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Social Organization and the Transition from Direct to Indirect Consumption*

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Abstract

This paper presents a new theoretical framework for the study of environmental consumption at the micro-level by building on concepts from classical sociological theory and recent macro-level studies of the environment. The framework emphasizes the local community context as an important determinant of environmental consumption. We test this framework with unique micro-level data on consumption, household size, household affluence, and community context from Nepal, a setting in the midst of dramatic change in community organization, population size, and consumption behavior. The results of these tests are consistent with the hypothesis that local nonfamily organizations shift the consumption of environmental resources from direct to more indirect. We argue that the framework presented here is a useful early step toward more comprehensive micro-level models of environmental quality.

Introduction

Human consumption of natural resources is generally identified as the key link between human behavior and degradation of the natural environment (Stern et al. 1997). Research on degradation of the environment has intensified recently, at least in part because it is believed to have broad consequences for humanity. As the social sciences become engaged in this research, social research has primarily focused on the total volume of human consumption. However, classical sociology suggests an important link between social organization and human consumption that influences type, as well as volume, of environmental consumption. We propose a general framework to study consumption patterns, which highlights changes in social organization. We apply this framework using unique micro-level measures from a setting in the midst of a dramatic consumption transition.

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At the foundation of the framework we propose are two ideas borrowed from classical sociological theory. One is Durkheim's idea of the relationship between social change (such as improved communication and transportation, monetization, and population density) and the division of labor in society (Durkheim 1984). The other idea is Marx's *metabolic rift* (Marx [1867] 1976, [1863-65] 1981). As argued by Foster (1999), these classical sociological ideas have much to offer contemporary thinking about human relationships with the environment. These ideas suggest a relationship between social organization and the basic ways in which humans use their environment. Our framework integrates longstanding ideas about the volume of consumption with newer ideas about its social organization. A key contribution of our framework is to expand the conceptualization of changing social organization from the organization of production and consumption to the organization of a broader range of social activities. At the micro-level this framework points toward social organization as the key engine of a fundamental transition from direct to indirect consumption of the environment – a transition shaping both the nature and volume of consumption.

The empirical information to test this micro-level model of environmental consumption comes from a unique study in rural Nepal. Nepal is widely known as one of the world's most diverse ecological settings, but also as a setting on the brink of serious environmental degradation (Blaike and Brookfield 1987; Eckholm 1976; Zurick and Karan 1999). The study combines community-level measures of social change with household-level measures of size, wealth, and consumption. The results provide valuable new insights into the micro-level processes of environmental consumption.

Concepts

Environmental Consumption

Because the natural environment is the origin of all the raw materials that are ultimately consumed by human beings, all consumption affects the natural environment. Thus we begin with Stern's (1997) definition of environmental consumption as "Consumption of human and human-induced transformations of materials and energy," (p. 20). This broad definition of consumption includes many activities that are considered *productive* in social research terms. Issues revolving around this broad definition of environmental consumption, including the problem that use of such a broad definition makes it difficult to identify any consumption that is *not* environmental consumption, are discussed in great detail elsewhere (Stern et al. 1997).

To begin moving beyond this broad definition, we differentiate between two types of environmental consumption, *direct* and *indirect*, based on the social connections between the person consuming the resource and the natural resource itself. *Direct consumption* refers to humans' use of natural resources – including flora, fauna, water, and soil – with their own hands. An example of direct consumption is cutting down a tree or branch and burning it for heat. *Indirect* consumption refers to humans' use of goods that are separated by some type of social connections from the natural resources originally used to create them. By this definition, almost all consumption in industrialized countries is indirect because natural resources are processed (or at least moved) by people to create the goods that are ultimately consumed. However, even in a non-industrialized setting, indirect consumption may be widespread. Purchasing wood from someone else and then burning it for heat is an example. Other examples include buying food rather than growing it, purchasing building materials rather than collecting them, or purchasing clothes rather than making them. Changes in social organization that promote social arrangements that intervene between natural resources and consumers promote indirect consumption. Monetization and transportation are two such changes. Social organization that enhances opportunities for direct contact with resources promotes direct consumption. Hunting and gathering and subsistence agriculture are two such forms of organization of production. Note that this contrast between direct and indirect consumption is

not aimed at understanding the overall influence on the environment, or the total environmental footprint (York, Rosa, and Dietz 2003a). Rather it is aimed at advancing our understanding of the processes of environmental change.

The environmental consequences of direct versus indirect consumption depend on the overall magnitude of consumption. Nonetheless, some evidence from around the world indicates that when humans consume natural resources directly, they create more effective management systems for those resources, which help preserve environmental quality in the long run (Chambers 1997; Douglas 1992; Ostrom 1992). This seems reasonable because direct contact with the environment may clarify the link between ways of consuming and environmental degradation, and thus may motivate more careful management of environmental resources. This is an idea with which both classical and contemporary environmental sociology concur (Foster 1999).

However, indirect consumption does not necessarily have a worse impact on the environment, nor does it preclude effective management systems to preserve long-term environmental quality. It may simply take time and investment to develop those systems. Nevertheless, the transition from direct to indirect consumption of environmental resources is a key change in the way that humans interact with the environment at the micro-level.

Social Change

Many classical sociological treatments of social change focus on the mode of production, and the implications of those changes for social life (Durkheim 1984; Marx [1867] 1976; [1863-65] 1981). Durkheim (1984) argued that improvements in transportation and communication, the spread of monetization, and increased population density all stimulated the division of labor in society. The changing division of labor altered the mode of production, with widespread implications for social organization and social relationships. Marx ([1867] 1976; [1863-65] 1981), on the other hand, focused on the spread of the capitalist mode of production itself, its implications for the relationship between humans and the fruits of their labor, and its consequences for a broad array of social relationships. Both of these approaches begin with the idea that when technological and institutional contexts change, they alter individuals' daily lives across many different dimensions, not just production. Our conceptualization of social change builds on this foundation by considering the relationship between macro-level social change and a broad array of micro-level social activities, including production.

Historically, most social activities of daily living were organized within the family (Ogburn and Nimkoff [1955] 1976; Thornton and Fricke 1987). These included activities centered around consumption, residence, recreation, protection, socialization, procreation, and production. Social changes in the technological and institutional context alter the extent to which these social activities are organized within versus outside of family and kinship units (Thornton and Fricke 1987; Thornton and Lin 1994). As new macro-level nonfamily organizations spread, the micro-level social activities of daily life are reorganized to increasingly occur outside of the family (Coleman 1990). The micro-level consequences of these changes are both broad and dramatic (Coleman 1990; Durkheim 1984; Marx [1867] 1976, [1863-65] 1981; Thornton and Lin 1994). As we argue below, these include consequences for the nature of environmental consumption.

The key element in our conceptualization of social change is that the proliferation of nonfamily organizations allows multiple domains of individuals' daily lives to become increasingly organized outside the family. For the purpose of the present study, the domain of consumption is particularly important. Nonfamily organizations, or what Coleman calls *corporate entities*, provide the means to organize consumption outside the family and thus stimulate widespread change in related social activities – for example, a shift from making clothes in the home to

purchasing clothes in stores, from cooking in the home to eating in restaurants, and so on (Coleman 1990; Ogburn and Tibbits 1934). We expect the proliferation of nonfamily organizations in communities to alter the social context so that more daily activities, including consumption, become organized outside the home and family.

Social Organization and Indirect vs. Direct Environmental Consumption

Social organizations promoting the organization of daily social life outside the family are likely to produce a shift from direct to indirect consumption of environmental resources. This builds on *metabolic rift* – Marx's idea that the spread of capitalist production alters both agricultural production and resource consumption so that humans interact less directly with the natural environment (Foster 1999; Marx [1867] 1976). The more intense the capitalist production, the less direct are interactions with the natural environment. Both Marx and Engels predicted that these changes would lead to environmental degradation (Foster 1999). *Metabolic rift* results in individuals knowing less and less about the environmental consequences of their consumption decisions. According to Marx, *metabolic rift* produces an unsustainable exploitation of the natural environment (Foster 1999; Marx [1867] 1976, [1863-65] 1981).¹ In fact, these concepts continue to be widely discussed in the social science literature on environmental change (Burkett 1999; Clark 2003; Clausen and Clark 2005; Dickens 2004; Fischer-Kowalski and Haberl 1988; Foster and Burkett 2000; Foster and Clark 2003; Moore 2000; Moore 2003; York, Rosa and Dietz 2003a, 2003b).

Our framework expands the focus on social change from production and consumption to multiple dimensions of social organization. As discussed above, macro-level social changes that spread nonfamily organizations may alter not only the mode of production, but also the nature of consumption, socialization, recreation, protection, procreation, residence, and others. Social life organized through nonfamily organizations promotes social arrangements that intervene between natural resources and consumers. Family-organized social life, on the other hand, provides more opportunities for direct contact with the resources.

This is clearest in the case of nonfamily consumption-oriented organizations, such as shops and restaurants that process natural resources for consumers, adding social connections between resources and the consumers of those resources. Harvesting wheat, shipping wheat to mills, milling wheat to flour, shipping flour to bakeries, baking flour to bread, shipping bread to restaurants, and serving the toast to consumers sitting at a tables are all examples of social connections added in between the consumers of toast and the growing and harvesting of wheat. Shops and restaurants add moving and processing of natural resources, through connected webs of social interactions, in between natural resources and the consumers of those resources. The result is less direct consumption of those resources.

The spread of other nonfamily organizations may have similar consequences. Nonfamily productive organizations, such as wage labor employers, also promote indirect environmental consumption. In part these organizations are often engaged in processing resources with people other than the consumers themselves who separate the consumers from the resource. From the example above, farm laborers growing the wheat, mill workers, and bakers are all examples of people who add social arrangements between resources and users of those resources. In addition, wage labor employers provide access to money. By acting as a store of value that allows employees to purchase goods from others, money also helps to promote social arrangements between resources and the users of those resources. There are other mechanisms linking nonfamily production to indirect consumption, but many other forms of nonfamily

¹Note that Marx was neither the only scholar to espouse these ideas, nor the first. As much as a century earlier, for example, Adam Smith proposed similar ideas (Smith 1776).

social organization also promote indirect consumption relative to family organized social activities. Nonfamily forms of transportation, such as busses and trains, increase opportunities to consume natural resources a great distance from home and add social connections by those who transport resources. Nonfamily financial organizations, such as banks, provide opportunities for indirect consumptive transactions. Nonfamily legal organizations, such as courts and police, provide the legal enforcement of contracts, which may also promote indirect environmental consumption. Nonfamily health services, such as hospitals, clinics, and pharmacies, use people to process the raw materials of medical treatment to provide health care. In general, nonfamily organizations promote changes in consumption, from direct to indirect environmental consumption.

Households with access to nonfamily organizations in or near their communities are, therefore, more likely to consume environmental resources indirectly rather than directly, while households with little or no access to nonfamily organizations are likely to consume environmental resources more directly. The introduction of nonfamily organizations to a community that previously had none is likely to increase indirect environmental consumption.

Social Organization and the Volume of Consumption

Theories of change and variation in the volume of consumption generally emphasize the importance of the number and affluence of consumers at any particular level of technology (Stern et al. 1997; Hunter 2001). Below we translate these general, often macro-level, ideas about the volume of consumption to the household level, and emphasize connections to the social organization of consumption.

Household Size

Environmental scientists have long argued that, at the macro level, human population size and density are key determinants of environmental quality (Cohen 1995; Ehrlich, Ehrlich, and Daily 1993). Larger and denser populations consume more natural resources and therefore more rapidly degrade the environment at regional and global levels. At the household level, household size is analogous to population size. Following this analogy, *holding the number of households constant*, larger households are likely to consume more environmental resources than smaller households (Cramer 1997; Cramer 1998; Liu et al. 2003).²

In addition to its effects on the *nature* of environmental consumption (direct versus indirect), social change may also shape the *level* of environmental consumption via household size. Social change affects the fundamental processes shaping household size, including marriage, fertility, and migration (Axinn and Yabiku 2001; Massey and Espinoza 1997; Yabiku 2001). For example, the proliferation of nonfamily organizations dramatically increases the use of contraceptive methods to limit childbearing (Axinn and Yabiku 2001). Thus, communities located near nonfamily organizations tend to produce smaller households. Thus, to better understand the relationship of household size to environmental consumption, it is important to account for changes in access to nonfamily organizations.

Affluence

A great deal of macro-level evidence suggests that the affluent consume more environmental resources than the poor (Najam 1996; Stern et al. 1997; World Bank 1999). We expect a similar relationship at the household level — affluent families are likely to have higher *levels* of consumption than poor families, regardless of the *nature* of consumption (York, Rosa, and

²Of course, by contrast, holding population size constant, increasing the number of households is also likely to increase the volume of consumption (Liu et al 2003). Also note that in some settings smaller household size may promote less efficient sharing of natural resources.

Dietz 2002; York, Rosa and Deitz 2003a). However, this is complicated by the relationship between affluence and family size, which is complex and reciprocal. Large families may reduce household affluence, particularly in the long run, because they are a barrier to social and economic attainment (Ahn, Knodel, and Lam 1998; Blake 1989; Featherman and Hauser 1978; Guo and VanWey 1999; Zajonc and Markus 1975; Wongsith and Knodel 1991). At the same time, affluence may increase family size because the affluent can afford more children (Becker 1976), or affluence may decrease family size because the affluent prefer other forms of consumption (Easterlin 1980)³. In the rural agricultural setting we study here, household size is virtually the same as family size, so this complex relationship between family size and affluence also characterizes the relationship between household size and affluence.

Resolution of the complex and reciprocal relationship between affluence and family size is beyond the scope of the present study. We treat them as correlated without attempting to adjudicate the causal relationship between the two. However, to understand the relationship between either household size or household affluence and environmental consumption we must consider this complex relationship, because family size is closely related to household size, and affluence is associated with family size. This complicates our understanding of the total effect of either household size or affluence because they are correlated with an undetermined causal relationship, but is a necessary consequence of examining environmental consumption at the micro-level because both factors may shape consumption behavior. Social change shapes some of the fundamental determinants of wealth and affluence (Smith 1776; Marx [1867] 1976, [1865-70] 1978, [1863-65] 1981), with the spread of nonfamily production and nonfamily organizations likely to increase affluence (Firebaugh 1992, 1996; Firebaugh and Beck 1994). Thus, in addition to its consequences for the *nature* of environmental consumption, social change may also affect the *level* of environmental consumption via its influence on wealth.

Setting

Nepal provides us with an ideal opportunity to test our hypotheses. Nepal had virtually no nonfamily organizations and extraordinarily little indirect environmental consumption until recently (Axinn and Axinn 1984; Axinn 1984). The setting for this study is the Western Chitwan Valley located in south-central Nepal. Until the early 1950s Chitwan was covered by virgin forests, infested with malaria-carrying mosquitoes, and home to many dangerous fauna, ranging from poisonous snakes to Bengal Tigers. Beginning in the mid-1950s the Nepalese government began a program of clearing the forest, eradicating malaria, and distributing land to settlers from the higher Himalayas. Approximately one-third of the original forest was preserved as Chitwan National Park, which remains home to several endangered species today. Our study examines consumption patterns among 151 neighborhoods located in a 100-square-mile area of Western Chitwan that was cleared and settled.

Rich soils, flat terrain, and the promise of new opportunities drew many farmers into the area, but the valley remained a remote, isolated frontier until the late 1970s. By the mid-1980s new roads transformed this once-isolated valley into the transportation hub of the country. This change produced a rapid proliferation of government services, businesses, and wage labor jobs (Pokharel and Shivakoti 1986). Together these forces dramatically altered the social organization of Chitwan within the lifetimes of its residents. The increase in access to nonfamily organizations allows us to test our expectation that this shift will transform the nature of environmental consumption, away from direct consumption of the environment and toward indirect consumption of the environment.

³Some fertility literature treats childbearing as a form of consumption.

Data

We examine social change and consumption in the 151 neighborhoods using measures from the Chitwan Valley Family Study (CVFS). The CVFS defined a neighborhood as a geographic cluster of five to fifteen households. Given the rural setting, the people within each of these neighborhoods know each other well and interact personally every day. The CVFS selected an equal probability, systematic sample of neighborhoods in Western Chitwan. The sampling strategy was designed to eliminate national and regional sources of variation by focusing on a single area, Chitwan Valley, but maximize neighborhood-level variations by sampling neighborhoods from a setting with much local variation (Smith 1989).

The CVFS measured neighborhood context with the Neighborhood History Calendar method, which combines archival, ethnographic, and structured interview methods to gather detailed, continuous measures of neighborhood change (Axinn, Barber, and Ghimire 1997). The CVFS also interviewed every household in those 151 neighborhoods in 1996, with a response rate of 100%. In 2001, 97% of these households were re-interviewed, producing 1,365 households with interview measures from both 1996 and 2001. The household interviews documented patterns of household consumption, agricultural practices, wealth, and size. Interviews with every household member aged 15 to 59 in 1996 provide additional information on all adults living in those households.

Measures

Environmental Consumption

Although relatively little information is available on historical patterns of micro-level consumption in Nepal, an exception is a 1977 survey that documented patterns of household consumption in the Chitwan Valley at that time. These data show that virtually all goods consumed by a household were produced within the household in 1977 (Axinn and Axinn 1983; Axinn and Axinn 1984; Axinn 1984). Detailed analyses of household energy flows revealed that virtually all external energy inputs were from nearby forests, mainly in the form of fodder for animals and fuel wood for cooking (Axinn and Axinn 1984; and Axinn 1984). Therefore, our measures of environmental consumption focus on fodder and fuel wood consumption, and on new forms of indirect consumption that have come to Chitwan since the mid-1970s. We use several measures to capture a range of dimensions of environmental consumption.

Direct Consumption—When consumption proceeds from householders' interactions with the nearby natural environment, we consider this direct consumption. Our measures are setting-specific and are taken from the 1996 and 2001 household surveys. First, we focus on milk production, which requires fodder to feed animals. Our measure, *ownership of any cows or buffalo* is coded 1 if the household has at least one cow or buffalo kept to produce milk and 0 otherwise.⁴ Table 1 presents descriptive statistics for this and other measures. Second, we focus more closely on consumption of fodder from common land resources. Households with fodder-consuming animals were asked, "Where do you usually graze your livestock?" and "Where do you usually go to collect fodder?" If common land was used for either purpose, *common land use* is coded 1; otherwise, it is coded 0.

⁴Note that some households keep many cows or buffalo and sell milk on the dairy market. Some keep male cattle or buffalo for draft power. Many households also keep goats and some keep sheep. We investigated measures of animal ownership that focused on each of these subsets as well as the sum of the number of cattle, buffaloes, sheep, and goats the household owns (because sheep and goats are much smaller than buffaloes and cows and thus consume less fodder, we coded each sheep or goat as 1/4 of a large animal). The results of our investigations into these alternative measures of animal ownership closely parallel the results we present for owning any cows or buffaloes. For parsimony, and because the ownership of at least one cow or buffalo to produce milk most closely matches our hypothesis, we present only results for this measure in the text.

Indirect Consumption—Consumption of a good separated from the original natural resource that provided the means to create that good is considered indirect consumption. First, we investigate the purchase of milk versus ownership of milk-producing cattle or buffalo. The dichotomous variable *all milk purchased* indicates that the household buys all of its milk from a market and produces none of it at home. Second, we examine purchase of fuel-wood or alternative fuels, versus gathering fuel wood, as an indicator of a shift toward indirect environmental consumption. The dichotomous indicator *any fuel purchased* is coded 1 if the household purchased *any* of the fuel they consumed for heating or cooking in the household – including fuel wood, kerosene, electricity, or natural gas – and coded 0 if the household itself collects *all* of the fuel-wood they consume. Third, we examine the consumption of manufactured goods. *Ownership of consumer durables* is coded as the number of different types of non-agricultural goods the household owns, including radios, televisions, bicycles, and motorcycles. The maximum is 4; the minimum is 0. None of these consumer durables are produced in Chitwan, and though some are assembled in Nepal, the natural resources to manufacture each good originate outside the country.⁵

All of these dimensions of indirect consumption were measured using identical questions in both 1996 and 2001, with one exception. The measure of whether the household purchases all of its milk was only collected in 2001. As a result our models of this dimension of consumption are limited to investigation of variation in 2001 and will not investigate change between 1996 and 2001.

Social Organization

To operationalize appropriate setting-specific measures of social organization in the local context, we draw heavily on previously published research (Axinn, Barber and Ghimire 1997; Axinn and Yabiku 2001). Axinn, Barber, and Ghimire (1997) demonstrate that measures obtained with the Neighborhood History Calendar (NHC) have the flexibility to reflect both temporal change and spatial variation in access to nonfamily social organizations. Axinn and Yabiku (2001) investigate the temporal change and spatial variation in these measures in detail. They conclude that summary measures counting the number of types of specific nonfamily organizations located within a fixed walking radius appropriately reflect the local variation in nonfamily social organization. In fact, the measures derived by Axinn and Yabiku (2001) have been used repeatedly in a number published studies of social organization and change in the local community context (Barber and Axinn 2004; Beutel and Axinn 2002; Yabiku 2004).

Following that lead, we construct a summary measure of the number of types of new nonfamily organizations within a 15-minute walk of each neighborhood to measure social organization in the local community context. We use data from the NHCs to construct dichotomous measures of whether each neighborhood has an employment opportunity, market place, school, bank, health post, police station, or bus service within a 15-minute walk.⁶ For instance, if a household is in a neighborhood located within a 15-minute walk of the nearest employment opportunity, the household is coded 1 for the employment opportunity measure, and coded 0 otherwise.

⁵Note that the 2001 household survey interview measured a much larger range of consumer durable ownership. Using those data we estimated an alternative model of variation in ownership of consumer durables in 2001 that included ownership of radios, televisions, bicycles, motorcycles, telephones, sewing machines, video players, camera, gas stoves, refrigerators, rice cookers, electric fans, and electric irons. The greater variance produced by this alternative measure results in even larger effects and a stronger explanatory model than presented in Table 2. Effects remain in the same direction as in Table 2, so that the results presented in Table 2 represent a conservative assessment of the effects on ownership of consumer durables.

⁶An employment opportunity is the nearest employer who employs ten or more individuals for pay. Bus service is the nearest location where a resident could board a public motorized vehicle and ride for a fee (including tractors and jeeps). A market place is the nearest location of two or more contiguous shops where goods and services are sold for money, including tea shops. A school is the nearest location of nonfamily instruction and socialization aimed at children and youth. This includes religious schools and schools without a physical building. A health post is any facility that provides medical services or supplies, including hospitals, family planning clinics, and pharmacies.

Each of the other measures of nearby nonfamily organizations is coded the same way. To summarize these seven measures, we also constructed an index of the total number of types of nonfamily organizations within a 15-minute walk of the neighborhood. We compare values of the index for 1956 and 1996 to measure *change* in access to these organizations (within a 15-minute walk) over the 40 years *before* the household interviews. Note that our original NHC measures have no limiting boundaries; respondents reported all distances however was most appropriate from their own point of view.

Household Size

Household size is constructed from a census of all households in each neighborhood, conducted shortly before the household interviews. A resident of a household is defined as having eaten or slept in the household for at least three of the past six months at the time of the study. It is important to note that the analyses presented below are conducted at the household level, so they hold the total number of households constant and focus on the variations in numbers of people (household members).

Affluence

Measurement of affluence is particularly difficult in a study of the effects of affluence on consumption. This is because it is common to use measures of consumption as indicators of affluence. Therefore, we have explicitly conceptualized affluence through a series of dimensions that affect consumption, but are not themselves consumption. In an agricultural setting such as Nepal, with nearly 95% of the labor force engaged in agriculture, owning land is a key form of affluence. We measure land ownership three ways. First, we dichotomously measure ownership of a house plot, coding this measure 1 for ownership and 0 otherwise. Second, we measure the total land owned by the household using the number of *khatha*, the local Nepalese metric (equal to approximately 720 square feet). Third, we dichotomously measure whether the household rents out any land, coding this measure 1 for yes and 0 otherwise. Land rental is a key source of income in this setting. Next, we measure the key alternative source of affluence in this setting – human capital. Both education and labor force participation build human capital, which household members can convert into earnings (Mincer 1974). We calculate the percent of household members who have any nonfamily schooling and the percent of all household members with any non-family labor force experience. Finally, we measure household affluence with two measures of money. The first is a categorical measure of income for the year 2000 in Nepalese rupees (0 = no income; 1 = 10,000 or less; 2 = 10,000-25,000; 3 = 25,000-50,000; 4 = 50,000-100,000; 5 = 100,000-250,000; 6 = 250,000-500,000; and 7 = 500,000 or more). The second is a measure of savings, which is still rare in this setting, so we use a dichotomy coded 1 if the household has any monetary savings and 0 otherwise.

Ethnic Group

We control for Nepalese ethnicity in our analyses because it corresponds to key cultural factors affecting the relationship between individuals and their natural environment. This approach is consistent with previous research, which also links ethnicity and cultural differences to consumption patterns (Lutzenhiser 1993; Lutzenhiser, Harris, and Olsen 2001). Ethnicity in Nepal is complex, multi-faceted, and interrelated with religion. A full description of the ethnic groups residing in this setting is beyond the scope of this paper (for detailed descriptions of these groups, see Fricke 1986; Gellner and Quigley 1995; Gurung 1980; Guneratne 1994), but we control for five classifications of ethnicity. These five groups are: 1) high caste Hindus; 2) lower caste Hindus; 3) Newars; 4) hill Tibeto-Burmese (Tamang, Gurung, and Magar); and 5) terai Tibeto-Burmese (Tharu, Deraï and Kumal). Each group is coded with an dichotomous measure and high caste Hindus are omitted as the comparison group in analyses.

Analytic Methods

Households are the unit of analysis for this investigation. We use two closely related statistical methods in our analyses. We use logistic regression in models in which the dependent variable is dichotomous – ownership of cows or buffaloes, common land use, milk purchasing, and fuel purchasing. We use ordered logistic regression for ordinal measures of consumer durables ownership, in which the distance between each unit of the measure may not be equivalent. We present results as exponentiated log-odds coefficients (odds ratios). The effect on environmental consumption is positive if the coefficient is greater than 1.00, negative if it is less than 1.00, and neutral if it is equal to 1.00. These transformed coefficients can be interpreted as the multiplicative percentage change in the odds of the dependent variable. We discuss examples of these interpretations in the results section.⁷

Results

We begin by examining models of household variation in 2001 (again, with households as the unit of analysis). Historical evidence from this part of Nepal indicates that as of the mid-1970s this setting still had extremely little indirect consumption, and almost no variation across households (Axinn and Axinn 1983, 1984). Therefore our analysis of variation across households in 2001 indicates change from the early 1970s, at least at the population level.

Table 2 presents models of the relationship between community social organization and household-level environmental consumption. This table shows that social organization is associated with the type of environmental consumption. Specifically, the increase in the types of nonfamily organizations within a 15-minute walk over a 40-year period decreases direct environmental consumption and increases indirect environmental consumption. The pattern is remarkably strong and consistent. Households located in neighborhoods with new types of nonfamily organizations nearby are less likely (estimated coefficients of less than 1.00) to own cows or buffalo and to use common land for grazing or fodder collection (Table 2, row 1, columns 1 and 2). These households are more likely (coefficients of more than 1.00) to purchase all of their milk, to purchase their cooking and heating fuel, and to own more consumer durables (Table 2, row 1, columns 3, 4 and 5). This is consistent with our hypothesis that nonfamily social organization decreases direct environmental consumption and increases indirect consumption⁸. These results are seen by reading the coefficients of all five different models across row 1 of Table 2. Note that each model provides estimates for a different dependent variable, so is not appropriate to compare the specific magnitudes of coefficients across models. Instead we reach this conclusion from the consistent direction of effects across models. This pattern of observed relationships in the first row of Table 2 is the key empirical result of this analysis.

These results are large, substantively important, and statistically significant. Households with just one additional nearby nonfamily organization have 29% lower odds of owning a cow or buffalo and 26% lower odds of using common land. Our measure of new nonfamily organizations ranges from 0 to 7, so households with 4 additional organizations (e.g., 6 relative to 2) have 75% lower odds of owning a cow or buffalo ($.71^4 = .71 * .71 * .71 * .71 = .25$) and 70% lower odds of using common land ($.74^4 = .30$). In terms of indirect consumption, households with just one additional nearby nonfamily organization have 33% higher odds of buying all of

⁷Because the households in this sample are grouped into clusters of five to fifteen, we re-estimated all of our multivariate models using estimation procedures designed to correct standard errors for the neighborhood level grouping of households (e.g. HLM). These tests revealed no substantial or significant differences in the substantive interpretation of the results after this correction. Therefore, for ease of interpretation, we display the unadjusted logistic regression results in the tables.

⁸In contrast to either the possibility that nonfamily social organization might have no influence on consumption, or the possibility that nonfamily organization might increase direct consumption and decrease indirect consumption.

their milk, 34% higher odds of purchasing any of their fuel, and 16% higher odds of owning an additional type of consumer durables. Households with 4 additional organizations have more than 200% higher odds of both purchasing all milk and purchasing any fuel ($1.33^4 = 3.13$ and $1.34^4 = 3.22$). Likewise, households with 6 organizations (relative to 2) have more than 80% higher odds of owning an additional type of consumer durable ($1.16^4 = 1.81$).

These effects of social organization are also independent of the household characteristics included in these models, many of which are also associated with consumption behavior. Large households have significantly higher odds of owning a cow or buffalo, of using common land, and of owning more types of consumer durables. Affluence is also important, but its influence varies across dimensions of affluence and by specific type of consumption. Households that own their house plot have higher odds of owning cows or buffalo and purchasing fuel, but lower odds of purchasing all their milk. Households that own a large amount of land have higher odds of owning cows and buffalo as well as consumer durables, and lower odds of using common land and purchasing all their milk. Households that rent out land have higher odds of purchasing all of the household's milk supply, but lower odds of owning cows or buffalo. Of course owning cows or buffalo and purchasing milk are opposite types of consumption, so it is not surprising that these land-based measures of affluence influence these two behaviors in opposing directions.

Other dimensions of affluence are also associated with consumption behavior. Our household-level measure of education is associated with higher odds of all forms of indirect consumption, and lower odds of direct consumption. Our household measure of labor force participation is significantly associated with lower odds of consumer durable ownership. In this setting, high rates of labor force participation are associated with poverty, particularly landlessness, so it does not reflect the type of human capital effects on consumption that our theory predicts. This may change over time as a greater proportion of the population leaves agricultural production. In the meantime, our education measure of human capital produces results consistent with the consumption transition produced by access to nonfamily organizations and services. In fact, new nonfamily organizations in this setting are strongly associated with increased educational enrollment (Buetel and Axinn 2002) and the observed effects of social organization on consumption are even stronger with the education measure omitted from the models (not shown in tables). These results are consistent with the possibility that education of individual family members may act as a mechanism through which new forms of social organization reshape consumption behavior. Educated households tend to engage in less direct and more indirect consumption than other households.

Monetary dimensions of affluence are also associated with consumption behavior – households with higher income and savings engage in more indirect consumption (but not necessarily less direct consumption). This is consistent with our definition of indirect consumption as involving a market that links the user and the resource. Higher incomes are associated with purchasing milk and fuel, and owning more consumer durables. Having savings is associated with owning more consumer durables.

Also note that ethnicity is strongly associated with environmental consumption. Upper caste Hindus are more likely to own cows or buffalo and are less likely to purchase all of their milk than the other ethnic groups. This is consistent with the emphasis of Hinduism on cows and the use of dairy products in daily life (Bennet 1983; Gurung 1980). Lower caste Hindus and hill Tibeto-Burmese have higher odds of using common land than upper caste Hindus. Lower caste Hindus and terai Tibeto-Burmese groups have lower odds of purchasing fuel and owning consumer durables than upper caste Hindus. A detailed exploration of the nature of the relationship between ethnicity and environmental consumption is beyond the scope of the present paper, but may be a fruitful avenue for future research. Cultural differences in

interacting with the environment are necessary for investigations of social change and environmental consumption at the micro-level.

Results from Models of Change between 1996 and 2001

To interpret the results displayed in Table 2, above we argue that variation in 2001 reflects change between the 1970s and 2001. Though historical evidence is consistent with this argument, the interpretation is indirect rather than a direct model based estimate of change over time. To provide a more direct evaluation of change over time, we use panel study measures of environmental consumption, featuring exactly the same survey questions asked to exactly the same households in both 1996 and 2001. Using these measures, we re-estimate the models displayed in Table 2, this time treating environmental consumption in 2001 as the outcome of interest (dependent variable) and adding measures of environmental consumption from 1996 as controls in the multivariate models. This formulation of the model focuses on the associations between other measures in the models, such as our measure of social organization, and household level *change over time* (1996-2001) and each specific dimension of environmental consumption. The limitation of this approach is the focus on change over a relatively narrow window of time. The strength of this approach is direct, model-based estimates of the association between social organization and change over time in environmental consumption.

The results of these models are summarized in Table 3. This table displays only the estimated effects of social organization on changes in consumption, although the models include all variables displayed in Table 2. Greater access to nonfamily organizations is associated with a significant decrease in the odds of direct environmental consumption and a corresponding increase in the odds of indirect environmental consumption. Specifically, households located in neighborhoods with more nonfamily social organizations experience a decrease in the odds of owning cows or buffalo, a decrease in common land use, and a significant increase in the odds of purchasing fuel and owning consumer durables.⁹

The direction, statistical significance, and interpretation of these estimates are remarkably similar to those presented in Table 2. One interpretation of this result is that much of the change which took place in this setting between the mid 1970s and 2001 actually took place between 1996 and 2001. Another interpretation is increased confidence that our observation of associations between social organization and environmental consumption in 2001 actually does reflect association between social organization and *change over time* in environmental consumption. This increased confidence comes from the direct assessment of change over time in environmental consumption provided by the models displayed in Table 3 based on direct measurement of change in household consumption behaviors between 1996 and 2001. Thus even though the results of these models are essentially the same, what we learn from them is an important advance over cross-sectional analyses alone, such as those displayed in Table 2, in which the interpretation of associations with changes over relies on indirect argument about historical conditions.

Conclusion

Our empirical analysis provides micro-level evidence of the “metabolic rift” described by Marx and Foster (Foster 1999; Marx [1867] 1976, [1863-65] 1981) and highlighted in the recent social science literature on environmental change (Clausen and Clark 2005; Fischer-Kowalski and Haberl 1998; Moore 2000; York, Rosa and Dietz 2003b). We examine a setting characterized by rapid social change – the spread of nonfamily organizations at the community

⁹Note there was no measure of milk purchase behavior available from the 1996 household survey.

level – that reorganizes the nature of daily social life. The social changes include, but are not limited to, the spread of capitalist production. In fact these changes include a host of new organizations that stimulate the reorganization of daily social activities – including production, consumption, socialization, residence, recreation, and protection – away from home and family. At the micro-level, households in communities that have experienced more of this change are engaged in more indirect environmental consumption and less direct environmental consumption.

Our empirical estimates indicate that these differences in social organization have an enormous association with environmental consumption patterns. The negative influence of community change – operationalized by the number of new nonfamily organizations within a 15-minute walk – on direct environmental consumption is large. The positive influence of the same social changes on indirect environmental consumption is similarly large. The combined effect on the shift away from direct consumption and toward indirect consumption is dramatic. This relationship between social change and environmental consumption is net of the well-established relationships among social change, household size, and affluence, and is net of the relationships among affluence (measured by land ownership, human capital, and income/savings), household size, and consumption. On its own, greater access to nonfamily organizations results in a dramatic micro-level shift away from direct environmental consumption toward indirect environmental consumption.

Marx's idea of metabolic rift describes the mechanisms through which the spread of capitalist modes of production alters humans' interactions with their natural environment, so that people consume environmental resources more indirectly. To expand the metabolic rift thesis, we draw on Durkheim's (1984) idea that improved transportation and communication, monetization, and increased population density all stimulate an increased division of labor in society, with widespread consequences for the social organization of daily activities. Building on Durkheim's notion of the spreading division of labor, we argue that a wide array of social changes, including but not limited to the spread of capitalist production, stimulate the reorganization of daily social activities outside the family. As nonfamily production, consumption, recreation, socialization, and protection organizations spread, they stimulate a reorganization of daily life so that social activities increasingly take place away from the family and household (Coleman 1990; Thornton and Lin 1994). In particular, we argue that this reorganization of social activities outside of families and household has dramatic implications for how household members interact with the natural environment – stimulating more indirect and less direct environmental consumption.

Of course the consumption transition we document here does not specify the total volume of consumption or the overall environmental consequences of consumption, sometimes described as the environmental footprint (York, Rosa, and Dietz 2003a). Factors such as affluence and population size shape the total volume of consumption at the macro level (Stern et al. 1997). At the micro level similar relationships probably take place. But at the micro level, social organization appears to be a key engine of a fundamental transition away from direct consumption of the environment toward indirect consumption of the environment – a transition with potentially profound environmental consequences. High levels of direct consumption result in a population's influence on the natural resources immediately surrounding its location. High levels of indirect consumption, on the other hand, translate into effects on distant natural resources, potentially out of sight and out of mind of the consumer. From Marx to the most recent leading scholarship, social scientists have argued that consumption of local resources by the users of those resources is more likely to produce sustainable resource management systems (Foster 1999; Douglas 1992; Ostrom 1992). Therefore, even if potentially independent from the total volume of consumption, this transition from direct to indirect consumption has the potential to accelerate the degradation of natural resources.

We close by arguing that as the social sciences move to more micro-level research on the factors shaping environmental quality, our models must include explicit consideration of local contextual dimensions of social organization. The evidence we present here is consistent with the conclusion that local social organization is a powerful force shaping the nature of consumption practices in ways that may shape environmental quality. Our models suggest that settings with an extremely high level of nonfamily social organization (such as the United States) will be characterized by high levels of indirect consumption. In such settings, geographic proximity may not be adequate to connect a population to the resources it consumes. For research this means variations in social organization will limit the extent the scientific community can use spatial relationships to link people and the environment (Fox et al. 2003). For the practice of improving the management of environmental resources this means that strategies focused on localizing consumption practices may hold great potential in settings of high indirect consumption.

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Table 1

Descriptive Statistics for Measures Used in Analysis

	N	Mean	Standard Deviation	Minimum	Maximum
<i>Direct Environmental Consumption</i>					
Ownership of cows or buffaloes	1,365	.68	.47	0	1
Ownership of cows or buffaloes	1,365	.67	.47	0	1
Common land use (1996)	1,110	.29	.45	0	1
Common land use (2001)	1,103	.21	.41	0	1
<i>Indirect Environmental Consumption</i>					
All milk purchased (2001)	1,365	.19	.39	0	1
Any fuel purchased (1996)	1,365	.96	.20	0	1
Any fuel purchased (2001)	1,365	.65	.48	0	1
Ownership of consumer durables (1996)	1,365	1.31	.98	0	4
Ownership of consumer durables	1,365	1.76	1.11	0	4
<i>Social Organization</i>					
Change in number of nonfamily organizations within 15-minute walk	1,365	3.80	1.56	0	7
<i>Household Size</i>					
Number of people in household	1,365	5.64	2.51	1	26
<i>Affluence</i>					
Household owns house plot	1,365	.91	.29	0	1
Total land owned	1,365	19.80	23.43	0	220
Rents out land	1,365	.16	.37	0	1
Percent of household members with nonfamily schooling	1,365	.61	.33	0	1
Percent of household members with non-family work	1,365	.64	.31	0	1
Annual income	1,365	2.25	1.44	0	7
Savings	1,365	.25	.43	0	1
<i>Ethnic Group</i>					
Upper Caste Hindu	1,365	.48	.50	0	1
Lower Caste Hindu	1,365	.11	.32	0	1
Newar	1,365	.06	.24	0	1
Terai Tibeto-Burmese	1,365	.18	.38	0	1
Hill Tibeto-Burmese	1,365	.16	.37	0	1

Table 2

Regression Estimates of the Relationship between Social Organization and Environmental Consumption (asymptotic z-ratios in parentheses)

	<i>Direct Environmental Consumption</i>		<i>Indirect Environmental Consumption</i>		
	Ownership of cows or buffaloes (2001)	Common land use (2001)	All milk purchased (2001)	Any fuel purchased (2001)	Ownership of consumer durables (2001)
<i>Social Organization^a</i>					
Change in number of nonfamily organizations within 15-minute walk	.71 *** (6.98)	.74 *** (5.35)	1.33 *** (5.53)	1.34 *** (6.87)	1.16 *** (4.29)
<i>Household Size^b</i>					
Number of people in household	1.14 *** (3.81)	1.08* (2.45)	.94 (1.83)	1.02 (.58)	1.10 *** (4.39)
<i>Affluence^b</i>					
Household owns house plot	4.03 *** (5.70)	.66 (1.26)	.33 *** (5.01)	2.70 *** (4.45)	1.16 (.81)
Total land owned	1.05 *** (7.81)	.98 *** (3.32)	.97 *** (4.97)	1.00 (.78)	1.02 *** (5.62)
Rents out land	.32 *** (5.51)	1.01 (.02)	2.33 *** (4.17)	1.00 (.00)	.83 (1.30)
Percent of household members with nonfamily schooling	.74 (1.34)	.55* (2.29)	2.95 *** (4.27)	1.73 *** (2.73)	2.76 *** (6.03)
Percent of household members with nonfamily work	.85 (.70)	1.30 (1.44)	.81 (.84)	.69 (1.76)	.46 *** (4.54)
Annual income	.95 (1.03)	.76 (1.05)	1.13* (2.14)	1.14** (2.70)	1.37 *** (8.28)
Savings	1.16 (.88)	.78 (1.28)	1.12 (.66)	1.20 (1.18)	1.80 *** (4.91)
<i>Ethnic Group^{b/c}</i>					
Lower Caste Hindu	.25 *** (6.31)	1.90* (2.50)	2.12 *** (2.99)	.67* (1.97)	.45 *** (4.59)
Newar	.35 *** (3.75)	.79 (.54)	2.89 *** (3.77)	.96 (.13)	1.47 (1.79)
Terai Tibeto-Burmese	.09 *** (11.50)	.98 (.10)	2.87 *** (4.61)	.31 *** (6.58)	.51 *** (4.43)
Hill Tibeto-Burmese	.42 *** (4.34)	1.58* (2.08)	1.68* (2.34)	.81 (1.18)	.77 (1.81)
N	1,365	1,103	1,365	1,365	1,365
χ^2	471.84	95.57	197.99	202.15	508.12

* p < .05,

** p < .01,

p < .001

^a One-tailed test.

^b Two-tailed tests.

^c upper caste Hindu is reference category

Table 3

Regression Estimates of the Effects of Social Organization on Change over Time (1996-2001) in Environmental Consumption (asymptotic z-ratios in parentheses)^a

	<i>Direct Environmental Consumption</i>		<i>Indirect Environmental Consumption</i>	
	Ownership of cows or buffaloes (2001)	Common land use (2001)	Any fuel purchased (2001)	Ownership of consumer durables (2001)
<i>Social Organization</i> ^b				
Change in number of nonfamily organizations within 15-minute walk	.81*** (3.95)	.85* (2.50)	1.37*** (7.13)	1.13*** (3.65)
N	1,365	1,008	1,365	1,365
χ^2	665.92	220.06	207.72	792.03

*
p < .05,

**
p < .01,

p < .001

^aThese results come from multivariate models including *all* of the factors presented in Table 2 (Household size, multiple dimensions of affluence and ethnicity)

^bOne-tailed tests.