems such as result from theft, assault, poor health, and so on. Although statistics on criminal offenses and other human-induced crises are rarely available, case histories (e.g., Mangin, 1970), diaries, and other evidence show that squatters, like everyone else, experience perhaps more than their share of crises and loss from human and natural causes. Fire and flood have more than once figured into the accounts of residents studied by Leeds (1969; 1974). However, squatters are vulnerable to the effects of crisis and loss because low levels of income, uncertain employment, little credit, no insurance, restricted access to institutional aid, all decrease the range of solutions open to them. At the same time, these factors increase the importance of informal modes of coping with, offsetting, or circumventing unforeseen losses and perturbations.

Finally, as we shall see in later sections, the various "external entropic" influences and their direct and indirect ramifications on security and well-being of squatters dovetail with bodily limitations, that is "internal entropy"--the physical limitations inherent in expenditures of personal effort. Bodily metabolic constraints are often complicated by disease and nutritional deficiencies. Health, nutrition, and purely metabolic factors are not at all adequately researched. Time budget studies, such as that by de Souza (n.d.), are indirect ways to study energy use by squatters. However, personal case histories suggest that the many sources of variation, heightened

vulnerability, and the constrained choice set referred to earlier, all impair the ability of households to marshal resources to meet crises when they arise. These conditions have a disintegrating effect on the use of personal efforts of households, forcing them to spread their effort across a number of possible and actual problems of survival that, for instance, may be eliminated by more wealth, or taken care of given a more favorable class position. Squatters cannot always afford or otherwise manage to acquire appliances or equipment to bolster or extend their personal efforts to be sure there is enough food, clothing, and housing. Limitations of personal energies are thus relatively more important constraints on squatter as compared, say, to middle class households.

3. Production technology. This brings us to the remaining two elements of the new home economics framework: 3) the so-called "household technology" and 4) the linkages of (market) interchange with the outside world. The focus on production in the household is shared by the Turner and Leeds models as well as by the transformational perspective.

Vetter, in applying the new home economics to squatter housing choices in Brazil, states the issue clearly:

the whole distinction between consumption, saving, and investment becomes quite fuzzy . . . as expenditures such as food, education, health, and housing, which were formerly considered as types of consumption, are seen as highly profitable investments, yielding high monetary and non-monetary returns over time (Vetter, 1977:47).

Perhaps the best example of production by households is in the creation of what new home economists call 'human capital.' Nerlove discusses the investment of time in raising children and providing quality child care (1974). Other scholars have employed the new home

economics framework to study investments in education in anticipation of raising future income (Mincer, 1974). However, Sant'Anna's study of income distributions in Belo Horizonte, Brazil, suggests that the relationship between education and earnings may be blurred or erased by other, class-related circumstances (Sant'Anna, 1975:51).

The transformational perspective coincides with Sant'Anna's conclusion but approaches the production aspects of households from a slightly different point of view. The question is not so much one of explaining low incomes, but rather of explaining survival and creating value despite low incomes. The transformational perspective raises the question of the mechanics of securing jobs in a labor market flooded with unemployed, or when part time work is the best strategy, of earning a steady income. Moreover, how are investments in real estate and possessions secured in the midst of the constraints described in the preceding section?

The focus of this perspective on ordering and on the different means by which order may be achieved provides a more general view of household operations than is available so far. Production in households is but one facet, admittedly important, in the ordering actions of households. Ordering is also geared to achieve security, material well-being, insurance, and ease of access to further resources. Rather than making time the central dimension of household resources as Becker has theorized (1965), personal energies and personal knowledge are seen as the chief resources with which households conduct their ordering. Energy is a more direct measure of household effort than is time. The reader will recall the comparison between transformations and the conventional notion

of production drawn in the preceding chapter. Personal energies and knowledge may be combined in different ways (i.e., in different proportions) to produce different things --housing, more reliable networks, education, health care, an information system, etc. Personal effort expended by individuals is as important as the time spent in this production.

Returning to the literature on the "technology" of squatter households, one finds that four aspects of households operations are mentioned repeatedly which cover both the "technology" of household production and the "linkages to the outside world" of the new home economics model. These four aspects, reviewed and defined in greater detail below, include: 'membership,' 'resource inflows,' 'resource outflows,' and 'networks of exchange.' The review that follows shows that all of these, or similar aspects of household organization under different names or slightly different definitions, are usually regarded as instrumental in the coping strategies of households. The chief point to be made is that these four aspects may be manipulated by the household and therefore are devices which help to make transformations. Further, the four aspects are more complexly interrelated with one another than is usually acknowledged. For instance, as I shall discuss shortly, networks of exchange overlap in many ways with both the means by which monetary and nonmonetary income are gathered. All of these factors are mentioned in the Turner and Leeds models. They are not spelled out in detail, although they are implicit, in the new home economics notion of 'household technology.'

'Membership' of the household refers to persons making up the household unit, whether family or not, who either help gather or otherwise help bring resources into the household, or consume them, or

participate in the decisions regarding their allocation. The household and frequently, but not always, the family, have been central in the analysis of squatter coping strategies. Pearse formulated an "ethic" based on familial relationships in Rio's favelas and saw family as the "first line of defense" (Pearse, 1961:200). Family members in the household and the city have often been instrumental in facilitating the migration process and in easing adaptation. Household size, plus the age, sex, and the personal qualities of individual members in the household are important factors in the weighting process of different ends Leeds described above.

At the same time, membership interrelates with other instruments to affect the resource gathering power of households. Households may decide to have or not have children, or postpone them, or they may take in boarders, or send children to live with extended family, or hook up with other households to form joint economies, thereby affecting their potential for income generation, for instance, as well as the size and diversity of their networks. Also, membership influences the potential gains from education and in numerous other ways, (e.g., providing for one's own future well-being) affects the ability of households to respond to the opportunities and constraints facing them.

'Inflows' are the various forms of resources which come into the household such as monetary earnings from employment and also any and all nonmonetary income from jobs, favors, donated labor, gifts, information, inheritance, fortuitous discoveries, etc. Leeds (1973b) has perhaps best detailed the varied forms of income squatters generate.

Lewis's Children of Sanchez (1963) also reflects this variety, as does de Jesus (1962), Higgins (1974), and many others.

Although income may originate from many sources, employment is by all accounts the most important. However, within the realm of employment many possible options exist and it is evident that squatter households, like many other households everywhere, exercise different options at different times. Multiple income-earners are quite common in Latin American urban households. Sant'Anna (1975:11) shows this to be especially true for the largest families of the lowest-income groups she studied in Belo Horizonte. Many households set up their own businesses (Higgins, 1974; Peattie, 1974b). This means that a single earner may hold several jobs, while secondary earners also hold one or more jobs. Odd-jobbing, or temporary employment, provides a flexibility in this regard which suits the difficulties of households either unable to find steady work, or unwilling to be stuck in a "secure," but low-paying job.

Employment as a means of gathering resources is also closely associated with other household instruments. Roberts (1970, 1973) shows how the kind of interactions and kinds of information transmitted via workmates depend upon the type of job or jobs held by members of a household. The relationship between employment and nonwage resource inflows is perhaps most clearly illustrated by the case of domestic service. Daily contact with upper or middle-class residents opens flows of goods, services, cash, information, contacts, and other resources which are not available in other types of employment. At the same time, employment as an activity sometimes competes with time needed by householders to maintain network ties, as Perlman observes (1976:80).

'Resource outflows' are the inverse analogue of 'inflows.' Outflows have been studied in widely different manners. First are the quantitative analyses of household expenditures (e.g., Higgins, 1974; Kemper, 1974). Budgeting of time is also an indicator of effort (de Souza, n.d.). Complementing these types of data are statistics gathered on possessions (Lewis, 1969), and nutrition, although analyses of food intakes rarely concern themselves with behavioral correlations with other areas of householding (for example, see Kemper, 1974; Higgins, 1974). Data on the use of time or effort are also available in diaries (e.g., de Jesus, 1962) or personal case histories as in Lewis (1958, 1961). Still a third kind of data consists of reported investments in housing, such as described by UNCHPB (1975).

The transformational perspective views household spending of resources, as well as the refraining from making expenditures, as an instrument in making transformations. Controlling expenditures is decisive in changing the form of resources. Investments in housing and acquisition of material objects are two of the most concrete examples of such transformations. However, expenditure of personal energy is also important and despite its ubiquity, relatively unmeasured. An exception is Aguilera's study of Spanish entrepreneurs (1975a). The energies of individuals, expressed directly in the time, effort, motion, work, labor, self-help and so on, remain implicit quantities unspecified and sometimes unarticulated. Yet the personal energy of individuals constitutes the single most important resource in the construction of squatter settlements. This raises a problem concerning evaluation of labor.

Conventional measures of the returns on personal energies expended fail to discriminate among different activities. For instance, using conventional methodology, personal effort expended by householders constructing their own shelter would be assigned a capital value equal to that assigned to time spent on any other effort, e.g., enlarging one's personal knowledge about the city.² This is true even though it is self-evident that different activities can have quite different payoffs.

Also, analysts of urban phenomena rarely, if ever, scrutinize the calculations squatters make in allocating their personal time and energy. The personal rules squatters use to translate one reward or resource into another need to be explored. What are squatter perceptions of "equivalence" between resources?³ Also, it may be speculated, energetic aspects of resources are in some sense more limited or less elastic than informational aspects of resources. If so, then we may expect to find patterns of personal action in which informational aspects of resources are substituted for, or used to magnify, energy resources. We will return to these considerations in later chapters.

Finally, 'exchange networks' refers to the various channels of communication and contact through which resources pass. Analysis of social networks has progressed from a convenient metaphor to an analytical tool of growing repute (Mitchell, 1969; Whitten, 1970). Networks have been seen variously as "back-stopping" mechanisms, a

²Calculations of "shadow wage" for urban labor are based chiefly on earnings foregone in the primary sector (e.g., Little and Mirrlees, 1976).

³I owe this application of the notion of equivalence to Anthony Leeds, although I have modified it somewhat from his original usage in connection with migration.

source of emergency relief and insurance, and transmitters of information, services, goods, and cultural norms (e.g., see Bott, 1957; Lomnitz, 1971, 1974; Stack, 1974). Research ranges from gaining insight into family lives via the morphology of network systems, to sophisticated analyses of the social learning process (e.g., Aronson, 1970b; Roberts, 1970, 1973; and Uzzell and Provencher, 1976).

The transformational perspective will concentrate on two aspects of networks as instruments. First, it will show the importance of interconnections with other instruments. The relationship between networks and jobs has already been mentioned. Also Lomnitz has shown how the size and diversity of household membership can affect the size of the network system, the levels of use, and the kinds of information, goods, and services that can be channeled into the household (1974). Studies of political participation (e.g., Leeds, and Leeds, 1976; Cornelius, 1975; Collier, 1976) and of social integration (e.g., Lomnitz, 1974) imply or state explicitly the importance of formal and informal contacts for achieving power, securing goods and services, or eliciting promises from politicians.

A second aspect of networks as instruments concerns "open" contacts. By this term, I refer to contacts with informational or energetic aspects of resources not restricted or controlled by other persons or by unilateral contacts with impersonal sources in the environment. Much information gathering is achieved through idle conversation, barroom talk, overheard conversation, or by nonpersonal contact with such media as news ads, radio and TV broadcasts--the category of resources I have termed "loosely-coupled." Contact with resources in this category

is never discussed in connection with networks, even though acquiring such informational or energetic aspects of resources is a logical extension of the network concept and an important part of learning in the city. This subject will be taken up in later chapters.

D. Conclusions

This review of the literature shows that the transformational perspective builds on a number of themes and constructs developed over several decades of research and writing on squatters. The aim of this analysis has been to probe key aspects of the transformational perspective, and to take the study of squatter households one step further by re-examining implicit and sometimes separate themes, and recombining them to construct a new transformational model of households. In this model households are seen as self-transforming entities whose instrumentalities are articulated in a coordinated fashion. The underlying motive is the creation and holding of value in an environment filled with disorder, uncertainty, and risk. Although this review has covered old ground, it is guided by theoretical notions related to system theory which are quite new to the study of squatters. The perspective poses new questions and offers new clues to the study of ordering by squatter households. The following chapter examines the theoretical significance and utility of employing the transformational view in understanding squatter households.

CHAPTER III
THE CITY AS ECOSYSTEM

This chapter explains the theoretical basis for taking an ecosystem approach to the study of squatter households. Although there is some precedent for the application of system concepts in squatter research, no attempts have been made to extend these applications to explain individual actions in relation to the Second Law. The theoretical framework in the form of the ecosystem model discussed in this chapter concerns itself with the Second Law and with growth in open--what Prigogine calls "dissipative"¹--system. The purpose of this chapter is to explore ecosystem theory as a source of insight and guidance concerning the nature of urbanism and squatter household organization.

This chapter consists of three parts. First is a rationale for using an ecosystem model. Second, I present briefly some key features of ecosystem models noting the importance of energy, information, and transformational ideas. This brief survey raises a central theoretical question in this study concerning the hidden, that is, so far unexplored, rules of conduct that systems, and in the present case, squatter households, must use to survive--to secure resources from the environment, and generally, to steer themselves through the many uncertainties and adversities they face. Third, is a brief review of R. L. Meier's model of the urban ecosystem. His is the most appropriate and provocative ecosystems model of behavioral phenomena in cities. Meier's model serves as a point of departure for applying the ecosystem model to the study

¹ as discussed in von Bertalanffy (1968b: 141, ff)

of squatter households. At the same time, we shall see in this extension that some of Meier's conclusions concerning resource-conserving urbanism are challenged.

A. Rationale for an Ecosystem Approach

The reader will recall from previous chapters that this exploration began from two starting points, one, the empirical data and, two, the "fundamentals" of nature. The Second Law of Thermodynamics, established in the previous century as a fundamental, has long held ominous implications for living organisms and for civilization. 'Living systems' by definition produce negentropy, that is they "fight" entropic decay by means of selective interchange with their environments. Living systems extract energy while they "export" their own entropy into the environment. These negentropic actions enable the system to maintain integrity and to grow.

The notion of negentropic growth is at the core of ecosystem theory. Squatters do not merely maintain an equilibrium in the flow of resources. Many squatters convert resources into investments or other forms of value which represent net gains in resource flows. Conceptually and practically, ecosystem theory, and particularly the idea of negentropic growth, are well-suited to synthesize the many forms of growth exhibited in squatter households.

Net gains or growth in open systems is of special theoretical interest because growth suggests a reversal of entropic decay--that is, a reversal of the irretrievable dissipation of available energy and increasing disorder predicted by the Second Law. This point is of special importance. In fact, entropy is never reversed. Any exchange

of energy, information, or material between a system and its environment requires energy and involves entropic decay. This is unavoidable. But entropic decay may be kept to a minimum or "sidestepped," so to speak, by effective organizing within the system. For instance, energy may be imported so that entropic decay occurs outside the system, or energy may be used more efficiently. Thus, certain kinds of systems, such as "self-organizing," "purposive," or "living" systems effect negentropic or ordering action. These negentropic actions--the ordering necessary to import energy, for instance--must, at a minimum, be significant enough to sustain the flow of resources needed to maintain the system. Growth in these systems underscores the importance of negentropic actions. These are the chief theoretical considerations guiding this exploration of the processes of squatter ordering.

A further rationale for using an ecosystem model is that squatters, like all urban actors, interact with their environment in a way which changes both actor and environment. This interaction is fundamental to ecosystem theory. Its application to squatter studies will help redress some of the problems of conventional treatments observed in the previous chapter. Ecosystem notions also give special attention to energy, to energy conversions, and to information, all dimensions which are common denominators of the multiplicity of resource forms which circulate in the city. This enables one conceptually to encompass both informal modes of exchange and the workings of formal market mechanisms into a single framework. Both of these modes of exchange may be seen as different aspects of the same process in which resources are obtained and converted into different forms.

Finally, in addition to its theoretical value there is concrete, empirical value in employing ecosystem theory. The exploration of the transformational perspective, applied in the context of squatter households, provides the opportunity to explore new measures of resources appropriate to actions in the informal sector. The role of personal energies in maintaining a balance of resource flows and household survival, two concerns which are central in ecosystem theory, have rarely been applied outside formal sector situations where normally only conventional resource forms, such as fossil fuels, are taken into account. The ecosystem framework, bolstered by the thermodynamic perspective described in the present work, projects a view in which personal energies and personal knowledge, among other resources, may be examined in relation to survival of squatter households in the urban ecosystem. This view is especially appropriate in light of the prospective increases in demand for energy in Third World cities at a time when the cost of energy is steadily climbing (see Meier, Berman, and Dowell, 1978).² These prospects redouble the importance of the many forms of energy employed by squatter households. As we shall see in later chapters, exploration of the transformational perspective highlights certain energy-conserving practices of squatters and leads to insights regarding resource-conserving policy and technology.

²For a slightly different view of energy use among the poor see Cecelski et al., 1979.

B. Concepts of Ecosystems

A useful definition of ecosystem is provided by E. Odum:

The ecosystem, or ecological system, is considered to be a unit of biological organization made up of all the organisms in a given area (that is, 'community') interacting with the physical environment so that a flow of energy leads to characteristic trophic structure and material cycles within the system (Odum, 1969:262).

Margalef focuses on the material pathway which separates an energy source and an energy sink within such systems (Margalef, 1968:14). Positioned in various niches along this "pathway" are life forms of different types capable of converting energy and putting it to work. It is the attention to the relationships among these life forms, or actors, together with sensing and feedback mechanisms, which make ecosystems a useful application of the 'living systems' concept. Actors in ecosystems detect changes in the environment and, if necessary, are able to take responsive actions as well as to maintain structural integrity and to grow.

The idea of the urban ecosystem may be traced to Park (1916) and to later work of the Chicago School.³ Hawley (1950) revived and gave new meaning to the concept, and it has persisted in various forms, for instance, in Duncan (1960, 1969), Mumford (1961), H. Odum (1971), Holling and Goldberg (1971), Stearns and Montag (1974), Newcombe (1975), and Meier (1974a, 1974b, 1978, 1980). Only rarely has the notion of the urban ecosystem been explored explicitly in terms of the Second Law (e.g., see Meier, 1962; 1974b). We shall return to Meier's work in a

³ See Berry and Kasarda (1977, Chapter I) for a review of the historical development of the notion of urban ecology.

later section. In most urban ecosystems notions, energy, informational, and transformational dimensions are important elements of analysis and description. But usually these notions are analyzed at a macro-level, and for the most part the implications of the Second Law are left implicit. I shall show shortly how the urban ecosystem may be applied taking the Second Law into account at the micro, or household, level so as to complement the household model developed in the previous chapter.

1. Energy in ecosystems. Recognition of the importance of energy in social organization goes back at least to Ostwald, who, in the first decade of this century, proclaimed energy as the "sole universal generalization" (Ostwald, 1907:488). Although Ostwald was partly stimulated by an appreciation for the First and Second Laws of Thermodynamics, it was Lotka, writing in the next decade, who made reference to the idea of energy efficiency as an evolutionary principle (1922a). The importance of energy and thermodynamic efficiency in the organization of culture is described in detail by White (1949:367-8). More specific analyses of energy in particular (peasant) settings appear, for example, in Lee (1969), Rappaport (1971), Harris (1975) and Briscoe (1979).

In urban settings, the significance of energy, and energy efficiency, is difficult to take into account both conceptually and methodologically, partly because energy forms are so protean. Somewhat surprisingly, Zipf's Human Behavior and the Principle of Least Effort (1949) is a landmark work because it is not always recognized as a contribution in the analysis of energy particularly, or of urban phenomena. Zipf explored different aspects of efficiency in individual communication

(an economy of words) and in social organization (an economy of geography). Zipf presented a prolific amount of quantitative evidence to support his Principle, for instance in expressing the rank-size regularities of cities in terms of logarithmic functions. He was less thorough in developing causal explanatory hypotheses to account for these regularities beyond asserting, most plausibly in the case of word frequency, that these regularities reflected a propensity to expend the "least average rate of probable work" to get something done (1949:6).

Zipf's contribution is significant in several ways. First, Zipf dealt with "rules of procedure" in the economy of effort (1949:517), a subject which touches the matter of thermodynamic efficiency in social affairs. Second, Zipf's work became the foundation for a whole body of research by urban geographers and economists on the rank size regularities of city systems. The regularities in city distribution reported by Zipf are thought to be a result of systemic actions and "entropic" in the sense that city distributions are "most probable" (Berry, 1964:129,ff). Woldenberg speculates that rank-size distributions of cities, like other natural distribution systems, are the most efficient way to dissipate energy in open systems (1968:558).

However, no followup work was undertaken to extend Zipf's contribution to the understanding of organizing actions at a micro-level. Even with the onset of the environmental movement and the energy crisis, attention to thermodynamic efficiency and inefficiency in society has been focused at a detailed engineering level or discussed in abstract terms. With few exceptions the unit of analysis in tracing energy flows is at the level of major sectors in the economy, agriculture

for instance (Steinhart and Steinhart, 1974), or at the level of the metropolis (Newcombe, 1975; Meier, 1974a; Jackson, 1978); particular commodities (e.g., Hannon, 1977), and most recently in households (Cecelski, 1979, McGranahan et al., 1979).

The purpose of the analysis in the following chapters is to broaden this line of inquiry by examining efficiency of energy use at the level of the individual household. In a sense, the overarching hypothesis in the present endeavor is complementary to Zipf's Principle of Least Effort. The regularities Zipf observed may be seen as manifestations of a thermodynamic imperative to achieve economies in the use of energy. A similar imperative is seen as central in this exploration of squatter households seeking to negotiate environmental adversities and to create and preserve value.

2. Information. Most ecosystems theorists use information in a sense which traces its roots to Shannon and Weaver (1949). By their definition, information is a change in uncertainty, that is, a message which shifts an assignment of probabilities among a finite number of known possible answers to a well-defined question. As we shall see shortly, production of information in an ecosystem is linked to the process by which systems are maintained and perpetuated. Strictly speaking, information has no meaning. That is, in technical usage, it has none of the special significance we are accustomed to attaching to it in everyday usage. Rather, information refers to the amount of uncertainty removed by a message. Thus, information is defined in terms of a specified number of alternative outcomes to a well-defined question. In most field settings such specificity is neither possible

nor necessary. It is possible to think of reductions of uncertainty even if it is not possible to measure them quantitatively. In common usage, we may employ the concept of information to apply to situations of learning and knowing in the city.

Mumford and Meier have employed two such usages of information in urban settings which are illustrative. Mumford (1961) views cities as "organisms" which move in alternate rhythms of development. Growth is expressed in concrete material forms such as citadels, walled cities, and the like. At the same time, an inward, symbolic, organizational growth takes shape. Mumford refers to know-how, or technology, in a society. As know-how is applied to design and construction, resources are dematerialized, or "etherialized," to use a term Mumford borrowed from Toynbee. More is achieved with less effort. In other words, society learns new techniques to economize on its resources. "Know-how" is ordered and becomes available in the form of technologies which are codified, transmitted, and diffused into the culture. In turn, this know-how, a form of information, constantly interrelates with design and building and thus is used to make cities more efficient.

Meier also focuses on an informational aspect of knowledge in urban organization (1962) which leads to a form of efficiency. He stresses the growth of information processing capability which, he asserts, expands in step with the diversity and complexity of urban life. For Meier, transactions are defined as exchanges of information between actors. Transactions are the instruments of social learning in which uncertainties and risks are reduced and so wasted effort is cut down. In these exchanges, knowledge is expanded and refined.

Also, innovations are spawned with fewer failures. New options and new ways of doing things, Meier's "recipes," (and Uzzell's plays) are developed. Transactions augment and speed up the acquisition of knowledge about the city. All the while, knowledge and effort are conserved, further promoting the ability of actors to order their environment.

Thus, it may be seen that Meier's perspective on information as a building block in ordering runs along the lines that Mumford suggested in Toynbee's term "etherialization." Neither of these usages adheres very closely to the formal definition of information cited earlier. Both refer to ordering. Both point to the elastic quality of informational resources. Mumford and Meier thus link their usage of information to an economy of effort pertinent to the present study as we shall see later.

However, neither Mumford, nor Meier gives much attention to the applications of their use of information to ordering actions at a disaggregated level. It is important to explore the constraints and promises associated with an individual's acquisition of knowledge about the city and the mechanisms of transforming this knowledge so as to secure resources. Succeeding chapters will explore different ways that information--as a reduction of uncertainties--plays a role in the ordering of squatter lives.

3. Transformational aspects of ecosystems. The most important functional aspect of ecosystems models has to do with the interrelationship between energy and information in the process of growth. Ecosystems overcome the degenerative, entropic forces of nature.

To continue operating as a system, actors in ecosystems must generate a positive balance of resources which enables them to survive. In building and maintaining their structure, and in setting their boundaries and adjusting interrelationships, actors must constantly offset gravity, friction, and the inevitable decrease in available energy that comes with entropic decay--the tendency of the universe to slide into increasing disorder. In the present analysis of squatters, one challenge is to understand the operational logic or the rules of conduct mentioned above which give rise to negentropic growth.

The reader will recall that entropy was defined partly in terms of increasing disorder. Technically, entropy is a measure of the energy (in a closed system) available to do work and a measure of disorder (as in the degree of dispersion of molecules) (Schrodinger, 1945; Brillouin, 1949). As the molecular or chemical organization breaks down, available energy to do work, such as maintaining structures, also decreases. In lay terms, we may associate 'entropy' with 'disorder' and 'entropic' as 'disordering.'

Adams, one of a handful of social scientists who employ these concepts, reminds us that the idea of entropy originated in the study of closed systems, but that the concept of entropy may be useful heuristically even though societies, cities, and squatter settlements are far from being closed systems. What is significant for social sciences and urban studies in particular is the observation that certain living systems are able to control the degree of closure, achieving, in effect, "local islands" of order where energy degradation is temporarily delayed or reversed (always with the understanding that

energy must be decayed somewhere else in the creation and maintenance of this local order) (von Foerster, 1960). Delay or reversal of this disordering process, even temporarily, is said to constitute ordering or organization. Thus, conversely to 'entropic,' 'negentropic' denotes 'ordering' (see von Bertalanffy, 1968b; Schrodinger, 1945, Chapter VI; Koestler, 1967).

The presence of ordered systems is significant because building and maintaining structure requires a continual flow of energies. For instance, in social organizations, Etzioni takes as his starting point a state of "social entropy" in which "no special bonds are assumed and no social order is posited." His Active Society is then based on the assumption that "...the activation of the social potential" and "...the establishment of social order are unnatural" in that their introduction and maintenance require continual effort (Etzioni, 1968:95). In an economic system, for instance, entropic tendencies undermine the energies which drive the economic system (Georgescu-Roegen, 1972). Or, in economic geography, the "friction" of distance impedes the diffusion of economic activity and wealth across space (Berry, 1964).

Yet another entropic model may be seen in Blackburn's view of the Academe (1973). Blackburn has pictured the U.S. higher educational system in relation to thermodynamic considerations. Energy is required, he points out, to build educational institutions and to diffuse knowledge. At the same time, the knowledge produced by this educational infrastructure affects the whole of society.

It is argued that "islands of order," represented, say, by living systems, require energy and somehow reverse entropic decay. The relation-

ship between positive and negative entropy, on the one hand, and information on the other is discussed in Schrodinger (1945), Pierce (1961), and mathematically in Meier (1962), Tribus and McIrvine (1971), and by some ecosystems theorists (Margalef, 1968). One knotty problem in these discussions is the relationship between negative entropy and information. It is asserted that the two are at least conceptually equivalent (in Pierce, 1961). Others claim an even more rigorous relationship (Tribus and McIrvine, 1971). This problem arises, in part, because the concept of entropy has origins in two distinct disciplines, information theory (Shannon and Weaver, 1949) and before that, thermodynamics.⁴ Although this problem is not yet resolved definitively, the debate has focused attention on an important aspect of ecosystem theory.

For even if it is not possible to prove a mathematical equivalence between negative entropy and information, it is possible to grasp intuitively one sense of this relationship. Order and structure are created out of an environment, and this creation does require energy. The structure of the ecosystem, or of cities and social relationships, protects and promotes life within its boundaries. Lotka hypothesized that organisms that minimize entropic gain are those most likely to survive. He speculated that a criterion of energy efficiency forms part of the selection process in evolution (Lotka, 1922b). By extension, the question concerning the urban ecosystem--and squatters in particular --is how an urban order is achieved and how its achievement interrelates with economy in the use of energy.

⁴See Tribus and McIrvine (1971) for a discussion of these origins.

Zipf's Principle holds that the myriad of individual decisions in independent urban transactions all follow some underlying "least effort" motive and produce the rank size regularities he observed and Berry, Woldenberg, and others have studied. This theoretical question of regularities underpins the present exploration concerning a "least effort" principle in the operation of squatter households. The aim of the succeeding work is to explore the energy and informational dimensions in squatter actions. Squatters work out ways to minimize "least average rates of probable effort" based on what they can learn and find out in the city. At the same time, squatters produce negentropic effects, i.e., they order their environment, making succeeding efforts easier. Thus, it is supposed that squatter households achieve negentropic ordering by a combination of effecting economies in the use of their energies and in learning and ordering.

C. Meier's Urban Ecosystem

It is useful at this point to illustrate and to integrate the organizational and functional aspects of ecosystems by looking in more detail at Meier's version of the urban ecosystem.

In his book, Planning for an Urban World, Meier suggests that cities as ecosystems act like giant social reactors which "grow people." Individuals and organizations are linked together via networks which enable them to interact with each other and with resources in their environment. The significance of this interaction is that it produces an emerging quality: the accumulation of knowledge and the generation of a negentropic gain. The negentropic idea is important, for it

denotes much more than social learning. All the energies expended in the building of urban structure, as well as in the learning, will be more than offset by the gains society realizes from incorporating learning into the conduct of its affairs. Negentropic payoffs are realized in many ways. Technological innovation in communications, for instance, permits more and easier social intercourse (that is, more transactions at a lower energy cost). Research may suggest new legislation or administrative rules which tighten up on efficiency or avoid calamitous mistakes. Better sensors can forewarn of disasters and help cut losses in times of catastrophes.

A chief insight brought about by Meier's living system paradigm is in visualizing how the needs for resources are filled in metropolises. Fuels and materials, for example, are needed to maintain and repair what has previously been built, both physically and socially, as well as to build new structures. Maintaining this flow is not merely the economic problem of finding the cheapest fuel. It is an ecosystemic problem of survival, for no matter what technology is employed, all fuels degrade. As we have noted before, consuming energy increases entropic decay, gradually bringing about an irreversible drop in the level of available energy in the system. This is not a problem in abstract theory. It is clearly illustrated in the so-called "energy crisis" of recent times. Industrialized nations are awakening to their dependence on fossil fuels. Developing nations have suddenly discovered yet another evil of reliance on foreign technologies. Both are seeking new sources of savings in conservation and in new or alternative technologies.

Thus, Meier invokes a thermodynamic rationale for his focus on transactions as the mechanism of social learning. The reader will recall that transactions are exchanges of information among people, singly, or in organizations. After these exchanges, the seeds of learning, innovation, and diffusion take hold. New options are opened up and new "recipes" created. Transactions augment and speed up the acquisition of knowledge about the city. Thus, negentropic learning increases in cities.

The key assumption underlying Meier's ecosystem model is tied to his thermodynamic rationale. The assumption is that decisions by actors in the urban ecosystem conform to some least-effort rule obliging actors in the urban ecosystem to make the most of their transactions. However, in Meier's work, this assumption regarding city functioning is left implicit. In other words, it is assumed without discussion that individuals in Meier's urban ecosystem will make decisions, each in their own way, each largely uncoordinated from the rest, so that, at some aggregated level, energy efficiencies are achieved in carrying out the business of the metropolis. Over time, and given experimentation in trial and error, together with occasional outside assistance, cities and societies may be kept on a course which steers clear of large mistakes, or when disaster does strike, to recover quickly.

Planning for an Urban World is devoted to extending Meier's sophisticated vision of urban reality to the problems of Third World cities during the rest of this century. But in critical respects--concerning the role of energy and learning at the individual level--the theory

has not been tested, leaving some applications inconclusive or even vulnerable to contradictory results.

Meier concentrates on information to the exclusion of energy flows. Meier speaks of energy but he does not relate it to the generally elastic quality ascribed to information. Personal energies are ignored. Because Meier's analysis is aggregated at a macroscopic level, interpretation of these ideas in terms of individual actions is seldom discussed. Perhaps the most serious shortcoming in Planning for an Urban World is that it takes cities or organizations as the unit of analysis without seeking implications at more specific, disaggregated levels. Although he proceeds methodically in chapter after chapter of example and analysis testing this theoretical construct against the evidence of cases, it becomes apparent that the high level of aggregation cannot in itself warrant conclusions drawn about micro-level behaviors, that is decisions and actions of individuals in the urban ecosystem.

It seems apparent from Meier's arguments concerning transactions and negentropic gain that a logic which I have referred to earlier as survival logic, is in operation. This logic is designed to fight what Koestler (1967) calls "the ghost in the machine," that is the entropic imperative which establishes a limit on mechanical efficiency.

By inference, this logic ought to be observable among individuals making decisions in their self-interest, as opposed to the interests of metropolis survival. Yet nowhere are the tenets of this logic specified or tested. The decisions and constraints at the level of individual squatter household, for instance, ought to reflect a survival strategy,

a learning to use energies and information to offset the effects of entropy gain. In other words, the corollaries to the principal axioms of the urban ecosystem ought to be observable at the individual level, yet this potentially rich area of urban ecosystems has been ignored.

Ironically, the conclusions drawn and policy recommended by Meier promote high technologies in communications and industry for reception by "open" metropolises. The most advanced production and marketing knowledge can "most quickly be put to work by collaborating with multinational corporations" (Meier, 1974:385).

The irony in this prescription is that, at the level of individual proletarians, it leads directly into the formula for marginalization articulated by many researchers who see the poor vulnerable to "openness" in the system, subjecting them to class and economic constraints which impede their ability to gather and transform resources. It is in this sense that the aggregated level of Meier's analysis produces questionable and possibly even contradictory results. For if negentropic properties are in operation among the urban poor, then Meier's analysis bypasses and his prescriptions disfavor the very mechanisms he pretends to value: the negentropic properties of urban ecosystems. In fairness to Meier, it should be made plain that his is an original contribution generating new insights and opening new lines of inquiry. Meier has accomplished his task by stimulating the types of questions I have posed here. This exploration is a step in the direction of furthering this theorizing--of testing, completing and, where necessary, revising his model. In the following chapter, I turn to the task of resynthesizing

the principal features of the ecosystem model in terms of the squatter household.

D. Koestler's Ghost in the Favela

The body of ecosystem thinking is suggestive and provocative and it serves to guide inquiry into certain aspects of squatter social organization not heretofore explored. At the same time, the ecosystem constructs investigated here go only so far. They are limited by the lack of experimentation and searching for elements of urban reality which logically correspond to the principles many scholars have adopted to theorize about social organizations. In this chapter I have tried to show at pertinent points where ecosystem ideas appear to bear on the question of squatter life. I have noted that the single most advanced interpretation of urbanism, R. L. Meier's version of the urban ecosystem, looks beyond individual actions and leads to contradictory policy regarding the urban poor. Nevertheless, Meier's version of the urban ecosystem serves well to illustrate the concept of transformations. The time has come now to translate this concept into the observable reality of squatters. The question now becomes one of understanding how favela households are guided to avoid or offset the favela equivalent of Koestler's "ghost." How do households achieve the negentropic transformations referred to in Meier's and others' versions of the urban ecosystem.

CHAPTER IV

FAVELA HOUSEHOLDS AS ACTORS IN THE URBAN ECOSYSTEM

The outlines of ecosystem theory reviewed in the previous chapter set a framework for analysis of squatter behaviors. This chapter defines a working model of squatter households within the ecosystem framework. The objective in the following sections is to interpret key features of ecosystems, particularly transformations, in terms of everyday household experience so that we may test this new model against empirical data. The chapter includes descriptions of the ecological contexts of two favelas from which household case studies, which appear in succeeding chapters, will be drawn.

A. The Question Rephrased

The question at the origin of this exploration is now expanded in its theoretical significance. The generative character of favelas implies a systematic ordering in the sense that the openness of the system in which squatters operate and which leaves them vulnerable to the predations of the larger system is somehow controlled. Mechanisms are set into place which compensate for or help offset the disadvantages of poverty, uncertainty, and class. Accumulation of material resources, seen from the ecological perspective, signifies that squatters are fabricating a structure which is negentropic and which permits them to create value. The analysis now seeks to explore elements which shape household decisions and to identify commonalities in everyday decisions which build up this order, allowing squatters to economize on their efforts, to gather resources, and to protect

their holdings. To go further now requires refinement of the model of households so as to reflect key features of the ecosystem model and at the same time incorporate "instruments" of household transformations.

B. Household Model Refined

The reader will recall from Chapter I that households are taken as the unit of analysis. This choice follows the reasoning of Wolf (1966), Bender (1967), and Leeds (1974). Household, rather than individual, or family decisions and actions are more appropriate for analysis of resource manipulations because households act in a corporate fashion to gather and transform resources. The household is a budgeting, and economic decision-making, social group which gathers, consumes, and expends resources while interacting with other decision-makers in the environment. Household members are usually, but not always, related as kin, who share a domicile or building and sleep regularly there. In most cases households consist of whole nuclear or pieces of extended families, but occasionally households join forces, as we shall see, and others admit, or are comprised of, nonfamily aggregates.¹

Households interact with other households, businesses, associations, churches, politicians, government agencies, social welfare organizations, samba schools, individuals and so on.

The environment of households refers mainly to the local favela, but also, as Leeds points out, to the "supralocal" complex of social, political, economic, and technical specializations which interlock and make up the fabric of the city (1973a). Municipal, state, and

¹Proportions vary from favela to favela but nonfamily aggregates in the Leedses' data usually comprise well below 10% of the total.

national factors also have influence through such means as official policy regarding favelas, housing, employment, and inflation. As well, natural factors such as geography and climate play a role in shaping the environment. Rains, flood, and terrain all figure into the functioning of households. In short, the environment consists of the total natural and social milieu surrounding households.

It is assumed, consistent with ecosystems theory and some conventional views reviewed in Chapter II, that the basic objective of households is "survival." This means several things, but most important is that households meet their day-to-day physical requirements for food, water, shelter, and disposal of wastes. Leeds's description of household needs and objectives, cited earlier, is appropriate here. The household as a budgeting unit has the task of allocating its resources "...to an array of ends in different proportions, giving priority to some, playing down others, and putting off still others altogether, if possible" (Leeds, 1974:75). It is assumed that the weightings of households vary widely in accordance with the prevailing environmental circumstances and the capabilities and idiosyncratic needs of individual households.

The review of the squatter literature in Chapter II concluded that the household system consists of four interlocking aspects or instruments: membership, resource inflows, resource outflows, and networks of exchange. Each of these aspects is regarded as an instrument in that each can be used in a given household in different ways to achieve household objectives. The manner of using instruments depends upon the collective knowledge and energies in that household. In turn, the manner of use determines the level and kinds of resources brought into the household.

For instance, it takes effort and knowledge to raise and educate children, to find jobs, and to find good prices on needed items. Similarly, it takes effort to maintain network links, often the source of further resources.

The problem for squatter households is one of balancing the effort of acquiring resources with the expected payoff yielded by the resources they do gather. In Chapter I was described a continuum of availability of resources reflecting different degrees of ease with which resources may be acquired. The environment of squatter households, despite the adversities and problems of scarcity, is awash with resources potentially useful to a household's survival. Some of these resources are easily obtainable, others are not. The trick for households is to find a mix of resources obtainable in different degrees of difficulty, and to transform them into something useful. There are uncertainties associated with the utility of every resource, but especially so with "loosely-coupled" resources. For the most part, "tightly-coupled" resources, although reliable and potentially rich, are by definition hard to come by.

The bits and pieces of loosely-coupled resources in the environment may be easily obtainable, but they do not always "fit into place." At first they may appear to be trivial or extraneous. "Knowledge about" the city can come in small unconnected bits. Noncoherent bundles such as "secrets," tips, hunches, odd ideas, perhaps chance observations all tell something of truth to a householder. But, odd shreds of information (knowledge) about the city can be tied together in a large if not infinite number of combinations. For the individual, in a given time or place,

such knowledge may have no immediate referents, no obvious implications. Informational aspects of resources may not be logically tied to other pieces of knowledge to fit together and form some recognizable whole as, for instance, might a samba dance fit into the larger pattern--samba school--and further, into the power structure of the community.

The task for squatters may be seen in terms of fitting loosely-coupled resources together into a larger whole. This involves testing resources for validity and utility and gradually building up knowledge about the city. For instance, a newly arrived migrant and potential squatter, while drinking in a botequim (a pub or bar), overhears someone mention a vacant shack available in a certain location in the city. Although this bit of news is easily obtained, there are many uncertainties about it. Does the shack, for instance, actually exist? Is it vacant? If it is vacant, is it viable as shelter? Most important, is it free from harassment by authorities? To reduce these uncertainties requires much more learning about the city. All of this learning comes at a cost.

This example is analogous to the problem of reducing uncertainty in Uzzell's concept of "plays" (Uzzell, 1972; 1973). Plays are defined as moves, actions, or steps that can be taken by actors toward some goal. In Uzzell's usage, plays may be said to consist of small pieces of knowledge. To take an example from Uzzell, consider the plays facing a newly arrived Quechua migrant to Lima:

At first, he is faced with a suddenly depleted play lexicon [repertoire]. He may not know how to find food, clothing or shelter. Plays exist for him, but they are not arranged in categories that are called forth by the environment. He will make what use he can of the alternatives he perceives.... During the initial period, plays are added very quickly (in whatever manner). This is a condition of extremely high uncertainty [entropy or disorder] (1972:24).

The task at hand, in this case for the migrant, and more generally in squatter situations, is one of reducing uncertainty, that is of creating information. This task may be expressed in the amount of energy required to find, carry out, or correct a play. To return to Uzzell's example:

Even after a play has been added, it may for some time exhibit high internal entropy [uncertainty]. Over time, however, uncertainty will diminish, especially in the plays that are used. Gradually, entropy throughout the lexicon [repertoire] will be reduced... (Uzzell, 1972:24).

The phrase "over time" involves much more than just chance events or fortuitous encounters in which all squatters would have an equal chance to emerge with play lexicons equally reduced in entropy. It is obvious that work is involved, in the first instance, to find plays. More energy still must be expended in the trial-and-error method to test their efficiency, to make modifications, or to create new plays altogether.

In still another way, energy is involved in the work of organizing and politicking to change the shape of local situations in order to arrange favorable outcomes or otherwise increase householder's chances of survival. In short, like information, an energy dimension ramifies into every aspect of household existence. Moreover, energy and information are inextricably intertwined. However, of the two resources, energy is the more constrained.

In the first place, although personal energy is highly subjective, there is a more or less fixed metabolic limit on personal action. Information on the other hand can be expanded. Second, the energy of personal effort cannot be stored and accumulated as easily as information, and when it is stored, as in the built environment, the energetic aspects of resources cannot be retrieved from the environment. In addition to the metabolic limits, there is also a limit on time, meaning that opportunity costs must be considered. People must constantly decide what is the best allocation of their time and effort from among competing demands. For example, squatters like everyone, must decide to what point efforts to confirm, say, accuracy of information in tips, hunches, and "plays" will advance their goals more than, say, efforts in building their own housing. The myriad of everyday decisions for squatters, or for any group subject to scarce monetary resources, must be made to best parlay those resources they do have (personal effort, personal knowledge) as they search for ways to economize.

This ecosystem model of households suggests that the degree to which uncertainties are reduced depends upon the above-mentioned allocational decisions, and also on the alacrity of households in wielding their instruments -- to hustle and parlay resources and to be aware of alternatives. Those households that meet all their needs by conserving on energies and drawing upon the relatively expandable, i.e., informational, aspects of resources in their environment, naturally will have an edge. However, transformations are not simply a matter of substituting information for energy. Personal knowledge and personal effort have a reciprocal effect upon each other.

To summarize this model of households, living in the city may be viewed as a game consisting of households struggling to survive by exploiting a given minimum, but expandable, resource endowment. Some resources are easily obtainable but of dubious utility. Other resources are tested (more certain) but more difficult to obtain. In their highly uncertain environment, squatters must deploy their personal energies carefully so as to derive the greatest payoff from the resources they acquire. It is to their advantage to play the urban game in a way which maximizes their information payoff--to acquire the highest possible knowledge about the city at the lowest possible energy cost. The ability to secure value depends not only upon the alacrity of households to contact and make use of resources, especially informational aspects of resources. Also it depends upon the ability to recognize and maintain a balance between plays representing tightly-coupled resources which are more certainly useful, and bits of loosely-coupled resources which are easily obtained but whose utility is uncertain. All the while squatters, like everyone else, must economize on energy use.

C. Transformations

From this description it is evident that transformations occur everyday, in many ways, large and small in all households. Transformations are a part of the learning process and part of the process of eking out a living. Whenever an individual hits upon a new idea, or makes use of a stock of existing knowledge about the city, or for that matter, enlarges his or her personal store of knowledge, a transformation occurs. Some personal effort has to be expended to

observe, test, and record this change in certainty. This intertwining of energy and information is illustrated for example, when a given material resource, a packing crate, for instance, designed with a specific function in mind, is adapted by squatters for use as roofing or siding on a house. The knowledge represented in knowing its whereabouts and availability and the energies required to find and install it are the elements of a transformation. Information, energy, and materials are recombined. Resources are taken from the environment and converted to serve wholly new and valuable ends.

In transformations may be seen the elemental mechanisms of resource-conserving practices. When individuals create and make use of resources, they are effecting a form of productivity never counted in national accounts or cost-benefit calculations in housing or community development (compare with Frankenhoff, 1967). Not only are capital stocks created in these transformations, but resources are also conserved. Conventional solutions to the problem of housing shortages, for instance, would require resources to be developed from more elemental forms, sometimes involving foreign exchange or other scarce national resources. In other words, squatter transformations earn a premium by yielding extra utility while the entropy gain, compared to conventional solutions, is relatively small.

D. Negentropic and Entropic Transformations

We are now ready to propose a workaday interpretation of negentropic transformations in the favela. Throughout the discussion of resource transformations in households ran the implication that a stream of resource expenditures runs parallel, but in the opposite direction,

to resource gathering. Informational and energetic aspects of resources are recombined, for example, as resources flow in and out of households. When households maintain a positive net balance in the course of their transformations, they may be said to be negentropic. That is, they build up a stock of knowledge about the city. They may also build up other forms of value. Negentropic gain may take the form of knowledge, learning, status, or capital. They may also be measured in the form of increases in housing quality, cash, consumer goods, diet, etc.

Case studies presented later will suggest that at any given moment, households may be placed on a "social entropy spectrum." On one, negentropic end are households which produce a positive net balance; on the other end are entropic households, those which are unable to retain a corporate character. These households split up, leave the city, dissolve into other households, or move into different, possibly slum quarters. In negentropic households, a positive balance of resources --knowledge, material, capital, or other resources--is generated. In practice, favela populations are likely to display degrees of negentropic balance because capital investment is required to enter in the first place. The place of a given household on this spectrum changes over the domestic cycle and in accordance with other outside forces which are discussed in succeeding sections. Households which may be entropic, i.e., unable to sustain surpluses at one time, nevertheless, make transformations as a part of day-to-day living, even if they are "losing ground." They may be negentropic later on. For instance, some favela households may find it necessary or advantageous temporarily, to operate entropically, for example, when recovering from a death in the family.

Analogous distinctions may be made between entropic and negentropic favelas. The ecosystem model suggests that households interact with, and are conditioned by, the resource environment of which households are a part. The collective knowledge and efforts of residents are sometimes coordinated as in favela residents' associations. Households draw upon their collective resources in the favela as well as upon resources from jobs and network links outside their immediate environs. Uzzell has suggested that a dynamic, self-reinforcing system, to be discussed further in Chapter VIII, can sometimes be set up which promotes a community character (1974). Favelas exhibit negentropic character in associations, community activities, and housing investments all of which, to one degree or another, involve reductions of uncertainty.

The remainder of this chapter is devoted to the description of two favelas, each in a different entropic state, studied by the Leedses. Alto Solar was relatively well-ordered, as will be evident, in comparison to Ruth Ferreira. Located on opposite ends of Rio, the two settlements were both jurally illegal and consist or consisted of substandard, irregular housing. The different organizational character of these favelas presents markedly different environments for the households in them.

Succeeding chapters examine a number of households in these environments from the point of view of the transformational perspective. First (in Chapter V), three households, two of them operating as a quasi-joint economy, are examined. Each is at a different point on the social entropy spectrum. These cases illustrate differences in the use of instruments and divergent strategies of ordering. Next

(in Chapter VI), a negentropic household is examined as it moves through different phases of life, one involving a stay in the entropic environment of Ruth Ferreira. This case enables us to examine how a long-term strategy is supported by shifting the use of instruments to compensate for shifting uncertainties in the environment. Chapter VII will explore these instruments in quantitative detail.

E. The Empirical Setting of Alto Solar

Before it was eradicated in 1970, Alto Solar was a settlement of some 96 houses located in the South Zone of Rio, technically a part of the administrative district of Gavea. The first settlers took up residence on the hillside behind the Solar Apartments (hence the favela name) sometime in the early to mid-1950's. The steep hillside rises some 600 feet on the northern flank of the Pedra dos Dois Irmaos, a large rock upcropping visible from many points in Rio. The residential and small commercial establishments (markets, gasoline station, drug stores) clustered within two blocks of the settlement serve the largely middle-, upper-middle, and some upper class houses and apartments that surround the immediate area. A large sanatorium and the Catholic University (Pontifica Universidade Catolica) are barely a bus stop away. The favela was located across a drainage canal at the end of a one block street just off the present major southerly route connecting the South Zone to the coastal highway, and further south, Barra da Tijuca.

Employment was both accessible and plentiful as commercial, industrial, and recreational establishments were all found in the area. This was true particularly near the lagoon, where various industries-- Coca Cola, laboratories, commercial cleaning firms, and other factories-- took advantage of available land and reasonable access to other areas of Rio. A number of favela residents were employed at Sudamtex, a large textile plant within walking distance of the favela. Women found employment in the commercial laundry and as domestic servants in wealthy homes in Gavea, Ipanema, and Leblon. Some women were employed in the Solar Apartments, less than 100 meters from the favela. Major bus routes passed within a block of the favela providing frequent and regular access to posh residential and commercial businesses in the surrounding areas. Many employers in the areas, for instance Sudamtex and Coca Cola, were easily reached on foot. In addition, nearly a quarter of the households reported some form of agricultural activity: fruit trees, vegetables, and even animals could be raised easily in the hills behind the favela.

A former president of the residents' association spoke with pride and satisfaction about community life in Alto Solar. The residents built their own facilities such as waterpiping, drainage, concrete steps, a sewerage main, electrical hookups, and even a community center. An early project was a school built in 1961 with the help of a local politician and donated labor from the community. The former president maintained that there was no profiteering in Alto Solar. A former neighbor corroborates this view, declaring that Alto Solar housed

"good people, very few 'vagabundos,' not like Rocinha" (a giant favela nearby).

The favela resident's association was active for more than a dozen years. About half of the households interviewed by the Leedses claimed some linkage to the association, most of them saying that the association controlled light or water connections and coordinated favela improvements. A number of residents mentioned the association in connection with improvements they contemplated for their own property (for instance, approval was needed for water hookups). Leeds reports that the president of the favela association was "a very capable administrator, a good wheeler-dealer and a good mediator."² A taxi driver and sometime chauffeur for the School of Social Services (Escola de Servicos Sociais) of the Catholic University. He was able to make good use of his contacts in the service of the favela as a whole. He was instrumental, for example, in mobilizing resources from the School of Social Services.

Partly as a result of his work, Alto Solar was selected as a practicum site for students in the School of Social Services. Many of the physical improvements and some of the political and social activity in Alto Solar were attributable to the efforts of well-placed social workers and their students who could carry the struggle, so to speak, to the desks of bureaucrats. The fruits of their efforts were sometimes free goods and services such as emergency assistance in the forms of construction supplies, meals, loans, and other relief

²Personal communications.

items, such as clothing and blankets after the heavy rains in 1966. At other times, services they helped acquire were beneficial but involved costs for residents. The installation of electrical power by the State Energy Commission (Comissão Estadual de Energia) was an important improvement although hookups required fees, a surcharge, and labor from residents. Then again, some of their efforts were questionable, and could even be viewed as retrograde. For example, with support from the head social worker, the favela school was closed to eliminate a source of "segregation" of favela children from children elsewhere in the Gavea district.

Although there was some pressure from wealthier neighbors to remove Alto Solar, it was not until January of 1970 that the Guanabara State Department of Streets and Highways ordered the removal of the favela. This action was taken under the dubious pretext that the favela land was needed for public use ("utilidade pública") for the construction of a tunnel connecting Gavea to the coastal highway. The favela was situated on a hillside adjacent to the mouth of the tunnel. The residents were moved to a housing project in a part of Rio called Cascadura, some 45 minutes from downtown Rio (and 90 to Leblon) by public transport. The move thus extended by a large factor the time required to get to their jobs, reducing opportunities for odd-jobbing, and obligating residents to expend one or even two bus fares, whereas before they were able to walk to most work places in 5 to 30 minutes.

F. Ruth Ferreira

Roughly the size and age of Alto Solar at the time of the Leedses survey, Ruth Ferreira was in most other respects distinct. Moreover,

Ruth Ferreira survives today as a favela in the form of a thin ribbon of houses resting squarely on the nonexistent official street of Ruth Ferreira in the heavily industrial North Zone district of Ramos, about 13 kilometers from downtown Rio. Ruth Ferreira is located in flat, densely populated terrain immediately adjacent to, and bordered by Avenida Brazil. This major thoroughfare forms the north-eastern boundary of the favela as it extends out from the heart of Rio. It eventually becomes a national highway connecting Rio to the other cities in Brazil. When this route was widened to six lanes, the area surrounding the favela experienced a spurt of growth, increasing the industrial and commercial activity in the area and raising land values. The favela backs up upon other residential working-class housing on the south-west and is sharply demarcated by concrete walls of an adjoining private residence on the south-east, and on the north-west by a cinder-block wall built by the CIFERAL bus-body assembly plant. The 30-odd shacks which remain in the favela in 1977 when I visited it are shabby and run down, much as they appeared during the Leedeses' study, showing little or no evidence of repair or new construction.

From the point of view of employment, Ruth Ferreira is well-located. It sits amidst a crowded industrial and commercial area of large and small factories, foundries, shops, auto body repair facilities, assembly plants, and their supporting service industries--parts suppliers, warehouses, wholesalers, restaurants, and transportation enterprises. Heavy trucks and commercial vans dominate the vehicular traffic. Workers in industrial uniforms, including those of CIFERAL, circulate through the area passing to and from work. A number of residents

of Ruth Ferreira work next door at CIFERAL. Many others work in similar factories nearby. However, in contrast to Alto Solar, overall income is lower, and domestic work for residents of Ruth Ferreira does not involve the level of personal patronage, favors, and nonmonetary income that comes with domestic service in Leblon or Ipanema.

CIFERAL dominates the scene as it has since the Leedses interviewed there. The plant has constructed a seven-foot cinderblock wall, barely three feet behind the single row of remaining houses in an apparent final resolution of the land struggle which has lasted more than 10 years. Some residents speak with sharp irony of the predatory intrusion of CIFERAL, whose drive for land was abetted by the laissez-faire attitude of government which, in turn, received ever-greater tax revenues as CIFERAL expanded. Other residents, who once regarded the company with distrust, now speak of the CIFERAL in positive terms, seeing it in a paternalistic light as an entity which employs them and pays them indemnities. The most recent and probably last of these occurred before the wall was built in 1977.

There has never been a favela residents' association in Ruth Ferreira. The only evidence of communal action followed one of the intermittent fires (some originating in CIFERAL) that destroyed part of the favela. Numerous residents signed a petition to appeal for help in restraining CIFERAL from fencing off burned-out areas for its plant expansion. Fires were fought at least twice at CIFERAL in 1966-67 alone. Each time, burned-out pieces of the favela were fenced off by CIFERAL. Moreover, aside from the efforts by local residents, no attempts were made to save favela houses from the blazes. Over

the years the housing stock degraded. Little evidence of maintenance or repair is visible--no new paint, little or no new materials, and no communal facilities. Interior furnishings, however, are substantial. Televisions, new stoves, and refrigerators are seen.

An additional factor depressing prospects for capital improvement is the lack of drainage. The improvements of Avenida Brazil left the area without drainage, thus subjecting it to periodic flooding and standing sewage.

Ruth Ferreira looks very much like a way station, a holding place for people who have landed there for reasons of fate or choice, waiting for a break. Although their perch is now probably secure, several residents report a desire to move to a nearby Parque Proletário, a once "temporary" but now aging housing project which they see as more advanced, more expensive, and a step up in terms of status.

Municipal and state authorities have probably let CIFERAL and the favela residents fight their own territorial battles, preferring a private solution to public action. CIFERAL thus carried out its own indemnification program, buying out residents who had squatted on land appreciating rapidly in value. The dramatic increase in land values following the highway improvements gave CIFERAL new incentive to rid themselves of pesky squatters and to capitalize on their locational advantage. Now the process has reached a logical conclusion as far as CIFERAL is concerned. The company has burned out or bought out all the residents up to the municipal street of Ruth Ferreira.

G. Comparing Ecological Settings

The contrasting contextual factors surrounding these two favelas are shaped by distinct geographical and historical circumstances, just as the residents who comprise them reflect, interact with, and, as I shall show later, reinforce certain aspects of their surroundings. One important distinction brought out by Leeds is "... the considerable correlation between type of labor market and the development of squattments as a whole" (1969:75). Leeds saw Alto Solar as a "well-developed and orderly place" partly because of the South Zone labor market which offered a wide array of employment opportunities.

The competition for land was another important factor in the immediate ecology of both favelas. Although the uncertainties about removal were felt by both communities, it was much more immediate and made evident to residents in Ruth Ferreira who could witness CIFERAL burn or continually buy their turf, bit by bit. In Alto Solar, on the other hand, the tunnel road, which eventually spelled the end for the residents there, had been planned for years, but it had also been long-postponed, and so prospects for removal seemed more remote. Ruth Ferreira is the type of favela which "appears to have stagnated physically." In Leeds' words:

The immediate ecology of these types of *barriadas* and favelas (of which Ruth Ferreira in Rio, which we have intensively studied [is] an excellent example) appears to be a major factor. There is no room at all for physical expansion or for the development of an economic infra-structure, without severe dislocation of a large part of the inhabitants... (Leeds, 1969:76).

In addition, various forms of outside assistance especially the workers from the School of Social Services enhanced resources in Alto Solar. As a consequence, Alto Solar showed signs of flowering.

Compared to Ruth Ferreira, the stock of housing was better--more houses were in advanced stages of completion, and they were more cheerful, more durable. A larger proportion of the wooden houses was painted. More brick was used and more of it was "finished" (plastered), compared to Ruth Ferreira. Several households were buying suburban property whereas none had reported doing so in Ruth Ferreira. Community infrastructures were well-advanced in Alto Solar and practically non-existent in Ruth Ferreira.

Running parallel to these differences, and interacting with them, were differences in the respective populations which extended comparative advantages into tangible improvements. On the whole, many more households in Ruth Ferreira (26%) were composed of singles or nonkin members than in Alto Solar (6%). Also, residents in Alto Solar had lived longer in their favela than their counterparts in Ruth Ferreira. Eighty percent of residents in Alto Solar had lived there for over four years, whereas in Ruth Ferreira, nearly half the households had been there less than three years. The fact that far fewer households in Ruth Ferreira consisted of nonfamily or singles underscores the transitory image of Ruth Ferreira in comparison to the more stable Alto Solar.

Although the favorable conditions in Alto Solar eventually vanished, they were sufficient to stimulate forms of organization and order that could help to take good advantage of resources supplied by the social workers. No such forms of order were visible in Ruth Ferreira. The uncertainties engendered by CIFERAL, together with the unfavorable setting with respect to drainage and fire, not only repelled investment, it undermined efforts of organization, elevated the risks of investment,

raised the cost of learning, and perpetuated the depressed character of Ruth Ferreira. These observations are explored further in Chapter VIII.

These contrasting ecological settings set the stage for case studies showing how different households perceive and manipulate resources in their environment. The following three chapters explore the household model further by describing and comparing households at different points on the social entropy spectrum, illustrating differences in capabilities of coping with different environments.

CHAPTER V

SQUATTER HOUSEHOLDS IN A FAVORABLE ENVIRONMENT--

The Cases of Paula and Jose, and of Rosa and Antonio¹
in Alto Solar

This and the next two chapters test the transformational model by exploring how different households operate in diverse contexts. The cases seek to identify those factors which are shared and those which are idiosyncratic among households as they learn about, gather, and transform resources. How do opportunities offered in favorable settings get taken up and exploited? How do households wield their instruments, and how is it that some households find and make use of opportunities, and compensate for adversities, while other households in similar settings do not? In short, the question to be addressed in these cases concerns the means of coping with an open system-- of bringing closure to protect well-being, offset adversities, bring about order, and create value.

The two households to be described in this chapter are chosen not because they represent midlines of the collection of households in Alto Solar, but because they illustrate a range in the power to acquire resources and different strategies of transforming those resources they do get.

¹ These names, and all other names of persons in the cases in this and the following chapters, are pseudonyms. The cases are described in the present tense for clarity and ease of reading even though most of the data were gathered over 10 years ago.

The first case is actually two households operating in certain respects as a joint economy. Paula and her brother, Jose, share a large, relatively sturdy, five-room structure which Jose has purchased and which they jointly improved. They have divided the space not quite equally in terms of square-footage. The spatial difference is offset by the facilities of their respective quarters. Paula has less room but more amenities (an inside toilet). They each have a kitchen, although neither has a sink, and each cooks on his or her own kerosene stove. Each also provides groceries separately.²

The second case consists of Rosa and her son Antonio who occupy a small, three-room section dug out under and tucked beneath a larger building not far from Paula and Jose's. Two other households, one of them that of the president of the favela association, occupy the building. Both Rosa and her son work. Although little information is available as to his wages as a mechanic, with her wages alone their per capita income is greater than that of Paula and Jose's households. Their respective manners of using resources however, differ markedly.

²The extent to which the two households should be treated as a single economy is unclear. Although Jose purchased the house and joined forces with Paula to repair and enlarge it, there is also reason to regard their joint undertakings as limited. In the first place, the house was split up into separate living quarters. Second, there is no evidence that they share cooking functions, a sign of consolidated, joint-householding according to Lomnitz (1974). The food budgets are independent of each other and, further, differ markedly in types of items purchased. Slightly less than 25% of Paula's food budget goes to meat, for instance, while in Jose's household, meat amounts to nearly 45%. Last, each of the households have expenditures and incomes quite independent of the other.

A. The Case of Paula and Jose

Paula, her mother Flavia, three children, and a boarder share two rooms in their section of the house. Paula, almost 30, migrated a year earlier than her mother and Jose from Alagoas State over 15 years ago. They came to live with another of Flavia's daughters who was the first of her family to come to Rio. Paula's sister settled in the giant favela of Rocinha, and now lives in another favela. Flavia is now 68 and although she has no job at present, she does get a pension, and her skill as a seamstress, an occupation she has practiced more than 30 years, helps in clothing the family now. The three children living in the household are all of school age, ranging from eight to 12. The oldest boy, just 12, already contributes to the household enterprises by doing biscates, i.e., odd jobs, in this case working irregularly as a mechanic's helper. He earns enough to cover some incidental expenses--or in Paula's words, "to pay for haircuts." All the children are in a private school outside the favela and one of them was awarded one of the five government scholarships offered for the school. The children's education is important to Paula, a value she evidently inherited from her mother.

The attainment of secure employment is some reward for her and her mother's efforts to get Paula through three years of high school after she was already into her adult years. Her skills as a nurse-paramedic in a veterans' clinic in Laranjeiras (a section of central Rio) seems to encourage her interest in educating her children. So too must her mother's complete illiteracy stand as a benchmark, a measure of her own progress, as well as of her ambition for the children.

Because she works full-time six days a week and sometimes a seventh day when there are operations in the clinic, Paula has brought a young woman boarder into the household. This arrangement has advantages both ways. Although she receives no pay for her services, the girl does enjoy a quasi-family membership. At the same time, Paula has someone to look after her mother and the children when they are not in school. Beyond that, the girl works in a supermarket on an irregular basis and contributes some of her income to cover household expenses, particularly a share of the electric bill, reflecting her use of the sewing machine.

Paula's brother, Jose, 28, and his wife Gloria, 25, moved to Alto Solar with their two children and her two teenage brothers about the same time Paula and her mother arrived. Jose came to Rio at age 13 with his mother from Alagoas, following the footsteps of his brother and sisters who had come years earlier. Jose began work at 14, earning the equivalent of $\text{¢ } 25^3$ per week (\$5.55) at an outdoor market in Alagoas. In the jobs that followed, Jose learned and improved his mechanical skills working for over a year as a mechanic for the state-run railway. This was a public service job bringing him an equivalent of a $\text{¢ } 400$ (nearly \$89) indemnity when he was released. Later he worked as a mechanic in the Sudamtex spinning mill in Gavea. This led eventually to his present and longest-lasting job as a mechanic in a large foreign car franchise. He earns $\text{¢ } 260$ (nearly \$58) per

³ ¢ denotes Brazilian Cruzeiros, which in 1968 were equal to US \$.22 (\$1 = $\text{¢ } 4.50$). All cruzeiro and dollar amounts will be expressed in terms of 1968 values.

month, plus tips. In addition, on weekends Jose can earn extra cash as a mechanic when he has permission to use the garage of his neighbor, Dr. Horacio, just down from Jose's house.

Like his sister, Jose regards education as important. Flavia began Jose's formal education early. Flavia enrolled him in a Catholic school in Maceio, the capital of Alagoas. He completed the fourth grade, but his education did not end there. Flavia saw to it that he received regular instruction after his migration to Rio at the same parochial school where Flavia worked and where Paula also was enrolled. Later, a tutor who lived near their home in Rocinha saw Jose for an hour and half a day for several years, enough to satisfy requirements for a primary education certificate. Jose and his wife, Gloria, are both relatively well-educated; both read newspapers daily.

Jose bought his house in 1965 for $\text{R}\$1000$ with help of a windfall indemnity to Gloria's former husband, part of which was passed along to her. Before buying the house, Jose had lived in the neighborhood first at Dr. Horacio's. He then discovered his present house was being vacated by its former owner who was building a new dwelling outside Alto Solar. Paula and Jose's house is now one of the more substantial in the favela thanks to the investments they have made.

The building stands on concrete columns and is further supported by a concrete retaining wall. The roof is completely tiled and the wood walls are entirely painted. With joint efforts, Paula and Jose have not only replaced structural members of their house, they have also built a kitchen, indoor bathroom, and parts of a sewerage line. They have terra cotta pipe coming indoors connecting their toilet

to a sewerage main outdoors. Jose's toilet is outside. Electricity is distributed from this State Energy Commission line into Jose's side and thence to Paula's. They have talked of plans to install their own water and a meter, but they have yet to raise the necessary funds and to get permission from the favela association. Since 1966, the two have spent on repairs and improvements an amount equal to nearly twice their combined monthly salaries.

Were it not for the joint efforts they have undertaken, it would be difficult to imagine how the visible cash flows could account for the capital equivalent in their shelters, furnishings, and daily expenses. Paula reports an income totaling ¢200 to ¢250 per month (roughly \$44-\$56). This includes her mother's pension and may or may not reflect odd income produced by the boarder and by Paula's son. Even if their income were to total another minimum salary, most of the household income would still go into food expenses. The same is true for Jose. His reported income comes to ¢250 to ¢300 (\$56-\$67) per month. An average monthly food bill for Paula comes to ¢217 (\$48) and for Jose ¢264 (\$59). This leaves very little cash to cover other expenses, much less for emergencies. Possessions alone count for a great deal. A stove and sewing machine are the major items in Paula's household. Jose owned a bicycle and television (which have since been sold) and presently a blender and refrigerator among the other more common furnishings. In addition, resources flowed out in the form of help extended to family outside the immediate household as well as emergency expenditures. Jose has supported his mother by purchasing a house and contributing to

her daily needs for many years. And when Gloria's brother grew ill, almost all of Jose and Gloria's cash reserves were spent on medical bills.

Still another form of capital expenditure, which in the final analysis comes from individual residents, are the community facilities evident in the favela of Alto Solar. These include concrete walkways, utilities such as water pipes, spigots, sewerage pipes, collectors, electric lines, and concrete poles, insulators, meters, and so on; as well as drainage tiles, ditches, and community adornments in paint and flowers.

On the other hand, we should not discard the possibility that the incomes in these households are underreported, and even that their economy is tied in with other households. This may well be the case although the Leedses designed and carried out their survey to pick up nonwage and other forms of income. Certainly a significant flow of auxiliary resources reaches their households over and above the monetary flows coming from their regular employment and even from odd-jobbing, from Flavia's pension, and from other minor contributions. Paula and her housemates are able to mobilize a spectrum of additional resources, some of them "in-kind" through their mutual assistance networks of formal and informal social ties with family, employers, friends, and neighbors.

Perhaps the most important of these ties are the family bonds linking Paula and Jose, their mother, their sisters, in-laws, and their children. Paula's and Jose's mother contributes to the care of her grandchildren as well as to her own support. Jose also provided shelter and, at an earlier time, maintenance of a previous residence for his

mother. Also, Jose helped Paula's former husband with schooling and later in finding employment. The purchase of their house was greatly facilitated through Gloria's ex-husband, and her relatives have helped with housing and other needs from time to time. Gloria and Jose received money, a cooker, a clothes closet, and bed from her family when they were married.

The network ties of Paula and Jose reach beyond family. Through his long-standing tenure at work, Jose has achieved a position which has evolved into a godfather relationship between his patrão (boss) and Jose's son. Jose's patrão has given his son a tricycle and other gifts. The patrão has lent Jose money in times of need. Also, Jose has maintained a good relationship with Dr. Horacio at the foot of the hill where Jose once found temporary shelter and where he now does his auto repair business.

One of Paula's deepest-seated and most trustworthy ties outside her immediate household is her relationship with her sister. Flavia's other daughter was the first to come to Rio and she has figured importantly in the conduct of Paula's household affairs. In the beginning she put Paula and her mother up when they first came to Rio. Later she took and still cares for one of Paula's children. She provides most of the children's clothes and also frequently sends gifts and other small articles such as school supplies to the children. Paula, in turn, occasionally sends her money. Moreover, Paula's sister has ties through friends to the school director where Paula's child received a scholarship, opening for Paula yet another channel of communication which otherwise would not be available.

Paula and Jose also have "loosely-coupled" resources not subject to implied debts associated with transactions across personal network links. Instead, there is evident an array of resources pulled in by their powers of observation and talents for maneuvering in and out of the variety of urban life. In this respect, Paula and Jose do comparatively well.

For instance, Paula was able to learn about and make use of a savings and loan institution where, before the rains, she had as much as 5000 (\$1,100) deposited from which she made occasional loans to others. She found and arranged for a girl to live without pay in the household. She and Jose found a bazaar downtown where a clock, tables, chairs, and old clothes were purchased, all "very cheap," which she was able to buy on time and at no interest. They have also found a second-hand building materials supplier who delivers materials--cement, planks, tiles, and terra cotta pipe. They both have taken advantage of the resources offered by the social service workers of the Catholic University. Paula knows where to seek medical care for her family and she has found access to medicines in the form of free samples available from the clinic. Paula located her last two jobs through news advertisements in papers she reads regularly.

Jose and Gloria also read the papers periodically. Gloria reads the Correio da Manha daily. Jose scans the want ads in the leading paper, the Jornal do Brasil. He searches for items advertised for sale by families who are leaving Rio or otherwise are obliged to sell off possessions on short notice. Jose once found a TV he purchased for half price. When the TV was stolen he still managed to recover it and repair some of the

parts and sell them. Jose has also discovered that he can supplement his income by selling blood donations. An instance of slightly less loosely-coupled informational aspects of resources is the photocopying of his documents to safeguard them and extend their use.

Various forms of resources--some aspects predominantly informational aspects, others energetic--are evident in this case. Households gather and change the form of these resources. Skills, common knowledge, education, tips, discoveries in newspapers, all form part of the informational aspects of resources Paula and Jose and their families have engaged and trained into their households. Help in the form of labor from family, friends, neighbors, and their own efforts, as well as other energetic aspects of resources are combined with the informational aspects of resources and transformed. Some proportion of these resources are transformed into capital--some of it ends up as housing improvements or repairs. Still other portions show up as possessions. Also, Paula and Jose have transformed their own capability to get along in their environment and manipulate different aspects of it.

The process of gathering resources and then transforming them into capital can be seen in the case of the housing reconstruction following the heavy rains and floods of 1966. Exceptionally heavy rains caused considerable damage in some areas of Rio. Paula and Jose's house was especially hard hit. The rains eroded the foundation wall and some of the pilings. Paula had some savings and Jose got a loan from his boss to launch their efforts to rebuild. Together Paula and Jose bought 10-15 sacks of cement and gathered other materials--wood, tiles, and nails. The labor came from five to 10

friends and neighbors in exchange for lunch on successive weekends. A nephew of Paula's sister also contributed labor. "That is how it is done in Alto Solar" says Paula. Her experience calls to mind the "mutirao" system of house building in rural Brazil.⁴

Many kinds of links to resources were used to recover from the storm. Jose and Paula received some of the donated assistance-- materials, furnishings, beddings--from the nearby Catholic University. They even mention arrangements for a loan through workers at the School of Social Services. Paula's ties in the favela association may have helped to generate voluntary assistance from her neighbors during the time of reconstruction. Some of these resources were contacted even before coming to Rio. The woman for whom Paula worked as a domestic servant for five years gave Paula and her children a number of items-- gifts, school equipment, and a bed after the flood.

The use of instruments such as social networks of exchange and the making of investments in an environment of poverty are in themselves not new subjects of study. What has not been done in the past is to blend together these notions into a holistic perspective which throws light on the orderly transformation of urban resources into different, more valuable forms. In the urban ecosystem, where environmental resources of energy, information and materials are inextricably bound together, the process of making these transformations is subtle and complex. The possibilities are as varied as individuals in cities.

⁴ Neighbors pool their efforts to raise, and roof, a house in a single day.

In the following case, that of Rosa and Antonio, a different pattern and underlying set of values and abilities can be observed.

B. The Case of Rosa and Antonio

Not far from the house of Paula and Jose is a large, two story, wood and brick structure which houses four households. In one two-room section dug out under the building live Rosa, about 60, and her son Antonio, in his early twenties. Rosa doesn't know her exact age, her birth certificate is still in the small town in Espirito Santo where she spent the first 15 years of her life. She held only two important jobs before coming to Rio, both as a domestic servant. She worked first for a businessman who took her with his family from her small home town to a municipal seat in Espirito Santo. The second job was with a doctor who again migrated taking Rosa with his family this time to Vitoria, the capital of Espirito Santo. From there, Rosa followed her sister to Rio. She has had no education; she cannot read or write. She first went to the large favela of Rocinha, located in the extreme south-west of Rio, there she stayed with her sister. She rented a small room and when Antonio was born she bought a small shack. When it began to become apart she moved again. In all, she spent seven years in Rocinha before moving to Alto Solar. Her son Antonio has had no education either.

They share two small rooms which total about 15 square meters. They get water from a public spigot. They have no kitchen, no bath, no indoor water, no sewerage, no electricity. Their space is divided into a bedroom and a combination living room/cooking area. The building does have some facilities--water and electricity--but none of the

services reaches Rosa's quarters. They share an outdoor toilet with two other families. They have to bring their water in buckets from the spigot outside. Like Paula, Rosa cooks on a small two-burner stove, somewhat better than the charcoal brazier cookers other poorer families use, but not as nice as the four burner models. Rosa and Antonio manage to repair some of the damage to their place caused by the rains in 1966. But they had to pay a laborer to do the work. Raising money and finding materials took over two months. Rosa has no plans to further improve or modify her dwelling space. She seems more inclined to look for an alternative to Alto Solar.

"I never got accustomed to the place (Rio), the mugging and robbery," she says. "It was never like that in Espirito Santo." She has been searching for land in the suburbs. She would like to have space, a place "to plant and raise food." She knows of plots in Catacumba (a favela some distance from Alto Solar in the South Zone), and on the outskirts of Rio in Nova Iguaçu. "There are many kinds of lots, some lots with walls up, some with buildings. There is plenty of land." But the cost is high. It will be hard for her to raise the cash to buy a place. It was hard enough to purchase their small part of the building in Alto Solar. Five years ago she paid less than ¢400 (\$89) for her two rooms. Today she guesses its worth less than ¢600 (\$133), even with the tremendous appreciation of the other property in Alto Solar.

Rosa has been out of touch with her brother although he lives in Rio. She has visited his place only three times in the 23 years she has been in the city. Her sister has come upon hard times.

She has long suffered from a bad hip and sometimes calls upon Rosa for help in getting to a doctor. Then her sister was forced out of her place in Rocinha. Rosa did get help from the family when her son Antonio was born. But help came not from her brother and sister, but from her parents back home. Her mother and father, both "very hard workers," have labored in coffee plantations in Espirito Santo all their lives. In hard times, for instance during slack times of employment, Rosa has had to rely almost exclusively on her former patrões (employers), the doctor and the businessman. When the rains came in 1966, it was her neighbors who lent a hand, though, unlike Paula and Jose, she had to pay for most of the repair work.

Her employment is regular but scattered. She usually works five days a week doing cleaning and laundry in homes in the South Zone, and earns a minimum of ¢140 (\$31) a month. She travels to a number of houses each week. Antonio helps somewhat but his earnings as a mechanic are not a regular flow of household income. When Antonio was a child, Rosa cooked regularly two days a week at a restaurant. Now, her transportation costs are an added expenses of over ¢15 (over \$3) a month. In addition to this monetary outlay, Rosa has less time to do other things. She has to take the bus from place to place and some days she spends 45 minutes in transit.

Like Paula and Jose, Rosa and Antonio spend most of their income on food. But compared to Paula and Jose's household, Rosa and Antonio eat well. They buy much of their meat, fruits, and vegetables in supermarkets in the South Zone. Most residents in Alto Solar buy meat at a small butcher shop just outside the favela. They buy fresh

produce at the neighborhood feiras (periodic, open-air markets). Rosa and Antonio buy more food comparatively speaking, but they buy proportionately less dairy, fruits, and vegetables than do Paula and Jose. In all, Rosa and Antonio's food budget comes to ¢140 (\$31). For clothes, Rosa and Antonio spend between ¢50 and ¢100 (\$11-\$22) a year on ready-made clothes purchased in stores. This contrasts with the home-made clothes Paula manages to acquire. Elsewhere, priorities, or at least effort, given to education, medical care, and housing also set the two households apart from one another.

C. Comparative Analysis

In many respects the individuals pictured in these cases share remarkably similar histories, especially Rosa and Paula. They both play major roles in their households without a senior male present, although Paula shares this role to some degree with Jose. Although Paula is about half the age of Rosa, both women have gained a good deal of experience in the metropolis. Nor was Rio their first urban experience. Both started in rural settings with Catholic backgrounds. Both were exposed early in their lives to city ways as domestic servants. These first jobs were important not only in moving them through and up the urban hierarchy, but also in the sense that contact with their patrões (employers) still figures in their lives. Both entered the metropolitan environment with the help of sisters already living there. Both started in Rocinha and ended up in Alto Solar. They are in accord on certain disagreeable aspects of urban life--of being dejected not so much by poverty but by the muggings and robbery. In Paula's words: "I am not revolted by poverty--I never knew anything else." And they

both indicate a desire to make a better future in the suburbs. But Paula's life, on balance, shows much more promise towards fulfilling that desire. Whatever their fates, they have made different lives for themselves in the favela.

In the main, the two household systems differ in the way they interact with their environment. This interaction can be seen in several ways. First, it is visible in the values and attitudes displayed by the two households. Paula, for example, sees value in making some short-term sacrifices (i.e., in food) in favor of savings in the form of cash in a bank, certain consumer durables, and education. Paula's mother has played an important intergenerational function of obtaining education for her children. As a cleaning lady in the school, she made use of her own network link to enroll Paula and Jose in elementary school and Paula in high school. Later she found a tutor for Jose.

These aspects of Paula's household suggest a future-orientation which contrasts with the apparent more present-mindedness of Rosa. Although Rosa may have stored a cache of resources with which to purchase a place in the suburbs, other aspects of her life suggest this is not the case. Rosa's case shows no visible means--neither in income, savings, nor latent resources--to realize her dreams of owning a plot in the suburbs. She has no plans for improvements. Rosa shows little evidence of the means to bring in resources and to raise their value. Rosa's food budget takes a larger percentage of her resource flow than in Paula's household. With time, this may change. But for the time being Rosa seems only to verbalize a wish to return to the farm. She has been

unsuccessful in persuading her sister to join her in a move to the suburb, but also her son is reluctant to go.

The desire to acquire suburban land, seems at the moment closer to reality for Paula than for Rosa. Paula would also like to leave but her complaint is of a different nature. She believes at least that Alto Solar is a "humane" place to live compared, say, to her sister's life in the favela of Praia Preto. There, people are forced to live "in high densities amidst robbers and thieves." Perhaps the age difference between Paula and Rosa could account for some of their value differences. But it would be hard to imagine Paula following in Rosa's footsteps. Paula's options are too ample; she is closely connected to her family and to urban resources. Rosa by contrast is much less aware of or at least less in touch with the variety of urban resources.

This leads to a second, material dimension in which the interactions with the environment of these two households are reflected. Paula's contact with the city environment and with Jose is organized in a way which allows her to order and manipulate its resources to their mutual and individual advantage. She can mobilize and make use of latent resources, some through family ties and friends, others "floating about" in the urban environs. Rosa has a much narrower resource base and she seems to have fewer options. Paula has a steadier job and a broader network of supports to cushion her should some problem arise. Paula has managed to build something out of her interaction with the environment of Alto Solar.

Among their neighbors, a good number, like Paula, feel that Alto Solar is not even a favela, but that it has reached the status of a neighborhood (bairro, a term not tainted with pejorative meaning conveyed in the term "favela"). Many, like Paula and Jose, have decided to stake their fortunes in Alto Solar by investing in housing and community facilities. Although the favela offers some advantages for this type of investment--no rent, free land, and transferrable housing--as Rosa illustrates, not everyone does invest.

One of the most striking differences between these two investing and noninvesting households is in their network ties. The structure of social relationships that encircles Paula's and Jose's world is well-defined and more substantial than Rosa's. Paula's and Jose's links with their mother, their sister, with their present and former employers, and with other neighbors as well, are deeply rooted and fruitful.⁵ Rosa has similar links, but they are not as abundant. But also, unlike Rosa's network links, Paula's and Jose's total networks extend openly into the environment, some of them reaching far outside the favela, allowing them to find loosely-coupled resources and to bring in odd or unforeseen opportunities, such as the housemate, the scholarship, and medicines, resources that Rosa and Antonio have not found.

Rosa and Antonio have contacted less of their environment. Their networks are more limited. Rosa's ties are less securely attached; some are stunted. Rosa, for instance, has lost touch with her closest

⁵ Paula's fruitful contact with resources was underscored by her marriage, sometime after the eradication of Alto Solar, into the "middle class." Her former neighbors reported to me in 1977 that she was now "living well, in the suburbs."

family members in Rio. Rosa does not have the ability to mobilize the quantity and quality of resources that are accessible to Paula. This limitation leaves her less free to apply her energies elsewhere, for instance in making housing improvements, or more important, in keeping her primary income stream flowing. Networks are the primary instrument for contacting the environment. With neither "open" nor "bounded" network systems as strong as Paula's, Rosa is disadvantaged, compared to Paula. Rosa will not only be less likely to come into contact with resources, she is also less likely to be able to meet occasional unforeseen needs. In short, her opportunities to make transformations of resources are limited from the start.

D. Conclusions

Viewing these cases from the transformational point of view produces certain insights into the organization and functioning of households. Households may be seen not only as coordinated entities seeking to acquire and then allocate scarce resources, despite adversities in the urban ecosystem. Nor is it sufficient to view households only in terms of registering increases in social status or income. The cases show that households are capable not only of production, or the transforming of resources into new, more valuable forms; they also create resources, as in the expansion of knowledge. The cases also suggest that households' instruments are indeed coordinated, to a greater degree, perhaps, than conventional modes of analysis have recognized. Moreover, the case material has thrown some light, though not enough, on the energy and informational dimensions of household

operations, thereby giving some hint as to the mechanisms which lead to increased power to marshal resources.

Viewed in the abstract, a certain logic, one of reducing variations and of making the best use of informational resources, may be seen to underlie the coordination of instruments and to guide the actions of households so that household operations are carried out efficiently. In this respect clear and systematic differences show up in these cases.

The two households might be placed on opposite ends of what I have called a "spectrum of social entropy." This term refers to a range of ratios of total resources consumed (or used) by a household, to those produced by (or available to) the household. Toward one end of the spectrum is Paula and Jose's household which produces a positive net balance of resources. Their household is organized in a way that generates information--they develop options, test alternatives, learn and create plays, and reduce sources of uncertainty. They create an order tailored to their particular needs. In the process, Paula and Jose create economies in the present and prospective use of energy. They also increase their ability to mobilize and transform resources. Future resource gathering is made progressively easier. Some resources they transform into material form, for instance, as possessions or capital investment.

In most respects, nearly the opposite is true for Rosa and Antonio's household at the other end of this spectrum. They have less contact, fewer options, and are confronted with a greater degree of uncertainty. Transformations occur but they appear to be marginal and few resources are channeled into capital investment. Unlike Paula and Jose, Rosa and

Antonio have not transformed their household system so as to achieve economies in their energies and to realize net gains in their resource balance.

Despite these differences between the two household systems, certain commonalities exist. Although the net effect is different, both households do transform resources. Both coordinate the use of instruments to achieve these transformations. We shall explore this coordination in more detail in later chapters. Also, both households in their own way find resources in the environment. This engaging of resources is essential. In the first stages, households gradually take inventory of the different kinds of resources available to them. Later they learn which among those loosely-coupled or other resources are appropriate for them, and under what circumstances they have value. Both households' families learned, after some years of pioneering, that a move to Rio from their hometowns was viable. Once in Rio, they learned the ropes, gradually reducing the uncertainties regarding resource availability and conditions of use.

Networks of exchange are paramount, and within these networks, the "open" information system is important. To repeat, this open system is not composed of particular nodes of individuals or other households. It is not subject necessarily to obligations of reciprocity. Both of these characteristics customarily apply to definitions of networks and network exchanges. Rather, these open links function as an auxiliary to conventional networks and involve channels and messages which are nonpersonal, or if they are personalized, there is no implied or explicit obligation to reciprocate. Resources flowing through this auxiliary system often include loosely-coupled resources ("free goods" in

economic jargon) discussed in Chapter I. Such resources may not be possessed nor restricted and are open to anyone, and so luck and skill play a role in obtaining these resources.

However, the difference between the two household systems described in this chapter is not only a matter of luck. The case of Manuel described in the following chapter makes this point clear.

CHAPTER VI

BUILDING ORDER IN AN UNFAVORABLE ENVIRONMENT

The Case of Manuel in Ruth Ferreira¹

The scene shifts in this chapter to the favela of Ruth Ferreira, where Manuel and his family lived for more than 10 years. Manuel's stay in Ruth Ferreira is merely one interlude in a lifetime which has been spent on more than half a dozen jobs in as many locales, all in Rio. Although he has simultaneously held two nearly full-time jobs for almost half a century--in his words completing nearly "100 years of labor"--his transforming of resources has oscillated up and down. The case of Manuel furthers this examination of the transformational perspective, and suggests that both entropic and negentropic characteristics fluctuate over time. The case also reaffirms the validity of the instruments identified earlier, and shows how the ecological setting, decidedly entropic in Ruth Ferreira in comparison to Alto Solar, influences both the use of instruments and the forms of transformations. Succeeding chapters examine instruments and strategies at a more aggregated level.

A. The Case of Manuel and Euridice in Ruth Ferreira

In many ways Manuel's household mirrors the aggregate picture of his transitional neighborhood. Manuel, 63, and his wife, Euridice, 37, have had two children now in early school age. Also living with them are

¹The information for this case is drawn from data gathered mostly by E. Leeds in 1968 and by the author in 1977. As in the preceding chapter, this case is described in the present tense for clarity and ease of reading.

two step-children: a son born to Manuel and his now deceased wife (Euridice's sister) and a son born to Euridice out of wedlock before Euridice met Manuel. They share two rooms in a one story wood structure Manuel built up little by little with his own hands over five years before the Leedses' interview. Manuel's residence in the favela is not intended to be permanent and Manuel probably would have moved from there sooner were it not for the possibility that CIFERAL--the bus assembly plant--may indemnify him in order to get his land. He came there five years ago after a fire burned him out of his suburban house. The public housing they were allotted afterwards was tiny; Manuel refused to bribe the administrator for a larger housing unit and so he refused it to take his chances. The place he bought in Ruth Ferreira offered him advantages of free rent and reasonable location, even though the facilities are considerably below his accustomed standard.

Manuel's shack is modest in size and lacks the infrastructure more frequently found in Alto Solar. Water must be carried by hand to the makeshift kitchen set up in Manuel's living room. The house has no indoor sink, no toilet, no sewerage. Although the facilities are sparse, the structure is completely painted inside and out. He laid a zinc roof and put on compressed fiber siding (known as eternite), one of a few houses in the Leedses' data having such material. Manuel's extensive experience in building trades and material supply no doubt aided his house-building efforts. Manuel would like to improve his small house--to lay on new siding and a floor. In his words, "I don't want luxury, just \$300 to improve the shack." But the difficulty of raising the money is not worth the risks of losing it to fire or

being offered a small indemnity. For one thing, the lack of drainage means periodic flooding and fires have more than once destroyed parts of the favela. The greatest danger is the predatory actions of CIFERAL. Although Manuel feels that the authorities will not "throw him in the street," he can't tell in advance whether and how much indemnification he might expect.

The features of resource use in Manuel's household are similar to other households in that there is no visible flow of income equal to their reported outflows. The burden of resource outflows is especially heavy because, in addition to the five dependents under his roof, Manuel provides a substantial portion of support for his sister, her five children, and two of Manuel's children by another woman, all living in a suburb 90 minutes by public transit from Ruth Ferreira. In particular, Manuel's allocations show signs of a value set and orientation neither completely like Paula and Jose's, nor like Rosa's. But Manuel is certainly closer to Paula and Jose on the spectrum than he is to Rosa.

Manuel and Euridice could do much more to improve their house. But rather than channel their resources into investments, they choose a combination of ends quite distinct from those seen in the other cases. The value of their possessions for instance surpasses that of Paula's household. Among the appliances are a blender, two radios, and an electric iron. Manuel's is one of the few households to possess a bicycle. Their expenditures are not confined to material items. They pay Ø10 (just over \$2) a month to a neighbor for laundering their clothes.

The pattern of food expenditures, on the other hand, resembles Rosa's. The food budget comes to ¢228 (nearly \$51), meat is prominent, and dairy purchases are kept low. In addition, Manuel's is one of the few households to purchase bottled water. The ¢20 (over \$4) a month in transport costs also contrasts with other households.

At the same time, some of their other expenditures, together with the verbal emphasis given to health care, suggest a more deliberate and forward-thinking concern than is reflected in Rosa's household. Euridice sees a private doctor outside the favela although he charges her ¢8 (almost \$2) a visit, he also gives her free medicine samples. Manuel and Euridice share the disdain commonly found among squatters towards the public health clinics, calling them a "lottery" and "butcher shops." They have worked out alternative means of health care through personal knowledge of the city as natives and by parlaying certain institutional benefits to good advantage.

Perhaps the most significant feature of their household budgetary practices is their expenditures on education. Manuel's two older sons, ages 16 and 18, both went to school. One is a machinist and the other an electrician, although the youngest has trouble finding work because of his age. Manuel and Euridice have taken seriously the education of their children, keeping track of their school costs. He notes that "I've given them what money I can for their studies...."

Both Manuel and Euridice managed to reach at least the first year of high school. Manuel was fortunate perhaps in living near a tutor when he was young. He completed two years of high school, but quit in the thirties when he was only 14 to take his first job

as a mosquito abatement worker. This began a long and checkered career which, over the next 50 years, would carry him into carpentry, plastering, electrical work, make-up, set design, chauffeuring, political ward-heeling and several kinds of odd jobs, including a transport business.

B. Manuel's Work History

His first job in a yellow fever program had one great advantage which probably helped pull him away from school: it offered a civil service status coveted for social security benefits and for the opportunity for job security. As for his youth, Manuel says, "nobody paid any attention to the minimum age laws then." He received a short course in materials and worked on a mosquito abatement team. After two years he gave up the security and benefits of the position despite an economic depression that threw people out of work by the thousands. He moved on, as he says "for better or for worse, to face life." He found jobs as a chauffeur and at odd jobs (biscates) in the construction industry at various places in Rio. In 1934 he found a job in a transport business which carried workers on a flat-bed truck between central Rio and the suburbs. He learned to drive and eventually he became the manager and part owner of the business before it was dissolved in 1947 under pressure from public transit authorities.

Through one of his workmates there, Manuel learned of employment possibilities in a theater in downtown Rio. He showed up one day and was hired, along with several buddies, as a stage hand. He worked as a prop-man, electrician, and later in make-up. He brought in several others and was responsible for their work. Once, while waiting long

periods for set changes, he tied strings to his partners to be sure they were alert to work the props at the right time. But theater in the immediate post-war epoch, he recalls, was not a great success. If productions failed, the stagehands would often not be paid. The hours were long and the long trip back to the suburbs was hazardous. Transport was unreliable, sometimes obliging him to walk and be vulnerable to assaults. In the meantime he continued to work as an odd-job driver when and where he could manage it. He soon learned that gasoline companies and embassies were preferable for their high pay and regularity of work.

Early in his career Manuel concluded that "if you dedicate yourself to only one line [of work], you end up broken." Manuel managed to keep regularly employed. He worked in chauffeuring, carpentry, construction, and the theater. To fill in the gaps he did biscate, usually in chauffeuring and in the building trades--plastering and electrician work. His many careers overlapped, one leading to the next usually through contacts with workmates. Along the way, Manuel became involved in political activities.

During the post-war era, Manuel was drawn to the charismatic appeal of Tenorio Calvacante, an enterprising and sometimes unscrupulous populist-type political figure who built a powerful political base in the suburban working class neighborhoods with middle-class aspirations. Manuel became a cabo eleitoral (ward heeler) for registering voters. His contacts in the political scene later helped him extract resources from the bureaucracy.

Manuel met his first wife during his political work. She was the daughter of a minor bureaucrat in the Ministry of War. They married and moved into a small house in the suburbs. When a fire destroyed his house in 1956, Manuel was able to find shelter at the "Club dos Democraticos" where he worked and kept records. His political contacts were helpful. It is likely that Manuel's association with the Tenorio people led him to a job in the construction of the Luta Democratica building, erected to house Tenorio's newspaper in Rio. By this time the combined effect of the long and hazardous trip from the suburbs into Rio at nights, the misfortune of the fire, and new opportunities presented by the construction of the Luta Democratica building, prompted Manuel to move closer to work. His contacts also may have helped him arrange for a public housing unit. But when the housing administrator wanted a bribe, Manuel refused to pay. Manuel was assigned a unit so small that he simply refused it and moved out. Manuel later set up a house in the Ramos section of the North Zone in Rio.

During this time, Manuel's enthusiasm for politics gradually subsided and after a time turned sour. He described to the Leedses how loyalties cost freedom to act and to exercise other options and how cabos occasionally suffered beatings. Now he would say "politics doesn't pay--all parties are the same." He cast a blank ballot as a form of protest in the elections of 1965. After buying his place in Ruth Ferreira, Manuel found a new and promising job at a local television broadcasting station located only an hour by bus in a well-to-do neighborhood of Rio. Then in 1965, Manuel suffered the tragedy of death by automobile accident of his wife and one of his sons.

Manuel's sister-in-law, Euridice, moved in to help care for the children. She had lived with them for five months on a previous occasion. They later married.

C. Manuel's Partner, Euridice and Other Dependents

Like Manuel, Euridice is also a native of Rio. She was born in a casa de comodo (rooming house; see Salmen, 1969) and eventually moved to a home in a suburban neighborhood. Though her father did not want her or her mother to work, Euridice took several jobs as a domestic servant in homes of a large nearby suburb when she became pregnant. She left home only once after fighting with her father over her illegitimate child. When she refused her father's wish to marry the child's father, she moved in with her sister and Manuel. Five months later, when tensions with her father flared into fighting once again, Euridice moved out for a short period with a sister in yet another suburb, finally moving back to Manuel's shack in Ruth Ferreira after the fatal accident.

Manuel and Euridice operated their household in Ruth Ferreira for nearly 10 years. For most of that time the household was actually a joint economy because a large fraction of the resources Manuel brought in was shared with his sister's household. She was caring for and housing two of Manuel's older children, in addition to her own five children.

The weight of these dependents strained Manuel's resources to the limit. His impressive array of skills and jobs show that he could sustain a considerable flow of resources. He knew of opportunities in Bahia and elsewhere in Rio which could earn him even more

money than he made at the television station, but they would involve free-lance renovation of houses and that would be risky because it would require capital and would depend upon resale. His work at the television station was steady and that, for Manuel, outweighed the value of a possible short-term doubling of income.

D. Elements of Manuel's Strategy

Although the context of this case differs significantly from the others, Manuel's history and household organization show coordination of instruments in many ways similar to those encountered in the other cases. The emphasis however is different in Manuel's case. The most salient feature of Manuel's resource inventory are informational aspects of resources. Manuel's story is filled with urban folk wisdom, sophisticated knowledge of history and contemporary events, and other "knowledge about " the city. He recalls the unemployment crisis of the thirties, the "parasitic civil servants" such as "Quadro's Sao Paulo people" who filled the post office in the late thirties. He has witnessed first-hand and has gauged the drawbacks of usurious practices of small-time money lenders, the bribes requested by public housing officials, and the system which enforces biscate (odd-jobbing) among construction laborers so that the companies may avoid overhead costs.

He is aware of the injustices to the poor of land expropriation by the rich, and reveals a cynical sophistication in the maxim that "when things get better for the rich, they get worse for the poor."

He was aware that legislation concerning property tenure and expropriation was being debated in the Chamber of Deputies. He remarks, for

instance, that the property interests of CIFERAL will be favored by the state even though the land CIFERAL occupies, just as his own and that of his Ruth Ferreira neighbors, was expropriated by Lacerda when the Avenida Brazil was widened. Yet the state will cooperate with CIFERAL's removal of the squatters "because the industry pays rent."

Some of Manuel's informational aspects of resources extend into the institutionalized formal sectors. Manuel and Euridice maintain a host of documents--birth certificates, a marriage license, employment cards, identity cards, election cards, social security cards, and even formal authorization for Manuel to be absent from work to attend to medical affairs and for Euridice to make use of free maternity care.

In some instances, personal knowledge has been converted into personal gain. Manuel has discovered the better employers for chauffeuring. He has worked out the details of bus fares and train fares and weighed the differences in cost against the time and reliability of each mode of transport. He knows that the buses are slightly more reliable and that the slightly higher price is calculated to take advantage of their performance advantage over the trains.

Yet another capital consequence of his knowledge are loans he has taken, although he sometimes decided not to take them, from company loan funds at his places of work. He could get ready cash when he needed it to care for Euridice when her nephew and stepson attacked and hit her over the head with a hammer. The wound was serious enough to require hospitalization and involved considerable expense which he met by taking out a quick loan. He also was able to arrange for time off from work without penalty to attend to his son in a reformatory.

In another example, the construction materials and paint for his shack were acquired at places he has discovered while working in the building trades.

Manuel has diminished the costs of acquiring his knowledge about the city. Certainly some informational resources have been tied to an implicit obligation, for example, the house renovation possibilities in Bahia and elsewhere passed along to him by workmates at the television station. No doubt his relationship with political figures when he worked as a ward heeler 20 years ago involved implicit debts. But these resources and their ties to reciprocal obligations have shrunk in importance as Manuel matured and cultivated his substantial knowledge of the city system.

At present, Manuel seems to exercise careful control over the outflow of his resources. His work is steady--even at the cost of losing greater income. Manuel has become a source, as much as a beneficiary, of resources. Within his immediate family, Manuel plays the role of provider and protector for two households. At present (1977), he and his family are living with his sister once again in a suburb. His contributions to the household are over and above rent, even though he has spent money to support his sister and their children for many years. Moreover, Manuel has found work for his eldest (possibly handicapped) son in the set design and paint shop of the television station. Educating his other children will have their payoffs, he hopes, especially for his 18-year-old, who is now about to make his application to police seargent's school. Graduation can mean steady, well-paid work.

Although Euridice is younger by 26 years, her familial relationships are also limited because they have been severed. When she became pregnant and then moved in with Manuel, her relationship with her father had nearly reached a breaking point. When her father died, all his property went to her step-mother. Although Euridice has not worked since living with Manuel, she has participated in picking up resources--the identity cards for free maternity care (she had six pregnancies and four premature babies) as well as finding an inexpensive physician who donates free samples.

E. Conclusions

Manuel's intelligence, his schooling, his skills and experience have held him in good stead from the standpoint of survival. His wits and keen observations have opened to him opportunities which might not be possible in the lives of other less-gifted individuals. Manuel's mental acumen correlates with a particular operating style. Manuel has not produced many capital investments in housing, for instance, which originally was part of the question posed in Chapter II. In fact, he gave up major investment opportunities in Bahia and in Ruth Ferreira. Instead, Manuel's goals were less material and perhaps more interesting. For the strategy of investing in education and maintaining a continuous work record involves a forward-looking, future-oriented system of values.

Throughout this history, Manuel's fortunes have risen and fallen. His shack in Ruth Ferreira was less desirable perhaps than any of his dwellings before or since. This variation is not entirely the result of movement through the domestic cycle. Some of the up and down swings coincided with fate and fortunes and intervening opportunities, the

fires and the actions of CIFERAL, for instance, which were independent of his familial situation. These external influences are taken up again in the next chapter.

The energy consequences of his strategy should be noted. Manuel's grasp of city ways shapes his use of time and conserves his personal effort. Manuel and Euridice relied perhaps more than any of the cases on open-ended networks and a large fund of knowledge. These features result from and reinforce his occupational diversity and spending patterns, and they condition the amount of personal effort he had to expend.

By moving in with his sister, for instance, Manuel has sacrificed a shorter trip to work in order to economize on the heavy housekeeping demands made by the 11 members now (1977) living in his household. The round-trip journey from his sister's house in the suburbs to Rio can take five hours and, on occasion, Manuel will sleep at work in order to economize on his energies or in order to be able to do biscate. The importance of energy expenditure in strategies, and the use of various familiar instruments thus resemble the other cases, although Manuel's method of using his resources is attuned to different, non-material transformations, as the following comparison shows.

F. Comparing Strategies in Different Environments

Although all of the cases reveal different strategies, and a use of instruments which varies in accordance with environmental and individual circumstances, the cases also corroborate the view that an underlying commonality may be observed. Reducing uncertainty is

the central rule which guides squatter actions. As uncertainty is reduced, the chances for realizing economies in effort, at least in the avoidance of wasted effort, are improved. With this improvement come the conditions for realizing net gains in resource flows. Each of the previous cases demonstrate different ways to make these gains.

Turning first to the households in Alto Solar, several strategies are evident. Net gains in resources of a material and informational nature have been generated by Paula and Jose. Together, they have generated a greater number of contacts and enjoy a greater degree of certainty in their resource sources than either of them could separately. Partly as a result, they demonstrate a willingness and ability to transform resources into capital investments. Rosa operates in a different way. Although Rosa has exploited some of the contacts she made as a domestic servant, these have not been converted into visible material gains. Her energies appear to be self-limited. Also, because she must spend money and time to reach her employment, she has that much less available to form a cushion of friends and neighbors. She reports a smaller network.

The factor of uncertainty is decisive. Paula and Jose not only mobilize a greater diversity of contacts, the relatively higher certainty of their resource supply means they can count upon more consistent payoffs than can Rosa. With her son only partially committed to the household, Rosa's resource-gathering apparatus is hampered, and as a consequence, she is more vulnerable to variations in her level of income. By comparison, Paula and Jose's sources of household income are more reliable and steady. Moreover, the two can count to a certain degree

on the resources which flow directly or indirectly from their mutual dependence and, perhaps more importantly, from other members in their households.

With resource flows secured, Paula and Jose are free to turn their attention and their efforts to other opportunities. They may pay greater service to their network contacts, shoring up their reliability by spending more time with their most important contacts. Alternatively, they may expand their "open" network links. Rosa is not in as good a position to curry her already limited network links. Paula and Jose can also afford to make plans for the future because they can count on some aspects of their life to be steady. They have controlled sources of variation which hinder Rosa from generating a larger stock of resources or from being able to purchase her plot in the suburbs. Reducing the uncertainty of income gives to Paula and Jose the freedom to take risks which Rosa cannot, or will not.

Rosa must play her options more conservatively, knowing that mistakes can quickly evaporate her resource flows. Instead she enjoys more immediate gratifications in diet and possessions. Paula and Jose allocate more of their resources to household improvements, even though they know as well as Rosa that a sudden turn in political persuasion could mean the destruction of all the homes in Alto Solar. Rosa perhaps succumbs less to this risk than to the paucity of latent resources, and the lack of certainty underpinning her operations. Although she expresses the desire to invest, and shows some evidence of extracting resources, she has done to her house only what is necessary to keep herself dry and protected.

Crosscutting these divergent strategies is the case of Manuel. The greater adversities of Ruth Ferreira lead Manuel to adopt a strategy which takes both a long and short-term view. During his sojourn in Ruth Ferreira, Manuel bided his time, channeling his earnings into the support of his large family and withholding material investments in favor of amenity and nonmaterial investments. Manuel and Euridice are making their major transformations in the form of education of their young. Also important in this strategy was Manuel's maintenance of long, uninterrupted tenure of employment with attendant social security provisions. Manuel shunned major investment in his shack in Ruth Ferreira and he decided not to invest in housing renovations elsewhere. Rather, his strategy called for investment in family maintenance and education, employment longevity, and personal knowledge. Under the circumstances--the predatory threats of CIFERAL, the possibility of flooding, the hazards of fire, and so on--this strategy has merit. Manuel represents a character which does not fit into the "present-mindedness" of Lewis' "culture of poverty."

Manuel's case is more complicated. He was able to generate resources and achieve transformations. Environmental constraints closed off certain options leading Manuel to follow particular (nonmaterial) kinds of transformations.

The steady sources of income from Manuel's considerable work talents are augmented by careful parlaying of information. Manuel's personal knowledge was converted into personal gain on more than one occasion. His strategy of biding his time in Ruth Ferreira was built to a certain degree on an accurate understanding of CIFERAL's plans,

and Manuel was rewarded eventually with an indemnification of more than three times the amount he originally paid for his property and house. With this windfall, Manuel and Euridice consolidated households with his sister in a suburb. Though this now has disadvantages in lengthening his commute time and reducing his opportunities for biscate, it also cuts his housing costs and allows other economies in feeding and shopping.

Nor does Manuel's case suggest his strategy lacks a logic of security. Besides his steady income, Manuel and Euridice's personal knowledge, acquired both formally and through informal learning, is perhaps the strongest of any of the cases. Their personal knowledge of the city enable them to wend their way through many adversities-- death, fire, hospitalization.

Above all, Manuel preserved his continuous work record in order to qualify for double pension upon completing 50 years of continuous employment. On more than one occasion Manuel gave up opportunities he had uncovered which would yield much greater monthly income. But he chose not to risk breaking his record of continuous contributions to this social security fund. To pursue his goal, Manuel has arranged for an attorney to help him file his papers in anticipation of his retirement. Collaterally, Manuel has encouraged his teenage son, a good student and a hard worker, to complete high school, whereupon he will enroll in a police academy. Even though un auspicious circumstances in Ruth Ferreira closed off investment channels there, Manuel sought to circumvent this limitation. He developed his personal knowledge of alternatives, shunned certain material amenities, and maintained steady employment to retire with a bonus.

Manuel's case in particular shows the importance of education and personal knowledge as a part of the transformation process. Also his case, with his long history of variegated employment, shows the influence of changes in the domestic cycle on the kinds of opportunities and transformations households may make. Moreover, Manuel's case shows how the ebb and flow of opportunities can result in alternate swings through generative and degenerative phases of householding in an uncertain environment.

CHAPTER VII

COORDINATION OF HOUSEHOLD INSTRUMENTS --

A Quantitative Analysis

It was suggested earlier that households coordinate the use of their household instruments in order to carry out their strategies. The purpose of this chapter is to further explore this proposition, using a portion of data collected in two separate house-to-house surveys carried out by A. and E. Leeds in 1967-68, covering varying numbers of households in four favelas. For the analysis presented below, only a selected portion of the Leedses' data is used. I have selected households in two small favelas which have made one kind of transformation: material investment in housing and infrastructure. This material investment is only one of many possible kinds of transformations. Many others, such as investment in education, health care, or savings are also important. However, investments other than in housing and infrastructure are unsuitable for this analysis either because of a lack of sufficiently large number of responses in the Leedses' data, or because of the ambiguity of low levels of expenditures. In addition to being tangible, easily quantifiable, and comparable, housing investments represent a commitment of resources. Besides, housing investment in a small favela is in some ways an ideal measure for this analysis. In small favelas, a commitment of investment is more pronounced because the uncertainty of tenure is generally greater than in larger favelas such as Jacarezinho or Rocinha (where levels of investment of housing, infrastructure, communal facilities, and social organization are correspondingly greater).

The use of household instruments by investing households will be compared with that of households which have not invested. Although the sample size of the data I will employ is too small to draw statistically significant conclusions,¹ the quantitative analysis deepens our appreciation for the ways in which households coordinate their efforts internally. The evidence presented in this chapter corroborates the conclusions reached in the case studies concerning the importance of loosely-coupled resources, open networks, and the significance of patterns in food purchases and household possessions in the making of transformations.

I will also point out that these data on instruments serve another purpose. Manipulation of household instruments reflects well-being, or a "state of health" of households. Household instruments may be seen as social indicators of the ability of households to mobilize resources. In this regard, they serve a purpose which conventional indicators are inadequate to serve, given rapidly changing urban environments.

A. Survey Data

The data used as the basis for my presentation below are gathered in two separate efforts, one an independent study by the Leedses, the second by the Leedses as an autonomous study linked into an assessment of the effects of government housing policies on the Brazilian economy originally proposed by the Centro de Pesquisas de Habitacao (CENPHA) for the Brazilian National Housing Bank to be executed by Columbia

¹ Chi-squares were calculated for all relevant relationships, but none proved to be statistically significant.

University's Institute of Urban Environment. Anthony Leeds, then at the University of Texas, was contracted to develop a survey covering the housing economy of the favelas. These data are the results of that study.

The Leedses' survey instruments consisted of two questionnaires. A short census of 81 questions was designed to get at statistical descriptions of favela economies including investment in infrastructure, housing, and agriculture. This questionnaire explored the building's use (as business and residence); its legal status with regard to property titles, licenses, and ownership; the number, age, and sex of occupants; kinds of materials and utilities; and uses of property (including several dozen questions on agricultural activity).

This short questionnaire was applied to all households in three favelas: Alto Solar, Ruth Ferreira, and Tuiti. After eliminating unfinished cases, this census yielded data on 96, 81, and 987 households, respectively, in the three favelas. Data from only the two smaller ones are utilized in the analysis of this chapter. In addition to being selected for their small size (as explained above), Alto Solar and Ruth Ferreira are on opposite ends of the city, thereby making possible a comparative analysis of environmental factors outside the favela. An additional reason for selecting these two favelas for analysis here is that a second, long-form questionnaire of the Leedses (described below) was applied to large random samples (30%) of the households for which short form data were obtained, yielding interconnected data on 32 households in Alto Solar and 27 in Ruth Ferreira.²

²Eleven long-form interviews were carried out in selected households for two other, larger favelas, but these are excluded from this analysis.

The long form questionnaire (651 questions) was created to examine household economies with respect to investment in housing. It was broadened to include investment in everything with the idea of positive and negative balances in resource flows, and the use of family, friendship, associational ties and nonnetwork institutional contacts in getting access to and making use of resources. Thus, the construction of the questionnaire, though not formulated exactly in the terms used here, embraces the system's notions put forward in preceding chapters.

The long questionnaire is divided into three main sections. The first two cover case histories of the one, and if a second existed, two principal contributors or decision makers in the household,³ and include such socio-ethnographic information as origins, migration, urban experience, socialization, political and associational life, and employment experience, including part-time jobs and informal full-time work. The third section of over 200 questions is devoted to the household budgeting process. This section goes into detail covering such aspects as incomes and outlays. Irregular income (e.g., inheritance, indemnity, lottery) as well as regular income (e.g., pension, rent) are covered. Considerable detail is devoted to sources and disposition of gifts, aid, assistance, etc., to construct a picture of social networks of exchange. On the expenditures side of household budgets, there are two main sections: 1) resources expended on such items as food, clothing, education, health, and furnishings; and

³The number of cases was limited to two in order to keep the questionnaire manageable. The Leedses controlled for the possibility of more than two earners elsewhere in the questionnaire.

2) housing construction and capital improvements, covering the level of investments, sources of resources, and value of household improvements (about 50 questions).

This last section especially, but also in conjunction with other information as to inter- and intra-favela differences, is examined to test quantitatively various observations made in the course of the case studies, particularly the observation that households coordinate the use of instruments.

B. Coordination in the Making of Household Transformations--
A Provisional Hypothesis

I have suggested that the distinctions between Paula and Jose's type of households, on the one hand and Rosa's type, on the other, are rooted in different abilities and strategies of gathering the resources from their environments and, once gathered, manipulating and transforming them. Case studies have shown that various instrumentalities are employed in a coordinated fashion to effect resource transformations. The idea in this proposition is that all households must make decisions on certain aspects of the gathering, exchanging, and expending of resources. Common to all households is the problem of deciding how best to allocate their personal resources--personal effort and personal knowledge. With few capital resources and great uncertainties, they must decide when and where to apply them, or when to expand their "knowledge about" the city in relation to their survival. The hypothesis put forward is that household actions are integrated so that the various aspects are made to work in the same direction. I have hypothesized that a logic of reducing uncertainty, in combination with minimizing their

energy expenditures, guides decision-making so as to coordinate household actions, producing the negentropic or entropic character we observe from outside.

C. Definition of Negentropic Transformations

The first step in exploring this proposition is to specify how, among the 59 cases, negentropic households are to be distinguished from entropic ones. Although the cases suggest that many different expressions of negentropic qualities are possible, a straight-forward material indicator will be employed to make this distinction: physical additions to or improvements in the durability of houses or infrastructure (water supply, sewerage, electric power) or in community facilities such as walkways, outdoor staircases, etc. Expenses on these items will be defined as investments, although they could also be considered consumption or savings (e.g., see Nerlove, 1974). To some degree, expenses of this type are made by deferring present consumption in anticipation of future gain, i.e., increasing the future sales value of their house. Besides, works of this type cannot be moved, or taken apart, or recouped, should some unforeseen loss or disaster (e.g., eradication) take place. In other words, these expenditures of, or investments in, housing reflect a consolidation of holdings. They indicate a tightness of perch on resources and a sense of security of households in the favela.

By this definition favela households interviewed by the Leedses may be divided into two groups, investors and noninvestors, according to their responses to the following question posed in the Leedses' survey: "How much [of your total household resources recorded extensively

earlier in the questionnaire] did you invest in the house (include interest payments, materials, water and electrical systems, equipment such as pumps, meters, etc., and labor)?"

As shown in Table 1, the distribution of investors over both favelas is somewhat skewed. Of 31 households responding to this question, 21 are classed as investors, 10 as noninvestors. Very few (four) investors reported making expenditures over the previous year equal to more than one month's average income. A large number (17) reported expending less than half a month's average income. Smaller investments are more difficult to interpret. A larger sample would probably reveal a continuum of investors ranging from major commitments to tiny trickles. Accordingly, an array of "intermediate" households would be expected along the continuum between the hypothetical points of entropic and negentropic. But for the exploratory work in this thesis, and the small sample size, the two groups of investors and noninvestors totalling 31 households are sufficient for the analysis that follows.

It is useful to recall at this point that a number of conventional variables, alone or in combination, could explain (and indeed are often used to account for) the differences between investing and noninvesting households as they are defined here. Chief among these explanatory variables would be income. As indicated plainly in the following table, investment depends on many variables such as the size of income, i.e., investment rises with wealth, or with windfall income. Investment may also vary inversely with the number of dependents in a household and proportionally with good location and other conditions such as proximity to streets, to existing infrastructure, or the size of the favela.

Table 1
Investment Level by Favela

Investment Level (N Crs.)	Alto Solar	Ruth Ferreira
None	6	4
1-150	4	4
151-300	4	1
301-450	1	1
451-600	1	1
601-750	3	0
751-900	0	0
901 and above	1	0
No response	12	16
TOTAL	32	27

However, the point of this analysis is to examine certain dimensions of squatter life which extend somewhat beyond the confines of customary interpretations of such conventional variables as monetary income. The concern here is with household decisions to allocate time, personal effort, and personal knowledge about the city. The purpose of the analysis is in part to explore an alternative method of understanding and analyzing urban behavior. The emphasis of this exploration is on resources which are not priced or exchanged on markets. Besides, as argued earlier, the environment of adversity, scarcity, and uncertainty, makes high income itself a phenomenon to be explained. From whence come high incomes amidst environmental stresses and socio-cultural

Table 2⁴

Investor Type and Conventional Variables

Investor Type	Length of Residence ^a		Household Size ^b			Income ^c			
	Short	Long	No Resp. ^d	Small	Large	No Resp.	Low	High	No Resp.
Investors	9	4	8	14	7	0	6	14	1
Noninvestors	5	5	0	7	3	0	3	3	4

All of these categories are determined somewhat arbitrarily.

^a"Short" refers to those households reporting less than 3 years in their house, "long" refers to those in residence 4 years or more.

^b"Large" households refer to those with more than 6 members, "small" refers to 5 or less.

^c"High" income is more than 3 minimum salaries; "low" income 2 minimum salaries or less.

^dNo response.

⁴N=31 for this and all succeeding tables in this chapter, except where noted.

conditions structured adversely to the interests of squatters? How is it that well-paying jobs and, for that matter, any jobs still, are evident in some households and not in others?

Here the question is one of interpreting conventional variables from the point of view of resource transformations and not merely of per capita income or accumulation over time. This is not to say that conventional variables are not important. Certainly, wealth, membership, size, age, and location of households each have a bearing on the possibilities and constraints facing householders' abilities to manipulate their environment. But it is also evident from the cases and from Table 2 (showing a number of investors in Ruth Ferreira, a bad location; and a number of young and old, large and small, and low-income investor households) that many other factors are involved, factors concerning the deployment of personal information and personal energy.

D. Analysis of Data

The material definition of transformations has identified two basic subpopulations: 1) a group which transforms resources in the form of investments--a group referred to as 'investors;' and 2) a group whose members make no such investment, which are be called 'noninvestors.' These terms are not ideal, but they are adequate. 'Investors' and 'noninvestors' miss some of the developmental character implied in their actions. But other choices, 'generative,' 'degenerative,' or 'ordering' and 'disordering' seem to have similar or greater drawbacks.

Although these groups are identified statically based on investments made during a relatively short (one year) time interval, a comparative analysis focusing on key aspects of household organization--namely

membership, resource gathering, resource exchange, and expenditures-- reveals characteristic patterns across many households and provides clues to the strategic use of instruments.

1. Household membership. The cases of both Paula and Jose, and of Rosa illustrate the proposition that household size and the ages, talents, education and urban experience of members in a household all play a role in the ability of households to gather and transform resources. But the effects of these variables can work in several directions. For instance, large households, even if they are composed of working-age members, do not necessarily mean, as in Paula's and Jose's case, that everyone is employed, or employable, and able to pay their way or even contribute to the household resources. On the other hand, in Rosa's household of two, although Antonio contributed irregularly, their per capita income was greater than Paula's and Jose's. A more graphic example is that of the Sanchez family, recorded by Oscar Lewis (1961). Sanchez's complex arrangements, which at times occupied three separate households, itself speaks of the ability of Jesus Sanchez to create negentropic transformations. At the same time, two of his offspring, Mario and Julio, were, at best, a positive drain on resources, rarely employed, almost never contributing to the household, and occasionally getting into situations (being jailed, having children) which only drew more heavily on Jesus' already overtaxed resources. Thus, size itself, even large numbers of working-age members, can be a drain.

As for age, origin, and education, the data fail to confirm the most likely patterns, such as high income levels in households of many working-age adults, attributable to the variable of household membership.

The one factor where differences may be detectable is in the structural character of a household's composition--that is, the nature of relationships among members of the household. Table 3 shows that complex arrangements (under the category of "other family") are disproportionately investors, suggesting that working cousins, step-relatives or adopted members, as in Paula's and Jose's households, help to enrich the corporate earning power of the household, or somehow help convert its resources into positive gains. This contrasts with the nearly equal numbers of investor and noninvestor simple nuclear family households.⁵

Table 3

Investor Type and Household Composition

Investor Type	Simple Nuclear Family	Other Family ^a	Nonfamily ^b	Total
Investors	8	9	4	21
Noninvestors	7	1	2	10

^aIncludes extended family, pseudo-relatives, and nonkin.

^bHouseholds consisting of single or groups of unrelated persons living together.

2. Gathering of resources. Analysis of the gathering of resources in urban situations customarily begins with, and frequently is confined to, income from employment. Because incoming resources are wide-ranging,

⁵One explanation may be that some young nuclear households are just getting off the ground while others are well-advanced in their household careers. Further statistical breakdowns of these few cases, however, are inconclusive.

and because the present analysis focuses on nonmonetary resources, network systems will be considered first.

Empirical analysis of networks will cover two main areas. First to be examined is the evidence that investing households are, like Paula and Jose, in more intensive contact with their environment than other households. On this score, empirical evidence will be consulted covering frequencies of interactions reported by the different types of households. Second, two different facets of household networks will be compared: "bound," and "open." The reader will recall that bounded network exchanges imply reciprocal obligations, especially among families; open exchanges have no such obligation. The wide array of family, friendships, and workmate links in Paula's and Jose's households contrasted with the narrower range of links in Rosa's life. Is there some feature in the structure of networks that allows investor households to develop and secure resources?

a. Data. Although the Leedses' questionnaire included about 80 questions related to network contacts, only 45 are included in this analysis. The remainder are excluded either because they are associational in nature, meaning the question implies network contacts but does not refer to a specific transaction, person, or group of persons, or if they are specific responses, the transactions referred to are categorized in a way which is incompatible with statistical presentation here. All responses to the 45 questions included in this analysis fall into a single set of categories.

Network data are derived from three series of survey questions. The first series has to do with the work history of principal wage earners.

One, and sometimes two respondents (depending on the number of earners and/or decision makers in the household) were asked eight questions concerning sources of help in finding their first place of residence, their jobs, credit, and the like. For example, each respondent was asked who, if anyone, was of assistance in getting his or her first job. Another series of questions in the household budgeting section described earlier, concerns household income. Respondents were asked about the origins of some 20 different kinds of resources. These questions take the following form: "Have you ever received: (object)?" (e.g., gift, house, money, land, etc.). Still another set of questions concerns the sources of help, capital, materials, etc., for making improvements in housing.

From the 31 households, the total number of affirmative responses to these questions was 224. Most households (mode = 11) reported having made contact only five times with some person or resource. Certainly this number is too low to reflect all the interactions of the households with their environment during the previous year. (Some questions established no time frame.) However, a narrow range in the number of responses suggests a validity of these data.

b. "Frequencies." The data suggest that investor households engage in more frequent network transactions. Data in the following table are collapsed into two columns representing low and high numbers of transactions (1-4 and 5-10, respectively).

Several aspects of these frequencies of transactions deserve comment. A number of network studies have noted the "cutting loose" from ties

usually with kin as people move up the social ladder and gain wealth. This is interpreted as a move to reduce claims on new wealth (Lomnitz, 1974; Aguilera, 1975). An examination of the number of reported network interactions does not drop off with income. In fact, the Leedses' data (not reported here) suggest the opposite is true.

One possible explanation for the divergence between this and other research findings, is that the transaction data developed from the Leedses' survey cover a greater variety of transactions. These network data cover more open network transactions than would be included under Lomnitz's or Aguilera's definitions. In addition to the customary transactions, I have taken into account (though the Leedses did not consider them) a transaction or part of networks not involving other persons. Some responses to the network questions, for instance, include "other" or nonpersonal sources, such as newspaper ads. I have already suggested that the environment of squatters consists of many loosely-coupled resources. Certainly these played a role in the case of Paula and Jose. It is conceivable that the higher frequency of interactions shown in Table 4 indicates that investing households as a group, like Paula's, are more likely to encounter loosely-coupled resources which in turn, bolster their ability to invest. Access to resources is gained in different degrees. I suggested on the basis of the case studies that frequent contact with all types of resources is central to negentropic households. As will be shown later, the pattern of

Table 4
Investor Type by Numbers of Transactions

Investor Type	No. of Transactions		
	<u>Low (1-4)</u>	<u>High (5-10)</u>	<u>No Response</u>
Investors	8	12	1
Noninvestors	7	3	0

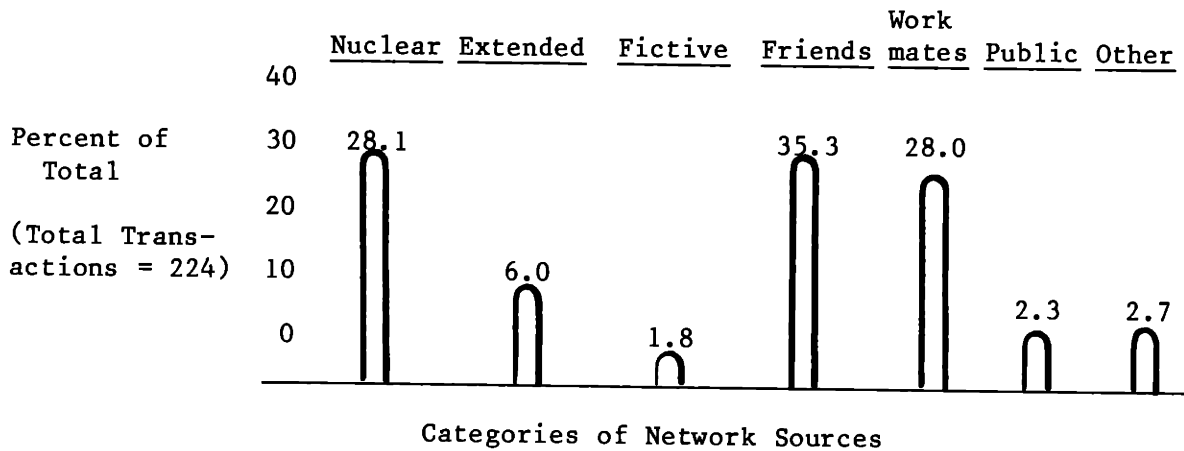
active interchange corresponds to other features of resource gathering in investor households.

c. "Sources." The sources of resources for investing and noninvesting households are distinct. Each network transaction recorded by the Leedses included a source (e.g., father on wife's side; husband's sister, etc.) of which over 50 were mentioned. I classified these sources in the following manner: "nuclear family," (when necessary, other categories such as "other family," or its subdivisions "extended family," and "fictive kin" will be added), "friends," "workmates," "public," e.g., governmental agencies), and "other." The "other" category includes voluntary associations (such as samba schools, football clubs, and religious organizations), and nonpersonal sources of resources such as newspapers, radio, and TV.

The total number of transactions, 224, recorded from the 32 households are distributed among these sources as depicted in Graph 1.

Graph 1

Distribution by Source of All Household Transactions



Though Graph 1 shows that "friends" rank first for the population as a whole, Table 5, below, shows investor households rely much more extensively on nuclear family members. Moreover, Table 5 shows a clear pattern in the comparison of our two groups of households. Though investor households have more secure jobs, as will be discussed shortly, friends, rather than workmates, rank as more important partners in interaction. This pattern is made all the more sharp with the addition of an intermediate investor category (low investors), defined as those households having invested in the previous year less than one half a monthly minimum salary. Also, the importance of nuclear family appears to grow in step with levels of investment.

These data appear to conflict with Lomnitz and Aguilera (cited above) who suggest that family ties are severed as wealth expands. An interpretation that would reconcile these apparently divergent views is that accumulating households select and maintain only the most reliable family ties as a source of insurance. Lomnitz has a similar view of

network systems among Mexican squatter families (1974). Thus, though some family ties may be cut, interchange with family remains active possibly because these links are subject to less uncertainty than non-family. In this way, investing households would be able to control for variations, i.e., uncertainties in their environment, thereby easing the risk of investment. At the same time, the relatively stronger interaction between investor households and public agencies and "non-personal" contacts in the "other" category, compared to non-, and low investors, may suggest expanded resource horizons for investor households.

Table 5
Investor Type by "Sources" in Transactions

Investor Type (expanded)	Sources of Transactions (percent)					
	Number of Households	Nuclear Family	Other Family	Friends	Workmates	Other ^a
Investors	6	44.0	4.0	28.0	12.0	12.0
Low investors	14	29.7	5.4	36.5	21.6	6.8
Noninvestors	10	24.4	7.3	39.0	26.8	2.4

^aPublic agencies and voluntary associations are included in the "other" category.

Another way of interpreting this evidence is that investor households count upon higher quality of interactions. Each "source" reflects degrees of "social distance." This idea goes back to early sociology and was incorporated by Sahlins to measure the strength of obligation

binding a beneficiary to reciprocate (1965). The strength of this obligation to reciprocate varies in proportion to the strength of ties between the interacting parties (e.g., strong for family members, weaker among acquaintances). The idea of the quality of exchange is based upon Sahlins' notion.

If the obligation to reciprocate is strongest among blood ties, then by implication, the responsibility to be forthcoming, that is, to respond to need, a simple request, or a call for help may also be stronger among kin. This is illustrated in Rubenstein's analysis of the Sanchez family debate over tithes to be paid to a deceased relative (1975).

A gravitation over time to family as a source in network transactions, as depicted in the following Table 6, further supports the proposition that family exchanges are more reliable. These figures may be interpreted to mean that over time households interact more and more where the payoff is best. By contrast, transactions with friends and workmates diminish over time. It is conceivable that noninvesting households, like Rosa's, may not have family in town upon whom to call for help. Alternatively, more family may migrate to town. Either way, evidence in Table 6 suggests families draw closer together over time.

Table 6
Household Age by Share of Transactions

Age in the Favela	Share of Transactions (percent)				
	<u>Simple Nuclear Family</u>	<u>Other Family</u>	<u>Friends</u>	<u>Workmates</u>	<u>Other</u>
Younger (1-3 years)	21.7	5.8	39.1	31.9	1.4
Older (4-13 years)	31.4	8.0	28.5	23.4	8.8

d. Conclusions. Analyses of network transactions have focused on frequencies and sources, two variables which reflect the extent and reliability, respectively, of interaction in the environment. Investor households, compared to noninvestors, interact more with their source environment. Evidence from the case studies supported by reports in the literature also suggests that interactions among family (more prevalent among investing households) are subject to less uncertainty compared to interactions with other sources such as friends, or workmates. By interacting more with selected family, investing households reduce sources of variation in their sources of resources. At the same time, investor households count more heavily than their counterparts on "impersonal" sources of resources, as well as on resources of institutions in the public and private sector. This suggests that they are reaching further into their environment and increasing their prospects of encountering resources. Noninvestors, as a group, show a lower frequency of transactions. Moreover, their sources are dispersed

among generally less-reliable contacts, thus decreasing the overall certainty of their resource base.

3. Gathering of resources--employment. Although the employment pictures of Paula, Jose, and Rosa contrast sharply, rather similar work experiences steadily moved them over the years toward Rio and Alto Solar. The two cases also illustrate how closely intertwined are the two instruments of employment and networks: fellow workers exchange informational resources; networks lead to new employment. Roberts has illustrated how work conditions influence the frequency and type of information available to Guatemalan urban workers (1973).

The Leedses' data indicate that although job skills and incomes are important, again it is not the size of income which is decisive for investors, nor even the type of job. Important also is the cost of earning income. Recall that Paula and Jose's combined earnings provided less for their household, per capita, than did Rosa's meager and Antonio's intermittent wages. The difference is that Rosa was obliged to spend time and money each day merely to get to her work. The data below suggest that regularity, that is the steadiness of work in one place is also important.

The data on employment are derived from the Leedses' battery of questions concerning the household's jobs, job types, other work, and principal wage earners. Data were collected for each household on the type of job, i.e. "primary," "secondary," "odd-job," or "private business" (e.g., taxi driver, artisan, etc.) for one, and as described above, sometimes two wage-earners. In the data presented below, a

maximum of eight positions or jobs per household is possible.⁶ In fact, some households may (and did) hold more than eight jobs. The breakdown by transformer group appears in Table 7.

Investor households are not so much distinguished from the non-investors by job type or status, although these are undoubtedly important. Instead, as Table 7 suggests, the key feature seems to be a lower number of jobs for the investor group. This would suggest that investing households have reduced uncertainty about income flows. Fewer jobs probably reflects more secure employment and less wasted effort.

Table 7

Investor Type by Number of Jobs

<u>Investor Type</u>	<u>Number of Jobs</u>	
	<u>Low No. of Jobs (1-4)</u>	<u>High No. of Jobs (5-8)</u>
Investor	13	8
Noninvestor	3	7

Longevity then remains an important aspect of employment, but for reasons different from those Leeds and Perlman cite in their discussion of discriminatory employment practices. For instance, Leeds describes how employers fire workers before job tenure becomes obligatory (1974:85).

⁶ Such as when two wage earners in a household each report holding a primary job, a secondary job, doing biscate, and conducting some sort of business.

These data suggest that longevity is important also because it provides a basis of operations. Sanchez's long-time restaurant job (Lewis, 1958) and Manuel's job at the TV studio illustrate this point. Job security also conditions outside resource gathering. It conserves household energies and allows time and effort to be channeled elsewhere—into raising animals, construction, etc. But also, securing employment in good jobs reflects skills similar to those required in filtering or testing information. Information about job opportunities may arise, but it is something else to come upon jobs which may be converted into secure sources of income. Perlman found that migrants who spent time searching before taking their first job, found "better" jobs (Perlman, 1976:80). Thus, some migrants reduced uncertainty in their job information. Later, as work becomes more routine, new contacts may be found and new sources of trustworthy information may be built up with workmates on the job.

As for the coordination of employment with other household instruments, the composition of households also interacts with employment and network patterns, although this correlation is not simple. As mentioned earlier, young families recently arrived with small families or no children may be in favorable circumstances to make investments. A similar argument holds for households with young working adults, as Paula and Jose and Rosa's cases illustrate. It is more plausible that stages in domestic cycle correspond with swings in and out of negentropic

phases, depending upon changing size and age of household membership.⁷ However, the Leedses' data do not permit a test of this hypothesis although certain aspects of it will be discussed in the following chapters.

In short, secure employment leaves time to eliminate certain sources of concern, i.e., job security may mean it is possible to "wheel and deal," and to look for new opportunities. Noninvesting households, on the other hand, scatter their energies. Sources of income are less secure. Network data suggested that their integration into the community is less intensive. All in all, noninvesting households, compared to investing, face more uncertainties and thus may be less able to afford the risks of converting wealth into material forms. These conclusions complement the data on "sources" discussed earlier.

All of these factors together suggest objectives of security in employment rather than of maximizing income. It is important to remember that investor households are not necessarily richer than noninvestors. The reader will recall from Table 2 that a significant number of investing households were in the "low" income category. It would be reasonable to assume that a high number of jobs would produce more income and perhaps greater material wealth. The Leedses' data in fact show this is not the case. Since uncertainties cloud some alternatives and

⁷ Several alternative strategies are conceivable. One would be to maximize the number of income-producing members, as Paula did. Another would be to limit the number of nonproducing members in households, as Manuel did for awhile. It may be speculated that this latter strategy is one of the mechanisms at work keeping household size down in investing households. Similar patterns in minimizing uncertainty of income have been observed among Brazilian peasants (Wharton, 1971; and Johnson, 1971).

class barriers close off others, one reasonable strategy for squatters would be to attempt to equalize risk in making choices, in the instance of employment, sacrificing size of income for certainty of flows, or in other ways controlling for some of the effects of uncertainty and constant change. We shall return to this subject later.

4. Expenditures of resources. So far we have seen a pattern in which investing households may be distinguished from noninvesting ones in terms of composition, networks, and employment. This pattern extends into the area of household allocation of resources. Purchase of food and acquisitions of possessions are yet other means of executing a strategy. Decisions over whether or not to make purchases reflect perceptions of risk by households and its abilities to control uncertainties and to mobilize resources. Moreover, households decide not only on the quantity of food, but also on the quality of diet--for instance in choosing meat vs. other forms of protein, or in selecting the total amount of starch. Also, households decide whether to exploit electrical energy as an auxiliary to household resources. Such discriminating choices are sometimes suggested but rarely tested in the literature (Leeds, 1974; Lewis, 1969; Kemper, 1971; 1974). When they are recorded, expenditures on diets and possessions are not linked to other aspects of household organization. The data from the Leedses' survey show that investing households make sacrifices both in quantity of food they buy and in the quality of their diet. Also, the two types of households exhibit selectivity in material acquisitions.

The Leedses recorded detailed data on food purchases and prices paid. A complete list of food items appears in Appendix I. Food items and costs are broken down into five main food groups. Average monthly expenditures for all households amounts to $\text{£}165.13$ ($\text{\$}36.68$). Meat accounts for 37% of this figure, followed by starches (25%), fruits and vegetables (18%), dairy (8%) and miscellaneous items taking up the balance (12%). The order of importance measured by total cost of these items and the total expenditures on them, differentiate the two groups of households from each other. Table 8 shows food expenditures for monthly purchases in five food categories for the two groups of households.

Table 8
Investor Type by Food Expenditures

Investor Type	Food Expenditures (percent)					Total £ (absolute)
	<u>Meat</u>	<u>Fruits/Veg.</u>	<u>Starch</u>	<u>Dairy</u>	<u>Misc.</u>	
Investors (N = 15)	34.7	17.1	25.1	11.3	11.8	165.90
Noninvestors (N = 8)	40.6	15.6	24.8	6.7	12.3	172.00

Here are evident sacrifices on the part of investor households. In the first place, their total expenditures for food are lower, albeit marginally, than for their counterparts. But also, investor households appear to sacrifice meat consumption (which represents high monetary value) and compensate with larger dairy purchases (mainly in dry milk),

eggs, and fruits. Noninvestor households enjoy more meat, less dairy, and fewer fruits and vegetables.

Data on material possessions form a pattern of selectivity which broadens the overall picture already formed. I have culled out from the Leedeses' data on possessions (listed in Appendix II) those items which can serve as appliances or utilities in order to determine the extent to which electrical power is employed in households. Electrical energy is a work-efficient resource capable of multiplying the efforts of households.

Table 9
Investor Type by Possessions

Investor Type	Weight of Furnishings Total (abs.)	Appliances	
		Electric (% distribution)	Nonelectric
Investors	17.3	62.3	37.6
Non-investors	16.6	50.0	50.0

As Table 9 shows, investor households report more electrical appliances than their counterparts. It is not surprising that investor households are more likely to acquire electrical appliances, since their investments frequently include stringing of power lines to houses. But also, electrical energy saves time and personal effort.

This evidence fits a consistent pattern. Those households which make certain sacrifices in diet, spending less and buying more selectively, also report slightly more sophisticated possessions.

With respect to the coordination of household budgeting with other instruments examined earlier, it is obvious that food budgets vary in direct proportion to household size. It is not so obvious however that network systems, both bounded and open, have a bearing on the cost of acquiring materials for furnishings or construction. Recall that resources were acquired by Paula and Jose at little monetary cost to rebuild after the rains. Or again, Jose's purchase of second-hand items via newspaper advertisements illustrates the relationship between monetary outlays and network links. This variety of resource channels contrasts with the straightforward market methods used by Rosa to rebuild. Similarly, employment can influence expenditures. For instance, as I noted earlier, domestics may eat meals at work, as well as get gifts, sometimes possessions, or credit to bring into their households.

E. Conclusions

The idea of transforming resources and producing net gains has been imprecisely (and inadequately) defined in terms of material wealth. This definition nevertheless is sufficiently broad to show how instruments of composition, employment, network interactions, and style of expenditures are coordinated. The commonality in these aspects is in the way resources are gathered and converted to effect the objectives of households. Negentropic households compared to entropic ones settle into fewer, more secure jobs and manage their membership more effectively (keeping their nonproductive numbers lower); they conduct more lively network

systems which tend to focus on more reliable (nuclear) family members. Furthermore, negentropic households sacrifice meat for cheaper sources of protein and reveal a selectivity in their possessions. Less negentropic households have richer diets and sometimes fancier possessions. But their efforts to establish a secure source of income appear to be frustrated and their interaction with their source environment is both less active and less reliable.

All in all, negentropic households behave as though they were running a tighter ship. They are generally more parsimonious in the organization of household life. They have fewer extraneous problems to worry about and they are therefore able to make their resources go further. This notion may be further refined. First, negentropic households reduce the sources of variation or uncertainty better than entropic households. Second, negentropic households are more proficient in making transformations.

As for uncertainty, it is important to note that each of the four main aspects of household organization involve decisions and are subject to sources of variation. Unexpected variations in the source of income, in the patterns of exchange, in tenure, and in many other areas, can upset the balance of survival or impair the ability of households to accumulate resources. A loss of job, sickness, or death in the family, even a sudden eviction, not to mention fire, flood, theft, and so forth, all can quickly evaporate a thin veneer of wealth. Yet some households are in a better position to recover.

There appears here the underlying logic of reducing uncertainties, discussed earlier, which coordinates the use of instruments among

negentropic households. Negentropic households eliminate uncertainties about income, make the most effective use of networks, and sacrifice in diet and possessions. This logic, in effect, builds up a structure of security which protects household survival and lays down the groundwork for accumulating resources. With their emphasis on interacting with nuclear family members, negentropic households also are better able to test for, and perhaps in some instances, affect the outcome of given situations. Negentropic households build, in effect, a better intelligence system.

Other characteristics of negentropic households suggest they make transformations more proficiently. By this I mean that they minimize the total energies sunk into the maintenance of household organization. From this it might be hypothesized that for the product (security, capital, education), negentropic households expend less energy. I have already argued that negentropic households, compared to entropic, have fewer details to worry about, i.e., fewer dependents, fewer mouths to feed; they have more secure sources of incomes, and generally more choices in meeting routine and emergency needs. The overall pattern suggests that less risky and perhaps less energy-intensive "plays" may be substituted for riskier, untried alternatives. Also, personal knowledge helps to avoid needless wasted effort in searching through trial and error.

But negentropic households also eliminate redundancies. Job security means, in addition to turning household energies to other tasks, that not much wasted effort need to go toward the maintenance of income. Also, new sources of assistance are available through

employers or workmates once new job relationships are established. More important perhaps, negentropic households have narrowed down their sources of possible error in network interchanges, as shown in the large proportion of investor household transactions occurring within the "source" category of nuclear family.

Although the data do not permit establishing firm conclusions, the evidence presented suggests that instruments are indeed coordinated around reducing uncertainties, at least among investors defined in material terms. This analysis is weakened by having been based on a narrow sub-sample of the Leedses' data. Furthermore, the analysis has been static in viewing transformational actions. Negentropic behaviors defined in nonmaterial terms and seen in a dynamic context--one in which different stages in the domestic cycle may be examined--would throw more light on how the different household objectives change over time and on how different objectives are achieved.

CHAPTER VIII

FAVELA TRANSFORMATIONS

This chapter tests the transformational perspective further, this time by examining it applied at the level of the favela. The following sections consider the reciprocal relationship between environmental influences and the use of instruments. A comparative analysis of different strategies, presented in previous chapters, suggests that different strategies may be traced to different environmental factors. At the same time, the capabilities to make transformations in individual households viewed collectively form part of the environment of other households in the favela. The populations in Alto Solar and Ruth Ferreira are examined in light of Uzzell's proposition that settlements undergo a self-reinforcing growth. Thus, the descriptive terms of entropic and negentropic may be applied at the favela level. This chapter examines the differences between Alto Solar and Ruth Ferreira and shows how certain factors strengthen what may be called the "informational infrastructure" in Alto Solar, reducing sources of variation, while the opposite is true in Ruth Ferreira.

A. Interaction of Contexts and Instruments

It has been shown in Chapter IV that Alto Solar and Ruth Ferreira were quite distinct as settlements. Although political and economic forces were constantly in flux, resources accessible to residents in Alto Solar were both more numerous and more varied than in Ruth Ferreira. As well, Alto Solar was relatively free of predatory actions

such as those of CIFERAL. Together with other systemic factors, these conditions promoted in Alto Solar resource flows and investments which were suppressed or extinguished altogether in Ruth Ferreira.

Actions of individual households considered in the aggregate both interact with and help to shape the favela environment. I shall show that favorable aspects in the environment, such as the presence of social workers in Alto Solar, were magnified and reinforced while intrusive outside factors were offset, such as the threat of the tunnel construction, so as not to erode the gains of favela residents. Conversely, in Ruth Ferreira, favela residents were vulnerable and without protection against exploitative actions of the CIFERAL. With the help of an informational infrastructure it is easier for households collectively to produce net gains and order their environment. The relationship between households and the favela environment may be analyzed in the following familiar categories: household membership, employment, networks, and spending.

1. Household membership. As described in Chapter IV, Alto Solar in comparison to Ruth Ferreira consisted of households with greater longevity and more variations on a basically kin-oriented system of domicile arrangements. Residents of Ruth Ferreira on the other hand, reported uniformly shorter periods of occupancy. As well, females over age 15 represented a higher proportion, 53.7%, of the total in Ruth Ferreira compared to 47.6% in Alto Solar. The origins of residents sharpens the distinctions between the two favelas. A majority of residents in Alto Solar came originally from outside Rio, mainly from small or medium-sized towns. Nearly a quarter of them settled directly in Alto

Solar. A majority of residents in Ruth Ferreira on the other hand, came either from Rio itself, natives like Manuel and Euridice, or from villages and farms. Less than 5% made Ruth Ferreira their first stop.

One possible interpretation of these data is that Alto Solar consists of residents who are more stable and who have, like Paula, upwardly-mobile aspirations. Though they have urban backgrounds, residents in Alto Solar have come to make a better life in the city. Ruth Ferreira, on the other hand, is populated more by natives of Rio who have been overcome by urban adversities, either defeated or temporarily set back. The presence of single female parents is one possible instance of this refuge notion. Manuel's case is yet another. A fire, followed by an encounter with a crooked public housing official, precipitated Manuel's settling in Ruth Ferreira.

Paula, Jose, and Rosa's histories on the other hand, show they migrated to Alto Solar in contact with other family members. They came in waves, one linked to the next. Further, they remain in touch with family either in Alto Solar, or in other favelas. In effect, this contact before and after arrival reflects a degree of order and insurance which is not found in Ruth Ferreira. Family links constitute a channel of resources. Experiences within the family are absorbed over time and learning passed along through these links to both present and prospective urban residents. This has the effect of further amplifying their resource-generating powers, as the case of Paula and Jose illustrates. Resources--shared information, mutual assistance, discoveries, and so on--are made more widely available.

This pattern calls to mind Uzzell's study of "cholofication" among Quechua Indian migrants to Lima and his subsequent hypothesis of amplified deviation in particular settlements (Uzzell, 1972, 1974). As migrant settlements get established, their collective experiences of travel, lodgings, settlement, and work are tried and tested. This collective experience gets transmitted back to rural areas where it becomes available to a wider population perhaps previously less disposed to take the chance of migration. In effect, the uncertainties in migration to Lima are reduced. Information has been created. One Quechua follows another, each giving a hand, so to speak, to the next. One consequence is that settlements of migrants take on a character which increases its appeal to other Quechua migrants.

A similar process seems to apply to migrant families in Alto Solar. Although the data do not permit a direct test of Uzzell's thesis, they suggest its validity. Table 10 compares the two favelas in terms of the first contacts in Rio or in the case of Rio natives, the last residence before setting up ones own household.

Differences are marked in the use of family, especially extended family, in the two favelas as a first foothold in the city. These data support network data cited earlier and below with regard to the prevalence of interaction among family members in Alto Solar. As discussed in Chapter VII, contacts with kin are presumed to be among the most reliable resources. The role of friends as contacts in Ruth Ferreira may lend support to the idea that Ruth Ferreira is a way-station, perhaps a holding place, as in Manuel's case, rather than a place desirable

Table 10
First Contacts in Rio

Stayed with Whom Before Setting Up Household in Rio ^a	<u>Alto Solar</u> N = 32		<u>Ruth Ferreira</u> N = 27	
	No.	Percent	No.	Adj. Percent
Nuclear Family	9	28.1	8	33.3
Extended Family	9	28.1	4	16.7
Friends	2	6.2	7	29.2
Patron	10	31.2	4	16.7
No One	2	6.2	0	0
Other	0	0	1	4.2
No information	0	0	3	--

^aRefers to present household for Rio natives.

for families to gather and settle. Work-related contacts in Alto Solar, on the other hand, reflect the importance of ties of domestic servants to well-off families. This aspect will be taken up again shortly.

The data suggest that the composition of households also shapes the choices and opportunities of individual households and constitutes a favela resource. Viewed in the aggregate, the composition of households may be seen as the logical outcome of systematic selection resulting in the settlement of a population disposed to share resources along family lines and to maintain organized cooperation and assistance in Alto Solar. The composition of households containing relatively greater numbers of members in contact with other family members represents a potential for informational resources not present in Ruth Ferreira.

Alto Solar was thus able to capitalize on the protection, aid, and resources of the School of Social Services. This "informational infrastructure" of family ties also had favorable implications for the level of personal effort required in a given household to secure shelter, employment, and other resources.

In Ruth Ferreira, on the other hand, a lack of space and poor drainage inhibited development there. Later, CIFERAL stood as a manifest threat to even the most fundamental construction of order. The complicity of authorities abetted and reinforced the predations of the bus company. Ruth Ferreira thus operated in an environment which eroded any efforts to organize. Settlers selected it as perhaps a last resort, trading off the risks of dispossession and lack of facilities against the inexpensive housing and easy access to employment.

2. Employment. Chapter IV has already described the labor market characteristics of the two favelas. The structure of the two labor markets reflects and reinforces the locational and compositional features of the two favelas as described above. Table 11 elaborates on these descriptions showing the shift to characteristically urban job skills. Also, Table 11 provides further evidence in support of the view that Alto Solar is relatively more stable than Ruth Ferreira. The data in Tables 11 represent key parts but not all of the Leedses' data gathered on the work histories of favela residents. In addition to questions on present employment, respondents were asked a battery of questions on work history, including, for instance, their first work and up to the four next most important jobs. Only the first of these past employments is shown in Table 11 (column 1) in order to reduce

complexity. The "professions" (column 2), or job categories respondents used for official matters such as social security papers, were also recorded in order to establish a reference point against which both first and present jobs (column 3) could be compared. Categories of employment used in both tables are described in footnotes to Table 11.

Patterns of employment in both favelas reflect the emergence of characteristically urban skills, especially services, even though a large fraction of the working population began their work experience in urban settings. As expected, agriculture as an income-earning activity, of great importance in the earlier lives of many residents in Ruth Ferreira, disappears almost entirely, although the raising of fruits, vegetables, and animals was practiced to supplement household resources in Alto Solar. No such agricultural activity was reported in Ruth Ferreira. In place of agriculture, jobs either in the building trades, office work, sales, commerce, or transport all increase. In addition, more people either stop working by choice, or become unemployed involuntarily; I shall return to unemployment below.

The growing importance of the building trades and the services sector is only one aspect of the shift to urban work patterns. It is also important to take into account (though no evidence appears in this table) that generally higher incomes are earned in large cities as compared to farm and even small town earnings. In addition, there are increased opportunities to work in larger cities. Evidence of increased opportunities is seen in the 'variety,' or number of different kinds of jobs reported for present work, as compared to first work, especially for workers in Ruth Ferreira. Workers there reported an

Table 11
Work Experience by Favela
(percent)*

Employment Type	Ruth Ferreira			Alto Solar		
	First (N = 43)	Prof. (N = 39)	Present (N = 43)	First (N = 44)	Prof. (N = 40)	Present (N = 43)
Primary ^a	32.6	-	-	11.4	-	-
Secondary						
Skilled factory ^b	7.0	-	-	4.5	5.0	9.3
Semi/unskilled ^c	18.6	15.4	13.9	11.4	7.5	9.3
Building trades ^d	2.3	17.9	18.6	6.8	10.0	4.6
Services						
Office ^e	-	-	-	-	2.5	4.6
Sales/commerce ^f	4.6	12.8	13.9	13.6	15.0	14.0
Transportation ^g	-	5.1	4.6	2.3	10.0	9.3
Public Service ^h	2.3	2.6	2.3	4.5	-	-
Personal Service ⁱ	11.6	15.4	11.6	2.3	5.0	2.3
Domestics ^j	9.3	10.2	2.3	29.5	30.0	20.9
Medical ^k	-	-	-	4.5	2.5	2.3
Building Care ^e	2.3	-	-	4.5	5.0	4.6
Not working ^m	4.6	12.8	13.9	4.5	5.0	14.0
Unemployed	4.6	7.7	18.6	-	2.5	4.6

*Excludes No Response

- a. day-labor, field work, tenant farming
- b. machinery operation, shoemaking, foundary work, electrical work, metal work
- c. apprentices, oven-tending, machinery helper, homecrafts
- d. carpentry, finishing, painting, stone masonry, plastering, sawyering, construction help
- e. office boy, assistants
- f. counter clerks, waiters, store workers, cashier, faire sales
- g. mechanic, driver, chauffeur
- h. street crew, tram driver
- i. seamstress, tailor, cook, laundry, gardener
- j. live-in maid
- k. lab technician
- l. custodian, doorman, gardening
- m. persons out of the labor market e.g., homemakers, or retired.

increase of 15% (from 20 to 23) different kinds of jobs. For Alto Solar, this variety shrinks by 14%. A change in variety reflects several things, depending on the context of the labor market. First, it reflects opportunities to pick up new work. In the event of lay-offs or firings, the presence of a variety of opportunities such as doing odd jobs in the building trades by workers in Ruth Ferreira, offers a cushion, representing an important incentive to live in cities. At the same time, the variety measure also reflects a degree of instability, or high job turnover. Both opportunities and instability appear to be true in the case of Ruth Ferreira, while the great importance of domestic work available to residents of Alto Solar lends a measure of stability there. Data to be presented later will also show a higher number of jobs in Ruth Ferreira, suggesting a higher turnover there as compared to Alto Solar.

The stability of the labor force in the two favelas is also reflected in the frequency with which present jobs or lack of work differ from the stated profession. The percentage changes in Table 11 reflect this mobility, but do not show it directly. In Ruth Ferreira, 20.9% of the cases reported such differences, many of them arising from new unemployment, and fewer from dropping out of the labor market. In Alto Solar, only 11.7% of the cases reported present work different from their profession, and, compared to Ruth Ferreira, the proportions are reversed. Relatively more workers in Alto Solar dropped out of the labor market; only a few became unemployed.

The significance of the "not working" is that people are not seeking work. Many have opted to run households full time, or in a handful of cases, have retired.

As described earlier, the context of the labor markets in the two favelas is distinct, and it may be observed from Table 11 that unstable work is more prevalent in Ruth Ferreira. The building trades, which are subject to fluctuations and instability for workers, become more important in Ruth Ferreira and presently represent over 18% of the work force. Conversely, less than 5% of the working population in Alto Solar was employed in the building trades and this work seems to become less important. Domestic and personal services work, which offers somewhat greater stability than the building trades, declines for both favelas. Again, roughly twice the proportion of workers in Alto Solar (23.2%) are employed in these jobs as are workers in Ruth Ferreira (13.9%) where many workers are employed in personal services which are generally less stable than domestic work.

Finally, it should be noted that domestic work is important beyond the number of people employed. It opens access to an array of resources and contacts seldom encountered in other employment. These are magnified by the general level of wealth in the South Zone, compared to the North. Resources include credit, food, material assistance, and pistolões, the Brazilian term for someone with "pull" or "clout" who can help extract resources from bureaucracies, agencies, businesses, etc., through personal intervention. Manuel, for instance, may have benefitted from his pistolão, Tenorio, to find shelter after the fire. Domestic work is also important as a stepping stone for migrants to Alto Solar. After family contacts,

domestic work ranked as the second most important initial contact in the city. With a foothold established in the city, domestic workers are then in a position to channel resources from their employers into their households, to other migrants, and into the favelas.

Thus, there are more "fringe benefits" of the informal kind to be exploited, especially in domestic work in Alto Solar than in Ruth Ferreira. It is important to note that workers in the informal sector come in contact with a number of resources such as assistance, information, or loans that are in effect fringe benefits. Though they are customarily thought of as a phenomena of the formal sector, this source of resources is a common feature of informal sector employment. Paula's links to her present and former employers, and the wealthy clients in Jose's auto repair business, brought them into contact with a rich array of resources. Domestic work, much more prevalent in Alto Solar, is the occupation most likely to offer informal fringe benefits.

Residents of Alto Solar are not only employed in a richer context, as Table 12 indicates, they also have a larger employment base. In absolute terms, the number of jobs reported in the favelas is noteworthy. Despite the industrial character of Ruth Ferreira, fewer jobs per capita (.46) were reported there compared to Alto Solar (.49). Perhaps more important is the ratio of employed persons to "dependents," those under 12 and over 65. Assuming the number of jobs reported were 30% of the total, Alto Solar had 1.42 jobs per dependent person whereas Ruth Ferreira had 1.24.

Table 12
Employment Base

<u>Favela</u>	<u>Reported Jobs</u>	<u>Estimated Total Jobs</u>	<u>Jobs/Person</u>	<u>Jobs/Dependent</u>
Alto Solar N = 32	70	233	.49	1.42
Ruth Ferreira N = 27	58	193	.46	1.24

In sum, labor market characteristics, such as the demand for domestic work, shapes the households and the number and types of information channels available to the residents there. These channels, in turn, shape the possibilities for resource transformations. In a similar manner the origins of residents, structure of employment, and other contextual factors overlap with, and help determine, the degree of interaction of households with the environment, as well as the type of resources found in the favela.

3. Networks. The frequency of household transactions, in the aggregate, reflects the activity of the favela as a whole. The 32 households in Alto Solar reported a total of 144 transactions through their networks, whereas 26 households in Ruth Ferreira reported only 102 (an average of 4.5 vs. 3.9, respectively). Moreover, these frequencies correspond somewhat with the background of migrants. Surprisingly, it is not large city size but the farm as a place of origin which is associated most closely with large numbers of contacts. The active interchange exhibited by migrants from the farm in Alto Solar may be due to such things as upwardly mobile aspirations, or

a favorable environment. On the other hand, natives of Rio, found more predominately in Ruth Ferreira, together with migrants from other big cities and the farm, altogether comprising nearly two-thirds of Ruth Ferreira's adult population, tend to interact less with their environment than their counterparts in Alto Solar. This reduced interaction lends credence to the "holding station" image of Ruth Ferreira. This is not to say that Rio natives are least active generally, only that Rio natives in Ruth Ferreira are less active than residents in Alto Solar who were born in Rio or other large cities. Table 13 compares the number of transactions in each of these groups by favela.

Table 13

Favela Network Transactions by Origin

<u>Favela</u>	<u>Origins</u>	<u>Category of Household Network Transactions</u>	
		Low (1-4)	High (5-10)
		(percent)	
Alto Solar (N = 32)	Metropolitan areas and cities	75	25
	Small and medium-sized towns	53.6	46.4
	Farms	25	75
Ruth Ferreira (N = 21)	Metropolitan areas and cities	80	20
	Small and medium-sized towns	53.8	46.2
	Farms	52.6	47.7

As for the sources or network transactions, partners who are also blood ties play a more important role in Alto Solar, thus reinforcing the supportive environment of the favela discussed earlier in connection with Uzzell's hypothesis. Table 14, below, shows that households in Ruth Ferreira interact more with friends and workmates than with family members.

In sum, Alto Solar as a favela which is more tightly knit, more active, and more organized. The systematic recruitment of, and interaction with, kin, together with the structure of the labor market, combine with other environmental factors to produce a climate in which more information is generated, some of it routinized, and much of it shared. Investment and political organization, the latter expressed most strongly in the form of the residential association, appear in Alto Solar where none is visible in Ruth Ferreira. This combination of factors reinforces and maintains the construction of order. Also, the element of certainty this order represents has favorable consequences for negentropic transformations of resources such as capital and personal energy.

Reliable sources in networks of exchange and, to a certain extent, steady employment are perhaps the two most important factors for households, and by extension, the favela. These factors are important in the same way shelter and home are symbolically important. Reliable network interchanges and the plays, knowledge, or information about the city that they convert are predictable, known, routine, and even institutionalized, some to the point of being redundant. Social relationships which have been tested and confirmed do more than cushion the

Table 14

Network Sources by Favela

<u>Favela</u>	<u>Category of "Sources"</u> (percent)					<u>Total</u> <u>Transactions</u>	
	<u>Nuclear</u>	<u>Family</u>	<u>Friends</u>	<u>Work</u>	<u>Public</u>		<u>Other</u>
Alto Solar (N = 32)	31.1	8.1	32.5	25.2	1.5	1.5	144
Ruth Ferreira (N = 26)	10.4	9.2	39.5	32.6	3.5	4.6	102

shock of unpredictable change. They lay the groundwork for what Marris would call a thread of continuity. Steady jobs and steady contacts strengthen the transformational foundations in favelas because they are the sources of knowledge of economy in effort, as well as of other resources. The most obvious evidence of this is in the risk of loss in moving to Ruth Ferreira--a settlement which has little to offer in terms of opportunity. The cost in personal effort to gain access to resources--information, employment, emergency assistance--may be more easily avoided or reduced in Alto Solar. Residents indicate a knowledge of conditions in other settlements and so we cannot say that their choices of settlements are uninformed. The fact that Ruth Ferreira still survives, and that Alto Solar was eradicated, says nothing to change the essential validity of risk assessments by households.

In the first place, the removal of Alto Solar was carried out under the dubious pretext that the favela land was needed for "utilidade publica" when in fact the favela was situated over, not on, the tunnel route. In addition, the work had been long-postponed, meaning that over time the threat of removal was diluted. Also, some favela residents worked as service employees in nearby residential and commercial establishments, thereby creating a small incentive in the surrounding community to keep the favela in place. Finally, the presence of social workers, whose efforts were visible and in some respects representative of authority, was a favorable factor to be taken into account in the calculation of risk by residents or prospective residents of the favela. These considerations make Alto Solar more attractive than Ruth Ferreira,

although not more attractive than, say, a larger favela where security of tenure is generally greater.

Ruth Ferreira, on the other hand, had little to offer residents after Avenida Brazil was widened. Space for growth was limited, there was no drainage, standing sewage became a chronic problem. In addition, as shown earlier, CIFERAL became an active and obvious threat to survival in Ruth Ferreira.

At least it may be argued that the choice of favela by residents in Alto Solar led to a better post-removal adaptation than is (or would have been) observed among people who also left or were removed from Ruth Ferreira. In addition to the moving out and up for Paula, for instance, Leeds reports¹ that other former residents of Alto Solar kept things going or improved things in the new housing project, while former residents of Ruth Ferreira, on the other hand, went to other favelas or to parques proletarios and stayed as proletariats instead of moving upward in status and income.

From this evidence it may be concluded that an informal informational infrastructure in Alto Solar helped to not only to take advantage of the favorable environmental conditions made possible by the presence of the social workers. Also, the informational infrastructure may have helped in the post-relocation recovery. Certainly a greater variety of resources and more successful innovations were evident in Alto Solar many of them filtered through network links.

¹Personal communication.

4. Allocation of resources. The Leedses' data on food acquisition and material possessions, aggregated at the level of the favela, extend the pattern of negentropic characteristics in Alto Solar. The data in Table 15 on food purchases show that the average level of monetary outlay for food in Alto Solar (average of $\text{¢}193.76$; equal to \$43.05) is much higher, without counting food brought in by domestic workers or garden plots, than in Ruth Ferreira, where average expenditure was $\text{¢}126.37$ (equal to \$28.08) where no garden plots were kept. The major percentage differences, in meat and dairy forms of protein observed among different households (as discussed in Chapter VII), disappear at the level of the favela. This may be because Alto Solar harbors a fair number of households (like Rosa's) which make no sacrifices in meat. Also, the range of food expenditures in absolute terms is, in fact, much greater in Alto Solar than in Ruth Ferreira. The higher relative levels of fruits and vegetables and lower starches in Alto Solar are somewhat consistent with the patterns found among investor households as a whole.

Table 15
Food Expenditures of All Favela Households

<u>Food Group</u>	<u>Alto Solar</u> N = 25	(percent)	<u>Ruth Ferreira</u> (N = 18)
Meat	37.6		37.8
Fruit/Veg.	18.9		14.8
Starch	22.1		29.0
Dairy	8.8		8.1
Misc.	12.3		10.2
Total (absolute)	$\text{¢}193.76$ (\$43.05)		$\text{¢}126.37$ (\$28.08)

As for the data on possessions, Table 16 shows that the weights (established by the Leedses) for possessions are higher in Alto Solar than in Ruth Ferreira, again as expected. The data on electric and nonelectric appliances in Table 17 are inconclusive, except to note the higher absolute levels in Alto Solar.

Table 16

Distributions of Weights for
Furnishings and Appliances by Favela

Total Weights	Alto Solar (N = 31)		Ruth Ferreira (N = 24)	
	No.	Percent	No.	Percent
1-5	2	6.4	7	33.3
6-10	7	22.6	2	9.5
11-16	5	16.1	7	33.3
17-22	8	25.8	3	14.3
23-31	9	29.0	2	9.5

Table 17

Average Weights for Appliances by Favela

	Alto Solar (N = 31)	Ruth Ferreira (N = 21)
<u>Appliances</u>		
Electric	9.3	7.6
Nonelectric	9.5	6.1

Capital investments are a partial result of environmental conditions, and I have argued, investments can contribute to a strengthening of the favela environment. It was shown in previous chapters that a higher proportion of households in Alto Solar invested in housing and infrastructure than in Ruth Ferreira. The Leedses' data also indicate that Alto Solar residents used more utilities, underground sewerage, electric power, and piped water. In parallel with earlier arguments, the key condition favoring these investments in Alto Solar was the presence of the social workers. But also, reliable networks and jobs make investment easier, as they provide the skills, the credit, and the insurance to offset risks of these investments.

Information flows are interlaced with and reinforced by actions which have the effect of offsetting or changing the nature of risk. Squatters learn to install pirated electric power for instance and thereby endow their holdings with a quasi-legal status (Conn, 1969). They also learn through their information channels about property availability, and how such property may be acquired. In some cases, maintaining a continuous occupancy, clearing any financial obligations, and paying taxes on otherwise unclaimed property for a specified period of time, entitles the occupant to ownership (Conn, 1969). More dubious mechanisms are also developed for attaining legal status, including the adoption of quasi-legal papers, documents, certificates and even seals purchased for legal recognition, even though the documents to which they are affixed--sales receipts of favela property, etc.--may not themselves be legally binding. On the other hand, as I have pointed out in the case of the largest favela, squatters hope by the very act

of settling and upgrading property that authorities will be dissuaded to act against them.

The point in all this is that investment in property and housing, in addition to serving personal and social needs for day-to-day living, also serves a structural purpose of enhancing the concrete reality of the squatter presence and of building up for indemnities in case of removal. This building up of housing and community facilities was easier and safer in Alto Solar. Though this strategy eventually proved fallacious in Alto Solar, investment shifts the burdens of uncertainty by making removal more difficult. At the same time, investments in Alto Solar, both in favela housing as well as in property outside the favela, may be seen as a hedging of bets either to increase indemnification in case of removal or to lay the groundwork to move out.

B. Conclusions

This analysis has discussed certain aspects of the interaction between households, the favela, and the urban environment, attempting to identify mechanisms which either reinforce certain characteristics in the favela or which offset adversities or minimize loss. The favela and its residents operate in an open system in which the poor are largely vulnerable to the more powerful predatory forces of the larger society and to nature. However, favelas are not completely unprotected. A variety of systemic mechanisms are built up which shift risks by filtering or moderating outside influences so as to diminish deplorable influences and increase useful resources. Individual and favela-wide actions interact, building up an order founded on and protected by household structures of security.

Information gathering and, particularly, networks of exchange play a key role in these structures. Evidence from Alto Solar suggests that an informal informational infrastructure results from the collective information-gathering activities of its residents. Information and other resources are passed along to others, especially family, creating an intelligence system. But, whereas tightly-coupled resources are important, loosely-coupled resources play a key role in households like Manuel's, to offset the extreme adversities, uncertainties, and disordering forces in Ruth Ferreira. The difference is that, say, to secure information, Manuel is obliged to spend more energy both to find and test it. The residents in Alto Solar have the benefit of a broad base of personal knowledge resulting from accumulated experience of previous residents' trials and errors which have gradually winnowed out more costly plays.

In the material sphere, capital investment helps to offset uncertainties, if not influence risks, in a favorable direction. Under the right circumstances, households may act in concert, to build up their material presence and thus acquire a legitimacy and increase the security of their real estate and improvements. At the same time, investments and possessions serve as "reservoirs." Transformed to material form, resources help retard "leaking" back into the environment. The more widespread and substantial the material investment, the harder it is for creditors to collect their due. At the same time, because of possible indemnification, investments hedge the risk of possible eradication. In short, households and favelas may increase their protection somewhat by converting energy and information into possessions and investment.

Some of these efforts have a synergistic effect, giving to the favela emerging qualities which are not visible in the mere arithmetic sum of its parts. The employment situation is both a result of and contributor to order building in Alto Solar. Work there is more stable and offers more fruitful side-benefits than in Ruth Ferreira. The recruitment of social workers by the president of Alto Solar's resident's association is a particular instance of synergistic effects, as is the residents' cooperation in building community infrastructure. Other forms of surplus were also more evident in Alto Solar than in Ruth Ferreira. Collective actions combined to reduce uncertainty about how to make investments in Alto Solar and to produce shared knowledge as in the recognition of rules governing building and infrastructure in Alto Solar.

But it is the system of networks which is most prevalent in mediating one forms of resources--cash, materials, information--into other forms. At a deeper level, social networks serve to intermesh two levels of the urban structure, one the outside world and the larger urban environment, the other, the household, its members, friends, and associates. It is the synthesis of these two levels which tests a household's ability to contact and make sense of environmental resources and to entrain them into their service. This contact, ordering, and manipulation, under the protective umbrella of the social workers in Alto Solar, built up the tissue of urban structure.

New infusions of energy and information change the shape of alternatives open to individual households. It follows that the more skillfully a household is able to make use of information to substitute for or avoid the use of more "expensive" resources, the more able the household is technologically to use even more complex "recipes" and a wider scope of resources. This then becomes a spiraling process as shown by Paula and Jose, and by Manuel. It is also a self-reinforcing process. The structure so formed by individual households becomes, in the aggregate, part of the context for other households in the favela.

In short, a number of factors in the environment--location and composition of the favela being two of the most important--interact with and affect the use of instruments in favela households. In turn, the durability of household structures of security are tested and strengthened. By the same token these structures and the imagination and ingenuity with which instruments are wielded help determine the degree of success households enjoy in their efforts to garner and transform a positive balance of resource from their environment.

CHAPTER IX

PROBLEMS AND PROMISES OF THE TRANSFORMATIONAL PERSPECTIVE

The preceding chapters have explored the transformational perspective in an attempt to examine its utility as an intellectual approach to understanding squatters and urbanism. The utility of the transformational perspective depends upon its ability to improve our understanding of squatters and to predict behavior of, and to make interventions in, the urban ecosystem. The analysis of squatters has shown that this perspective has certain advantages. It encompasses the broad range of resources in cities and provides certain insights into the nature and types of transformations in cities. But the perspective also suffers from certain intrinsic weaknesses. At the root of these weaknesses is that key concepts have been borrowed from other disciplines which, until now, have been largely extraneous to squatter and urban research. This borrowing introduces degrees of "openness," in Kaplan's use of the term (1964), in the interpretations and definitions of terms. This openness widens the range of the descriptive abilities but dilutes the predictive powers of the perspective.

The following sections expand this critique. First, the critique identifies in more specific terms the theoretical origins of these weaknesses and, second, traces their impact through to operational concepts and variables. It will be shown that the theoretical basis for the transformational perspective involves a mixing of the physical domain of energy and material with the symbolic domain of information. This mixing compounds the difficulties of borrowing theory mentioned above. The result is that the utility of the transformational

perspective, as it has been interpreted in the preceding chapters, is diminished at the point at which concepts are translated into operational terms. Subsequent sections review counterbalancing considerations--the insights and promises of this perspective--and outline areas in which further work may be fruitful.

A. The Borrowing of Theory

The transformational perspective springs from principles which originate in the physical sciences, especially thermodynamics. Until now, the Second Law has not been invoked as a "starting point" in research on squatters, and furthermore, the Law is largely untested anywhere in the social sciences. As mentioned earlier, Etzioni uncritically employed a thermodynamic metaphor and Adams, going too far in my view, argued that the Second Law was integral to the explanation of social power. The present case fits somewhere in between. It has explored the merits of taking the Second Law into account more explicitly in the analysis of social organization. In this exploration, I have asserted that physical principles of entropy, either by means of conscious or unconscious decisions, inevitably come into play in individual actions and therefore, in theory at least, should be observable in social order. Precedents for this claim have been reviewed earlier in the works of Zipf, Berry, Meier, Uzzell, and others. But to prove this proposition, or even to extract something useful, operationally, from it in the analysis of squatter actions, is another matter.

The most troublesome point in this regard is to link the theoretical terms of entropy and negentropy in a formulation which is both intuitively understandable and operational. These terms, especially negentropy, are confusing and awkward even in their native intellectual environment. In the first place, the technical definition of entropy in the Second Law is expressed negatively, but unambiguously to be sure, as a measure of both the decrease in energy available to do work and of increasing disorder in closed systems. The term negentropy was invented outside the laboratory origins of its counterpart term to refer to those (life) forces which counter entropy. The terms are not exact opposites. We know that, once lost, available energy cannot be retrieved. But it is possible to create information. Thus, the terms entropy and negentropy are asymmetrical.

At least two major conceptual problems crop up from this borrowing of theory and from the theoretical asymmetry mentioned above. First, the borrowing necessitates the invention of a new array of terms which, ideally, must correspond to the principles in the parent body of theory and, at the same time, to observed reality. The difficulty of this inventing varies. The precise meanings of entropy and negentropy in their original contexts are replaced, in the present case, with a social analogue which aims to understand forms of local order and energies required to reverse or offset environmental disruptions and limitations in personal effort. Thus, the transformational perspective has been based on a certain relationship between the two domains of energy and information and their various transforms in the squatter environment. A limited stock of knowledge and experience is available from which

to draw insights and ideas on this relationship and from which to check and test the conceptual model internally. In addition, some definitions are incomplete. In the case of personal knowledge, for instance, informational aspects of resources (reductions of uncertainty) are assumed to be "internalized" in a particular actor as knowledge. This may be plausible but it leaves unexamined the problem in theory at least, of the exact nature of the relationship between information and knowledge.

A second and more serious problem, one that derives partly from the borrowing of theory, is the high level of generality of key concepts in the transformational perspective. The transformational perspective has suggested that many forms of order are of theoretical importance in the explanation of squatter behavior. However much in agreement one may be with the importance of order as an organizing principle, there are so many forms of order in the urban environment that this focus is in danger of directing our attention to everything and to nothing in particular. To be more meaningful, it is necessary to select which of the many forms of order and disorder are the most important.

This is an issue to be addressed in terms of the purposes and theory behind a given line of research. The question of purpose in the case of this transformational perspective is taken up in more detail in a later section. For the moment, we may say that the transformational perspective has been most useful, perhaps, in calling our attention to different orders, and of suggesting how a particular form of order is constructed, so to speak, than in isolating a given form as a main area of interest. For instance, this exploration has not only corroborated

the importance of security in squatter lives. We are able to see the structure of security in more concrete terms. We have some notion of how this structure is composed of network links, physical housing and infrastructure, employment, etc.

The problems of untested concepts and of being too general may be illustrated with the notion of the social entropy spectrum, introduced in Chapter I and employed as a comparative tool in later chapters. The social entropy spectrum attempted to simplify a great deal of complexity, too much, perhaps, so as to characterize households in a new way according to the degree to which they are successful in coping with the many factors of uncertainty in their environment and in maintaining resource flows. In reality, as is clear from the cases, many ordering and disordering actions take place simultaneously, and there are many ways a positive balance of resources might be made manifest in a household. Ordering actions are not resolvable to a single state, as the "resultant of forces" in physics resolves forces into a single direction. Households operate in many dimensions at any given time. Furthermore, the complex of dimensions changes as households move through the domestic cycle. But even if we are to ignore this complexity, as the entropy spectrum does for purposes of analysis, the ordering it attempts to reflect is only partly congruent with standard social science notions such as the gaining or losing of social status, economic mobility, monetary wealth, or political power.

In short, as a means to describe a given state or action, the transformational perspective is hampered and potentially confusing unless the phenomena it attempts to describe or explain can be expressed

in terms of specific meaningful situations, translatable at least into measurable quanta.

B. Transformations and Operational Variables

'Transformations' has been the key operational concept in the living system paradigm. The concept of transformations must be general enough to cover the many different ways resources change forms. This generality, however, exacts a price in the degree of precision it is possible to achieve in description of a given change. There are several aspects of this difficulty.

One is that a central part of all transformations engineered by squatters is abstract. That is, part of the act of transforming takes place in the mind or imagination of the person making the transformation. Thus, an important ingredient in the making of transformations is difficult to observe and measure directly. This difficulty arises, partly because of, and increases proportionately with, the use of informational aspects of resources.

A related factor is that this abstract ingredient bears on the question of efficiency. In the analysis of cases, this efficiency was expressed in terms of decision rules governing resource substitution. It was argued that relatively cheap resources (e.g., "loosely-coupled" informational aspects of resources) are substituted wherever possible for more expensive energetic aspects and, in particular, for personal effort. Though this notion may make sense from a logical standpoint, it is difficult to evaluate empirically. This is not only because energy and information in the urban environment are difficult to measure,

as I shall discuss below. It is also because some household transformations are not discrete, separable actions.

Thus, another difficulty with the transformational concept is that transformations are continuous actions integrated into the day-to-day routine and not easily observed and compared. It is not as easy to compare the efficiency, say, of two transformations, or of two households, as it is to compare two processes of production in the conventional sense of the term. Households blend informational aspects of resources--the sources for new ideas for improving efficiency--in an integrated manner with other resources as an on-going part of household life. Efficiency probably varies widely over time, even from moment to moment. In fact, for squatters, we might expect this variation to be large due to the many intervening opportunities and constraints of their uncertain environment. Nevertheless, as I have tried to indicate in Chapter VII, some households, those I have called negentropic (investors), systematically build up flows of resources so that patterns of transformations may be visible even if individual acts of transformations are not. Thus, to some degree individual differences may be expected to wash out even though, in principle, the difficulties of observing hidden aspects of transformations remain.

A more general problem of the transformational perspective is one of identifying better measures of key variables, particularly energy and information so that changes in one may be seen in relation to the other. As I have mentioned elsewhere, energy flows in primitive settings, perhaps the closest parallel to the problem at hand, have been analyzed and measured in terms of calories. Caloric measures

of energy intakes and expenditures are conceptually appropriate, logical, and operationally feasible, given the objective of calculating energy balances.

For our purposes, this is more difficult in the complex environment of cities. For instance, loosely-coupled resources, like a newspaper advertisement, may be gathered quite easily and, like Jose's TV, may have important consequences on the total energy budget of a household. Thus, for conceptual and empirical reasons, the objective of constructing energy accounts is made more difficult. At the same time, energy accounts may not be the only, nor the most appropriate purpose of the transformational perspective, as I shall suggest below.

For these and other reasons the measurement of energy in the preceding analysis has relied on indirect indications of personal effort, assumed to be the most important energy form, particularly for squatters with limited monetary forms of resources and reduced number of formal channels of resources. Caloric energy, as reflected indirectly in the food purchased by households and personal time, as a surrogate measure of personal energy expenditures, have both been employed. Yet calories alone are inadequate measure to understand the energy flows in households. Calories do not reflect the end uses to which personal effort is put. Nor could we be confident that a change in the level of household production, *ceteris paribus*, could be traced to changes in caloric intake. Recall that Rosa's food intake on a per capita basis was superior to the other more "negentropic" households. Time, referred to less frequently as a measure of squatter energies, is not really an objective unit which is physically expended. It does

have the advantage of reflecting the allocation of personal effort in various key categories such as physical work and learning. Calories and personal effort, together with inanimate forms of energy, are the most important in urban transformations. The challenge of developing these measures is discussed later in the chapter.

As for informational aspects of resources and personal knowledge, I have already noted at several points the difficulties of quantifying reductions in uncertainty. A central proposition in the foregoing analysis of households is that taking advantage of informational aspects of resources is the key to negentropic transformations. Anecdotal evidence and a theoretical argument were presented in support of this proposition. But no rigorous proof was made. None was attempted because of the difficulties of measuring information. Rather, the exploratory effort in the preceding chapters attempted to indicate how knowledge plays a role in making transformations and building order. By now, some of the measurement problems with knowledge as a resource are clear. Besides the unexplored conversion of information into knowledge, there are large gaps in our understanding of how personal knowledge is integrated and transformed to effect efficiencies in households.

At the same time, some possible measures of information have emerged from the analysis of transformations. The frequency of transactions, for instance, and the nature of network contacts with different sources in the environment reflect aspects of learning which are important for offsetting uncertainties. Also, the concept of plays may be put to greater use. Additional measures will be suggested later in the chapter.

The problems reviewed above have presented serious impediments to proof of the proposition, stated at the outset of this exploratory effort, that effects of the entropy law are visible in social organization. More than that, it has been difficult, given the empirical complexities, the data available, and the problems intrinsic to the transformational perspective, to construct typologies of households based on their abilities to maintain positive flows of resources. This does not mean that this exploratory effort has been fruitless, nor that the transformational perspective has no value. Further work in this area may lead to solutions to some of the problems. The present effort has made a contribution in formulating definitions and a framework with which to begin this work. Moreover, the exploration has produced certain results regarding our understanding of squatters and urbanism.

C. Insights and Contributions

The perspective I have examined has been useful in raising issues, in providing certain insights, and in suggesting new questions, even if some of them have been left unanswered. The utility of this perspective may be seen in many themes and policy areas such as urban resources, urban growth, and self-help, as well as the operation of households themselves. Below, I shall review the contributions this perspective has made to these topics. Later, in the closing section, I shall suggest areas where future work may be useful.

1. Concepts of city and urbanism. The analysis of households has underscored the creative actions of households and thus throws light on an important aspect of urbanism sometimes overlooked. In establishing their own forms of order, households do more than take part in the large

process of making sense out of the city, and participate in the creation of value. Households also increase the resource endowment of the urban environment in the transformations they make. It is important to recognize the contribution of squatters, and undoubtedly of other proletarians, to the growth in the knowledge-generating character of cities, and that this growth results not only from the formal sector, large corporations, institutions, nor even from educated elites, as some observers would have us believe. Rather, all actors in the urban ecosystem are partakers of and contributors to urban resources. The very essence of the city has to do with the manifold process of generating knowledge and conserving on energies.

2. Time and other resources. Although most observers already interpret urban resources broadly, in practice, nonmonetary resources such as personal effort and personal knowledge have not yet been recognized as fully as, and certainly not been placed on a common footing with, more conventional resources such as labor and capital. One contribution of the transformational perspective is to indicate how these resources may be integrated conceptually, if not operationally, into household operations. The transformational view complements and extends Uzzell's notion of plays, an analytically useful expression of the ideas of information and knowledge, by suggesting how plays fit into the picture of household production and how personal energies are required to learn, test, and carry out plays.

Measuring the use of personal time in this production process is usually ignored completely. Frequently, it is assumed that squatters are relatively free from competing demands on their time, and this

presumed low, or no opportunity cost is used as a rationale for labor-intensive strategies in projects such as self-help housing. The cases have illustrated that this rationale is not always valid. Squatter use of time is important even though this importance is not always manifested in ways familiar to us, as in clock-watching. Since transformations are smoothly blended into the stream of day-to-day events, there is no close to business hours in household economics. Time is a direct reflection of the allocation of relatively scarce personal effort. The case of Manuel showed that the allocation of time was a matter of careful deliberation.

3. Value in household economics of squatters. Factors which characterize "squatter household economics"--broad definitions of resources, low levels of monetary wealth, great uncertainty, and the manner in which resource production and consumption are blended into daily affairs--all point to the need for more general measures of value and welfare.

Even though there are problems of inventing measures, the transformational perspective on squatter household economics has suggested that some measure of value is needed which incorporated nonmonetary and particularly energy factors in capital formation. Monetary measures have obvious drawbacks in informal, nonmonetary situations. Few, if any, alternative measures have been explored. The need for such a measure overlaps in certain respects with the need for an ecological orientation--an orientation which gives more attention to the energy costs of economic processes as discussed for instance in Georgescu-Roegen (1971) and Hannon (1973a). A thermodynamic basis for such

a measure would augment an economic evaluation of system performance. Such a measure, giving more weight where it belongs on the nonmonetized energy costs of running households and building urban structure, would thus incorporate an element of long-term viability in the analysis needed to guide policy. This measure, and the ecological paradigm it serves, are discussed in more detail below.

4. Structure of security as basis for transformations. Underlying household operations, and largely determining the kind of transformations they make, is a structure of security consisting of a complex of knowledge and actions oriented towards reducing uncertainty and making life more predictable. I suggest that this structure constitutes a necessary, if not sufficient, condition for accumulation of resources, and must therefore be present in some form even before households get established. It is present initially as a willingness to risk migration, among Uzzell's Quechua migrants for instance, and then grows as they set up households in Lima. Actions taken by households to order their environmental resources begin with and contribute to this structure. Their subsequent actions, in turn, strengthen and reshape it. The case studies and other evidence I have presented suggest many routes and combinations by which households might achieve their purposes--for instance, accumulating capital, or gaining education, or status. Common to all of them, however, is a need to steady their ground, a need to reduce the sources of variation and uncertainty, in short, to order their environment. This ordering pertains to material resources, a house and a reliable source of income, as well as to nonmaterial structures, reliable ties with family, friends, and workmates.

This structure of security may be compared to the avoidance of uncertainty in Peter Marris's "conservative impulse," experienced as a drive to keep intact a thread of continuity running through one's life. Marris's hypothesis is built upon and illustrated by cases of loss. Important life upsets-- the death of a lifelong partner, the removal from neighborhood--trigger a reaction in grief to reconstitute the threads of continuity concerning basic truths and attachments which have been severed. The conservative impulse then constrains the ability and willingness to cope with change.

The proposition put forward in the structure of security broadens Marris's notion of a conservative impulse, without invoking traumatic loss as a precondition for its existence. Rather, the structure of security and the conservative impulse both suggest that some fundamental sense of stability, freedom from chaos, or "basic needs" is necessary to us all. Squatting, like other human experiences, has its limits to knowledge and certainty. It is the flexible use of household instruments, building upon a base of security, which enables squatters to fix their places in the city and to grow.

5. New social indicators. The instruments identified in the transformational model of households may be employed as indicators of status, or well-being, and the potential for growth, of a given household. Conventional social indicators--levels of wealth, health, education, for example--are insufficient to reflect the present and potential state of households which depend so heavily upon informal modes of operation in labor markets, intensive interaction within networks, loosely-coupled resources, and shrewd manipulation of

resource outflows. Thus, the measurement of the survival and well-being of proletarian urban households requires new indicators. Some indicators have emerged from the elements I have identified as composing the structure of security. Survival and well-being in households are matters of being able to take risks, to offset uncertainties, and to generate resources using the various instruments available to households. Also, the ability of a household to transform resources may change quickly, more quickly than indicators of education, for instance, are able to reflect.

At the same time, the strengths of correlation between different instruments and between instruments and different forms of negentropic growth are yet to be established. In addition, some precise measures of energetic and informational aspects of resources are necessary. This topic is taken up again below.

6. Policy on autonomy. A popular policy on housing for the poor now in effect in international development institutions is to follow Turner's notion of autonomy and reinforce the freedom and autonomy of individual decisions.¹ The implications emerging from this transformational perspective suggest that such a policy may not always be productive.

Differing use of instruments and strategies make more clear than ever that policies of the kind Turner proposes to encourage autonomous actions must be evaluated in accordance with the circumstances of a given household, its network of exchanging partners, and its local neighborhood setting. Squatter settlement upgrading projects, or sites

¹See Laquian (1976) for a discussion of the current method of employing self-help in sites and services development projects.

and services projects, for instance, should not insist that households commit resources only for housing improvements or that beneficiaries pay for their improvements. Such a strategy runs the risk of colliding with different strategies of individual households. A number of options should be made available to households for investment of resources and for creating alternative forms of value and order even if they have limited or negligible prospects for recovering the project costs. Example forms of value might include cooperative forms of transport, child care, education, health services delivery, apprentice work, etc.

Conversely, the selection of participants for such projects may be improved by using criteria based on the indicators mentioned in the previous section. The membership of households, the ability of its members to generate resources, the security of income, the degree and kind of contact by a household with its surroundings, and its manner of spending its resources all indicate the potential of a household to generate resources, or otherwise suggest the relative degree to which a household is prepared to make investments. Some households may not be in a position to generate resources at all. Others, passing into negentropic phases, may be ripe for certain forms of stimulation, such as technical assistance in building skills, or loans for small businesses. Moreover, it may be desirable to recruit aggregated household units--households tied together in joint economies, network relationships, or as Lomnitz points out (1974), in cooking units--for participation in such projects. This would capitalize on shared resources and keep structures of security intact.

The fact that household instruments are coordinated around different strategies reinforces a lesson learned long ago about the potential danger of public sector interventions for upsetting the equilibrium this coordination achieves. Experience has shown how complicated, disruptive, occasionally disastrous, compulsive relocations and even guided self-help, can be (e.g., see Salmen, 1969; see also Scudder, 1973; and Rush, 1974). The coordination of instruments suggests that even less dramatic changes--the loss of key network links--can threaten a household's equilibrium.

By the same token, the fact that households use a great variety of instruments to maintain an equilibrium may mean an increase in the policy options open to planners and managers concerned with improving the welfare of poor households. For example, promoting urban gardening, or subsidizing public utilities, along with other measures, can have a salutary effect on a household's internal allocation of resources.

The analysis also suggests that a given point in a household's domestic cycle may dictate a greater appropriateness of some instruments or resources over others. Offering property title may not always be sufficient to offset prevailing uncertainties about housing investment. Household structures of security take many forms. Higher income, for instance, could not induce Manuel to give up his steady job and move. Nor would property title have persuaded him to invest in housing if he could not count on drainage, fire protection, and future sources of income. At the same time, certain groups may be more able to benefit from material resources while others, in a negentropic phase, may take better advantage of nonmaterial, e.g., informational, resources.

Thus, local or neighborhood investments in developing cities must be carefully coordinated with and tailored to the strategies and use of instruments of households. A range of investment options may be feasible for and attractive to households, depending on how the mix of material and nonmaterial resources fits with their own strategies. For instance, it may be advantageous to encourage joint-ventures for households operating in joint economies and in other ways take advantage of shared risk and capital among households in close touch with nuclear family. This view thus supports a modification of policies that insist on participants building their own housing. The logical implication of this analysis (and of autonomous action) is to reinforce ordering irrespective of the form it takes.

7. Self-help and alternative technologies. Self-help and alternative technologies have been put forward as solutions for developing countries unable to afford resource-intensive, centralized technologies for water, power, and sewerage, for instance (Schumacher, 1973b). But new "soft" alternative or appropriate technologies (of which self-help is often a part) are too often merely pragmatic solutions to resource constraints. Though they may be resource-conserving, there is no theoretical principle or technique in the experience of self-help and alternative technologies which automatically safeguards environmental integrity or ecological balance, two factors which often figure in the rationale for alternative technologies. Even with the most careful assessments of technology, there is no decision rule analogous to the cost-benefit analysis which allows technologies to be ranked in order of preference ecologically, or even to signal acceptability of a given technology

from an environmental standpoint. The transformational perspective points to mechanisms of household operation which might be regarded as the "most appropriate" technologies. Attention has been given to decision rules operating in the ordering processes of households. The substitution of informational aspects for energetic aspects of resources may be viewed as a practical folk version of the Second Law. An ecological imperative is built in. Household production can be adjusted easily in accordance with available personal energy and other resources. Thus, the definitions of alternative and appropriate technologies to which Schumacher (1973b) and Jequier (1976) refer are incomplete without some reference to the mode of household operations.

From an energy standpoint, the difference between conventional alternative technologies and household technologies is the learning process by which energy-conserving techniques are acquired. Appropriate technologies result from organized research efforts which frequently originate outside the site where they are intended to be used. In squatter communities the same or similar results are achieved from gradual accumulation of information. The great advantage of the gradual process is that it not only achieves energy efficiencies, it is also integral to community life. This means that the final solutions gain acceptance more readily, thus avoiding the chief bottlenecks to diffusion of appropriate technologies invented from outside (Jequier, 1976). All of these considerations point to the conclusion that the ordering mechanisms in squatter communities ought to be given more weight and perhaps promoted through community action and that design standards

and tools for technology assessment be invented which incorporate principles of the Second Law.

8. Growth policy. Another issue raised by this new perspective bears on the debates over the merits of urban growth. It has been suggested, based on this new perspective, that proletarian households promote an energy conservancy, an effect which depends to a large degree upon the diversity and complexity of the environment and the ability of households to take advantage of this diversity and complexity. It has been observed before that complexity generally increases with city size. This leads, in turn, to increased potentials for the creation of informational resources and corresponding energy savings. Thus, larger cities may contain the seeds of energy savings not recognized in the debates on growth policy. To stem the flow of migrants to large cities and to divert growth to lagging regions, as is the tendency of many developing nations such as Brazil, is to constrain potential for realizing these savings by the very segments of the population with the most tenuous access to resources, those who stand to gain the most from living and having access to resources in large cities. Criteria for policy on urban size should give consideration to certain social benefits, such as the potential for the creation of social resources, of energy, and of resource-conserving practices, which appear to depend on the very size of cities.

D. Objectives of the Transformational Perspective and Areas of
Future Work

Further work on the transformational perspective may be fruitful by capitalizing on some of the insights mentioned above. The present exploration leads to the conclusion that the comparative advantage of this perspective lies in the elaboration and strengthening of an ecological paradigm for analysis of urban settings. Thus, the most promising contribution of the transformational perspective is to increase our understanding of the processes leading to stability and to survival of actors in the urban ecosystem. Because the transformational perspective is based on the Second Law, it is especially appropriate for this work. However, as was concluded in the analyses of preceding chapters, this does not mean it is advisable to emulate studies of primitive ecosystems and construct energy input-output accounts in cities.

Rather, this exploration has suggested it is important to understand more thoroughly some of the informal resource forms, and particularly personal energies and personal knowledge, highlighted in this study. In the coming decades, these informal forms of resources will be growing increasingly important as fossil fuels and foreign assistance, as well as other major resources such as food, water, and power, will be growing increasingly scarce in cities of developing countries, even as pressures to urbanize continue to mount. Urban growth over the coming decades is expected to continue largely unabated. Meier, Berman, and Dowell (1978) remind us that by 1995 as many as 12 megalopolitan regions, each having a population of between 10 and 45 million inhabitants, are not

at all unlikely. These figures reflect only the extremes of growth which will be taking place over the entire range of city sizes. Energy demand in developing countries may be expected to increase even more quickly than city growth, reaching as much as 400 to 600% of present demand by the turn of the century.

Most importantly, this means that developing countries will need to rely even more heavily upon indigenous resources of the informal, nonmonetary type. Shrinking supply of fossil fuels will create many problems with regard to planning and managing cities both to avoid inevitable threats to safety and welfare and to cope with severe dislocations that are bound to arise. From the standpoint of proletarian households, we will need to identify those aspects of household production which may be most easily promoted, and with the provisos discussed above, to discover how self-help can best be used to secure a minimum adequate standard of living.

To meet these challenges requires new measures and new means with which to evaluate resources and resource use in cities. It was suggested earlier that conventional tools for assessing resource use, and particularly energy use in cities, are inadequate on at least two grounds. First, the most popular tools are geared mainly to monetary measures of wealth and utility. The earlier analyses suggested that conventional measures are incapable of reflecting the most important features of the production and survival systems of proletarian households. Second, conventional measures fail to reflect features of ecosystems which are important for long-term survival, such as the efficiency of energy use and the rate of social learning.

Although the transformational perspective is based on the Second Law, giving it a suitable frame of reference with which to assess the use of energy and other resources, in its present form, this perspective is largely a theoretical idea of limited operational value. What is needed is to develop a broad-gauge analytical tool based on the Second Law with which decisions and policy regarding energy use may be evaluated operationally, much as cost-benefit analysis helps to evaluate decisions and policy regarding the use of monetary resources. At present, we are far from developing such a tool. This exploratory effort has considered some of the issues and provided certain insights into the challenges of moving in this direction. How might we go about solving the measurement difficulties, and what are appropriate next steps in research?

1. Resources and resource use in squatter households. We may begin to tackle this resource measurement problem by recognizing that two main qualities of energy flows should be taken into account, even if it is not possible to integrate the two into a single measure.

First are all the physical energies, such as food, commercial, and noncommercial energies which flow through the urban ecosystem for direct consumption, or for driving machines. These forms of energies may be more or less readily quantified at the household level. For examples of these studies in poor urban households, see McGranahan and Taylor, (1977) and McGranahan, et al., (1979). The aim of measuring these flows is to address some of the coming problems concerning supply of energy and other resources in cities. From a very practical standpoint, we need to know which parts of the household system are most vulnerable to sudden drops in supply, what kinds of uses are most wasteful;

where is new demand most likely to be expressed due to demonstration effects, and what substitutions are possible? More theoretically, which points of consumption are most thermodynamically "wasteful," and what activities show most negentropic "promise"?

A second aspect of energy flow at the micro-level is the way energies are expended in household production. A measure is needed to reflect the bodily constraints of the "internal entropic" kind and to reflect the variability in the allocation of personal effort exerted in the production process. Caloric measures fail to indicate anything about these allocational aspects of energy flows. Thus, caloric and commercial energy measures are necessary but not sufficient to account for all the important aspects of energy flows in the urban ecosystem.

The use of time is one possible measure which does reflect allocational differences. Normally, the use of time (as in "discretionary time") is seen as an indicator of welfare; little attention is given to behavioral interpretations of patterns observed in the use of time (e.g., see Schneider, 1972). But time budgets may be used easily to reflect the labor component of production, an input factor frequently overlooked, even though it is one of the most important in informal production. Time budgets are easily compiled, and comparisons, both longitudinally and cross-sectionally, can throw additional light on questions with theoretical and practical import such as the problem of translating the value of participants' time in self-help projects into terms which may be expressed both monetarily, as well as terms which reflect constraints imposed by the Second Law. Time does have its drawbacks as a measure, as we noted in preceding sections. It

is arbitrary, as well as being indirect. But because time has an arbitrary fixed limit which applies to everyone equally, it emulates the "internal entropy" constraints caloric measures do not. Time therefore is a suitable, though imperfect, complementary measure of energy flows in households.

Although we have noted difficulties in measuring knowledge, or more technically, information, some indirect indicators, developed in the preceding chapters, achieve the kind of measure needed. Frequencies of contact and sources of interchange, for instance, reflect the amounts of knowledge available, and the ability to generate knowledge. Other indicators of knowledge, such as formal education, are important as the case studies have shown. This particular variable could be controlled for by selecting cases from different socio-economic groups. But it is obvious that more work needs to be done to identify possible kinds of information and knowledge.

Several possible means may be identified by which to measure informational aspects of resources. One way to measure knowledge would be to categorize known urban lore in a given locale--stories, legends, myths, specialized places, famous people and things, and any other information about the local environment which has recognized value. A "catalogue" of local lore could be compiled from community leaders, older residents, and local elites. Such a catalogue would provide a way to rate households on the amount of information they may know. Another measure would be to ask householders to indicate the frequency of contact with people both inside and outside their immediate neighborhoods. Still another would be the amount of time

spent communicating or associating with people, or the amount of time spent reading newspapers, watching television, listening to radio, etc.

To repeat, the approach to households as producers is not to correlate energy flows in some rigorous mathematical way with negentropic growth. No claim is made that this is possible or even necessary. The measures outlined here are designed to permit a more quantitative analysis of how personal energies are expended to learn about new resources, to incorporate them into the household technology, to transform them into different forms of value and, reciprocally, to understand how the process of learning affects the use of energies and production in the household.

2. Transformations: strategies, rates, and substitutions.

A second major area in which further work needs to be done concerns how transformations take place and, within a given group of households (such as investors), how strategies differ in different contexts. Analysis of the cases in preceding chapters illustrated the great importance of disordering factors at the level of the favela for influencing the kinds of transformations made. A pattern was noted in which nonmaterial transformations (such as education) become favorable under conditions of high uncertainty. Much more needs to be done empirically to catalogue the kinds of transformations squatters and other proletarian households make and to record the conditions which give rise to altered patterns of production. We know that households are active in a range of "sectors" such as food, housing, education, and health, to name a few of the most important. But what factors in the personal energies of households and in the process of acquiring

knowledge are decisive in changing their "perceptions, cognitions and understandings," to use Leeds' words (1974:76) which, in turn, lead to a change in the "mix" of outputs? What conditions, short of legalization of squatters, for instance, are necessary to stimulate new investment?

Another aspect of transformations, almost entirely ignored in the analysis of the previous chapters, concerns rates of transformations. Longitudinal data is needed to provide a stronger basis with which to analyze dynamically the external and internal influences leading to fluctuations in resource transformations. What are the most important among the many possible factors, such as the external "ancillary constraints" and internal informational infrastructure, in the explanation of how transformation rates are altered? Taking an even longer view, what bearing do different positions in the life cycle have on the rates of production in households?

One possible approach to the question of rates of transformations is to study the process of informal learning--or, in the jargon of transformational analysis, of how "loosely-coupled" or "bits" of knowledge are aggregated into larger plays, and how plays are verified. Direct, in-depth observations of individual cases could follow and assess learning curves over the history of house-building by a household, or in a community. Another source of data is in job-finding experiences. Mobility studies have examined certain aspects of movement in the labor markets, but those studies have not concentrated on how new jobs are acquired, nor, to take the more interesting cases of self-employed, how new businesses are started. Evidence in the preceding chapters suggests that investing households exhibit higher frequencies and more channels of contact

with their environment. To what extent is this true in job mobility and income? Does this mean for job finding, business ventures, and other forms of learning, as I have suggested in the case of investment, that the greater the number of alternatives, or the higher the quality of the information system, the better are the chances of "success"?

Finally, the rules of substitution concerning the use or nonuse of personal resources (personal effort and personal knowledge) were predicted from the theory and inferred from the case studies. I have suggested that subjective rules of equivalence between different resources are a central feature in making negentropic transformations. Aguilera (1975b) reports some evidence for this among rural Spanish entrepreneurs, who are more careful than others in how and with whom they spend their time, taking care to "account" for it like other resources. Or, to take an instance from the preceding case studies, Jose sacrificed 18 days of biscate and other activities in order to do repairs on his house. These instances imply that these individuals are well aware of the value of their time and adjust their personal schedules accordingly. Additional data, possibly from participant-observation and from time budgets, are needed to confirm the extent to which negentropic householders' use of time differs from the population as a whole. Data is also needed to assess the value of their time, based on local opportunities foregone, and to identify the conditions under which these values change.

APPENDIX I

List of Food Items

Chart used by the Leedses to record how much a household spent (weekly or monthly) for food items, listing quantities, price per unit, and total expenditure per month.

<u>Comida</u>	<u>Quant/Sem</u>	<u>Quant/Mes</u>	<u>Preco/K ou outra unidade</u>	<u>Total do custo por mes</u>
arroz			850/k	
feijao			600/k	
macarrao			1000/k	
batata			400/k	
farinha			500/k	
fuba			400/k	
acucar			550/k	
cafe			800/k	
pao			180/b	ou 300/k 25.0
biscoite			2300/k	
banha			1800/k	
azeite			1800/l	
vinagre			1000/g	
cehela			1000/k	
alho			3000/k	
tomate			500/k	
manteiga			5200/k	
margarina			1200/l	
leite (liq.)			360/l	
leite em po			1800/lata	peq.
ovos			1500-1800/d	
banana			600/d	
laranja			1000/d	
tangerina			800/d	
maca			1800/k	
xuxu			400/k	
vagens			1000/k	
ceneura			1000/k	
beringela			800/k	
carne seca			1880/k	
carne fresca de bei			2800/k	
carne fresca de perce			3800/k	
bacalhau seco			400/k	
peixe fresca			1500/k	
galinha			2500/k	
produtos enlatados				
artiges de limpeza				

TOTAL NCr\$

APPENDIX II

List of Furnishings and Appliances

Sample inventory of possessions drawn from the Leedses' indicators of standard of living, listing items, weights, number of each item observed and total value, in weights. As explained in the text, weightings were assigned by the Leedses to reflect such things as cost, frequency, priorities, and accessibility.

<u>Item</u>	<u>Weight</u>
Cristaleira	1
Pia	1
Fogao Jacare	1
Ferro Electrico	2
Vaso Sanitario	2
Fogao Cosmopolita	2
Radio Transistor	2
Radio Portatil	3
Geladeira	3
Liquidificador	3
Radio-vitrola	4
Televisao	4
Colchao de molas	4
Dressing Table	4
Fogao Brastemp	5
Tocadisco	5
Chuveiro electrico (ou a gas)	6
Bomba	6
Ventilador	6
Encerador	6
Bide	7
Telephone	8
Total	_____

I classified these possessions in the following manner:

Appliances

Electrical

Electric iron
Transistor radio
Portable radio
Refrigerator
Blender
Table Radio
Television
Record player
Shower heater
Water pump
Fan
Telephone
Encerador

Nonelectrical

Sink
Toilet
Cosmopolita Stove
Jacare Stove
Brastemp Stove
Bide
Cristaleira
Dressing Table
Colchao de Molas

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