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**Author**

Jorgensen, Joseph G.

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# Ethnicity, Not Culture? Obfuscating Social Science in the *Exxon Valdez* Oil Spill Case<sup>1</sup>

JOSEPH G. JORGENSEN

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## INTRODUCTION

On 29 March 1989, the *Exxon Valdez* foundered on Bligh Reef just outside the Valdez Arm of Prince William Sound. Nearly eleven million gallons of crude oil spilled through the ship's ruptured hull. An oil slick and oil balls drifted with tides and currents throughout large portions of Prince William Sound, southwest down the Kenai Peninsula to Kodiak Island, and then northeast into Cook Inlet. The consequences for the native and nonnative residents of the oiled area were many.

One of the damage suits brought against Exxon Corporation was filed by a group of Native American residents from villages in the spill area who sought compensation for the damage the spill inflicted on their culture, and for cultural deprivation resulting from damage. The assertions made by social scientists for the native plaintiffs that their culture had been damaged; the assertion made by a social scientist for the respondent, Exxon Corporation, that native culture had been "smashed" centuries prior to the spill and that the modest differences between natives and nonnatives in the spill area at the time of the spill were "ethnic" only; and the decision of the federal judge at least in part informed

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Joseph G. Jorgensen is a professor of comparative culture and social science at the University of California, Irvine.

by this “expert” testimony” constitute the occasion for this analysis. The consequences of the bad and irresponsible social science used in informing attorneys for both sides and informing the judge were serious and injured the natives.

In regard to the *Exxon Valdez* oil spill and the litigation that followed, it is evident that the theoretical constructions chosen by social scientists for the native plaintiffs and by social scientists for Exxon had real world consequences. I say this with no intention to suggest or to claim that social scientists for the two sides were completely free to choose the constructions they used. Indeed, the attorneys for the native plaintiffs were instrumental, if not decisive, in defining the damages sustained by natives. The attorneys refused access to all but their own social scientists to natives in the smallest villages in the Prince William Sound region,<sup>2</sup> but they did not exercise a similar influence in the oiled villages of the Cook Inlet, Kodiak Island, and Alaska Peninsula regions.

Stephen R. Braund and P. J. Usher (and their associates), social scientists for the plaintiffs, reported to the attorneys responsible for bringing the suit,

Damage to any of the core elements (e.g., natural resource base or kinship system) damages the culture and the people . . . . Because subsistence is the basis of modern Alutiiq culture, the oil spill . . . damaged that culture in a multitude of ways . . . [and t]o the extent that the Alutiiq people’s subsistence, the most fundamental bases of the culture and life, remains disrupted, they and their culture have been damaged.<sup>3</sup>

In their conclusions and throughout their report, Braund et al. represent culture as an empirical phenomenon that can be damaged and was damaged as a consequence of the spill. The claim that culture is a thing that can be damaged is ontological, enjoying standing neither in social science nor in the courts. This misunderstanding and misuse, through reification, of the culture concept had severe consequences for the native plaintiffs.<sup>4</sup>

As I will show, the social science marshaled by the respondent’s experts was also deeply flawed, larded as it was with confusing and unwarranted claims about culture, ethnicity, and class. The key concepts of ethnicity and class to which considerable explanatory power are attributed are not defined at all. The key concept of culture, however, is attributed contradictory meanings by the respondent’s expert.

I pay sufficient attention to the concept of culture and its measurement throughout this paper so as not to require an introduction to the concept and its misuses, beyond those already reported in cameo for the plaintiffs' social scientists. But because Exxon's most senior and most recognizable social scientist claims for the here and now that (1) there is no Native Alaskan culture, only American culture; (2) the important characteristics that distinguish Alaska Natives from other Americans is their "ethnicity" (ethnicity itself is trivial in that scholar's view); and (3) the important factor that makes Alaska Natives similar to some Americans is their membership in the "working class," let us introduce the concepts of *ethnicity* and *class*. We will have occasion to measure the respondent's claims against our brief discussion of these concepts.

Definitions of the terms *ethnic*, *ethnic group*, and *ethnicity* have proliferated in the past two decades, making an already murky topic even murkier. An *ethnic group* connotes membership of persons aware of common interests. An ethnic group, then, is a group of persons, not a category. Although groups are "ethnic," they are usually thought to be formed from culture and descent, not biology. So when dealing with the term *ethnic*, scholars should define it, identify the group that is ethnic, and specify how *culture* (which also requires definition and measurement), and *descent* (which requires definition and measurement) coalesce to make persons aware of common interests.<sup>5</sup> As an important aside, a persistent problem with the *ethnicity* concept is that scholars seldom define and measure it and less seldom distinguish ethnic inequalities from racial inequalities.

The problems in using *ethnic* are compounded by using *class*. *Class*, whether understood as socioeconomic status (a composite measure of income, occupation, education and attitudes, ordinally ranked, that persons express about combinations of those phenomena) or as a relationship to the means of production (in the Marxian sense of ownership, control, exchange, labor, distribution, and consumption), requires definition and measurement, particularly so if it is a key factor in an explanation. *Class*, whether defined as socioeconomic status or as a relation to the mode of production, is a category, not a group of persons who share a common identification and whose common characteristics are the products of culture and descent. The bad social science to which the natives (and Exxon) were treated should never have been dumped before the judge.

Native residents of the area affected by the spill, I will demonstrate, are very different from nonnatives in that same area. They are different in the ethics that they express and practice, in their knowledge of the local environments, in the ways and extent to which they participate in their communities, in the networks and activities in which they engage, in their uses of environments and the meanings the environments hold for them, in their family-household organizations, and, if class is an issue, in their educations, occupations, incomes, political knowledge and participation in political affairs. I will demonstrate that the differences between natives and nonnatives are not simple differences in education, occupations, incomes, and access to power—although they certainly are quantifiable and quantified, and they certainly are different, significantly so; the differences between them are qualitative and embrace a host of phenomena. The differences are so great and so obvious that even persons untrained in multivariate multidimensional scale analysis will see them.

And how about change over the past few centuries? Was native culture “smashed” in 1600 or 1850, or in stages after earliest European contact? Without question, native subsistence economies in 1989, immediately prior to the spill, were different from native subsistence economies of 1889 and 1789 and 1689 in the technology, the speed and risks with which resources could be harvested, and the proportions that wild foods contributed to diets. But in 1989, as in the three centuries that preceded it, subsistence economies were directly linked to procuring food and shelter for the maintenance of life. For any household, the social organization in which the subsistence economy was embedded encompassed many households within and outside the village. I will demonstrate how native customs were invoked as a response to the spill and how nonnatives responded to the spill as well. The differences are marked. The differences are cultural. An empirically warranted analysis of the consequences of the spill and the responses to it would have benefited natives. Social scientists were irresponsible in this regard.

#### THE JUDGE'S DECISION AND HIS FINDINGS ABOUT CULTURE

On 25 March 1994, federal judge Russell Holland, in the district of Alaska, issued a summary judgment against a class of Alaska Native village plaintiffs who sought restitution from the Exxon

Corporation for damages inflicted on their culture by the *Exxon Valdez* oil spill (civil case no. A-89-095). The attorney for the natives, Michael D. Hausfeld, had claimed that the spill so seriously damaged the natives' way of life as to deprive them of their culture. He also argued that the wild resources on which natives relied were fouled and that the activities associated with those resources were altered negatively. Judge Holland found for the respondent that the villages cannot collect damages for harm that was alleged to have been suffered by native culture. He wrote that "[t]he *Exxon Valdez* oil spill was a disaster of major proportions, but it did not deprive Alaska Natives of their culture."

Holland sought to clarify his decision by saying that Alaska Natives should not interpret his decision as a failure to understand the subsistence lifestyle or as a failure to value cultural considerations. As a rationale for his decision, he asserted that many native groups "lost in the anthropological fog of ten to fifty thousand years ago" moved through or set down roots in what is now Alaska. Whatever accommodations the residents made to their habitat in the ancient past, those accommodations had been affected by waves of Europeans seeking fur-bearing animals, whales, and gold in Alaska. The judge did not mention, although he could have, the effects of waves of nonnatives entering Alaska since 1890 to engage in commercial fishing, establish and operate military sites, extract and transport coal, timber, and oil. These political and economic factors, too, exercised strong influences on the lives of Alaska Natives from the turn of the twentieth century but none so large as the Alaska Native Claims Settlement Act of 1971 (ANCSA) and the exploration, extraction, and transporting of oil that ANCSA made possible. ANCSA extinguished native claims to land and all subsurface resources on land not transferred to them and extinguished native claims to the control of wildlife—whether on native land (about 10 percent of Alaska), state land, or federal land—by vesting regulatory authority over wildlife in various federal and state agencies.

Judge Holland alleged in his decision that culture is "deeply embedded in the mind and heart" and cannot be changed by catastrophe. He wrote,

If (and we think this is not the case) the native culture was in such distress that the *Exxon Valdez* oil spill sapped the will of the Native peoples to carry on their way of life, then a Native subsistence lifestyle was already lost before March 24, 1989 (the date of the spill).

Apparently, Judge Holland consulted himself as the source for his claim—offered as an empirical generalization—that culture is located in “the mind and the heart,” although his findings appear to have been strongly shaped either by a report prepared by Paul Bohannon for the respondent or by Bohannon’s testimony in deposition. Bohannon is a social anthropologist known for his research among societies in sub-Saharan Africa. Judge Holland’s claim concerning the nature and location of culture is unwarranted. So far as I know, no social scientist from E.B. Tylor’s<sup>6</sup> pioneering work in 1871 to David F. Aberle’s<sup>7</sup> seminal paper in 1987 has sought to operationalize a proposition even vaguely similar to Judge Holland’s claim that culture is “embedded” in a function of the brain and a muscle at the center of the cardiovascular system. I would not know how to measure the judge’s proposition, even if I were able to define the properties he left undefined. Perhaps the judge was being allegorical, but allegory seems to me to be inappropriate to the framing of findings.

### The Judge on the Nature and Locus of Culture

The judge’s logic is correct that culture, per se, is not damaged or harmed, nor can it be damaged or harmed. Social scientists often define organizations of phenomena—acts, objects, ideas, and sentiments—that are dependent on the use of symbols, that are characteristic of a people, and that are transmitted—modified by innovations, borrowings, and deletions—from generation to generation as *culture*. The classification of those phenomena, the ways in which they change or remain stable, and the factors that influence stability and change are the topics studied by scientists of social change and the objects of their explanatory attempts. If persons gain their livelihoods from harvesting naturally occurring resources from places in areas they recognize as their home space, and if they assign significant symbols to those places, to the resources that they harvest, and to the manner in which they are to be harvested, prepared, distributed, and consumed, social scientists define those phenomena as *cultural*. But it is then incumbent upon the social scientist to collect empirical data pertaining to those phenomena and to consider the relations among them. They must measure the relations to determine how those data are organized and to determine the factors that influence variation in the relations.<sup>8</sup>

A person’s response to damage to places that hold significant symbolic meaning, to the resources that are harvested in those

places, and to the web of cultural relations that are entailed might be what was awkwardly and imprecisely presented by plaintiffs' attorney, Hausfeld, as "damage to culture." Culture is not a thing to be damaged any more than *mammal* is a thing to be damaged. *Mammal* is not a thing but a taxonomic class of warm-blooded vertebrates.

Unlike culture, natives experienced real, empirical loss of wild resources; real, empirical damage to the areas in which they gain their livelihood and which they define as their homeland; real, empirical alterations to their customs of harvesting, preparing, sharing, and consuming products and by-products; real, empirical threats to the future generations of animals on which they rely. Damage, then, occurred in two ways: first, to resource harvest areas and to normal and conventional (i.e., culturally specific) means of harvesting and distributing those resources; and, second, to cultural expectations—a discrepancy between what natives had and what they thought they were entitled to in light of cultural traditions. Responses to the spill and the damages it caused were conditioned by cultural expectations about what natives do in various contexts and instances of adversity. I will return to this crucial point, but native responses were consonant with native cultural practices invoked when responding to immediate and protracted privations. Natives are expert at adjusting to environmental variations—whether or not those variations are influenced by human beings.

The judge refers to cultural deprivation rather than to cultural damage and claims that natives were not deprived of their culture. I think the judge is correct that natives were not "deprived of their culture," but they did experience cultural deprivation. It was not absolute deprivation as the plaintiffs' attorney alleged and the judge denied. Natives were absolutely deprived of engaging in some ordinary and necessary practices, to be sure, and Exxon compensated natives for those absolute deprivations with a \$20 million settlement after Judge Holland issued his summary judgment. During the summer and fall of 1989 as well, Exxon provided food to native villagers to blunt the loss of wild resources that they normally harvested and consumed. And during the summer as well, natives gained employment from Exxon and VECO<sup>9</sup> in spill cleanup operations

The cultural damages that the plaintiffs' attorney and the social scientists who informed him did not address and hence did not measure were "relative deprivations." *Relative deprivation* is de-



defined as a negative discrepancy between legitimate expectation and actuality. It would be incumbent on the plaintiffs' counsel and social science consultants to define and measure the legitimate expectations of natives in the spill area, then to measure the actuality and the difference between the two. This could have been done for native communities in the spill area (a measure of legitimate expectations would require defining and measuring expectations natives have about their space and the places within it, about naturally occurring resources, about the organization of subsistence, including harvesting, processing, distributing, and consuming, and the ideas and ethics associated with these phenomena).

The consequence of damage to the environment is not damage to culture, but damage to the environment did affect the ordinary and normal expectations of persons, the normal and ordinary ways in which they harvested, distributed, and consumed resources, the normal and ordinary ways in which they discussed the consequences to the space—the biological and abiological region—in which they gained their livelihoods, the places of importance within that space, and the consequences to persons in their communities who were unable to provide their own necessities and who counted on relatives and friends to provide wild resources and by-products to them. If culturally defined expectations were negatively affected by the spill, personal responses of grief, dismay, anger, dysphoria, and the like are not only evidence of deprivation but effects of deprivation. Expectations are, to a considerable degree, culturally established. People suffer when their cultural expectations are not met.<sup>10</sup>

#### THE RESPONDENT'S SOCIAL SCIENTIST AND HIS CLAIMS ABOUT CULTURE AND ETHNICITY

In the fall of 1993, Paul Bohannon issued a report in behalf of Exxon Corporation. In his report, Bohannon claims that there are no cultural differences, only ethnic differences, between Alaska's natives and nonnatives. Prior to 25 March 1994, when Judge Holland issued his summary judgment, Bohannon was deposed by the attorney for the plaintiffs about Bohannon's report to Exxon in regard to case no. A-89-095 in the United States District Court for the District of Alaska.<sup>11</sup> Bohannon's report and deposition appear to have been compelling to Judge Holland inasmuch as the judge's findings parallel the claims of Bohannon that

culture, in part, is in the “mind,” that many native cultures had changed or been lost in the prehistoric fog, that cultures that had not been lost in the fog changed again as they accommodated to waves of Europeans while adapting to the altered conditions—presumably social, biological, and abiological—that were the consequences of those waves, and that native culture had not been damaged nor had natives been denied their culture by the spill.

Michael D. Hausfeld, the attorney for the plaintiffs, set the stage for the debacle by arguing an ontological definition in which culture is reified as a thing that can be and was damaged. Given Hausfeld’s invalid logic and the empirically unwarranted assertions on which his argument was based,<sup>12</sup> Bohannon’s claims may have appeared empirically warranted to Judge Holland.

In his report to the Exxon Corporation, Bohannon defines culture as “[a] basic device for surviving and prospering—a set of ideas and artifacts by means of which human beings adapt to the environment, including the social environment.” His definition of culture as a “device” by which “human beings adapt to the environment” suggests that culture is a tool that is used rationally by agents. Key terms such as *device* and *adapt* are undefined in his report, hence nothing of theoretical or empirical significance turns on them.

In deposition, Bohannon<sup>13</sup> testified that his sole knowledge of natives in the spill area was obtained from publications (scholarly literature, gray literature,<sup>14</sup> and newspapers and magazines), television, and radio. He had not inquired into the ideas of Alaska Natives concerning the spill or into the consequences of it to them until he was contracted to do so by Exxon in early 1992, some three years after the *Exxon Valdez* had foundered. Although Bohannon made visits of one to two hours’ duration to five villages in the spill area in 1992, he testified that he did not speak to a single native about native culture, the spill, or its consequences. And although he could not remember any specific evidence on the topic, he further testified that (1) natives returned to fairly normal subsistence activities “fairly soon after the cleanup”;<sup>15</sup> (2) “far and away the greater portion of the culture was never touched by the *Exxon Valdez* oil spill;<sup>16</sup> and (3) he knew of “no part of Alutiiq [Pacific Eskimo] culture in which the meanings were changed by the [*Exxon Valdez*] oil spill or by [the volcanic eruption of] Mount Katmai or by the earthquake [of 1964].”<sup>17</sup> In addition, Bohannon testified, “the tool kit [tools, speech, behavior, activities] part of

their culture was not changed, although the adjustment of one part of it to another may have been [temporarily] altered.”

Bohannon’s claim that culture was not changed, although adjustments among the parts may have been temporarily altered, suggests that he abandoned the definition of culture as a device used rationally by natives. In deposition he implies that culture is a self-regulating system composed of parts, each with a role to play. Indeed, each part makes a contribution<sup>18</sup> to the maintenance of the system. Bohannon claims that temporary adjustments are followed by readjustments that put the system back into proper working order. The assumption that a culture is a self-regulating system implies a nonrational character and is consonant with British structural functionalism as argued at mid-century. The postulate about culture as a nonrational system is the antithesis of the assumption of culture as a rational device, complete with meanings (Bohannon frequently uses *mind* to refer to meanings), by which persons adapt to their social, biological, and abiological environments.

Along with his failure to provide independent measures of such key terms as *device* and *adapt* in his definition of culture as a tool of rational, agentive behavior (reasons, intentions, dispositions), Bohannon fails to specify any nonrational, self-regulating cultural system, the parts of which it is composed, the relations among the parts, and the manner in which temporary adjustments among its parts occur.

It is conceivable that a system theorist competent in the uses of differential equations would seek to delineate and measure cultural adjustments such as those to which Bohannon refers. To do so requires considerable rigor, beginning with definitions of the parts of a native cultural “system” and then requiring the establishment of the ranges of behavior of each part, a hypothesis of the structure of relations among the parts, and a set of predictions as to the manner in which temporary changes to one part, such as the harvest of sea mammals, affect the temporary adjustments of other parts, such as the significant symbols (“meanings”) attached to sea mammals, to the places in which they are harvested, and to the importance of sharing the products and by-products of sea mammals. In order to demonstrate how the system works, that is, to lend empirical import to the hypothesis, the system theorist would have to collect longitudinal data and measure the relations among the parts. It would be incumbent on the analyst to distinguish the factors—external, internal, or both—that caused the

initial adjustment in the range of some part and the adjustments in ranges made by other parts to the adjustment of the first. And the system theoretician would also determine whether each part of the system was individually sufficient or whether all parts were jointly sufficient to adapt the culture to new circumstances before returning it to a steady state.

Whether Bohannon's definitions of culture—one based on rational assumptions and the other on nonrational assumptions—are contradictory or merely ambiguous cannot be stated, because he does not define any of his key terms; hence nothing of theoretical significance turns on any of his claims. Bohannon neither provides a methodology nor marshals data to lend empirical import to his claims.

When Bohannon was questioned about the most significant change he had observed in the behavior of Alaska Natives in reaction to the impact of the *Exxon Valdez* spill on their environment, he demurred by saying that he was not in the spill area to observe anything, but, on the basis of reports and various news media, he testified that “[t]he most important change was their [i.e., the natives’] need to join in the cleanup to see to it that their beaches and homes were not affected in any greater degree than was possible.” No evidence was provided to bolster his claim about “the most important change.” And when further asked whether there was anything about native culture, explicitly “meanings,” that made it necessary for natives to restore their environment, Bohannon<sup>19</sup> replied,

I believe the Alaska Natives are no different from anybody else in the matter. And when—people, when their environment is disrupted, tend to restore it, to want to restore it, or in many cases improve it as a result of the—of being forced to do something extra to keep their environment predictable and healthy and pleasant.

Thus, Bohannon alleged that native culture was no different from nonnative culture in responding to a disrupted environment. This was the harbinger of his cultural similarity/ethnic difference thesis.

When asked whether he knew of other inconveniences suffered by natives as a result of the *Exxon Valdez* spill to which they had to adjust, Bohannon testified that he knew of none. He thought that there may have been others, but none came to his mind.

After claiming that he had no firsthand knowledge of the culture of native residents in the spill area, had made no observations or conducted any research pursuant to the consequences of the spill, and could recall no specifics about villages or events, he was queried in deposition<sup>20</sup> about the claims in his report that there were no Alaska Native cultures in the spill area. In response, Bohannon again abandoned his definition of culture as a device used by agents to adapt to their environment and referred to the “smashing” of Aleut and Alutiiq<sup>21</sup> culture by Russians (beginning in 1741) and thereafter by all other Europeans and Americans who gained hegemony over natives. Thus, Bohannon asserted that culture is a thing that can be smashed, rather than a device to adapt people to their biological, abiological, and social environments. It is possible, of course, that Bohannon was suggesting, without saying so, that the smashing of culture and the adoption of a new culture was a rational decision by agents to adapt to their environments. Yet he suggests no mechanism for passing through the steps involved in the transformations from smashed to smasher’s culture. On its face this is uninteresting, because if culture is (1) a device manipulated as a tool by agents, and (2) a system that self-regulates, and (3) a structure that can be smashed, and (4) a hegemonic system that can be adopted when one’s own system is smashed, then culture is everything. Being everything, culture explains nothing.

Pressed, Bohannon asserted that there never was an Alutiiq culture in the sense of a general culture that embraced all Alutiiq. There were only specific village cultures, yet these specific cultures were “smashed” so that, by 1989, Alutiiq and Aleut (and, by extension, Eyak-Athapaskans, but he does not refer to these residents of the spill area) were American ethnics of the working class. The natives, according to Bohannon, were of the American culture (undefined), their class was working (undefined), and their designation was “ethnic.” Bohannon averred that the peculiar marker that natives in Alaska, including the spill area, gave to themselves was *subsistence*. He does not define *subsistence*.

Claiming that natives arrogated to themselves the marker *subsistence*, Bohannon then wrongly explains how they came to adopt that marker. He incorrectly asserts that subsistence rights were granted by the state solely to natives. Next he asserts that natives, while adopting American culture in progressive steps, were denied full participation in American cultural activities by the persons who dominated American cultural activities—its

economy, its politics, its arts, and the like. Thus natives were led to latch onto a symbol to distinguish them from nonnatives in their midst:

“[a]s the native Alaskans became more and more Americanized, but at the same time rejected from many of the activities that the other nonnative Americans engaged in, this [“subsistence”] was turned into a marker.”<sup>22</sup>

Bohannon acknowledges native engagement in hunting and fishing but also recognizes that nonnative Americans of the working class in the spill area also engage in hunting and fishing. He concedes that nonnatives may engage in hunting and fishing less frequently than natives, but he avers that the differences are of degree, not kind.

Lacking evidence to support his many claims, Bohannon<sup>23</sup> testified that the proportion of native cultural traditions practiced or maintained as ideas by natives in the spill area is but a tiny aspect of the total American culture (undefined) that, presumably, is the “device” by which they “adapt” or the self-regulating system that embraces them, to wit,

The Alutiiq [and, by inference, the Aleut and Eyak-Athapaskan] aspect of the cultural traditions in today’s world of the Alutiiq people, that is to say that are historically based, are important to these people but comprise a relatively small aspect of the totality of their cultural tradition.

#### ARE THERE NO DIFFERENCES, CULTURAL IN NATURE, BETWEEN NATIVES AND NONNATIVES?

I take logical and empirical exception to Bohannon’s claims about the nature of native culture and nonnative culture in the spill area. Before I can evaluate Bohannon’s claims, however, I must provide background about my spill area research and also provide a rationale for the cultural differences between natives and nonnatives in the spill area.

In 1986, I was contracted by the Minerals Management Service, Department of the Interior, to conduct a comparative, longitudinal study of residents of thirty-one coastal villages in Alaska in order to create two systems of social indicators, one based on a questionnaire (AQI) and one based on a protocol (KIP).<sup>24</sup> A third, less formal method, comprising anthropological observations,

was to inform the two formal methodologies and facilitate interpretation.<sup>25</sup> Each of the methodologies possessed unique strengths and was to produce a unique data set. Unavoidably, each method also had inherent weaknesses. The multimethod and multidataset design was structured so that the strength of each formal method (AQI and KIP) compensated for the weakness of the other method, and the informal method (anthropological observations) allowed for close analysis of the construct validity of items in each formal method.

The study was part of the Mineral Management Service's research program aimed at assessing potential human and social impacts of oil-related development throughout coastal regions in which the harvests of naturally occurring resources of the land and sea are central to commercial activity as well as to subsistence lifestyles. The goal was to identify indicators that are sensitive to the consequences of oil-related factors and to non-oil-related factors for persons, their households, their village social, economic, and political organizations, and the environments in which they gain their livelihoods. We sought indicators that will discriminate between oil-related factors and other types of factors that cause those changes. The indicators could then be employed to monitor coastal villages on a regular basis so as to avert or mitigate social and economic problems associated with oil-related activities.

The massive *Exxon Valdez* oil spill of March 1989 affected only two of the thirty-one villages in my original sample, thus prompting the Minerals Management Service to expand the sample and incorporate another ten villages into the study. The research among the forty-one villages conducted from January 1987 through March 1991 employed a Solomon Four Group Design with embedded panels<sup>26</sup> and comprised 2,655 interviews: 1,426 questionnaire interviews and 558 questionnaire reinterviews of panel respondents; and 485 protocol interviews and 186 protocol reinterviews of panel respondents.<sup>27</sup> (For convenience, we refer to study reports as *SIS I* through *SIS VI*.) It also comprised the ethnographic observations reported for each village during each research wave by the protocol and questionnaire interviewers, and hundreds of institutional protocols administered to "key informants," that is, elected village officials, persons appointed to positions in key public institutions, and local business owners and managers. The anthropological observations and the responses to institutional protocols were used to understand more fully the responses to our questionnaires and protocols.<sup>28</sup>

Each of the thirty-one villages in the original study design was visited and sampled three times between 1987 and 1990. The two villages in the original study whose beaches were oiled by the spill, Old Harbor and Kodiak City on Kodiak Island, were studied twice prior to the spill in the winters of 1988 and 1989 and along with the other oiled villages three times following the spill in the summer of 1989 and during the winters of 1990 and 1991. Three research waves were crucial to our research design. During each wave in each village, we drew random samples without replacement so as to conduct initial protocol and questionnaire interviews. Beginning with the second wave, we also reinterviewed our protocol and questionnaire panels, themselves drawn at random from the initial interview samples from the first research wave. With the exception of the first research wave conducted in 1987, our design allowed us to compare initial interviews and panel reinterviews in each subsequent research wave, thereby facilitating tests for threats to validity posed by problems of construct validity, item reliability, inter-instrument reliability, inter-interviewer reliability, nonresponse, test artifacts (or reactivity), ecological fallacy (specification error), history, regression, instability (lack of stationariness), and low reliability over time. We spent an average of about six person-weeks per year conducting research in each village. We eliminated all variables that failed the same test twice, or failed two or more different types of tests.<sup>29</sup>

In the development of the two indicator systems for spill area villages, special attention was paid to distinguishing differences between native and nonnative residents, between villages that possessed well-developed infrastructures and superstructures (Hub) and those that did not (Periphery), and between villages that receive more than 60 percent (Comfish) and those that receive less than 40 percent (Noncom Fish) of their total incomes from commercial fishing-related business.

In the final report for the spill area study,<sup>30</sup> the data sets for the two indicator systems are analyzed separately; then the generalizations obtained within each system are compared for similarities and differences. The effects of a single external event, the plunge of international oil prices that began in 1985, were marked as measured by out-migration and other economic and social indicators. In particular, the loss of employment directly and indirectly dependent on oil sales and the price of oil pushed Alaska into the bust portion of a boom-bust cycle. The bottom of the bust had not been reached when a second major external event oc-



curred, the oil spill. The spill precipitated a brief (eight to twelve months) boom-bust cycle nested within the bust caused by oil prices.

The spill boom-bust cycle was so short-lived that, had we not employed a longitudinal Solomon Four Group Design with embedded panels, we could not have understood the dynamics of that cycle. The spill pushed the prices fetched by Alaskan wild fish downward (Japanese and European consumers were particularly apprehensive of tainted salmon). Alaskan wild salmon and herring prices were, however, also negatively affected by the growth of the pen-raised fish market outside Alaska and the consequences of hatchery activities in Alaska that appear to correlate with larger salmon catches but smaller fish. The plunge in oil prices accounts for a dramatic increase in home loan foreclosure rates, business bankruptcy rates, and high rates of out-migration of nonnative residents from Alaska during the three years prior to, and the year of, the spill. In conjunction with the depressed market for oil, the depressed market for Alaska's wild salmon and herring and the restrictions placed on much of the spill area's in-shore fishing by the Alaska Department of Fish and Game (ADF&G) account for more foreclosures on houses and boats, more out-migration, and changes in the sizes and compositions of households.

#### On Cultural Differences in Coastal Alaska: "Western" and "Traditional-Communitarian"

Our research among the forty-one villages within and outside the spill area, before and after the spill, demonstrates significant differences between natives and nonnatives in their household economies, their relative positions in the commercial fishing industry, their cognitive attitudes about the environment and its management, and their subsistence activities. In particular, the most revealing structural differences between natives and nonnatives were the ways in which the subsistence activities fitted into their respective relations with wider networks of kinspersons and friends in and out of the village. These differences comprise ideas and sentiments, as well as customary acts.

The differences between natives and nonnatives confirmed by multivariate analyses distinguish "Traditional-Communitarian" from "Western" ideology and practices (our simple classificatory terms for complex differences). Responses to the spill provide

evidence that the differences between natives and nonnatives are not simply quantitative, in the sense that nonnatives earn more than natives, or reside in coastal villages for shorter amounts of time, or think that they, personally, or someone in the village in which they reside, influences ADF&G regulatory policies, whereas few natives think that they influence ADF&G policies. The differences are organized into multivariate structures that represent qualitative differences. A brief discussion of the rationale for distinguishing native from nonnative organizations as “Traditional-Communitarian” and “Western” is necessary to an understanding of the differences between native and nonnative responses to the spill.

### Rationale for the Differences

“Western” ideology, as we define and measure the concept, has been expressed in almost all major federal legislation pertinent to Indian, Eskimo, and Aleut affairs since 1887.<sup>31</sup> As recent expressions of national political ideology, the policies and the rationales for the policies of the Reagan and Bush administrations are pertinent exemplars of Western ideology. The ideology is the bedrock of both major national parties. As a theory of political economic development, Western ideology takes several forms, among which there are only modest differences.

In the course of our research, we discovered that differences between racial/ethnic types—natives and nonnatives—were more frequent and more frequently significant, hence more informative, than the differences between village types. Explanations of those differences reside in the “cultural” acts, ideas, and sentiments that distinguish natives from nonnatives and in the political economic relations that separate natives from nonnatives in an arena much larger than the area oiled by the spill of North Slope crude from the *Exxon Valdez*.

### Federally Promoted Programs of Western Ideology and Practices

In the major pieces of federal legislation that have addressed the Indians, Eskimos, and Aleuts of Alaska,<sup>32</sup> it has been assumed that, in order for native societies—all of whom were underdeveloped—to become developed, they must first become democratic. Members of those societies must enjoy the political franchise and

must be able to choose among candidates and programs (initiatives, acts, policies, and the like). The societies, variously referred to as tribes, villages and regions, were to be provided with some infrastructure (private buildings for productive capacity, public buildings to serve the public good, transportation to facilitate business and the public good, water works, waste disposal systems, and the like). The societies were also to be provided services to facilitate health care. Native persons were to be given access to education intended to provide skills and resources that would allow them to enter a market economy and to accumulate capital. When invested, the capital would serve as a multiplier for profits and growth, ever renewed. The transformation envisaged for natives by several Congresses is to a democratic, capitalist society that would be fully integrated into the democratic, capitalist society of the United States. This economic and political engineering was, and continues to be, driven by ideas widely held by Americans.

Western ideology structure is accompanied by several assumptions about the behavior of persons and the constitutions and practices of family-households. It is convenient to refer to these assumptions, which form a well-defined set, as the Protestant ethic, or the work ethic.<sup>33</sup> The Protestant ethic, regardless of whether a person is Protestant, or Christian, or atheist, directs that persons develop knowledge and skills; that they work hard to earn monetary rewards from those skills; that they save and economize scarce resources; that they delay gratification; that they withhold resources from frivolous requests (and from impecunious friends and relatives) so as to maximize the benefits that will accrue from those resources; and that they invest some of the benefits that accrue from those resources into the education of their children, so that those children, too, will acquire skills and knowledge, work hard, invest the proceeds from that work, and so forth.

The Protestant ethic, then, is a set of ethical ideals for single persons living alone to acquire skills, save, invest wisely, and delay gratification before, perhaps, marrying and forming a conjugal pair or a nuclear family. If persons live in conjugal pairs or in nuclear families, obligations are to persons within the household and not beyond. Skills are to be developed for the person and not necessarily for the benefit of others, except for one's closest family. And part of the benefit to one's closest family is to teach them to develop skills of their own so that they, too, will enjoy success. Good education, good health, good income, and exercise

of the political franchise should complement the single person, conjugal pair, and nuclear household arrangements. Children should be taught to develop their skills so as to be successful in all competitive endeavors that beckon them and to delay gratification so as best to invest in developing those skills and reaping rewards at a later date. These, too, are ideological elements of "American culture."

### Rationale for Our Hypotheses about Native Responses to Western Theory and Practice

One of the questions that motivated our inquiry into the differences between natives and nonnatives was whether Western ethical expectations for households, for personal success, for the development of skills, for the education of children, for the delaying of gratification, for saving, and for investment apply to natives. If the future for Alaska's natives is like the past for America's Indians in the lower forty-eight states, we averred, regardless of the development of skills, acquisition of education, development of public infrastructure, increase in services, and imposition of corporations mandated by Congress, native households will increase in size as public fund transfers are curtailed, rather than decrease in size as natives compete in the market. It is the cultural practices, particularly the obligations and responsibilities shared by kinspersons and friends, regardless of the roofs under which they reside, that seem to account for fluctuations in native family-household organization.

A large literature supports the generalization that native persons, couples, and families seek privacy and prefer living in separate houses when they can afford to maintain them. What is significant is that native houses seldom comprise households. The domestic functions normally associated with households—providing clothing, shelter, food, aspects of child-rearing and aspects of enculturation, from learning how to extract resources to learning how to share them—are very frequently accomplished by the efforts of relatives living in two or more houses.

### Hypothesis about Why Native and Nonnative Practices Are Different

In the forty-one villages in our study, the Protestant ethic does not complement the traditional native practices we observed of shar-

ing goods, labor, and cash. To save, to delay gratification, and to invest solely in one's nuclear family to the exclusion of others would cut against the grain of native life. And the notions of privacy and paying one's own way do not complement the large amount of visiting and sharing of meals, neither of which requires invitation or planning, among kinspersons and friends in different houses and different villages. Packing up and leaving the village when a job is terminated, a contract is lost, a business folds, or a retirement is commenced is not the native solution to adversity or to the termination of a career of work. Native cultural traditions, as instanced by the nexus of kinship and friendship obligations, facilitate remaining in place, while sentiments and ideas about place and space influence a person's resolve to stay.

#### On Protracted Needs and Differences Between Natives and Nonnatives

Although we observed that sharing and visiting are often prompted by need, need is not a necessary condition for either. It is, nevertheless, difficult, if not unimaginable, for a native person or a native family to withhold resources from persons in need. It is not easy to accumulate capital while maintaining traditional ethical practices.

If too much is given away with no prospect of immediate return, problems become grave, and any person's ability to assist others while trying to maintain his/her own household is threatened. For nonnatives, the threat is the repossession of boats and fishing equipment, house foreclosure, bankruptcy, dependency. Consequences can be dire should the exigencies created by a "normal accident,"<sup>34</sup> such as the *Exxon Valdez* oil spill, be compounded by the plummeting of prices paid for salmon and should low prices be compounded by unexpectedly small returns of salmon and herring; serious problems would arise also if the salmon have less body weight than prespill salmon of the same species, as during the 1992 and 1993 fishing seasons in the area closest to the spill event—Cordova, Eyak, Tatitlek, Chenega.

Soon after the spill occurred and as we prepared to enter the field to conduct research, we hypothesized, on the basis of our previous research, that natives would express grief over the spill and the attempts to clean it up. We also hypothesized that sharing would increase among natives as subsistence and commercial fishing pursuits were reduced or thwarted altogether. Our results

provided empirical warrant for those hypotheses. We doubted that anything beyond temporary divisiveness would occur among natives within their communities over the spill. We expected considerable divisiveness among nonnatives: personal, as between commercial fishermen who contracted their boats to Exxon/VECO and those who did not; grass roots organizations v. public officials; business owners v. erstwhile employees who abandoned low-paying jobs for high-paying employment in the cleanup; renters v. landlords who raised rents; public agencies v. Exxon/VECO for failing to assist in accommodating public needs and personal complaints about unmet needs.<sup>35</sup>

The analysis of data collected in the social indicators research conducted prior to the spill<sup>36</sup> supports the Western hypothesis in relation to nonnative respondents and the traditional-communitarian hypothesis about native organization. If natives in the spill area are similar to natives residing north of the Gulf of Alaska, we expected households to be interdependent, not independent. We expected natives to exercise their political franchise at greater rates than nonnatives. We expected natives to espouse ethics about obligations to the community that were correlated with their practices and that devalued some forms of competition by not referring to them when asked. We expected ethics and practices to connect old and young, employed and unemployed, healthy and impaired into native networks that were communitarian, not individualistic, in nature. We averred that these networks, and the activities in which the members engaged, served to spread risks and distribute resources, not as a means of leveling pain but as a successful means of maintaining friends, assisting elders, and providing for households in good times while coping with difficult problems in bad times. The ideology does not change when needs increase. Education, employment, high incomes, good health, and political involvement need not generate Protestant ethic behavior, particularly when the alternative is communitarian behavior.

For nonnatives to engage in practices we presumed would be commonplace for natives, we thought that nonnatives would have to be connected in extensive friendship networks in the region, dispense with any bookkeeping about who owes whom, and be willing to risk foreclosure, repossession, and bankruptcy when giving reduced their own resources to the levels of the persons they assisted. For short-term residents among nonnatives—one to five years—we presumed that selfless giving of resources and labor

would not occur or would be very rare. For long-term residents—ten to twenty years—to engage in practices common to natives, they likely would have to forsake their retirements and risk foreclosure and bankruptcy. We hypothesized greater divisiveness among nonnatives in the spill area, especially those engaged in or dependent on the commercial fishing industry, stemming from (1) perceptions of mistreatment by government, Exxon, or both, (2) fears of insolvency, and (3) demands for solutions.

### THE SUBSISTENCE MODE OF PRODUCTION AND CULTURAL “TRADITIONS”

Bohannon<sup>37</sup> testified about Alaska Natives,

By 1989 the major ethnic characteristic [of natives] was probably their application of the word subsistence to themselves as a marker against others. And with that, but to a much lesser extent, some hunting and fishing. I would like to add to that the non-natives in the communities also do hunting and fishing, so it's a matter of proportion.

In regard to subsistence and subsistence rights, Bohannon<sup>38</sup> further testified (1) that he believed state law was more important than federal law in defining native subsistence rights, (2) that those rights pertained only to natives, and (3) that the term *subsistence* was turned into an ethnic marker and adopted by natives to accentuate their differences from nonnatives because they were “rejected” from many activities in which nonnatives engaged. Bohannon<sup>39</sup> alleged that subsistence rights

were granted only to native Alaskans. As the native Alaskans became more and more Americanized, but at the same time rejected from many of the activities that the other non-native Americans engaged in, this was turned into a marker, because people in that situation, what they do is to look for what makes the differences, and then add the positive aspects of that difference. And if they can turn this into something that can make them feel good about themselves, it becomes a marker of their identity, which proves that they are superior in some regard after all. The word subsistence is such a marker. If I may sum it kind of crudely, Alaskans can say I have subsistence rights; therefore I am a special sort of person. And when that happens, it becomes an ethnic marker

in exactly the same way that any other ethnic group in this country has this kind of marker.

For Bohannon, then, differences in participation by natives and nonnatives in hunting and gathering is a simple matter of proportion. Bohannon leaves the impression that natives participate more than nonnatives, but does that mean that natives spend more time than nonnatives in hunting and gathering pursuits; gain larger bags, catches, and quarries throughout the year; pursue the same species and only the same species; and pursue them in the same manner for the same reasons as nonnatives?

The questions of "subsistence" and "tradition" are begged by the influx of nonnatives into Alaska in the past two decades. Contrary to Bohannon's assertion, the Alaska National Interest Lands Conservation Act of 1980 (ANILCA) provided protection for all "rural" residents, not natives alone, who depend on harvests of naturally occurring, renewable resources for their livelihoods. The law specifically defines those uses as "subsistence." The traditions of nonnatives are not borne of generations of subsistence economies and the changes that have shaped those economies. Nevertheless, as enfranchised residents, nonnatives residing in rural areas have been granted "subsistence" rights and permits from the ADF&G to act on those rights. Since ANILCA's passage, nonnatives in urban areas have sought equal access to naturally occurring resources as a constitutional right.

The pursuit of equal access during the 1980s generated a struggle within the state government and between the state and federal government that came to a head three months after the *Exxon Valdez* oil spill, when the Ninth Circuit Court reversed the district court's ruling on the state's definition of *rural*. The state's definition was not in compliance with ANILCA. The state was not in compliance a year later, so, in July 1990, the U.S. Fish and Wildlife Service assumed control (from the ADF&G) of the management of subsistence hunting on two-thirds of the land in Alaska, and the National Park Service assumed control of wildlife management on all NPS land in Alaska. The struggle, and the central role played by the state's definition of *subsistence* within that struggle, are relevant to the analysis of "traditional" customs, to Bohannon's misunderstanding of "subsistence," and to the decision rendered by U.S. District Judge Holland when he found for Exxon that native villages in the spill-affected area could not collect damages for the harm caused to their culture and way of life.



At the outset of the social indicators research in 1986, a central issue was defining and measuring “traditional” customs.<sup>40</sup> The items that survived our tests represented two dominant features of life in the bush: (1) communitarian acts and sentiments, such as the sharing of resources and meals with relatives, wider networks of kinspersons, and friends beyond one’s household, even one’s village, and also the active participation in community affairs; and (2) hunting, fishing, and other extractive activities—some solo and some with relatives or friends.

Extraction, *per se*, is not necessarily communitarian. For example, extractive activities need not be conducted by several persons, each with different skills that must be integrated. Since the advent of high-powered rifles and shotguns, aluminum skiffs with outboard motors, radar, sonar, beaming devices, radios, extremely accurate sighting devices, snowmachines, all-terrain vehicles, and down-filled, Gore-Tex protective garments, persons working alone can extract as much as did their grandparents earlier, but more predictably, more safely, and in a much shorter time than was required forty years ago. “Traditional subsistence economies,” a subset of traditional customs, do not refer solely to extractive pursuits. For example, the sharing of equipment, fuel, and food used for extraction, and the distribution of the items extracted can, indeed, be communitarian.

### Differences between “Subsistence” and the “Subsistence Mode of Production”

Perhaps no native or nonnative is solely dependent on the harvest of wild, naturally occurring resources. Bohannon was correct in his claim that *subsistence* does not mean what it means in relation to seventeenth-century native economies in what is now Alaska. Nor does it mean what is currently meant by a “subsistence mode of production.” The differences are marked, easily observed, easily measured, and largely historical. Native histories are very different from those of nonnatives in regard to resource harvests and the uses to which they have been put in the past and to which they are currently put.

I recently wrote that the

term “subsistence economics” refers to a specific mode of production. It comprises the organization of labor that is required to extract, process, and store naturally occurring

resources; the organization of distribution required to share, gift, or reciprocate those resources; and the patterns of consumption of those resources that can be observed. The natural resources themselves occur and persist without human planning or manipulation. Human activities can, of course, interrupt the growth, even the existence, of these natural resources, but in the absence of man and his activities, they will continue to exist, even if other natural events periodically limit their growth or distribution.<sup>41</sup>

We confirmed, in all phases of our social indicators research, that native subsistence economies remain quintessentially subsistence economies in their organizations of production: ownership, control, labor, distribution, consumption. They are directly linked to procuring food and shelter for the maintenance of life itself. It is the social fabric in which the subsistence economy is embedded that is crucial within and among communities.

#### Knowledge of Naturally Occurring Resources in the Local Area

In regard to Bohannon's claim that subsistence is a marker and that nonnatives, similar to natives, engage in hunting and fishing, the difference being in proportion, I mention briefly that, in 1989 and 1991, we asked 388 KIP respondents in the spill area—69 percent nonnatives and 31 percent natives—to identify seventy-seven naturally occurring resources (animal and plant species, such as spotted seals [*Phoca largha*], or groups of species, such as berries [*Rubus spp.*, *Vaccinium spp.*]) in the areas in which respondents reside. We inquired about which of the seventy-seven specific species or groups of species were available locally and whether the amounts that were available were sufficient or not sufficient for local purposes. Those purposes could be defined by the respondents. It was possible to define *sufficiency* as enough "X" to maintain normal constituencies in a habitat, or enough "X" to restore the habitat to what the respondent thought it should be, or enough "X" to satisfy household or village subsistence requirements, or enough "X" to provide satisfactory income from "X's" extraction and sale. In short, respondents could interpret the purposes of each "X" and whether there was a sufficient quantity of "X" for those purposes.

At the outset, we presumed but did not know that persons engaged in a complex subsistence organization would know more about "Xs" and think about more relations among  $X_1, X_2, \dots$

X<sub>n</sub> than a person who harvested very few wild resources or a limited number of species or none at all, and who was not engaged in networks of sharing resources, labor, and meals, or regular visiting, and who seldom established camps for resource extraction. We further presumed that, if persons harvested few species or no species at all but were engaged in sharing and visiting networks, as is common for many elderly natives, those persons would be knowledgeable about "X." Knowledge in these cases would stem from current conversations with extractors, sharing in the bag, catches, and quarry, and preparing and storing food and by-products.

Response rates were lower on the questions about species among 1989 (postspill pretest) than 1991 (postspill posttest) respondents, while responses among panel members were about the same in 1989 and 1991. The lower rates in 1989 than 1991 reflect the differences between a period five months after the spill in which transiency was at its peak and a period nearly two years after the spill, when transiency had lessened.

Upon tallying proportions of response rates from highest to lowest for the seventy-seven species or groups of species, we found that the principal ones about which residents of the spill area professed knowledge were those that were extracted for commodities<sup>42</sup> (e.g., salmon, halibut, cod, crabs). Response rates were much higher for more species in periphery villages than in hub villages (see table 1).

Table 1 rank-orders and contrasts the species for which information was most frequently obtained from respondents in hub and periphery villages.<sup>43</sup> To interpret the table, some information about the composition of hub and periphery villages in the study area is instructive. Nonnatives comprise about 90 percent of the populations of the three hub villages, Kenai, Valdez, and Kodiak City. Nonnatives also constitute 75 percent of the two largest periphery villages, while natives comprise from 78 percent to 100 percent of the smaller periphery villages.<sup>44</sup> The differences between hub and periphery responses reflect different knowledge based on different uses and different familiarity with environments.

Although the recognition of the differences between these two types of villages is inescapable, the remarkable similarities among natives is masked by the hub:periphery dichotomy. Upon controlling for race/ethnicity, we discovered that more than 95 percent of natives in hub and periphery villages responded to all

**Table 1**  
**Response Rates by Species, Hub:Periphery Contrast, KIP Instrument, Pretest**  
**and Posttest Samples Combined, N316, 1989 and 1991**

Hub			Periphery		
Rank	Species or Variety	Response Rate	Rank	Species or Variety	Response Rate
1	Silver salmon	74%	1	Silver salmon	92%
2	Halibut	61%	3	Chum salmon	85%
3	Red salmon	59%	3	Red salmon	85%
4.5	Pink salmon	48%	3	King salmon	85%
4.5	<i>Berries<sup>a</sup></i>	<i>48%</i>	5	Pink salmon	82%
6	King salmon	44%	6	Clams	80%
7	<i>Moose</i>	<i>43%</i>	7.5	Halibut	79%
8.5	Cod	36%	7.5	<i>Ducks</i>	<i>79%</i>
8.5	<i>Other mammals</i>	<i>36%</i>	9.5	Cod	69%
			9.5	Tanner crabs	69%
			11.5	Red King crabs	68%
			11.5	Snow crabs	68%
			13.5	<i>Ptarmigan</i>	<i>67%</i>
			13.5	<i>Brown bear</i>	<i>67%</i>
			16	<i>Dolly Varden</i>	<i>64%</i>
			16	Variant fox	64%
			16	Otter	64%
			19.5	<i>Moose</i>	<i>61%</i>
			19.5	<i>Kelp</i>	<i>61%</i>

<sup>a</sup> Italicized items are not sold as commodities.

seventy-seven questions about resource sufficiency. No nonnative responded to all seventy-seven questions.

Natives and nonnatives differ significantly and dramatically in the knowledge they claim to possess about the naturally occurring species in the local areas in which they reside. Inasmuch as nonnatives responded to queries about so few species, and inasmuch as the species about which nonnatives responded were almost exclusively harvested and sold as commodities, we may question, then, whether natives and nonnatives perceive the environment in the same way, as Bohannon claims.

### Perceptions of Local Environments

The spill exercised effects on the ideas that native and nonnative populations expressed about the biological and abiological envi-

ronment. We addressed several ideology and ethical topics with the protocol, some about the environment and some about the acquisition of skills to gain livelihoods in the environment. We thought the ideas about environment and about ethical principles were related, and we hypothesized that traditional native ideas would prove to be different from nonnative ideas. We further hypothesized that, if natives were well-educated, fully employed high earners, they would more likely express ideas similar to those expressed by nonnatives about ethical principles pertaining to competition and to the personal benefits from acquiring and using skills.

Following the third research wave (winter 1989 prior to the spill) our reliability and validity tests allowed us to reduce the topics to four ordinal variables that addressed (1) how respondents envisaged the environment (K29); (2) whether they attached significant symbols to features of the environment (Q7); (3) whether they expressed ethical ideals about the responsibility for acquiring skills and about who should benefit from those skills once acquired (K28); and (4) whether a person should compete for personal gain or cooperate with others for communitarian ends (K30). See the box, and also see the frequency distributions of AQI and KIP data in tables A1–A2.

Table 2 tallies only the proportions of natives and nonnatives in 1989 and 1991 whose responses on the ideology and ethical topics were “traditional-communitarian.” The variables are ordered into either 3 or 4 ranks. The highest rank (3 or 4) represents “traditional-communitarian;” the lowest rank (1) represents “Western;” and the mid-ranks are blends. Thus, in table 2 we see the proportions of respondents who thought that a person should seek success for family, networks of kinspersons, elders, friends, and the village (K28); those who believed that resources and the environment have spiritual and also cultural significance (K29); those who thought that personal ethics should seek cooperation-communitarian ends (K30); and those who personally have many significant places in the environment to which memories of events are attached (Q7).

The differences between natives and nonnatives are significant for each variable (see table A1). The evidence suggests that natives and nonnatives have very different views about why persons should acquire skills and for whom they should be used; how they cognize the environment; and the symbols attached to significant memories and places within their local environments. It is also

**Q7. Significant Symbols Attached to Places in Native Environments.** Does the respondent have special memories about the wildlife or the places, such as springs, promontories, lakes, capes, hills, woods, bays, lagoons, in his/her area which the respondent's family likes to recount?

- (1) none,
- (2) a few,
- (3) many,
- (4) many which have accumulated over two or more generations.

**K28. Ethical Responsibility for Attainment.** Who is responsible for personal, family, and village attainments of all kinds: success in occupations, education, income, businesses, village affairs and security. Is the individual specified as the person who should be solely responsible for his/her attainments, and are individuals free of obligations to others except, perhaps, one's own nuclear family? Or is the individual recognized as having responsibilities toward others—in the family, a wider network of kinspersons and affines, or the village—and any successes that accrue do so in a group context through the efforts of several persons?

- (1) A person should strive to make himself/herself a success. Success is earned through individual effort (saving, delaying gratification, hard work).
- (2) A person should work hard to assist his/her family, save scarce resources to help his/her family in times of need and for future expectations, such as education for one's children.
- (3) A person should work hard with whatever skills and resources he or she possesses to assist his/her family, wider circle of kinspersons and affines, and the village. Giving and sharing take precedence over saving and assisting self or nuclear family to the exclusion of others.

**K29. Ethics and Significant Symbols Attached to Environment.**

- (1) The environment, or features of it (rivers, forests, coal seams, oil deposits, fish, sea mammals, etc.) are viewed as commodities, that is, items whose values are established in the marketplace and are available for purchase or sale.
- (2) Combination of commodity and spiritual views.
- (3) The environment, or features of it, are viewed as things endowed with spirits, or which possess special relations to natives and to which significant cultural symbols are attached (beauty, spirituality, helpfulness, traditions). The general environment is not conceptualized as a commodity. (Fish, ivory, and other by-products may be sold, but what symbols are attached to those items?)

**K30. Ethics of Personal Cooperation/ Competition.**

- (1) A person should compete with others so as to do the best for him/herself.
- (2) 1, 3, or 4 depending on circumstances.
- (3) A person should do the best he/she can in developing and employing skills. The fruits of some of those skills—such as hunting, fishing, and food preparation—should be shared widely throughout the family and beyond. Some other skills, such as net hanging or outboard motor repair, should be used for personal gain.
- (4) A person should develop and employ skills, work in cooperation with others, and share in a communitarian fashion (perhaps principally on the basis of presumed need) the products of those skills.

**Table 2**  
**Communitarian, Historical, and Noncommodity Ideas about the Environment,**  
**Native:Nonnative Contrasts, KIP Postspill Pretest and Posttest Samples in**  
**Percent, N316, 1989 and 1991**

	K28 Success for Kin- Friends-Village (Communitarian)	K29 Resources & Env Spiritual/Cultural Significance	K30 Persons Should Cooperate (Communitarian) and Compete	Q7 Many Symbols over Genera tions
Natives 1989	46	25	51	36
Natives 1991	46	46	80	44
Nonnatives 1989	14	6	26	7
Nonnatives 1991	27	10	36	5

likely that the spill affected (upward) native and nonnative assessments of the noncommodity values of the environment and the ethical idea that cooperation should dominate work behavior or should be coequal with competition.

The differences in proportions of responses for natives and nonnatives on these ideological and ethical questions between 1989 and 1991 reflect changes almost surely attributable to the spill. To measure changes that occurred among ethics that were espoused immediately after the spill and two years after the spill, we could not rely on the evidence gathered from random samples drawn from the same villages, without replacement, in 1989 and 1991. This is specification error (attributing to group A [the 1989 sample] the results of group B [the 1991 sample]), a threat to validity also known as "ecological fallacy." To measure change and reduce the threat posed by specification error, we assessed the responses of panel members in 1989 and 1991 and tested for the significance of differences between panel responses and the responses of pretest and posttest sample responses for the same years. Although panel responses are more conservative than pretest and posttest sample responses, the differences on the four items (Q7, K28–K30) are not significant when controlling for ethnic groups. Table 3 demonstrates changes in responses by panel members on two items between 1989 and 1991.

The differences between ethnic groups in the pretest and posttest samples and both waves of the panel are significant, although, as is demonstrated in tables 2 and 3, slightly larger proportions of nonnatives in 1991 than in 1989 expressed the idea that the

**Table 3**  
**Ethical Codes for Personal Responsibility and Ideas about the Environment; Native and Nonnative Panel, N72, 1989–1991**

		<b>K28 Ethical Responsibility for Attainment of Skills, Education, Profession</b>					
		<b>Native</b>			<b>Nonnative</b>		
<b>1991 ↓</b>	<b>1989 ⇒</b>	<b>Personal</b>	<b>Family</b>	<b>Fam&amp;Village</b>	<b>Personal</b>	<b>Family</b>	<b>Fam&amp;Village</b>
Personal Succ.		5	16	5	26	18	7
Family Success		11	16	11	38	22	4
Village-Fam. Succ.		5	5	27	37	9	2
		21	37	43	36	49	13

		<b>K29 Ethics and Significant Environmental Symbols</b>					
		<b>Native</b>			<b>Nonnative</b>		
<b>1991 ↓</b>	<b>1989 ⇒</b>	<b>Commodity</b>	<b>Blend</b>	<b>Spirit-Symbol</b>	<b>Commodity</b>	<b>Blend</b>	<b>Spirit-Symbol</b>
Commodity		6	13	12	31	16	3
Blend		6	19	19	44	48	6
Spirit-Symbolic		6	6	13	25	2	3
		18	38	44	25	64	11



environment possessed an intrinsic spiritual value beyond the commodity value of the resources that comprise it and that personal responsibility extends beyond self (or conjugal pair or nuclear family) to a wider network of kinspeople. Nevertheless, nonnatives changed the least in their ideas about the environment's value (K29 principally commodity or a blend of commodity and such features as clean water and pristine views of the landscape and seascape) and about whether they claimed to have many memories about their environments to which they attached significance (table 2 only). The changes in the native panel toward communitarian ideas and ethics are more marked on all topics.

My concluding hypothesis is that these changes do not represent chance variation; rather, for nonnatives, they are a result of reflection about the consequences of the oil spill for the environment, for their occupations, and for family life in Alaska following a period in which assistance among neighbors was more widespread than in the prespill period. Assistance between and among nonnatives fitted the context of emergencies—immediate and short-lived.

Among natives, too, the oil spill and its protracted consequences influenced reconsideration or deeper consideration of the environment's meanings to them. Those meanings are "traditional-communitarian." Their expressions of communitarian ethics about responsibilities and ideas about the spiritual nature of the environment and the symbols they attach to it were perforce complemented by increased visiting and increased distributions through wider networks of kinspersons and friends in and out of their home villages following the spill.

### Subsistence Activities and the Uses of Local Environments

Are the only differences between natives and nonnatives in their uses of the environment the amount of hunting and fishing in which each population engages, as Bohannon suggests?

Throughout the first phase of the social indicators research<sup>45</sup> and in the spill area research analyzed here, we measured features of subsistence activities as indicators of the subsistence mode of production under which they were subsumed. The differences between disparate extractive activities and the variety of related customs and practices that reflected a subsistence mode of production are obvious. A host of measures of subsistence economics and of communitarian customs in the KIP and AQI instruments

provide reasonable indicators of traditional customs and the way in which they are related within the structure of village life.<sup>46</sup>

Whereas the harvests and preparation of wild animals occur as subsistence activities and also as activities within a subsistence mode of production, the restriction of activities to a few species of large land mammals and salmon indicates a sport "tradition." When extraction, preparation, distribution (a panoply of sharing practices), and consumption of a wide variety of plants and animals are organized within kinship-affinal networks, extend to networks of friends and elders, and are embedded in a nexus of visiting customs, the relations among these variables indicate a subsistence mode of production "tradition," i.e., a set of related customs that have persisted over time. This is not to deny that changes occur within features of these relations.

There were huge discrepancies between nonnative and native incomes in each of the six waves of our research from the winter of 1987 through the winter of 1991.<sup>47</sup> Nonnative households, which were smaller than native households, enjoyed incomes averaging twice those of native households. Two years after the spill, the incomes of nonnatives were less than they were immediately following the spill, while, paradoxically, the incomes of natives were higher in 1991 than in 1989. Native sample and panel respondents earned about 50 percent of what nonnatives earned in 1989 and about 60 percent in 1991.

With that backdrop, let us review the differences between natives and nonnatives in 1989 and 1991 as to how they used their incomes and how subsistence is fitted into the organization of those uses. In both years, natives invested more of their incomes into the harvests of wild resources than did nonnatives, but in 1991 natives invested less than they had invested in 1989. A similar pattern of change occurs in the item measuring the variety of species harvested. Natives harvested a greater variety of species than nonnatives but less than they had harvested in 1989.<sup>48</sup>

The most interesting difference obtains for the proportions of wild food in the diet.<sup>49</sup> The proportion of natives reporting 50 percent or more in 1989 was 52 percent; in 1991, it was 46 percent. The proportion of nonnatives reporting diets containing more than 50 percent wild foods was 24 percent and 26 percent in 1989 and 1991, respectively. The proportion who gained more than 50 percent was less for natives and more for nonnatives in 1991 than 1989 (panel responses confirm these differences, although panel respondents, both native and nonnative, gained less of their diets

from wild resources in 1989 and 1991 than did pretest and posttest respondents).<sup>50</sup> In good years and bad, the proportion of native households that gained more than 50 percent of their diets from wild resources was twice that of nonnative households. There were fewer species and less biomass harvested by natives in the eighteen months following the spill than in the eighteen months prior to the spill. There were, consequently, fewer wild resources to eat and fewer wild resources to share during 1990 and early 1991.

The sharing variables—distributions of cash, labor, and resources as donor or recipient—reveal incommensurable differences between native and nonnative subsistence activities, the ways in which those relations are organized, and the ideas that rationalize them. The twelve protocol items<sup>51</sup> measuring sharing—four cash, four labor-services, four goods-resources—are divided into donors and recipients and divided again into whether the sharing occurs between persons in the same village or different villages. Intervillage sharing is an enduring activity among Alaska Natives. Similar activities have fascinated economic anthropologists in their studies of reciprocity and distribution systems among societies around the world. Attention is often focused on the movements of goods from places of abundance to places of scarcity and the kinship, affinal, or ceremonial nexuses in which they occur.

The mechanism of sharing remains deeply embedded in the economic system of natives in contemporary Alaska, even as they have been integrated into the peripheries of the market. Things—food, services, cash loans—are bought and sold in the market. Except as occasional gifts to relatives and friends, gifts to legally sanctioned institutions that can be deducted from gross income in calculating taxes, and a variety of trusts that allow persons to transfer resources while minimizing tax obligations, sharing is a modest feature of a market system carried out in a very different spirit and rationalized in a very different way from native sharing. The marginalized Alaskan economy appears to be moving closer to the margins of profitability as the world fish market changes, leaving Alaska's wild fisheries behind, and as Alaska's oil economy continues its slow, downward trend.

In good times and bad, however, natives have maintained their sharing practices, and these practices are not restricted to holidays or to actions to avert tax liabilities. They cannot be characterized as activities that occur solely because of exigencies, nor are they

practices in which each person who participates does so with the specific expectation of being repaid in kind, amount, and within a specified time by the persons and households for whom he or she gives or does something. The system works in a context of seasonal and annual variations—frequently severe—so there is no intention to deny the utility of the system. If anything, natives are instrumental and expert at adjusting to the vagaries of environmental fluctuation. So, whereas the native system evens out bad times as best it can, the native organization of production has persisted because goods and services are shared for their own sake and not for a hidden agenda or for a misunderstood agenda.<sup>52</sup> For example, persons who have recently caught and prepared one hundred or so king salmon think about relatives and friends in distant communities who would like a “taste”<sup>53</sup> of smoked salmon (or walrus, or maktak). If those relatives reside in Anchorage, the donor may package the salmon and ask a traveler to deliver it. If they reside in Portland or Walla Walla, the donor may entrust it to the U.S. Postal Service. And the donor also thinks about giving a fish to the elderly person nearby, even if that person (or persons) is known to have close kinspersons in the village who provide food to the household.

Regardless of the season, most sharing between households occurs within villages. The sharing is characterized by small quantities of food, short-term uses of equipment, and small services, such as tending children or repairing windows. Sharing also takes place between persons who reside in different villages. Our data demonstrate how intervillage sharing works and also how it increased following the spill as fewer resources were harvested.

The sharing variables in the protocol are very informative. We note that the variables that measure the sharing of income behave differently from the variables that measure the sharing of goods (equipment, food) and the sharing of labor-services. Native:nonnative contrasts among sharing variables are especially distinct. Let us focus on the sharing of cash to highlight the differences. In 1989, natives shared cash more widely within and beyond the village (as donors and recipients) than did nonnatives. And in 1991, with larger incomes but fewer wild foods in their larders, natives reported increases in sharing cash in and out of the village.

Greater proportions of nonnatives, too, shared cash more widely in 1991 than 1989. Yet the only form of income-sharing in which

**Table 4**  
**Proportions of "Regular" Cash Sharing, KIP Pretest and Posttest, Contrasts of Native and Nonnative Subsamples in Percent, N316, 1989 and 1991**

	1989		1991		1989		1991	
	Cash-Donor In	Cash-Donor Out	Cash-Donor In	Cash-Donor Out	Cash-Receipt In	Cash-Receipt Out	Cash-Receipt In	Cash-Receipt Out
Natives	2	8	24	8	0	7	20	4
Nonnatives	6	11	14	19	2	4	4	4

they outstripped natives was in the regular sharing of cash with households in other communities (K12B). It is this item, over all others, that distinguishes the way in which nonnatives fit into local subsistence economies. They regularly (some occasionally) remit funds to households located in different communities, presumably the communities from whence they came, where members of their families reside, and to which they will return. Following the spill in 1990 and 1991, unusually large proportions of married nonnative respondents, including long-term residents, were not coresiding with their spouses and families in the villages in which they were interviewed (nonnative residency is discussed below). Remittances to family members were commonplace for such respondents.

The relations between income and the three forms of sharing among natives are very much affected by employment, as we determined in the first phase of this research project and confirmed in the *Exxon Valdez* spill area sample. As months of employment increase, so do incomes. And as incomes increase, the higher earners among natives tend to share income and resources (equipment, say) but little else. Employment restricts the time that can be given to harvesting, preparing, and storing wild resources and also restricts the time in which labor can be shared.

In 1989, when native incomes were less than 50 percent of nonnative incomes, natives who earned the most tended to be frequent donors of cash and less frequent donors of labor and services within the village. These high earners were also donors of resources (such as equipment or food), although infrequently, to relatives in other villages from whence they also received resources. The employment rates for and the months employed by the higher earners were high, and several had recently returned from the spill cleanup when we conducted our research in Sep-

tember 1989. They had some time to share labor at home and some funds to share. They did not have time or, perhaps, the inclination to harvest resources that they deemed oiled and tainted and then share those resources at home.

In 1991, native employment and incomes increased. Most of the employment increase was for short-term jobs (between one and nine months). The larger incomes among people who were not employed full time correlate positively with every form of sharing, significantly with sharing of resources—giving and getting—in and out of the village.

Some comparisons of the sharing of labor and resources that occurred in spill area villages in 1989 and 1991 reveal the differences in the scale locations of native and nonnative practices. Table 5 compares “regular” sharing activities of natives and nonnatives.

In 1989, significantly greater proportions of natives engaged in all types of labor- and resource-sharing practices than did nonnatives. In 1991, although the proportions of nonnatives increased in sharing practices, the proportional increase of natives was significantly greater, as was the extensiveness of the practices. (See table A1.)

Native incomes increased between 1989 and 1991, and so did all forms of sharing. Nonnative incomes decreased, but all forms of sharing increased. The increases in sharing by natives are functions of (1) the decrease in wild resources available to natives, and

**Table 5**  
**Proportions of “Regular” Labor and Resource Sharing Within and Outside the Village, KIP Pretest and Posttest, Contrasts of Native and Nonnative Subsamples in Percent, N316, 1989 and 1991**

	1989		1991		1989		1991	
	Labor-Donor In	Out	Labor-Donor In	Out	Resource-Donor In	Out	Resource-Donor In	Out
Natives	41	8	64	20	43	17	66	36
Nonnatives	15	5	35	10	19	2	29	14

	1989		1991		1989		1991	
	Labor-Receipt In	Out	Labor-Receipt In	Out	Resource-Receipt In	Out	Resource-Receipt In	Out
Natives	35	8	64	20	45	18	68	25
Nonnatives	14	4	23	9	19	2	25	14

(2) the reluctance of natives to harvest tainted resources. Our prespill data demonstrate that economic exigencies were more influential than either the availability of resources or the reluctance to harvest tainted resources in accounting for the increases in nonnative sharing practices during the emergencies of 1989 and the resumption of the bust cycle of 1991. The proportions of nonnatives engaged in sharing increased between 1989 and 1991, but the extensiveness of the sharing is very modest when compared with natives.

Although natives report sharing cash more widely than do nonnatives, the effects of greater incomes are apparent in the native subsamples for 1989 and 1991. Focusing first on transactions within the village, in 1989 less than 50 percent of natives were regular labor donors or recipients or were regular resource donors or recipients. In 1991, about two-thirds of natives were regular donors and recipients of labor and resources. Sharing with persons in other villages reveals similarly marked changes. In 1989, less than one-tenth of the native respondents gave to or received labor assistance from residents of other villages, and less than one-fifth gave to or received resources from residents in other villages. In 1991, one-fifth of the respondents both gave and received labor assistance. The most significant differences are in the increases in regular sharing of resources with persons in other villages. Thirty-six percent of native respondents regularly gave to, and 25 percent regularly received resources from persons in other villages. Thus, in 1989, sharing outside the village was less frequent than sharing inside the village for natives, but cash—an easy item to transport—was shared by many who engaged in sharing between villages. As incomes increased and wild resources decreased, all forms of regular sharing increased.

Nonnatives, too, increased the extent to which labor and resources—labor in particular—were shared between 1989 and 1991. Nonnatives donated labor within the village nearly two-and-one-half times more frequently in 1991 than 1989. Yet in 1989, natives were regular donors and recipients of labor and resources within the village at a rate 2.7 times greater than nonnatives. The comparison of relations between villages is more striking. Natives gave and received labor 1.8 times as often as nonnatives and gave and received resources regularly nine times as often as nonnatives. In 1991, the average rate differential between natives and nonnatives is nearly identical for all comparisons except the giving and receiving of resources between persons in different

villages. The marked increase in the regularity with which nonnatives gave and received resources reduces the differential with natives to 1:2.2.

### On Bohannon's Claim that Differences Between Natives and Nonnatives in Subsistence Practices Are a Matter of Degree

If we ask whether natives and nonnatives invest portions of their income into the harvesting of wild foods, the answer is "yes" for both. That natives invest more than nonnatives is, then, a matter of degree. And if we ask whether natives identify more species in their environments than do nonnatives in those same environments, but each identifies some species, then the difference between natives and nonnatives is a matter of degree. And if we ask who more frequently identifies spiritual nature rather than commodity values as the preeminent attribute of the environment, who more frequently reports that places in the environment have special meanings for them and their kinspersons (past and present), who harvests the greater amount and variety of species, who has the greater proportion of wild foods in their annual diets, and who shares more resources and more labor with persons within and beyond their village, and if the answer to each is natives, but a qualification to each answer is that some nonnatives profess the idea or engage in the activity, then the difference between natives and nonnatives is a matter of degree.

These comparisons, taken one at a time, reveal that the degree of difference between natives and nonnatives is significant on every idea, every ethic, every sentiment, and every activity compared. The sum of the differences is interesting, while the claim that the differences are of degree is redundant. The organization of the differences is more interesting than the sum of the differences. At this point, we turn our attention to the organizations of the differences in the spill area, one native and one nonnative. I think that the differences are cultural. This topic is much more interesting than the sum of the differences.

If culture is an organization of parts, as Bohannon contends, we should not conclude our analysis of American working class culture, distinguished by ethnicity, with a list of differences by degree. The spill had an effect on both populations, native and nonnative. The differences between the responses facilitated by sharing mechanisms are also facilitated by wider kinship and friendship networks by dint of place of birth, ethnicity, long-term



residence, and different ideas about community, the environment, and the benefits from work.

#### A Multivariate, Multidimensional Analysis of Subsistence and a Subsistence Mode of Production

To this point, I have sought to keep tabular data and statistical evidence to a minimum. In order to address the question of whether there are differences between native culture and the subsistence economy—an important part of that culture—and nonnative culture and the subsistence activities that comprise a part of that culture, I must take leave of that practice. Here I must invoke methodologies that allow us to analyze the relations among a large number of variables (the organization of the “parts”) and to measure the behavior of those variables over time.<sup>54</sup> If we have proposed that culture is an organization of parts in which changes to part A influence adjustments in part B, and so forth, it is a non sequitur to claim cultural similarities or cultural differences on the basis of comparisons of a few univariate distributions.

Native incomes increased between 1989 prior to the spill and 1989 following the spill, and increased again between 1989 following the spill and 1991. Native harvests of wild resources decreased in amounts and variety following the spill and remained low for eighteen months. The correlations of labor- and resource-sharing with the sharing of cash changed markedly for natives between 1989 and 1991, with the increase in incomes and the decrease in the harvests of wild resources. Correlation matrices for the native and nonnative subsamples of the KIP samples for 1989 (pretest) and 1991 (posttest) reflect these changes (tables 6 and 7). Large correlation matrices such as these are difficult to read and are also rather inefficient, although prerequisite to the multidimensional similarity structure analysis that follows.<sup>55</sup>

The grand average for all PRE<sup>56</sup> coefficients (disregarding signs) between all sharing variables in the matrices of correlation coefficients (tables 6 and 7) for the native subsamples is 22 percent in 1989 and 60 percent in 1991.<sup>57</sup> When income (K4) is dropped from the calculations, the average for 1989 is 35 percent and, for 1991, 71 percent. The coefficients in the nonnative matrices of sharing variables produces a grand average of 26 percent in 1989 and 34 percent in 1991. When income variables are dropped, the averages for the sharing variables are 37 percent in 1989 and 46 percent in 1991.

The analysis of changes to traditional practices in the organization of subsistence following the spill requires us to compare the reasonably good times when larders were full but the spill and the cleanup activities affected every village, to times when larders were not full, when fresh resources were scantily harvested, and when employment and income effects were different for natives and nonnatives. And it requires us to remember that natives eat fresh foods as they harvest them throughout the year. During the summer periods, almost every meal is built around wild foods recently harvested.

The majority of natives had food stocks on hand when the spill occurred. But, from the late spring through early fall of 1989, the period in which wild foods are most abundant and during which wild foods comprise the bases around which most meals are made, natives, in general, harvested much less than they had harvested before the spill. Few resources could be stored through 1990, since harvesting activities had not recovered. Sharing, on the other hand, increased as stores of preserved foods dwindled and fresh resources from wild harvests decreased.

### Similarity Structure Analysis of Native and Nonnative Subsistence

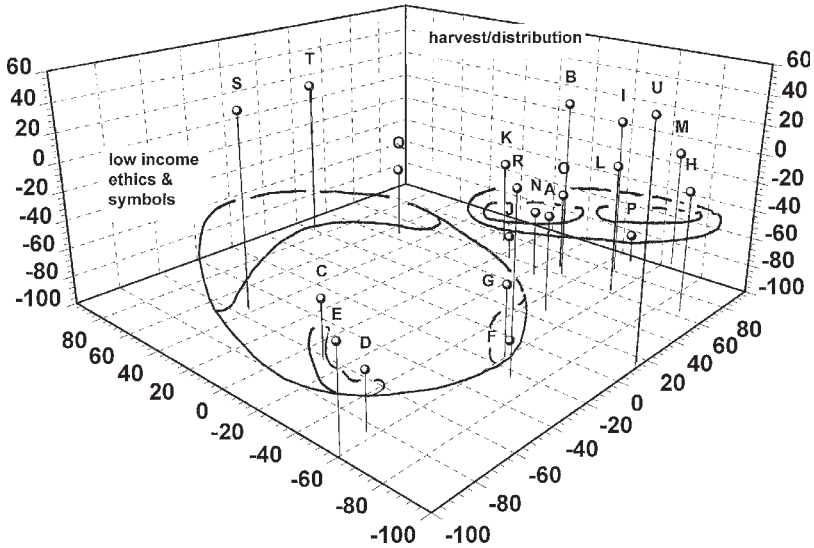
Table 6 and figure 1 are based on KIP data collected about five months after the spill in the summer of 1989. Table 7 and figure 2 are based on KIP data collected in the early winter of 1991, about twenty-two months following the spill.<sup>58</sup>

#### Native Structure of Subsistence in 1989

Two regions that are formed in the native KIP solution for 1989 (figure 1) are labeled "harvest and distribution" and "low income, ethics & symbols."<sup>59</sup> The item with the greatest centrality<sup>60</sup> in the multiplex labeled "harvests and distribution" (right-front quadrant) is variety of resources harvested. That item is fitted closely to the proportion of wild protein in the diet and the proportion of a household's total income invested in resource harvests (K2 K3 K1, A B U). Immediately around these items are fitted the items that measure sharing of labor and resources with persons in distant villages as donor and as recipient (K14A-B K16A-5, J K N O). This portion of the multiplex is pulled toward the left in largest part because the informants who most regularly gave and re-





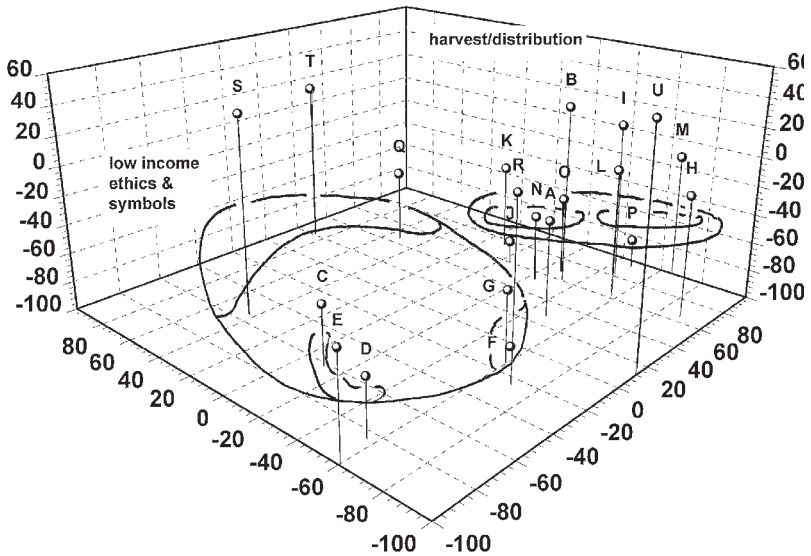


**FIGURE 1. SSA-1 FEATURES OF THE NATIVE SUBSISTENCE ECONOMY (KIP) 1989**

Guttman-Lingoes's smallest space coordinates for three dimensions, *Exxon Valdez* subsistence indicators, native subsample (N67) of total KIP postspill pretest sample, summer 1989.

Variable	Centrality Index	D1	D2	D3	
K2	A	18.585	27.341	-48.324	-32.796
K3	B	64.912	60.788	-32.725	26.253
K4	C	93.042	-62.323	-11.397	-58.403
K11A	D	115.317	-84.161	-56.763	-61.779
K11B	E	126.187	-100.000	-60.759	-32.412
K12A	F	80.830	-2.511	-53.059	-100.000
K12B	G	52.581	-13.920	-59.509	-51.742
K13A	H	71.644	63.900	-89.093	-15.197
K13B	I	70.570	80.354	-46.943	11.321
K14A	J	71.889	58.683	-5.000	-82.450
K14B	K	66.957	73.745	10.017	-37.968
K15A	L	49.763	61.622	-57.507	-9.411
K15B	M	85.474	100.000	-65.141	-12.392
K16A	N	40.524	52.456	-23.514	-42.435
K16B	O	48.288	67.176	-27.606	-44.405
K29	P	89.642	93.240	-48.032	-78.936
K30	Q	90.369	45.725	53.236	-47.139
Q7	R	75.780	-24.788	-70.665	18.137
D24	S	124.435	-54.769	42.585	36.963
D25	T	126.291	20.383	86.801	17.673
K1	U	107.639	11.955	-100.000	56.183

Guttman-Lingoes's coefficient of alienation  $K = .153$ ; Kruskal's stress = .138.



**FIGURE 1. SSA-1 FEATURES OF THE NATIVE SUBSISTENCE ECONOMY (KIP) 1989**

Guttman-Lingoes's smallest space coordinates for three dimensions, *Exxon Valdez* subsistence indicators, nonnative subsample (N145) of total KIP postspill pretest sample, summer 1989.

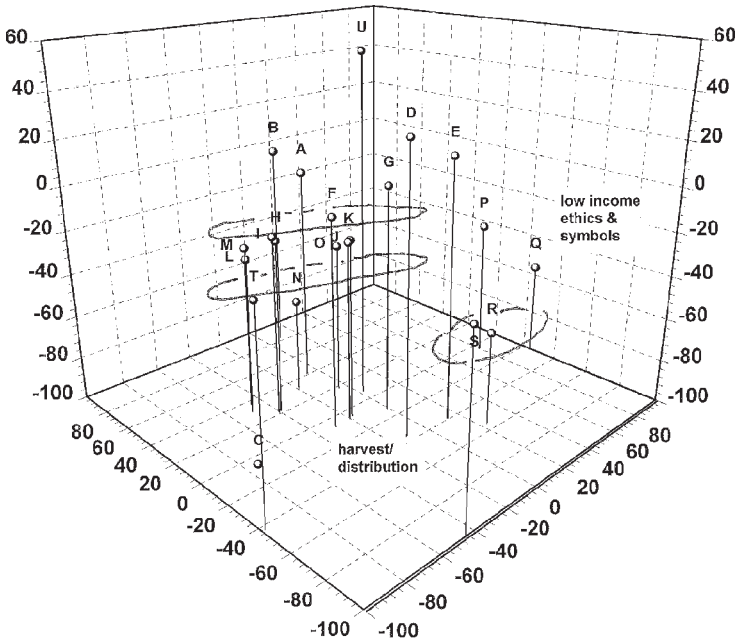
Variable		Centrality Index	D1	D2	D3
K2	A	56,746	39,760	-16,276	-49,961
K3	B	76.393	48.556	-55.469	-66.006
K4	C	128.070	-21.826	59.571	-100.000
K11A	D	52.363	-35.143	-2.070	13.438
K11B	E	97.131	-57.852	35.020	29.078
K12A	F	102.772	-100.000	-35.793	-35.365
K12B	G	97.040	-95.332	-39.222	3.766
K13A	H	50.502	-8.869	-46.162	35.123
K13B	I	34.622	7.616	-30.752	21.520
K14A	J	71.206	-36.270	-91.157	-.073
K14B	K	59.525	-34.682	-77.028	2.937
K15A	L	20.487	19.152	-29.087	-19.332
K15B	M	40.246	32.971	-42.886	7.653
K16A	N	66.062	-39.184	-79.889	-33.433
K16B	O	70.065	-36.651	-89.940	-22.467
K29	P	103.171	100.000	-56.069	-17.594
K30	Q	102.290	97.699	-31.209	18.146
Q7	R	69.695	6.907	-.402	-74.439
D24	S	95.737	20.826	55.186	23.570
D25	T	81.347	45.459	20.015	31.768
K1	U	84.760	47.549	-100.000	-25.774

Guttman-Lingoes's coefficient of Alienation  $K = .140$ ; Kruskal's stress = .124







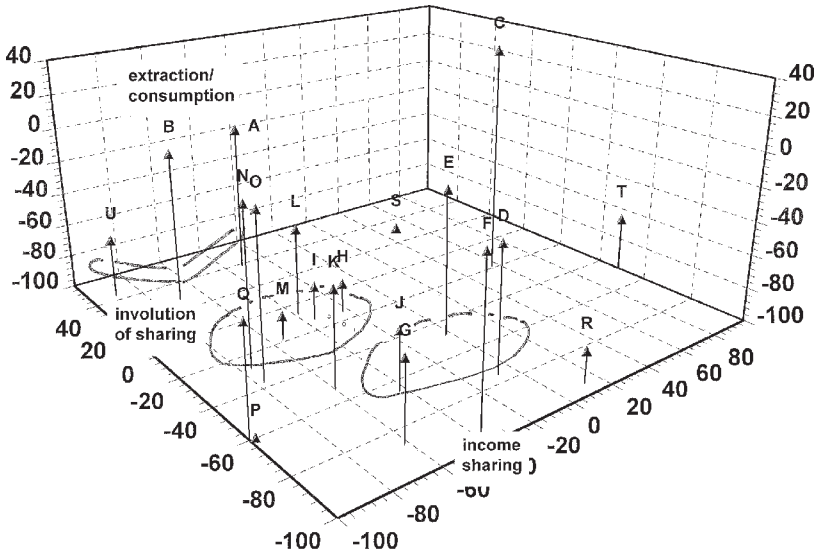


**FIGURE 2. SSA-1 FEATURES OF THE NATIVE SUBSISTENCE ECONOMY (KIP) 1991**

Guttman-Lingoes's smallest space coordinates for three dimensions, *Exxon Valdez* subsistence indicators, native subsample (N25) of total KIP postspill pretest sample, winter 1991.

Variable	Centrality Index	D1	D2	D3
K2 A	47.717	-7.118	40.391	-.329
K3 B	91.783	9.714	83.667	-.838
K4 C	101.486	-74.112	-5.877	-100.000
K11A D	61.798	-16.987	-41.172	30.402
K11B E	57.626	13.091	-39.158	17.773
K12A F	20.890	-29.692	-7.312	-5.203
K12B G	26.944	-1.082	-13.189	3.186
K13A H	35.298	-38.575	21.925	-20.317
K13B I	36.266	-41.297	20.522	-17.599
K14A J	6.350	-18.978	-7.058	-17.515
K14B K	7.156	-20.042	-7.015	-18.315
K15A L	52.335	-44.544	37.227	-31.042
K15B M	49.269	-49.703	30.470	-22.793
K16A N	47.269	-23.363	26.793	-53.551
K16B O	24.324	-5.827	16.772	-29.448
K29 P	94.786	79.369	-4.647	-34.928
K30 Q	121.856	100.000	-24.154	-56.140
Q7 R	74.899	23.103	-55.842	-56.715
D24 S	101.630	-45.123	-100.000	-17.418
D25 T	95.894	-100.000	-44.629	-9.401
K1 U	75.181	-1.587	3.494	55.532

Guttman-Lingoes's coefficient of alienation  $K = .097$ ; Kruskal's stress = .083.



**FIGURE 2. SSA-1 FEATURES OF THE NONNATIVE SUBSISTENCE ECONOMY (KIP) 1991**

Guttman-Lingoes's smallest space coordinates for three dimensions, *Exxon Valdez* subsistence indicators, nonnative subsample (N61) of total KIP postspill pretest sample, winter 1991.

Variable		Centrality Index	D1	D2	D3
K2	A	79.910	-32.370	38.166	-9.388
K3	B	78.275	-73.792	21.121	-5.727
K4	C	123.517	56.026	-18.998	38.794
K11A	D	53.097	-7.445	-76.008	-27.171
K11B	E	45.581	-3.319	-48.531	-14.468
K12A	F	79.119	-43.526	-100.000	-3.510
K12B	G	61.984	-62.471	-87.394	-54.396
K13A	H	43.191	-22.925	-14.622	-82.415
K13B	I	40.191	-35.864	-13.455	-79.829
K14A	J	39.983	-44.242	-66.497	-64.672
K14B	K	33.241	-60.184	-53.301	-44.910
K15A	L	26.749	-38.740	-7.205	-47.131
K15B	M	47.936	-55.494	-19.094	-85.168
K16A	N	56.424	-76.257	-28.384	-8.412
K16B	O	58.895	-77.757	-37.291	-6.235
K29	P	88.691	-97.883	-59.935	-39.547
K30	Q	71.646	-100.000	-59.680	-39.547
Q7	R	84.794	11.790	-95.505	-80.625
D24	S	117.593	49.200	30.569	-98.723
D25	T	136.178	100.000	-48.137	-66.931
K1	U	97.329	-90.030	43.526	-64.348

Guttman-Lingoes's coefficient of alienation  $K = .154$ ; Kruskal's stress = .137.

ceived resources and assistance from residents of villages other than their own were the higher earners among the natives. Fitted toward the right side of the “harvests and distribution” region are the items that measure giving and receiving labor assistance and resources in one’s home village (K13A-B K15A-B, H I L M). The donor items in the left of the region reflect somewhat higher incomes than the recipient items on the right. At the base (lowest plane) of the “harvest and distribution” multiplex is the measure of cognitive attitudes about the environment. The more people share, particularly locally, the more likely it is that they attribute cultural/spiritual significance to the environment and think that they are a part of it rather than mere users of it.

The “harvest and distribution” multiplex is interpreted thus: As the number and variety of resources harvested increase, the proportion of wild proteins in the diet and the amounts of total income invested in resource harvests increase. Those incomes are, however, relatively low. All respondents who harvest large varieties of resources and report large proportions of wild proteins in their diets share with others in the community. Those with the lowest incomes are more apt to receive more than they give, and those with the highest incomes are more apt to engage in more frequent sharing activities, including labor, with residents of other villages. Native high earners are the persons who can afford to take trips and, when so doing, provide labor to their hosts. There were many opportunities to donate labor during the summer of 1989, inasmuch as natives left their home villages for spill-related employment at a significantly higher rate than did nonnatives.

The “low income, ethics & symbols” region (circumplex on the left side of the native solution) is complex, first because of the relations among the items that are fitted there (the double order on the real plane is not perfect), and second because items on both sides of the circumplex have strong positive relations with the items in the “harvest and distribution” region. The circumplex is ordered on income—who gives most and who receives most—and ordered again on the increasing number (ranking) of symbols that persons attach to the environment and to the ethics they espouse about who should benefit from the skills that they have developed and that they employ.

Income (K4, C), on the far left of the native solution, strongly influences the entire configuration. As income increases, the regularity with which respondents give cash to persons in the

village and out of the village increases (K11A K11B K12A K12B, D E F G). And as income decreases, the regularity with which persons receive income increases. These phenomena connect the “low income, ethics & symbols” region with the “harvest and distribution” region. But, in addition, as incomes increase, natives are more apt to attach many significant symbols to their environments (Q7, R).

The ideology facet (ethics and symbols) is positively correlated with birth in the village, length of residence in the village, varieties of resources harvested, proportions of wild proteins in the diet, amount of income invested in harvesting, and ideas that the environment has spiritual/cultural significance beyond commodity values in the “harvest and distribution” region (Q R S T A B U P). Natives who have resided in the village a long time are likely to espouse the ethic of cooperation, The higher income earners among natives in 1989, on the other hand, espoused ethics that gave equal weight to competition and cooperation.

So as not to convey the wrong impression about ethics, if anything, natives are users of their environments. Their adjustments to them are as instrumental as relations can be. Employed natives in our samples in 1989 talked about the importance of acquiring skills and using them to advantage to benefit themselves and their immediate families but also to benefit others without harming the environment in which their forebears resided and in which their children will reside.

### Nonnative Structure of Subsistence in 1989

The nonnative solution for 1989 based on KIP subsistence data is similar to the nonnative solution based on AQI data. The basic structure of nonnative subsistence, then, is determined in both data sets, much as the basic structure in native subsistence organization is determined in both data sets. The individualistic nature of the nonnative solution contrasts with the communitarian nature of the native solution. To understand the three regions in the nonnative configuration (labeled “extraction and consumption,” “involution of sharing,”<sup>61</sup> and “income sharing”), we must remember the scale locations of harvesting and sharing activities in which nonnatives engage (nonnatives engage in little of either).

The “extraction and consumption” simplex (right-front quadrant) shows that the variety of resources harvested, the proportions that wild resources contributed to diets, and the extent to which resources were given and received within the village

increased together. They also increased as the proportions of incomes invested in harvesting activities increased. Given the large sizes of nonnative incomes, even outfitting for camping and big game hunting ventures seldom required more than 20 percent of a nonnative's annual income. By comparison, in 1989, natives invested more than 20 percent of their total incomes in resource harvests at a rate three times greater than nonnatives. The most active extractors among nonnatives tended to consume what they harvested. The sharing in which they engaged was principally of resources, mainly within the village, and reciprocal: Those who gave resources also received resources. These attributes, taken together, are characteristic of nonnative professional and market behavior. The reciprocal sharing of goods, mainly wild foods, differentiates the extractor/consumer households, as do their attitudes about the environment, which are similar to native attitudes. On the far right of the simplex we see that large proportions of income invested in resource harvests and large proportions of wild foods in the diet correlate with the cognitive attitude that the environment has commodity and noncommodity values and with the ethical ideal that persons should compete for their families but also cooperate so as to benefit wider networks of kinspersons and friends (K29 K30, P Q).

The "extraction/consumption" simplex for 1989 is similar in several features to the attributes of the higher earners among natives. Differences are that fewer resources are harvested, fewer are ingested, fewer are shared, and there is no close connection among birth, length of residence, significant symbols attached to the environment, and the majority of items measuring the sharing of labor and cash.

On the left side of the nonnative configuration is a simplex of "income-sharing" variables that is fitted around the measure of income. The relations between three of the income-sharing variables and income are near zero (positive and negative). Knowledge of income reduces more error in predicting that the respondent shares income with someone in a different community (PRE 12 percent) than someone in the same community (PRE 2 percent). Persons who earned a lot did not share much, and, if they did, it was most likely in the form of remittances to close relatives residing in a different community. The higher the income, the less likely it is that nonnatives shared anything on an occasional or regular basis. Seven of eight PRE coefficients measuring the relation between nonnative income and sharing of resources and labor are negative.

Between the “income-sharing” and “extraction/consumption” simplexes is a third simplex labeled “sharing involution.” Nonnative respondents who offered labor assistance to someone in the village were likely to receive labor assistance, and, if respondents extended labor assistance to persons outside the village, it was likely that assistance would be offered in return. The same phenomenon is true for the exchange of resources between respondents and persons in different communities (K13A-K14B K16A-B, H I J K N O) (see table 5). On the edge of the “sharing involution” simplex are measures of length of residence in the community and significant memories about the environment (D25 Q7, T P). These last two are more closely related to each other than either is to any of the sharing variables.

Neither length of residence in the community nor sharing of labor is fitted with sharing resources within the village, the ethic of sharing (competition and cooperation), or the idea that the environment has cultural/spiritual significance as well as commodity significance. The nonnative configuration reflects the harvesting and processing of wild resources by some nonnatives, most of which is consumed within the extractor’s household. Resources are shared on occasion, but the pattern better fits the Western model of individual preferences and adjustments on a frontier than behaviors embedded in an organization of production based on extraction and integrated into the periphery—the margin—of the market.

### Native Structure of Subsistence in 1991

Whereas high incomes are distinguishing in the configuration for 1989, low incomes are distinguishing in 1991. In the 1991 configuration, higher incomes correlate with more extensive sharing (beyond the respondent’s household and kinspersons) and more frequent sharing within and beyond the village. Thus, in 1991, the native configuration again produces two regions, but what was the “income, ethics & symbols” region in 1989 is the “low income, ethics & symbols” region in 1991.

Not surprisingly, the ideology items (see table 2) intercorrelate highly and positively, forming the “low income, ethics & symbols” simplex (right-front quadrant) with the receipt of cash from persons within the village (K29 K30 Q7 K11B, P Q R E). These items have either low negative or zero PRE coefficients with income and positive PRE coefficients with the sharing variables

and with the item measuring varieties of resource harvested. The relations with investment in resource harvests and proportions of wild foods in the diet, however, are near zero. The low income sector includes a high proportion of the persons who, because of age, incapacities, or obligations, were dependent on receiving most of their wild food from others or purchasing food with transfers of cash. Many households with low incomes had some able-bodied members available for harvesting, and these households harvested a wide variety of resources. Nevertheless, neither resources harvested by low income households nor resources given to low income households correlate with high amounts of wild foods in the diets.

With the exception of "receipt of cash in the village," all of the sharing variables are fitted into the "harvest and distribution" cylindrex (left-center of the hyperspace) in which the centrality is lowest among the items measuring the giving and receiving of cash, labor, and resources between persons in different communities. The variety of resources harvested, proportions of wild food in the diet, and amounts of total income invested in resource harvests are highly and positively correlated, yet much less was harvested and a smaller proportion of natives gained more than 50 percent of their diets from wild foods.<sup>62</sup>

As harvests decreased in intensity and yielded fewer edible wild foods, sharing of all kinds increased in extent and regularity with persons in other communities but also increased within the community. The 1991 configuration demonstrates the way in which the native subsistence economic organization facilitated an adjustment to scarce and presumably tainted resources (from a widely held native perspective) following a manmade disaster (a "normal accident") whose consequences were protracted, limiting resource harvests during spring through fall in 1989 and 1990 and prompting widespread sharing. The successful response required income transfers in the way of short-term employment to facilitate extensive sharing. Otherwise, there would be little to share and few resources to facilitate the movement of goods and persons to provide assistance.

### Nonnative Structure of Subsistence in 1991

The nonnative configuration in figure 2 replicates the 1989 solution in most details (figure 1). The "extraction and consumption" region (left-rear quadrant) is a simplex formed by household

measures of investment in harvests, variety of resources harvested, and proportion of harvested proteins in the diet (K1-K3, U A B). Respondents who were most actively engaged in resource harvests had the largest proportion of wild foods in their diets and invested relatively large portions of their incomes, perhaps 10 percent, in the activities. Persons who harvested the widest variety of resources and had the greatest proportions of wild food in their diets were most likely to share resources, reciprocally, in and out of the village, even though these items are not fitted into the "extraction/consumption" region.

Our review of the frequency distributions of the sharing variables has made clear the increases in sharing that occurred among panel respondents between 1989 and 1991, and the greater amount of sharing engaged in by posttest respondents. The increases were essentially reciprocal, although respondents, in general, reported giving more than they received in cash, resources, and labor. The reciprocal nature of sharing among a small proportion of nonnatives generates an "involution of sharing" region (circumplex in the center of the left-front quadrant) and an "income sharing" region (simplex in the left-front quadrant). The income facet separates the two regions.

As in 1989, the items measuring the sharing of cash occupy a region closest to the front of the hyperspace (K11A-K12B, DEFG). The strongest relation of any item measuring the sharing of cash is between income and the giving of cash to persons outside the donor's village. Important differences from the 1989 solution are the positive PRE coefficients between the sharing of cash with other forms of sharing.

A difference from the 1989 solution is that the "involution of sharing" region into which the labor and resource sharing variables are fitted includes the ideology items that measure whether respondents think the environment has significance beyond the potential commodity values of resources within it and whether persons think competition should be practiced along with cooperation between persons, or that cooperation alone should take precedence. Although little more than 10 percent of respondents espoused the first idea and 36 percent the second, the 46 percent of respondents who held these ideas were active sharers. These ideas were espoused by the most active extractors in 1989 and fitted into the "extraction/consumption" region for that sample.

Again, I arrive at the inescapable conclusion that native and nonnative subsistence activities are similar on the surface but not



similar in depth, i.e., not similar in the amounts and varieties of wild resources harvested, organizations of labor and distribution to harvest, prepare, and share resources, and ideological underpinnings of subsistence. Natives are of the place. Nonnatives are temporary users of the place. With a few tiny exceptions, if nonnatives engage in hunting and fishing, it is as sport for preferred species. This is not to suggest that the bag, quarry, or catch is pursued without the intention to consume. It is to suggest that the activities are not integrated into a subsistence economy and that common nonnative practices are significantly different from common native practices, which are integrated into a subsistence mode of production.

#### DO NATIVES AND NONNATIVES DIFFER BY CLASS?

Bohannon is wrong about subsistence and wrong about the self-anointed ethnicity markers he attributes to natives, but is he right about his classification of natives as members of the “working class” and as either the “wielders of” or the “subjects of” American culture?

#### What Does Bohannon Mean by *Working Class*?

Bohannon’s assertion about the working class is empty, because he does not define the attributes by which he distinguishes it and which allow it to be compared with other classes. Bohannon’s brief references to “working class” suggest that he is treating class as a socioeconomic status in which occupation, employment, and income are the key attributes in defining membership. Bohannon refers to *working class* rather than *lower* from the “lower, middle, upper” scheme used so frequently by American sociologists to classify socioeconomic statuses. Yet Bohannon does not define *working class* as comprising persons who sell their labor (their productive human capacities) in a mode of production comprising capitalists (rentiers, bourgeoisie), workers, and lumpen proletariat, and in which ownership, control, labor, exchange, distribution, and consumption are integrated. And he does not seek to distinguish among owners, managers, workers (a.k.a. laborers), and deadbeats in the spill area by social, economic, or ideology attributes. He merely asserts class similarity.

Focusing our attention on native and nonnative incomes, employment, and commercial activities following the spill, we see

inequalities between the two populations that are clearly structured, much as the differences between natives and nonnatives are clearly structured in subsistence activities, knowledge of the environment, ideas about the environment, sentiments about the environment, and sharing activities.

The boom response to the spill affected employment, income, and commercial activities. Some jobs were gained and some jobs were lost because of the spill. Whereas all of the losses were sustained by spill area residents, all of the gains were not. About 68 percent of all native households and the same proportion of all nonnative households in our samples had at least one member who received cleanup employment. Yet the population in the major staging village, Valdez, increased from three thousand to sixteen thousand within two months after the spill, drawing job-seekers from within Alaska but beyond the spill area, and also from outside Alaska. A large proportion of the cleanup jobs went to the nonlocal residents who flooded into the area. Among residents of the spill area, natives differed significantly from nonnatives in that, to gain cleanup employment, about half had to relocate away from their home villages as opposed to one-third of nonnatives.

Do these statistics suggest little more than that, among Alaska's working class, nonnative ethnicity was helpful in securing cleanup employment from Exxon in the nonnative's home village, whereas native ethnicity was helpful in securing cleanup employment away from the worker's home village? Or do these statistics also reflect hiring bias—perhaps unwitting—on the part of the nonnative employees of Exxon and VECO<sup>63</sup> responsible for hiring, in which nonnatives were hired first, natives last. And do they also reflect that nonnative influence was greater than native influence in getting work close to home? It was the case that more nonnatives lost work than natives, because more nonnatives than natives were employed before the spill, and because more nonnatives than natives were employed in the private sector prior to the spill. Indeed, significantly more jobs were lost in the private sector than in the public sector following the spill.<sup>64</sup>

Do these differences between natives and nonnatives in the spill area suggest little more than Bohannon's<sup>65</sup> assertion that "[a]s the native Alaskans became more and more Americanized, [they were] at the same time rejected from many of the activities that the other nonnative Americans engaged in . . ."? Or do the differences reflect differential access to the locus of economic power and the locus of political power?

The public sector was slower to respond to market forces that reduced tax revenues from oil and fish and, after 1989, was slower than Exxon to pull back from cleanup operations. Some public sector activities and programs related to the spill continued into 1991.

The private sector employment losses were a consequence of the problems experienced by fishermen who could not fish and the low prices offered for Alaskan salmon. Processors, cannery employees, and fishing crews lost work, as did hundreds of owner-operators of fishing boats—both native and nonnative. And of course, as an effect, fishing outfitters and suppliers lost income. It is important to mention that commercial fishermen comprised 42.5 percent of our sample in the summer of 1989. More than half of those respondents, nonnative and native, were owner-operators of fishing boats. They were, then, small businessmen who would not normally be classified as working class. Some of those small businessmen earned more than \$200,000 in 1987 and again in 1988 on much larger grosses. The vast majority of the high earners were nonnatives.

In addition, about 28 percent of all respondents were employed in the public sector in a wide variety of positions. The proportion of natives employed in the public sector was significantly higher than the proportion of nonnatives so employed. Yet nonnatives held a larger proportion of the public sector jobs that were highly technical and required postbaccalaureate educations (education, health care delivery, resource management, transportation safety and management). And many natives worked for native for-profit and nonprofit corporations, yet nonnatives occupied a larger proportion of the positions in those corporations that required special education in management, finance, and the like.

Two of the largest villages in the spill area—Valdez and Kenai—gain the lion's share of their income from oil-related employment activities, not commercial fishing-related enterprises. Thus, the economic multipliers for those communities are different from the multipliers for the communities that gain most of the income from commercial fishing. But whether the multiplier is oil or fish, the shopkeepers and entrepreneurs who benefit are predominantly nonnatives. Contrary to the implication of Bohannon's generalization, the employment, education, and income profile of the population in the spill area is far too complex to lump all residents into the working class of American culture and then to recognize trivial differences as "ethnic." And if the implication is

merely that some nonnatives and all natives in the spill area are working class Americans, it is incumbent on Bohannon to provide some independent measures of American culture, of class structure within that culture, and of the empirical fit of natives and nonnatives in the spill area into the categories he has claimed embrace them.

### On Access to the Locus of Economic Power

The incomes from spill-related activities increased for about one-quarter of our respondents, decreased for about one-quarter of our respondents, and remained about the same for one-half of our respondents. The boom response to the spill occasioned a quick and dramatic increase in prices for commodities, rents, and services in the spill area. Some services to spill area villages, such as transportation, were preempted by the needs of the cleanup operation. Commercial fishing for in-shore species was curtailed in some areas, forbidden in others. Jobs were lost, particularly in commercial fishing-related occupations but were gained in cleanup activities.

Nonnatives fared better than natives in securing income from cleanup activities—selling labor and chartering boats—while native incomes were more positively affected, mainly because incomes were so low prior to the spill. Between February 1987 and February 1988, the mean household income of native respondents on Kodiak Island was \$14,900; the mean household income of nonnative respondents was \$47,100.<sup>66</sup> Native incomes for the entire spill area following the spill, including Kodiak Island, were \$26,690 in 1989 and \$29,600 in 1991.<sup>67</sup> Nonnative incomes were \$54,010 and \$48,610, respectively, for the same periods.

Prior to the spill, income variation among natives was about three times greater than income variation among nonnatives in every research wave reflecting a preponderance of low incomes and a few high incomes. In two research waves conducted in the winters of 1988 and 1989 prior to the spill, the relative variation of incomes among natives on Kodiak Island was 90 percent and among nonnatives 20 percent.<sup>68</sup> Over the three postspill research waves conducted in the spill area, the average relative variation for household incomes was 35 percent for nonnatives and 70 percent for natives. This means that, although variation among native incomes was twice as great as variation among nonnative incomes in the period following the spill, in comparison with the

two years prior to the spill, variation among native incomes was reduced and nonnative income variation increased. Relative income variation can be measured only from some norm, such as the mean. Inasmuch as native incomes increased from 50 percent to 60 percent of nonnative incomes between the summer of 1989 and the winter of 1991, the income discrepancies among native households were reduced by a modest amount, while the average incomes increased (see tables A1 and A2). Nonnative incomes continued to far outstrip native incomes.

The high variation among native incomes was a function of the heavy influence exerted by a few high incomes on many low incomes during the cleanup seasons. Variation of nonnative incomes was half that of natives, while occurring around much higher means than those for natives. Nonnatives whose incomes plunged as a consequence of the spill and were exacerbated by the low prices fetched by salmon on the world market went into debt, or relocated, or shored themselves up with public transfers.

The high relative variation of native incomes is closely related to sharing practices, as we have seen: Among natives, high income respondents are bigger givers (of cash) than receivers, and low income households are bigger receivers (of cash) than givers. Fluctuating incomes provide endless situations for persons to give and to receive.

Whereas income, in general, decreased between the August 1988–89 period and the February 1990–91 period, native incomes increased, while nonnative incomes decreased. Indeed, a significantly larger proportion of natives (32 percent) than nonnatives (20 percent) in the 1991 samples reported that the spill had increased their incomes. Given the average incomes of natives prior to the spill, increasing those incomes was more easily accomplished than was increasing the incomes of nonnatives.

The marked increases in native incomes for the August 1988–89 and the February 1990–91 periods are attributable to employment made possible by the fortuity of the spill and the cleanup that followed. For some natives, benefits from the spill continued through the summer of 1990, as they acquired spill-related work, primarily from state agencies. The normal accident that caused the boom-bust cycle increased the incomes of one-third of native households through the summer of 1990. Natives, in general, are fitted on the margin of the market in an area that is, itself, on the margin.

Inasmuch as nonnatives—merchants, shopkeepers, oil company employees, commercial fishermen—earned about twice as

much as natives prior to the summer of 1989, the oil spill made it difficult for many nonnatives, particularly the commercial fishermen and the businesses that service them, to increase those incomes in 1990 when fish prices were depressed and there was much less boat chartering and cleanup work available. In a comparison of incomes for August 1988–89 with those for February 1990–91, native incomes were up about 9 percent, whereas nonnative incomes were down about 9 percent.

Not surprisingly, in the winter of 1991, public sector transfers were no longer important to a large plurality of native households alone (72 percent of all native households gained some of their incomes from unearned income, predominantly public transfers). In February 1991, 49 percent of nonnative households reported receiving stable unearned income in the past year. In August 1989, 29 percent of nonnative households reported receiving unearned income from regular sources at regular intervals during the past year. Welfare and other government transfers had gained increasing importance to the economies of many spill area households within the eighteen months following the spill.

### Working Class or Dependency

Bohannon's claim that natives in the spill area are working class participants in American culture is hollow. His suggestion that natives arrogated the marker *subsistence* upon being denied access to some activities participated in by nonnatives is no substitute for an analysis of political and economic power and native access to each.

ANCSA extinguished native claims to aboriginal hunting, fishing, and land rights while mandating the creation of regional and village for-profit corporations and promising forty-four million acres and \$962 million to those corporations. In 1994, all but two of the thirteen regional corporations mandated by ANCSA were insolvent or bankrupt. Beginning with the implementation of ANCSA, the corporations were undercapitalized, and the shareholder populations were undertrained, undereducated, and inexperienced in corporate ownership and control. The villages<sup>69</sup> are located long distances from markets, are dependent on naturally occurring resources for access to markets, and are subject to high costs for transportation and goods. Most of the villages have poorly developed infrastructures and meager political influence. The foundering of native for-profit corporations is not unexpected.

The problems of native corporations began in 1971 and were exacerbated by the plunge in the price of oil in 1985, the plunge in the price of salmon in 1989, and the reduction in public transfers beginning with the policies and accompanying budgets of the Reagan administration; the problems worsened with the reduction of state of Alaska revenues generated by oil sales. The native corporations, for-profit and nonprofit, are formally organized institutions. The for-profit corporations, regional and village, are shareholder corporations, but, unlike, say, Exxon Corporation, the for-profit corporations and the nonprofit corporations alike have been used to protect the natives' way of life. They have not become the instruments to propel natives into the worldwide market economy as fully integrated capitalists but have been shaped and used in culturally explicit, native ways to preserve the native ways of life while availing natives of all the technology that will make these ways of life more comfortable and predictable.

Industry in subarctic Alaska is capital intensive rather than labor intensive, and it will surely become more capital intensive. Ownership of Alaskan means of production generally lies outside of Alaska. That is the case for the oil corporations (vertically integrated exploring, drilling, extracting, transporting, and refining firms) and the big commercial fish corporations (vertically integrated extracting, processing, and marketing firms). It is likely that aquaculture (pen-raised) salmon operations, currently disallowed by Alaska law, will displace the thousands of small in-shore fishers (setnetters and purse seiners) and that ownership and control of the aquaculture operations will not be in Cordova or Tatitlek or Kodiak City or Old Harbor. It is not likely, either, that the oil transportation operations in Valdez or Kenai will, somehow, become owned and controlled by local nonnatives or natives.

Except for the solvent Cook Inlet Regional Corporation (Athapaskan), most of whose property is located near Anchorage, the regional corporations have foundered like Exxon's infamous oil transport, the *Exxon Valdez*. The difference is that Exxon patched up the *Valdez*, changed its name, and sent it on to other seas in the pursuit of profits ever renewed. The regional corporations continue to founder, enjoying few business successes, unless we tally as successes selling the losses of native corporations to the likes of the Hilton Hotel and Walt Disney corporations and getting about twenty-five cents for each dollar loss they sell.

The native subsistence mode of production relies on wage labor, much of it from public sector employment, on earnings from independent commercial fishing, and on public transfers. Through these sources of income, natives are able to maintain a subsistence way of life—a way of life that native corporations aid and abet.<sup>70</sup> The manner in which native dependency, political and economic, emerged and has been maintained is not addressed by Bohannon, although it is germane to his claims about the smashing of native cultures and the economic absorption of natives into the working class of American culture.

So again we ask whether Alaska Native culture was smashed and whether Alaska Natives are the northernmost participants in America's working class. Slowly but surely, after the Seward Purchase, the federal government established hegemony over natives, depriving them of the sovereign political power and the control of resources on which their lives were based, expropriated native land and resources, dominated native lives, and provided federal dole to them. With each expropriation, the federal government developed a little more of Alaska's infrastructure, either for the nation's defense or to accommodate the commerce that would accompany the next boom (fish, oil) or the commerce that had triggered the most recent boom (gold). Infrastructure was developed to accommodate business enterprises that beckoned nonnatives from the lower forty-eight and elsewhere in the world—people selling their labor, corporations extracting and processing resources. Until 1971, natives were given the dole. After 1971, they were mandated to create undercapitalized, for-profit, shareholder corporations.

The working class designation is wide of the mark. The native social organization of production fits a late twentieth-century, subarctic, subsistence mode of production. About one-third of all natives who were employed in 1991 had two or more jobs during the year, and, of all persons employed—whether part-time (including seasonal) or full-time—about half of the employment was in the public sector, and half was in the private, most frequently as owner-operators of fishing boats. The social organization that embraces all of the employed, underemployed, unemployed, aged, and disabled is harvesting, preparing, and sharing wild resources, sharing services and labor, sharing commodities and the use of equipment purchased with cash, and sharing cash. Even skiffs and motors purchased for in-shore commercial fishing of salmon and herring double in service for the households' harvest-



ing activities. Native households use the smaller skiffs (16' to 22') to clear their set nets, hunt waterfowl and seabirds, collect marine invertebrates, transport themselves to and from their summer or fall camps, harvest greens and berries, and drift the rivers looking for big game (deer, moose). The fruits of these activities flow to relatives and friends in other households and to guests in the homes of the harvesters.

Let us turn to the nexus of relations that accompany the social organization of production and that generated different responses to the oil spill from natives and nonnatives.

## CULTURALLY DISTINCT RESPONSES TO THE SPILL

### Introduction

Several ideological items and their corollaries distinguish native from nonnative social and economic organizations. These items comprise two contrasting sets (with some overlap): one “communitarian” (native) and the other “Western” (nonnative). Among the KIP data, some of the ideological items that characteristically differentiate natives from nonnatives are rules for household dynamics (K20), ethical responsibility of attainment (K28), environmental ethics (K29), and ethics of personal cooperation (K30). The corollaries in social practices of these ideological items include gender distinctions and other behaviors commonly employed in the acculturation of children (K31), the dynamics of household composition (K19), the kinds and amounts of sharing practices in which persons engage (K11A–K16B), and the kinds and amounts of subsistence activities in which persons engage (K1–K3). I have demonstrated that natives and nonnatives are organized differently on these key social features—ideas, sentiments, acts. Here I demonstrate that these organizations, one Western and the other communitarian, disposed nonnatives and natives to respond differently to the oil spill on several related indicators.

Again I will turn directly to multivariate analyses to discuss the solutions for postspill protocol (KIP) samples for 1989 and 1991, the latter being drawn without replacement of the former. I will not introduce the multivariate solutions for the KIP panels or for the questionnaire (AQI) samples and panels; I will, however, introduce some AQI data to demonstrate the similarity of results and the complementarity of the AQI and KIP data.<sup>71</sup>

The KIP and AQI samples confirm one another, and the second waves of each panel confirm the results of the samples with which they are matched. The similarities in the solutions by research wave and ethnic/racial contrast are expected, inasmuch as we discovered no test artifacts (reactivity) in the KIP or AQI panels, and we discovered no threat to validity that would inhibit us from claiming that differences between postspill 1 and 2 samples reflect change.<sup>72</sup>

The SSA configurations for the native and nonnative KIP subsamples of postspill 1 and postspill 2 provide multivariate confirmation that natives and nonnatives were affected by the spill and by the depressed Alaskan wild salmon market that accompanied the spill, and that persisted through the 1994 salmon season. Some of the effects of the spill were immediate and short-lived; others accumulated, as differences between our 1989 and 1991 data demonstrate. The spill

- occasioned changes in some household compositions;
- precipitated disputes between commercial fishermen;
- prompted persons in large proportions of households to avail themselves of a wide variety of social services, including family counseling, personal emotional counseling, financial assistance, and health care;
- occasioned an increase in participation in extracurricular activities and events sponsored by church-related organizations;
- made increasing numbers of persons aware of political issues, economic conflicts within their villages, and personal, economic conflicts within their villages;
- made almost all respondents skeptical that future economic developments that may occur in their local areas would provide benefits to local residents or be controlled locally; and, between 1989 and 1991,
- occasioned an increase in the proportion of nonnatives who espoused ethics, sentiments, and ideas about rules in household membership and behavior, the goals for the attainment of skills to become successful (in life's several pursuits), the roles of competition and cooperation in economic and subsistence activities, and the principles that should be followed in acculturating children that mixed Western and communitarian principles, while also occasioning a significant increase in the proportion of natives who espoused communitarian ethics, sentiments, and ideas.

The general differences between the structures of native society and nonnative society are measurable, empirical, real. Let us call the differences “cultural.” The movement of nonnative positions toward those of natives I presume to be temporary responses to the threats to household economies created by the spill and exacerbated by the changes in the commercial fish markets. The movement of many natives toward the most extreme communitarian ideas, too, is a response to exigencies. But those exigencies were protracted over twenty-two months during our investigations and continued through mid-1993, four-and-one-half years after the spill.<sup>73</sup>

Although Bohannon did not address the nature of Alaska Native culture north of the Gulf of Alaska, there are some marked differences between natives residing north of the Gulf and those south.<sup>74</sup> Natives in the spill area are different from their congeners in western and northern Alaska in that a much larger proportion of them fish commercially and reside in complex villages in which they are a minority. Average native households in the spill area are smaller, the proportion of single-person households is greater, the proportions of persons employed, and employed in the private sector, are greater. There is, then, some evidence that natives in the commercial fishing, oil- and tourist-industry regions of Kodiak Island, the Alaska Peninsula, Cook Inlet, and Prince William Sound are more similar to nonnatives on some employment and demographic measures than are natives north of the Alaska Peninsula.

In the spill area, the major businesses—commercial fishing-related and oil-related—and minor businesses—tourism and guiding—are owned and controlled by nonnatives, as are the businesses that service the larger communities. Native practices have accommodated to nonnative practices in this context, but natives, even in the largest villages, maintain communitarian activities that distinguish them from nonnatives.

The spill accounts for the increase of natives who attribute spiritual and cultural significance to the environment; espouse cooperation rather than competition; report that they attained skills with help from, and so as to benefit, their households, wider networks of kinspersons and friends, and the community; and state that they indulge their children, while teaching them by precept to do likewise with their own children. For natives, the spill is as memorable as the earthquake of 1964, yet the spill was manmade, a “normal accident,” not a natural disaster. The re-

sponse to the normal accident was to recognize the source of the problem and the differences in power between the persons and corporations responsible for the problem (and its cleanup) and the persons and environment that suffered the consequences.

In response, natives came to accentuate the communitarian principles of native society. They did so through reflection, through conversations that accompanied daily practices of sharing and visiting, and through attendance at public meetings that addressed consequences of the spill for the community and region and remedies for those consequences. In some cases, as consequences of the spill, natives accepted new members to their households or bid their goodbyes to erstwhile members. Native recognition of the ideological basis of native society was heightened by their postspill predicaments, the practical responses to those predicaments, and the conversations and activities in which natives engaged about the spill. The widespread similarity among native social, political, and religious responses to the spill are drawn from the structure we have named *culture*, empirically warranted, that our measures confirm.

The responses of nonnatives to the spill provide evidence of ideological and practical changes in daily life as responses to a disaster that harmed the environment from which they gained their livelihoods and which threatened their ability to survive economically. The responses appear to be crisis-oriented and do not suggest a permanent change toward native practices, ethics, ideas, and sentiments.

### The Configurations for 1989 (Postspill 1)

SSA analyses (figure 3) contrast native and nonnative subsamples of the postspill 1 and 2 samples.<sup>75</sup> The configuration for the native subsample of postspill 1 (1989) is a hypersphere with two conexes, one that distinguishes higher incomes (“high income practical”) and one that distinguishes lower (“low income ideology”). It is evident that the natives who enjoy the highest incomes are also the best informed, particularly politically, and the least in need of social services (other than health services, a right enabled by ANCSA).<sup>76</sup> Natives with lower income are less well informed in general and are more likely to have sustained changes in the compositions of their households recently, yet they are more apt than higher earners to be knowledgeable about the functions of community agencies and also to use those services more often.

Attendance at church activities is common to higher and lower income households (K26 K27, I J). In addition, in 1989, the members of both higher and lower income households included persons and their spouses who were born in the village in which they currently resided or in nearby villages (K37, K37B, S T). Whether respondents are high or low earners, persons born in or near the villages in which they were interviewed frequently expressed and advocated the most extreme communitarian values (K28 K29 K30 K31, K L M N), although these items are fitted in the lower earner region. The connections between the higher earners and the lower earners are expressed at the highest level in the third dimension (K L M N S T).

The relaxing of the communitarian practices and the adoption of Western practices by the most knowledgeable and financially successful respondents fits the assumptions about the Western hypothesis,<sup>77</sup> but the sharing, kinship, and friendship obligations in which most of these same persons engage counteract any deep-seated changes among financially successful natives toward Protestant ethic individualism. Native incomes in 1989, we recall, were about one-half as large as nonnative incomes. Financial success among natives, then, is relative to natives. As we have seen, the higher the income among natives, the wider that income is distributed beyond the household—either in resources (as in lending equipment or providing food, fuel, boat, motor, nets, tents, lanterns, and the like for subsistence harvests) or in cash.<sup>78</sup> By a regrettable error, K31 was omitted from several matrices; hence, in the postspill 1 subsamples, K33A is represented by *P* and K33B is represented by *Q*, but in the panel, K33A is represented by *O* and K33B is represented by *P*.<sup>79</sup>

The configuration for the nonnative subsample of the postspill 1 sample is similar to the subsistence configurations for nonnatives (figures 1 and 2). It is divided into two areas, one organized around short-term residency in the village (“high-income short term”), the other around long-term residency (“low-income long term”).<sup>80</sup> The period immediately following the spill required emergency responses. The low PRE coefficients in the matrix for the nonnative sample imply considerable variation that is unexplained. Nonnative responses were not structured in the same way as native responses, although some similarities between the two, albeit temporary, are observable.

The areas organized around nonnative long-term residents (left-center figure 3) comprise many ideological features that we

have classified as “mixed” Western and communitarian (or traditional). *Long-term* refers to nonnatives and to respondents’ spouses born and reared in the regions in which the respondents were interviewed (K37 K37B, S T). These respondents (K37, S) and respondents’ spouses (K37B, T) comprise a very small proportion of the postspill 1 subsample (about 15 percent for respondents and spouses). In 1989, lower incomes, greater use of social services (K39, U), and knowledge about economic conflicts within the village and between persons within the village (K33A K33B, P Q) correlated more highly with the items in the long-term area than the short-term area.

What is clear is that during the height of the spill cleanup, when commercial fishing activities were most disrupted and when the daily affairs of village life were most affected by the emergency requirements of Exxon, VECO, state, and federal agencies, respondents or their spouses born and reared in Alaska generally earned less than recent immigrants and required a wider variety of social services.

We expected that long-term residency in small villages would correlate with large networks (social connections) through which information passes and that social connections of this sort would correlate highly and positively with the ideological items that are amalgams of Western and communitarian features. In particular, we hypothesized that, in the context of the spill’s consequences, values expressed by longer-term residents would include competition-cooperation (K30, M), attainment (K28, K), significance of the environment (K29, L), and acculturation (K31, N) that mixed the principles we have called *Western* and *communitarian*. This was indeed the case in 1989, as figure 3 and table 8 attest.

The powerful influence exercised by economic factors, especially the threat to commercial fishing posed by the spill, demonstrates that social networks of long duration were not necessary for nonnatives to gain information and form opinions about the consequences of the spill. Large proportions of longer-term and only slightly smaller proportions of shorter-term residents were cognizant of economic problems (K33A, P), personal economic conflicts (K33B, Q), and disputes between fishermen in the village (Q16A, A). These items form a simplex (left-rear quadrant) fitted as a bridge between the “long-term” and “short-term” simplexes.

The extractable and salable resources of the environment are necessary for the livelihoods of nonnatives, especially so for those who are engaged in commercial fishing-related or oil-related

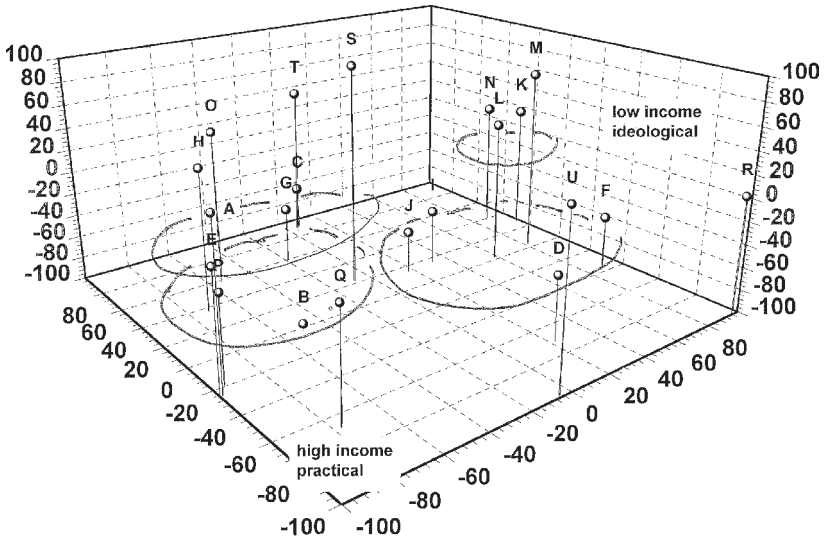


FIGURE 3. SSA-1 FEATURES OF NATIVE SOCIAL ORGANIZATION AND POLITICAL ACTIVITIES [KIP] 1989

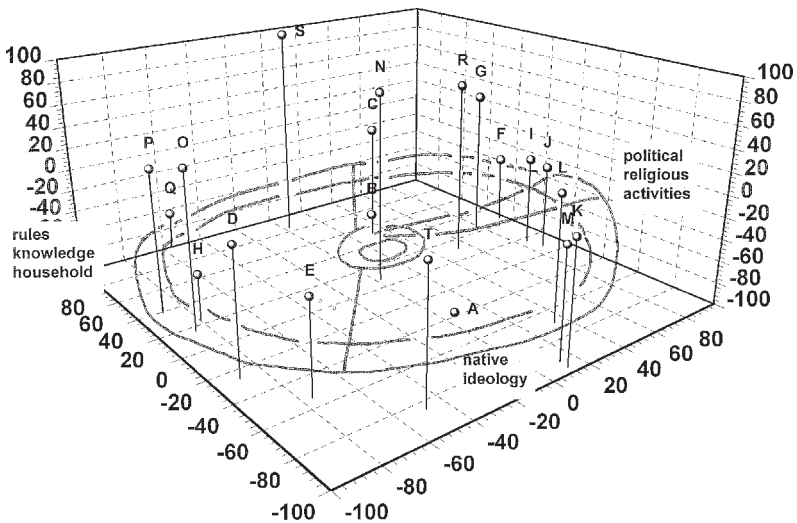


FIGURE 3. SSA-1 FEATURES OF NATIVE SOCIAL ORGANIZATION AND POLITICAL ACTIVITIES [KIP] 1991

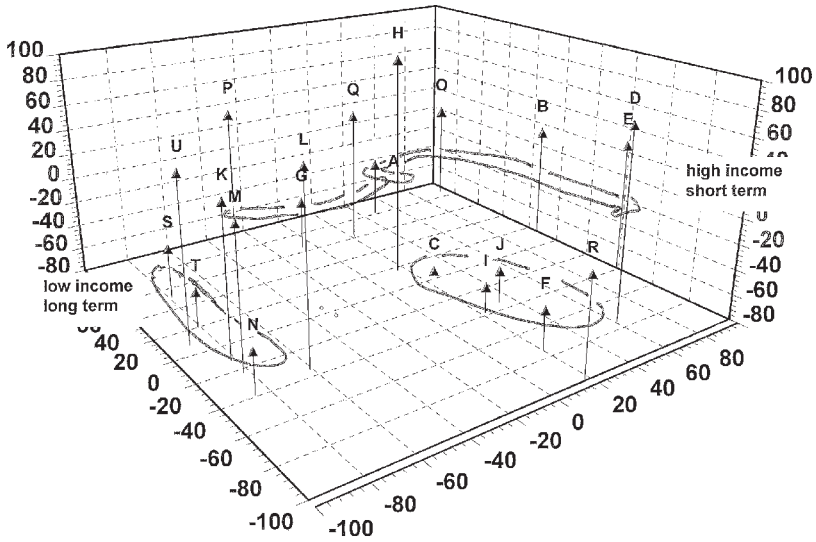


FIGURE 3. SSA-1 FEATURES OF NONNATIVE SOCIAL ORGANIZATION AND POLITICAL ACTIVITIES [KIP] 1989

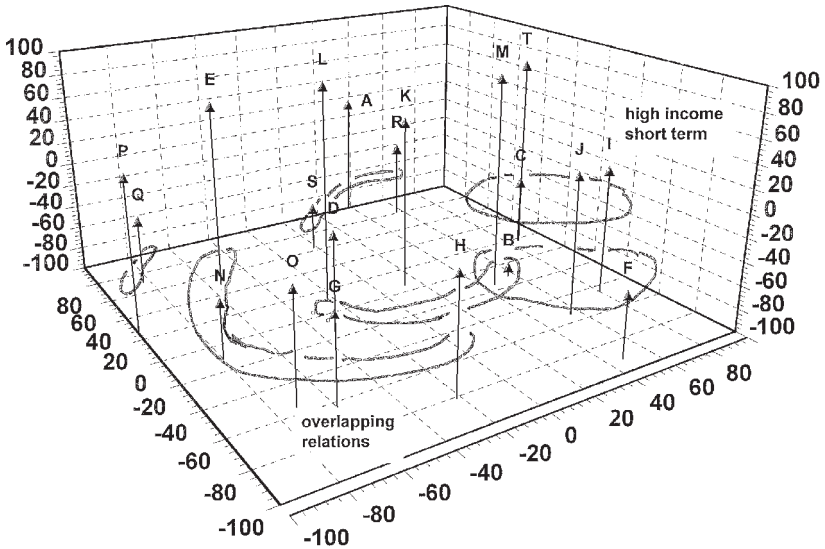


FIGURE 3. SSA-1 FEATURES OF NONNATIVE SOCIAL ORGANIZATION AND POLITICAL ACTIVITIES [KIP] 1991



**Table 8**  
**Matrix of Kendall's Tau<sub>b</sub> Coefficients, 20 KIP Variables Measuring Social and Political Indicators of the Exxon Valdez Spill,**  
**KIP Postspill 1, 1989S**

	Native Subsample 67N					Non-Native Subsample 145N				
	Q16A	K4	K17	K19	K20	Q16A	K4	K17	K19	K20
Q16A	1.000					1.000				
K4	-0.131	1.000				0.088	1.000			
K17	-0.051	0.214	1.000			0.045	0.124	1.000		
K19	-0.028	0.020	-0.114	1.000		-0.121	0.026	0.026	-0.138	1.000
K20	0.372	0.198	-0.080	0.024	1.000	0.001	0.247	0.048	0.229	1.000
K22	-0.219	0.076	-0.031	0.208	-0.200	0.059	0.074	0.195	0.064	-0.074
K24	-0.205	0.311	0.223	0.037	0.032	0.123	0.039	0.101	-0.023	0.016
K25	0.188	-0.016	-0.015	0.055	0.102	-0.004	0.153	-0.088	0.046	-0.118
K26	-0.011	0.003	0.117	0.134	0.104	-0.003	0.004	0.257	0.060	0.056
K27	-0.026	0.095	0.108	0.181	0.096	0.153	0.050	0.238	0.045	0.014
K28	-0.300	-0.148	0.091	0.002	-0.127	-0.119	-0.220	-0.026	-0.031	-0.191
K29	-0.028	-0.198	-0.146	0.048	-0.069	-0.127	-0.108	-0.092	0.084	-0.051
K30	-0.145	-0.102	-0.044	0.063	-0.074	-0.063	-0.224	-0.070	0.014	-0.097
K31	-0.247	-0.083	0.116	0.043	-0.329	0.020	-0.266	0.005	-0.093	-0.234
K32	0.151	-0.013	0.169	-0.055	-0.015	0.102	0.146	0.059	-0.023	-0.044
K33A	0.291	0.241	-0.059	-0.007	0.229	0.245	-0.010	0.028	-0.184	-0.122
K33B	0.135	0.118	-0.082	0.128	0.120	0.153	0.080	0.099	0.061	0.054
K35	-0.142	0.006	-0.068	0.127	-0.302	-0.079	-0.030	-0.007	-0.009	0.032
K37	0.052	-0.179	-0.058	-0.187	-0.008	0.033	-0.203	0.126	0.047	-0.064
K37B	-0.143	-0.148	0.037	-0.102	-0.004	-0.084	-0.172	0.111	-0.169	-0.281
K39	-0.094	-0.136	-0.075	0.068	0.011	-0.077	-0.207	0.052	-0.059	-0.168

	K22	K24	K25	K26	K27		K22	K24	K25	K26	K27
K22	1.000					K22	1.000				
K24	-0.010	1.000				K24	-0.071	1.000			
K25	-0.166	0.126	1.000			K25	-0.002	0.084	1.000		
K26	0.224	0.026	-0.037	1.000		K26	0.197	0.095	0.034	1.000	
K27	0.147	0.086	0.038	0.628	1.000	K27	0.228	0.017	0.058	0.630	1.000
K28	0.156	0.205	-0.076	0.096	0.077	K28	-0.017	0.019	0.017	0.059	0.088
K29	0.133	0.119	0.111	0.127	0.178	K29	-0.006	0.061	0.200	0.014	0.019
K30	0.039	-0.031	-0.022	0.011	-0.160	K30	0.026	0.121	0.016	0.062	0.058
K31	0.088	0.154	-0.168	0.169	0.140	K31	0.003	0.015	0.014	0.132	0.059
K32	-0.110	0.104	0.316	-0.013	-0.022	K32	-0.103	0.070	0.077	0.016	-0.072
K33A	-0.211	0.184	0.265	0.051	0.169	K33A	-0.038	-0.006	0.120	-0.101	-0.010
K33B	-0.118	-0.044	0.098	0.058	-0.049	K33B	-0.079	0.121	-0.038	0.013	0.018
K35	0.200	-0.195	-0.188	-0.215	-0.160	K35	0.144	-0.137	-0.169	0.042	-0.029
K37	-0.021	-0.041	-0.084	-0.037	-0.191	K37	0.057	0.093	-0.117	-0.068	-0.123
K37B	-0.183	0.039	0.221	0.204	0.287	K37B	0.032	0.220	-0.052	0.063	0.025
K39	-0.137	-0.118	0.035	-0.073	-0.076	K39	-0.016	-0.058	0.053	-0.050	-0.019
							K28	K29	K30	K31	K32
K28	1.000					K28	1.000				
K29	0.259	1.000				K29	0.387	1.000			
K30	0.327	0.153	1.000			K30	0.523	0.468	1.000		
K31	0.311	0.220	0.309	1.000		K31	0.062	0.129	0.077	1.000	
K32	-0.073	0.057	-0.026	-0.042	1.000	K32	-0.088	-0.193	-0.141	-0.120	1.000
K33A	-0.247	-0.037	-0.190	-0.254	0.114	K33A	0.127	0.087	0.045	0.019	-0.072
K33B	-0.423	-0.011	-0.103	-0.199	0.136	K33B	0.120	-0.030	0.040	-0.044	0.090
K35	0.000	-0.169	0.048	0.158	-0.182	K35	-0.030	-0.028	-0.071	-0.013	-0.166

Table 8, cont'd  
**Matrix of Kendall's  $\tau_b$  Coefficients, 20 KIP Variables Measuring Social and Political Indicators of the Exxon Valdez Spill,  
 KIP Postspill 1, 1989S**

	Native Subsample 67N					Non-Native Subsample 145N					
K37	-0.080	-0.118	0.082	0.085	0.070	K37	0.074	0.051	0.138	-0.028	-0.094
K37B	0.103	-0.072	-0.007	0.216	0.224	K37B	0.169	-0.012	0.158	0.304	0.029
K39	0.013	-0.015	-0.027	-0.037	-0.045	K39	0.392	0.201	0.202	0.113	-0.133
K33A	K33A	K33B	K35	K37	K37B	K33A	K33A	K33B	K35	K37	K37B
K33A	1.000					1.000					
K33B	0.555	1.000				K33B	0.256	1.000			
K35	-0.311	-0.206	1.000			K35	-0.058	0.055	1.000		
K37	0.014	0.076	-0.098	1.000		K37	0.035	0.038	-0.003	1.000	
K37B	-0.119	-0.231	-0.265	0.046	1.000	K37B	0.130	-0.042	-0.106	0.225	1.000
K39	0.018	0.169	0.067	-0.193	0.063	K39	0.194	0.081	-0.038	0.087	0.107
	K39					K39	K39				
K39	1.000					K39	1.000				

Guttman-Lingoes' smallest space coordinates for 3 dimensions social indicators, Native subsample (N67) of KIP *Exxon Valdez* spill area sample, Postspill 1, S1989.

Variable	D1	D2	D3
Q16A	-1.10	-.27	.41
K4	-.51	-.03	-.93
K17	.04	.87	-.56
K19	.22	-.71	-.43
K20	-1.01	-.23	-.01
K22	.91	-.35	-.53
K24	-.19	.60	-.50
K25	-.73	.35	.27
K26	.32	.16	-.50
K27	.18	.16	-.63
K28	.98	.28	.16
K29	.58	.02	.29
K30	.82	.04	.67
K31	.89	.41	.16
K32	-.55	.58	.39
K33A	-.95	-.19	-.26
K33B	-.78	-.69	-.05
K35	.97	-1.04	.03
K37	-.14	.13	1.18
K37B	.07	.91	.38
K39	-.05	-1.00	.45

Guttman-Lingoes' Coefficient of Alienation  $K = .187$ .

Guttman-Lingoes' smallest space coordinates for 3 dimensions social indicators. Nonnative subsample (N145) of KIP *Exxon Valdez* spill area sample, Postspill 1, S1989.

Variable	D1	D2	D3
Q16A	.48	.82	-.33
K4	1.20	.14	.12
K17	.28	.05	-.78
K19	.61	-.65	.70
K20	1.21	-.39	.25
K22	.20	-.75	-.49
K24	-.06	.65	-.39
K25	.16	.17	.95
K26	.22	-.38	-.59
K27	.33	-.34	-.54
K28	-.82	-.12	.36
K29	-.61	-.35	.64
K30	-.82	-.22	.27
K31	-.86	-.39	-.48
K32	.95	.87	.02
K33A	-.37	.74	.44
K33B	.22	.62	.30
K35	.17	-1.27	-.03
K37	-.79	.51	-.39
K37B	-.81	.20	-.52
K39	-.90	.08	.48

Guttman-Lingoes' Coefficient of Alienation  $K = .181$ .

**Table 8, Cont'd**  
**Matrix of Kendall's  $\tau_b$  Coefficients, 20 KIP Variables Measuring Social and Political Indicators of the Exxon Valdez Spill, KIP**  
**Postspill 2, Winter 1991**

	Native Subsample 25N					Nonnative Subsample 61N				
	Q16A	K4	K17	K19	K20	Q16A	K4	K17	K19	K20
Q16A	1.000					Q16A				
K4	0.179	1.000				K4	1.000			
K17	0.059	0.269	1.000			K17	0.134	1.000		
K19	-0.050	-0.051	-0.268	1.000		K19	-0.203	-0.144	1.000	
K20	0.126	-0.005	-0.188	0.401	1.000	K20	0.124	-0.205	0.140	1.000
K22	0.068	0.309	0.307	-0.043	-0.225	K22	0.012	0.139	-0.014	-0.232
K24	-0.008	0.145	0.152	0.058	-0.032	K24	-0.178	0.255	0.064	0.026
K25	0.013	0.155	0.122	0.328	0.277	K25	-0.020	0.107	-0.057	-0.014
K26	-0.023	0.248	0.332	-0.098	-0.006	K26	0.019	0.190	0.336	0.088
K27	0.134	0.214	0.300	-0.056	-0.063	K27	-0.065	-0.009	0.334	0.160
K28	0.056	-0.116	-0.104	0.006	0.239	K28	0.019	-0.102	0.086	0.045
K29	0.218	-0.161	0.033	0.091	0.096	K29	0.013	-0.207	-0.087	0.057
K30	0.073	-0.152	-0.042	0.059	0.300	K30	-0.045	-0.038	0.066	0.044
K32	0.004	0.073	0.017	0.217	-0.023	K32	0.012	0.032	-0.003	0.065
K33A	-0.312	0.027	0.070	0.398	0.336	K33A	-0.141	0.017	-0.231	0.138
K33B	0.126	-0.028	-0.045	0.240	0.345	K33B	-0.117	-0.129	-0.162	0.119
K35	-0.177	0.004	-0.132	-0.245	-0.176	K35	-0.039	0.000	0.069	-0.045
K37	-0.174	0.050	0.222	-0.028	-0.186	K37	0.224	0.135	0.295	-0.144
K37B	-0.405	-0.344	0.301	-0.344	-0.381	K37B	0.133	0.046	0.171	0.082
K39	0.109	-0.085	-0.093	0.168	0.587	K39	0.082	0.139	0.140	-0.201



**Table 8, Cont'd**  
**Matrix of Kendall's  $\tau_b$  Coefficients, 20 KIP Variables Measuring Social and Political Indicators of the Exxon Valdez Spill, KIP**  
**Postspill 2, Winter 1991**

	Native Subsample 25W					Nonnative Subsample 61N				
	K33B	K35	K37	K37B	K39	K33B	K35	K37	K37B	K39
K33B	1.000					1.000				
K35	-0.017	1.000				0.237	1.000			
K37	-0.294	-0.186	1.000			-0.174	0.005	1.000		
K37B	0.168	0.042	0.422	1.000		-0.252	0.101	0.387	1.000	
K39	-0.033	-0.093	-0.003	0.011	1.000	0.013	-0.178	-0.024	-0.190	1.000

Guttman-Lingoes' smallest space coordinates for 3 dimensions social indicators. Native subsample (N25) of KIP *Exxon Valdez* spill area sample, Postspill 2, winter 1991.

Variable	D1	D2	D3
Q16A	.05	-.40	-.96
K4	.29	.49	-.76
K17	.47	.72	-.06
K19	-.90	-.27	.09
K20	-.76	-.54	-.19
K22	.96	.27	-.35
K24	.78	.25	.38
K25	-.79	.25	-.60
K26	.84	-.05	-.13
K27	.87	-.13	-.18
K28	.11	-.97	.08
K29	.34	-.69	.14
K30	.12	-.92	-.02
K32	.02	.07	.75
K33A	-.86	.16	.41
K33B	-1.08	.41	.28
K35	-.55	1.22	-.65
K37	.53	.11	.63
K37B	.03	.85	1.00
K39	-.48	-.84	.14

Guttman-Lingoes' Coefficient of Alienation  $K = .157$ .

Guttman-Lingoes' smallest space coordinates for 3 dimensions social indicators. Nonnative subsample (N61) of KIP *Exxon Valdez* spill area sample, Postspill 2,

Variable	D1	D2	D3
Q16A	.39	1.10	.12
K4	.56	-.12	-.91
K17	.86	.18	-.41
K19	-.66	-.74	.39
K20	-.56	.47	.63
K22	.47	-.92	-.47
K24	-.34	-.15	-.84
K25	-.22	-.81	-.03
K26	.79	-.46	.11
K27	.55	-.54	.20
K28	.12	.05	.48
K29	-.23	.11	.86
K30	.46	-.15	.84
K32	-.80	-.11	-.53
K33A	-.72	-.56	-.09
K33B	-1.28	.27	.30
K35	-.83	.70	-.42
K37	.57	.82	-.32
K37B	-.02	.63	-.60
K39	.90	.22	.69

Guttman-Lingoes' Coefficient of Alienation  $K = .185$ .



industries and the businesses that service them. Inferring from our prespill research on Kodiak Island and north of the Gulf of Alaska, much greater proportions than we would have predicted of postspill residents of the spill area who were born and reared in Alaska expressed cognitive and instrumental attitudes that mixed some Western (individualist) and traditional (communitarian) practices. These respondents engaged in several communitarian practices—visiting, sharing meals, discussions—as responses to conditions imposed on their household economies by the spill. The communitarian features of the ideological and practical responses of these longer-term residents were consequences of the spill. Long-term proximity to and observation of native practices may have shaped the specific responses. It is my assumption that the conflation of Western-communitarian ideas espoused in 1989 suited the crisis response during the period of the cleanup, when households experienced the early impact of depressed fish prices and community services were most in demand. Helpful communitarian acts were frequent in this period.

Turning our attention to the “high-income, short-term” simplex (far-right figure 3), nonnatives earning higher incomes (K4, B) in 1989 tended to be short-term residents engaged in private sector occupations, particularly in businesses related to commercial fishing. Frequent church attendance and participation in extracurricular events and activities sponsored by religious groups (K24 K25, G H), Western ideology, and Western practices characterize the high-income area. Recent changes in the compositions of households (K19, D) occurred among the short-term, high-income earners. It was common during the period of high flux for nonnatives engaged in commercial fishing-related activities to maintain two households. This was particularly true if the respondent had immigrated in the past decade or so. In the summer of 1989, an unusually high proportion of nonnatives lived separate from their spouses. This was surely a response to the unusual requirements of the spill. Although household compositions had changed, clear expectations for membership and for the behavior of members in those households (K20, E) correlated with the other features of the area, underscoring the prevalence of Western rules and ideas.

On Kodiak Island in 1989 and 1990, it was the higher-earning, short-term residents among the nonnative commercial fishermen who most frequently attended public meetings, were well-in-

formed about political issues, and voted in state elections. In the larger spill area, short-term residence, long-term residence, and higher incomes correlate with knowledge of political issues (K25, H), knowledge of the services provided by community agencies (K35, R), and the opinion (cognitive)<sup>81</sup> that local economic developments would, in the future, be controlled by interests outside the area and would confer few benefits on locals (K32, O). In 1989, although higher earners were aware of community services, they used fewer of them than did the lower earners.

Responses on several items did not distinguish between the short-term and the long-term respondents in 1989: Each correlates highly with knowledge of disputes between fishermen, economic and interpersonal economic conflicts within the village, and knowledge of political issues.

### The Configurations for 1991 (Postspill 2)

These configurations reflect changes away from individualistic practices and toward native practices and the espousal of some ideas that have communitarian elements. The structure of native society for 1991 (conex figure 3) is so similar to the configuration for the native KIP panel in 1991 (not shown) that the changes that occurred over the twenty-two months following the spill are incontrovertible. Some native households experienced fissioning, others fusing. Western-type rules were relaxed or abandoned, whereas communitarian ideas and practices replaced them. These changes occurred in a context in which political and economic information was perforce discussed and in which knowledge and skepticism became widely shared. Differences attributable to income are less obvious and less important twenty-two months following the spill than they were five months following the spill, although income is fitted in the lower radex of the solution.

To understand the configuration for 1991, the reader may wish to consult tables A1 and A2. It is the case that, in 1991, in contrast to 1989, greater proportions of native respondents used services available in their villages or regions (100 percent), correctly identified the majority of political issues about which they were queried, espoused ethics and ideas that were predominantly communitarian, were skeptical that any benefits would accrue locally from future economic developments in the area, and were cognizant of political disputes between fishermen. Information was shared through native practices of visiting, attending public

meetings, and discussing the future of subsistence activities, commercial fishing, and the environments in which they lived, and also through discussions about the consequences to native foods, employment, and other losses attributable to the spill.

I call the center of the native solution for 1991 (figure 3 postspill 2 ) *native* for want of a better term, because the radii that extend from the center to the periphery serve to segment areas that are highly correlated and represent recurrent aspects of native social structure—forming simplexes and multiplexes within the radial segments. Income occupies a central place in the lower radex, while skepticism that economic developments will provide local benefits or be controlled locally occupies a central place in the upper radex.

Several items in the lower center of the configuration comprise the simplexes labeled “native ideology”: the ethics of cooperation over competition; the ethic that personal skills are attained with help from and so as to benefit self, family, and others in the village; the idea that the environment possesses symbolic significance (cultural or spiritual); and the idea that economic development would have few or no local benefits. These items of native ideology are joined with the practice, universal among natives in 1991, of using health and/or financial services available in the public sector; the widespread recognition of spill-generated disputes among commercial fishermen; and the birth and rearing of respondents in the village or region<sup>82</sup> (Q16A K28 K29 K30 K31 K32 K37 K39, A K L M N R T).

The “political and religious activities” area (right-center) includes a simplex whose members are characterized by skepticism about local benefits from local economic developments, higher incomes, higher incidences of divorces, households in which members hold political offices, regular attendance at religious services, and occasional or regular participation in extracurricular activities sponsored by religious groups (K4 K22 K24 K26 K27 K32, B F G H I J N). The persons who report these very attributes are, in subsequent years, most likely to be in the villages in which they were first interviewed.

The “rules knowledge and household” region (left of center) comprise items that measure recent changes in household composition, the absence or laxity of expectations about household membership, and behavior rules for members. These items form simplexes with knowledge of the services provided by local agencies and knowledge of political issues (K19 K20 K22 K25 K35,

DEFHQ). Knowledge of economic conflicts within the village are included in this area in the postspill configuration (K33A K33B, OP).<sup>83</sup>

The 1991 configuration for nonnatives in the postspill 2 sample (figure 3) separates items into several simplexes and multiplexes, although we know from the PRE matrices and from the coefficient of alienation for the SSA configuration that considerable variation is unexplained. The considerable variation represents flux—changes in household composition, espousal of some principles that conflate Western and communitarian ideas, widespread knowledge of economic distress and personal disputes, widespread use of social services, and widespread knowledge of the missions of social service agencies. The changes in these responses between 1989 and 1991 suggest that nonnatives were coping with a protracted crisis but without the structure around which native responses occurred. Particular needs and particular circumstances for respondents appear to have coalesced to create several small areas within the larger region.

The left half of the hyperspace (“lower-income long-term”) comprises several areas whose common features are lower incomes and longer residencies in the region among respondents and/or their spouses. The right half of the hyperspace (“high-income short-term”) shares the common feature of larger incomes and respondents who were not born or reared in the villages in which they were interviewed.

The longer-term residents, as we expected, more often reported knowledge of interpersonal economic conflicts, disputes between commercial fishermen, and economic conflicts within the village. Also, they more often thought that economic developments in the future would not benefit locals, and they possessed more correct information on political issues and the services provided by local public sector agencies. Although the espousal of explicit household rules is fitted in this area, so is the measure of recent changes in household composition. This is not contradictory; households can change without affecting the rules that respondents maintain for their households; for example, a family member may relocate to the lower forty-eight, or a renter may not return after an absence. Yet it is somewhat contradictory to profess explicit household membership and behavior rules while also espousing some combination of Western and communitarian ideas and ethical principles about attaining skills so as to assist family members and wider networks of kinspersons.<sup>84</sup> During the year following the spill, the espousal by long-term nonnative residents

of communitarian ideas about skill attainment, and ideas that attribute significance beyond commodity values to the environment are crisis responses, not responses to short-lived exigencies. The crisis was protracted.

The "high-income short-term" region of the nonnative configuration (right half) is a conex at three levels. At the base is income, fitted there because, although it correlates with larger households (K4, C), it also predicts political participation, but households in which some member or members hold political office are most frequently long-term residents (K24, G fitted in the region on the left). The conex demonstrates that household size, income, divorce incidence, and religious and extracurricular participation in events sponsored by religious groups increase together. At the highest level, the use of social services is predicted by religious participation, income, and household size, but expression of some blend of competition and cooperation in personal economic pursuits is predicted only by religious participation.<sup>85</sup>

### Changes in Household Compositions and Sizes as Spill Consequences

The AQI samples and panel yield results that complement the KIP results. I introduce AQI data to analyze changes in household composition and household size, because the protocol ratings lump household sizes of one to three persons into a single category, whereas AQI data distinguish one-person households from two- and three-person households. AQI data allow for a more careful analysis, then, of fluctuation in one- and two-person households.

Whereas native households were slightly larger than nonnative households in the postspill samples and in the waves of the panel in 1989 and 1991, both native and nonnative households were smaller in 1991 than they were in 1989. The decrease in household sizes, in conjunction with changes in household types between 1989 and 1991, reveal changes occasioned by the spill and the consequent depression of fish prices. Nonnative household arrangements demonstrate considerable flux in 1989, with a marked change toward single-person households in 1991.

The household arrangements for about 85 percent of nonnatives in coastal Alaska prior to the spill were single person,<sup>86</sup> conjugal pair, or nuclear family. During the summer of 1989, when population movement was at its greatest through commer-

cial fishing closures and clean-up activities, single, conjugal pair, and nuclear households accounted for about 76 percent of non-native living arrangements; 24 percent of nonnatives coresided in a variety of nonfamily households as renters and corenters (table 9).

In 1991, about 88 percent of nonnatives resided in single, conjugal pair, or nuclear family arrangements. Among the 12 percent that did not, 4 percent were single parent households (stable for the panel and increase in proportion for postspill 2 over postspill 1). The changes in 1991 clearly indicate a return to the dominant household arrangements before the spill and demonstrate that households of panel respondents were volatile in 1989, when large numbers of households had boarders.

Native households in 1989 and 1991 reflect states of flux. In every measure of native household types conducted both in the first phase and in the *Exxon Valdez* spill phase of the social indicators research, household living arrangements other than single-person, conjugal pair, and nuclear family comprise large proportions of the totals. It is the case that most married native respondents between the ages of, roughly, twenty-five and forty-five, sought conjugal pair or nuclear household residences. Economic circumstances normally determined whether those persons could satisfy their wishes and how long they would be able to maintain those residences.

Among natives, conjugal pair and nuclear arrangements increase as months of employment and income increase, while mixed and remnant households (and other composite house-

**Table 9**  
**Household Living Arrangements of Natives and Nonnatives, AQI Data, N566,**  
**1989 and 1991**

	Nonnative		Native	
	Single, Conjugal Pair, Nuclear	Other Forms	Single, Conjugal Pair, Nuclear	Other Forms
1989				
Panel Wave 1	77	23	49	51
Postspill 1	76	24	68	32
1991				
Panel Wave 2	91	9	61	39
Postspill 2	86	14	66	34

hold arrangements) increase as employment and income decrease and/or become less stable. Instability of months of employment, sources of income, and amounts of income characterize native respondents in both postspill samples and in both waves of the panel.<sup>87</sup> The contrasts with nonnative panel household arrangements in 1991 are interesting. Discounting changes from conjugal pair to nuclear households (due to birth of children), changes occurred among 27 percent of native and 11 percent of nonnative panel households between 1989 and 1991. The changes for both correlate with fluctuating sources and amounts of income.

Unlike nonnatives, household living arrangements among natives, I reiterate, do not always coincide with domestic functions. It is common for two or more native households, linked through kinship, to recognize themselves as a domestic unit, storing food together, eating together, tending children communally, and the like. The expectations for, and the behavior of close kinspersons—such as an adult son or daughter, or aging parent<sup>88</sup>—living nearby but not in the household, facilitate the movement of persons from one house to another as exigencies arise. The native response to exigencies is to share and accommodate.

#### Communitarian Behavior:

##### Visiting, Dining as Guests, Attending Public Meetings

Again I use AQI data to supplement KIP data. Inferring from our prespill research among nonnatives in coastal Alaska,<sup>89</sup> the period immediately following the spill occasioned visiting and dining among nonnatives much beyond our expectations: About 52 percent visited friends or relatives in the village three or more days in the week prior to being interviewed, and about 21 percent had eaten at least one meal as a guest in a friend's or relative's home during the two days prior to being interviewed. In 1991, visiting and dining among nonnatives in the days immediately prior to being interviewed had decreased markedly since 1989, but the proportions who engaged in each activity remained high: about 40 percent visited persons on three or more days, and about 17 percent dined as guests in the homes of friends or relatives (table 10). The visiting and dining activities of nonnatives in 1989 reflect the response to the crisis caused by the spill, as analyzed in the section on subsistence. By 1991, both visiting and dining had decreased to levels significantly below those of natives.

**Table 10**  
**Frequency of Visiting and Dining with Friends or Relatives in Past Few Days,**  
**Natives and Nonnatives, AQI Data, N566, 1989 and 1991**

	Nonnative		Native	
	Visits on 3+ Days in Past Week	1 or More Meals in Last 2 Days	Visits on 3+ Days in Past Week	1 or More Meals in Last 2 Days
1989				
Panel Wave 1	52	21	61	42
Postspill 1	49	22	53	52
1991				
Panel Wave 2	36	16	56	42
Postspill 2	44	18	53	34

The important point here is that proportions of nonnatives and natives who made frequent visits to friends and neighbors were quite similar in the summer of 1989. In 1991, natives continued to make frequent visits to friends and relatives, while nonnatives visited significantly less often. The difference between the proportions of natives in the postspill 1 and 2 samples who recently had eaten meals as guests, however, was greater (18 percent)<sup>90</sup> than the differences between the comparable nonnative subsamples in 1989 and 1991. Natives more frequently visited and shared meals than nonnatives in both research waves, but the decrease in meals for natives is a consequence of natives having harvested many fewer wild resources in the year following the spill than was normally the case for them.

Nonnative visiting and sharing of meals, although high in both postspill waves, had reduced considerably by twenty-two months following the spill. As the early crisis response waned, nonnative crises responses waned.

In the first phase of our study, we found that one communitarian activity that consistently proved to engage natives was attendance at public meetings focused on public or corporate issues. As we predicted from the first phase research and from the prespill:postspill Kodiak Island research, native attendance at public meetings was high in 1989 and also in 1991: about one-third of all native postspill respondents and from one-third (1989) to one-quarter of all panel respondents (1991) had attended at least one public meeting in the month prior to the date of their interviews. The summer of 1989 was certainly a crisis period during which public meetings were held in every community in our



sample. Yet all business and all complaints and all problems triggered by the spill were not resolved in the summer of 1989. Compensation claims were discussed, as were changes in plans by various communities for local infrastructure developments, readiness preparations for the next spill, issues in relation to the 1991 commercial fishing season, and the like.

In 1989, nonnatives matched, and in 1991 they exceeded, the proportions of natives who attended public meetings.<sup>91</sup> This was no fortuity; nonnatives—whether employed in the private or public sectors—were vitally concerned about maintaining their livelihoods in the spill area. Acquiring information, discussing alternatives, and exerting political pressure were deemed important to doing so: Fish prices had plunged, and debts had therefore gone unpaid for many spill area residents.

Another finding of the research conducted in the first phase was that greater proportions of natives than nonnatives voted in state and local elections. It is evident from table A2 that natives and nonnatives voted at rates much in excess of national rates in the most recent local and state elections. In the entire spill area, it is also the case that, following the spill, nonnative panel members (not shown) increased their participation in statewide elections by 20 percent (to 83 percent). Our interviews left little doubt that panel respondents were voting their interests. The proportions of natives who voted in the most recent native corporation elections following the spill were clearly voting their interests as well (about 80 percent of eligibles exercised their franchise).

The spill increased the communitarian activities of nonnatives for almost a year following the event, but, by two years after the event, many of those activities had waned (visiting, dining with friends and relatives, and other activities discussed in the subsistence chapters). Attendance at public meetings and exercising the franchise had not. These legal-rational means to influence personal, occupational, and economic interests enjoyed very wide participation during the two years immediately following the spill.

### Is the Sky Falling?

Economists for the state and federal governments used contingent valuation methodology (CVM) to obtain estimates for spill damages that cannot normally be converted to dollars. Examples of damages that do not have dollar values established in a market are damage to the aesthetic pleasure that residents and visitors

expect to enjoy from the environment, grief over the death of wild animals and plants, dismay over the destruction of places to which significant symbols have been assigned.

Although CVM rests on quicksand, the CVM research literature has discovered one interesting difference between American Indians and non-Indians in the lower forty-eight states for which our research in Alaska has produced a parallel result. The CVM literature suggests that nonnatives, generally, overestimate risks of low-probability high-intensity events. We established that commodity valuation takes precedence in the nonnative definitions of the environment and resources within the environment, whereas instrumental use, cultural, and spiritual valuation take precedence in the native definition of the environment. We also established that natives know more about the local environments than do nonnatives. So which of the two, natives or nonnatives, think that the sky is falling? If the *Exxon Valdez* can founder once and wreak havoc, are other spills as large or larger than the *Exxon Valdez* spill, i.e., normal accidents of disastrous proportions, in the oiled area likely to follow?

When asked, natives were significantly less likely than nonnatives to think that spills similar to the *Exxon Valdez* will recur frequently (Q13B). Natives thought the Exxon spill was unique; nonnatives did not (Q13A). Nonnatives fitted what we have learned about nonnatives elsewhere in the United States. Natives fitted what we have learned about Indians.

### SIGNIFICANT CONCLUSIONS

Bohannon argues that natives and nonnatives comprise a single universe, hence, a subset of them comprises the same target population. Bohannon is wrong. Native culture—that organization of acts, objects, ideas, and sentiments that are characteristic of natives in the spill area—was implemented by natives to cope with the spill's consequences to the naturally occurring resources on which native lives depend. Nonnatives implemented acts and expressed ideas and sentiments that were common to their culture to cope with the crisis caused by the spill. The responses were different.

On a wide variety of economic, subsistence, social, ethical, and political measures prior to the *Exxon Valdez* spill, differences between natives and nonnatives in Kodiak Island villages that were oiled by the spill were significant and systematic. Following

the spill, natives and nonnatives in all villages in our spill area sample proved to be systematically different in the amounts of income; number of months employed; amount of education completed; proportion of persons employed in the public sector; proportion of persons receiving unearned income; stability of income; amounts of income invested in the harvests of wild resources; the variety and amount of wild resources harvested; the manner in which those resources are distributed and consumed; the amounts in which goods, equipment, and income are shared and the persons with whom they are shared; the practices of contributing labor to relatives and friends; the way in which symbols are attached to the environment; the places to which persons retire; the consequences of job or business loss; the expectations for local benefits from oil-related developments; the sizes and compositions of households; the rules for membership and behavior in the household; the amount of visiting and dining as guests in the homes of relatives or friends; cognitive attitudes about whether and what species can be managed and who or what agency should manage them, who best understands the biologic and abiologic environments, and what consequences are most likely from oil-related activities.

The longitudinal, multidimensional, multivariate analyses of samples and panel demonstrate stability in the principles that distinguish nonnative from native societies, and the temporary crisis created by the spill demonstrates the differences between native and nonnative responses to the environmental, political, and economic consequences of the crisis.

By mid-November 1994, Exxon Corporation had either spent, paid, or been ordered to pay the following as a consequence of the *Exxon Valdez* oil spill of 24 March 1989:<sup>92</sup>

#### Spent or Paid

- \$15 million to the federal government for environmental studies to assess damages.
- \$304 million to fishermen and fish processors for claims.
- \$2.1 billion to clean up the spill.
- \$1 billion to the state of Alaska and to the federal government (settlement of a civil suit whose payments will be made over twenty years).

#### Ordered to Pay

- \$20 million to Alaska Natives to settle damage to food harvests (not for damages to native culture).

- \$287 million in compensatory damages to commercial fishermen.
- \$5 billion in punitive damages to commercial fishermen.
- \$9.6 million to several native corporations and to the Kodiak Island Borough for damages to land and archeological sites.

Alyeska Pipeline Service, of which Exxon owns 20 percent, has spent the following:

- \$32 million to settle state of Alaska and federal government claims.
- \$98 million to settle claims from commercial fishermen, fish processors, natives, and landowners.

Looking back at the conclusion of the first full round of litigation, which I date at 16 September 1994 when the whopping punitive damage judgment was rendered, I ask, rhetorically, whether that first round resolved all disputes about the consequences of the spill. There was no closure. Contentions remain about the adequacy of the scientific investigations of the consequences of the spill on the environment, about the sizes of the judgments, and about the advisability of Exxon and Alyeska having settled any of the cases prior to trial. Contentions also remain about the current condition of the environment, the recovery of fish stocks in the Prince William Sound region, and the causes of the low prices paid for Alaska salmon between 1989 and 1993.

### On Science, the Law, and the Spill

A couple of months prior to the conclusions of the last batch of civil suits against Exxon, Jeff Wheelwright, a journalist, completed his review of a large portion of the scientific reports pertaining to consequences to the environment from the *Exxon Valdez* spill. In a book and also an article, Wheelwright<sup>93</sup> concluded that the extent of the damages had been exaggerated. He claimed that Prince William Sound had “recovered” from the *Exxon Valdez* spill, that the plaintiffs in the ongoing civil suits were wrong, and that science had been diminished by the unwarranted and exaggerated claims made by scientists.

Two Canadian scientists, Roger H. Green and Charles H. Peterson,<sup>94</sup> who “served as scientific advisors, peer reviewers and chairmen of working groups (on statistics and on shoreline ecology) for . . . [73] impact studies into the *Exxon Valdez* spill”

conducted under the auspices of the state of Alaska and the federal government and who, at the time, were serving as expert witnesses for the plaintiffs in the civil suits, took issue with Wheelwright's conclusions. Green and Peterson<sup>95</sup> refute several of Wheelwright's key claims, including (1) that "marine science cannot account for a delayed response from an oil spill" by providing evidence that it can and does; and (2) that the drop in fish stocks in Prince William Sound in 1992 and 1993 were manifestations of "the rise and fall of populations driven by natural forces," by adducing information that overfishing and oil spills can put some populations at great risk, particularly species that naturally go through "booms and busts." As for Wheelwright's claim that the scientists offered no plausible causal mechanisms to account for perturbation of faunal and floral species in the spill area,<sup>96</sup> Green and Peterson<sup>97</sup> respond,

There is a lack of understanding here of basic scientific concepts. One doesn't prove to explain. One accepts or rejects a null hypothesis, which in this case is that natural causes (ones not oil-spill-related) suffice to explain things without invoking oil-spill effects as a contributing explanation. It is not difficult to reject this null hypothesis. It isn't necessary to show that the spill "caused" the trajectory. An oil-spill effect is a signal to be detected among other signals. It needn't be *the* signal.

About one month after the appearance of Wheelwright's claims and three days after the appearance of Green's and Peterson's rebuttal, Exxon returned to the U.S. District Court in Anchorage, arguing that it had paid heavily for the spill and that the corporation should not be asked to provide a windfall for the various and sundry plaintiffs.<sup>98</sup> As the trial was set to begin, Brian O'Neill, a lawyer for the plaintiffs, claimed, "The spill didn't even cause Exxon a hiccup." O'Neill sought \$15 billion to punish Exxon and deter others from letting such accidents happen in the future.<sup>99</sup>

The \$5 billion awarded to the plaintiffs is the biggest civil award in an environmental case—ten times larger than the amount paid by Union Carbide for the chemical leak that killed four thousand people in Bhopal, India. Although no survey of the plaintiffs—fifteen thousand in all—was conducted after the jury's decision was rendered, residents of Cordova and Valdez interviewed by two reporters expressed skepticism that the plaintiffs would ever receive one cent.<sup>100</sup> Should the award be paid in full, assuming a \$1.2 billion fee for the attorneys, each plaintiff will receive \$253,333.

Nina Munk,<sup>101</sup> writing in *Forbes* one month after the decision, criticized the news media for not putting the spill into perspective and for failing to note that "Alaska had recovered remarkably quickly." Citing Wheelwright as her source for debunking the scientific studies about the consequences of the spill to the environment, Munk wrote that the "money is said to cover damages to the environment. But how do you place a value on such ill-defined damages? With phony statistics."

The contentions remain. If Exxon appeals the huge punitive damage award, it is unlikely that the appeal will be based on the inadequacy of the scientific studies referenced by the plaintiffs; rather, the appeal will likely address the huge size of the judgment.

### On Bohannon's "American Culture, Working Class, Ethnic Markers"

In July 1994, Exxon settled the suit brought in behalf of thirty-five hundred natives for the loss of food harvests for \$20 million. The plaintiffs' attorneys fees are not known, but assuming they are around \$4 million, each native could receive as much as \$4,570 from Exxon.

Let us muse about Bohannon's "American culture, working class, ethnic difference" thesis: If the nonnative commercial fishermen actually collect \$253,333 each and the natives receive \$4,570 each, is the difference that nonnatives are "American culture, petit bourgeoisie, ethnic difference" and natives are "American culture, working class, ethnic difference"?

The Alutiiq and Eyak-Athapaskan native plaintiffs of the spill area were ill served by their attorneys and their own social scientists in their claims for damages from the oil incurred by their "culture." Social scientists for the respondent muddied the waters but carried the day. The consequences of bad social science were grave, indeed, for Alaska's natives.

**Table A1**  
**Frequency Distributions in Percents, KIP Variables, Theoretical Contrasts for**  
**Nonnative:Native Subsamples, Postspill Pretest and Posttest Samples<sup>a</sup>**

<b>Key Informant Protocol Variables</b>	<b>Nonnat 1989 (N145)</b>	<b>Native 1989 (N67)</b>	<b>Nonnat 1991 (N61)</b>	<b>Native 1991 (N25)</b>
Q7 significant environmental symbols				
None	6.3	*6.1	6.8	4.0
A few	34.5	33.3	44.1	24.0
Many	52.1	24.2	44.1	28.0
Many over generations	7.0	36.4	5.1	44.0
Q13A Is <i>Exxon Valdez</i> Spill Unique?				
No	54.6	47.7	55.2	48.0
Yes	45.4	52.3	44.8	52.0
Q13B Will events similar to the <i>Exxon Valdez</i> spill occur in the future?				
No	1.4	0.0	3.5	*4.3
Rarely	65.2	71.9	38.6	65.2
Frequently	33.3	28.1	57.9	30.4
Q14A How will future responses to spills compare with the response to Exxon?				
Worse	4.3	3.1	0.0	0.0
Same as	37.7	25.0	26.8	29.2
Better than	58.0	71.9	73.2	70.8
Q15 How did spill affect your income?				
Decreased	25.4	28.3	23.2	24.0
Stayed the same	47.2	41.7	57.1	44.0
Increased	27.5	30.0	19.6	32.0
Q16A Did spill cause disputes among or between fishermen?				
None	14.3	*32.3	1.8	*30.4
Very few	26.3	19.4	27.3	17.4
Many	59.4	48.4	70.9	52.2
Q16B Did spill cause disputes between fishermen and nonfishermen?				
None	29.6	*44.8	16.7	*59.1
Very few	22.2	24.1	31.3	9.1
Many	48.1	31.0	52.1	31.8

<sup>a</sup>Postspill, pretest research conducted in the late summer of 1989 and the early winter of 1990. Posttest research conducted in the winter of 1991. Tests for significance of difference: The Kolmogorov-Smirnov test for two independent samples is used for all ordinal variables. Significance of difference of proportions ( $X^2$ ) is used for nominal dichotomous variables. The differences are tested between nonnatives:natives for 1989 and again for 1991.

Table A1, KIP Frequencies by Native:Nonnative Contrasts, Cont'd

Key Informant Protocol Variables	Nonnat 1989 (N145)	Native 1989 (N67)	Nonnat 1991 (N61)	Native 1991 (N25)
K1 Harvest Expenses—Proportion of Income				
Very low, 0–9%	87.6	*68.2	86.7	84.0
Low, 10–19%	6.2	13.6	10.0	12.0
Medium, 20–29%	4.1	12.1	1.7	4.0
High, 30% or more	2.1	6.1	1.7	0.0
K2 Variety of Harvested Species				
None	9.0	12.1	18.6	12.5
Few, none in some categories	51.7	40.9	67.8	54.2
At least one species per category	14.5	12.1	8.5	8.3
Two–three species per category	9.0	16.7	1.7	8.3
More than three species per category	15.9	18.2	3.4	16.7
K3 Harvested protein in diet				
Less than 25%	51.7	*21.2	64.4	*25.0
25–49%	24.8	27.3	10.2	29.2
50–75%	16.6	36.4	15.3	29.2
76–100%	6.9	15.2	10.2	16.7
K4 Household annual income				
\$0–10,000	2.2	*21.5	4.9	*12.0
\$10,001–20,000	8.8	24.6	9.8	32.0
\$20,001–30,000	8.8	20.0	6.6	20.0
\$30,001–40,000	16.8	15.4	16.4	8.0
\$40,001–60,000	24.8	10.8	34.4	20.0
\$60,000–100,000	35.8	7.7	27.9	8.0
Over \$100,000	2.9	0.0	0.0	0.0
K9 Stability household earned income				
Irregular	0.0	*8.2	1.7	12.0
Erratic	2.8	4.9	6.9	8.0
Seasonal	24.5	34.4	27.6	24.0
Monthly	72.7	52.5	63.8	56.0
K10 Stability of household unearned income				
(1) Irregular	71.0	*53.0	50.8	28.0
(2) Monthly welfare or transfer payments	5.5	9.1	11.9	8.0
(3) Regular receipts a/o royalties a/o lease w/ (1) or (2)	22.1	30.3	37.3	60.0
(4) 1, 2, and 3	1.4	7.6	0.0	4.0



Table A1, KIP Frequencies by Native:Nonnative Contrasts, Cont'd

Key Informant Protocol Variables	Nonnat 1989 (N145)	Native 1989 (N67)	Nonnat 1991 (N61)	Native 1991 (N25)
K11A Income giving within the village				
Personal use only, not shared	19.4	27.7	22.8	*12.0
Pooled within the household	59.0	47.7	33.3	8.0
Occasional sharing w/ other households	15.3	23.1	29.8	56.0
Regular sharing w/ other households	6.3	1.5	14.0	24.0
K11B Income receiving in the village				
No sharing	29.7	33.3	51.9	32.0
Pooled within the household	57.2	50.9	18.5	16.0
Occasional sharing	10.9	15.8	25.9	32.0
Regular sharing	2.2	0.0	3.7	20.0
K12A Income giving between villages				
Personal use only, not shared	82.1	77.3	50.9	52.0
Pooled within the household				
Occasional sharing w/ other households	6.9	15.2	30.2	40.0
Regular sharing w/other households	11.0	7.6	18.9	8.0
K12B Income receiving between villages				
No sharing	90.8	85.0	83.0	64.0
Occasional sharing	5.6	8.3	13.2	32.0
Regular sharing	3.5	6.7	3.8	4.0
K13A Labor giving within the village				
Personal use only, not shared	6.2	*3.0	8.6	*8.0
Pooled within the household	24.8	9.1	13.8	8.0
Occasional sharing w/other households	54.5	47.0	43.1	20.0
Regular sharing w/other households	14.5	40.9	34.5	64.0
K13B Labor receiving in the village				
No sharing	8.4	*3.1	8.9	*4.0
Pooled within the household	26.6	12.3	14.3	8.0
Occasional sharing	51.0	49.2	53.6	24.0
Regular sharing	14.0	35.4	23.2	64.0
K14A Labor giving between villages				
Personal use only, not shared	79.3	71.2	72.0	52.0
Pooled within the household				
Occasional sharing w/other households	15.9	21.2	18.0	28.0
Regular sharing w/other households	4.8	7.6	10.0	20.0

Table A1, KIP Frequencies by Native:Nonnative Contrasts, Cont'd

Key Informant Protocol Variables	Nonnat 1989 (N145)	Native 1989 (N67)	Nonnat 1991 (N61)	Native 1991 (N25)
K14B Labor receiving between villages				
No sharing	83.7	67.7	74.5	52.0
Occasional sharing	12.1	24.2	17.0	28.0
Regular sharing	4.2	8.1	8.5	20.0
K15A Resource giving within the village				
Personal use only, not shared	4.9	*0.0	18.6	*4.0
Pooled within the household	15.3	4.6	6.8	12.0
Occasional sharing w/other households	60.4	52.3	45.8	20.0
Regular sharing w/other households	19.4	43.1	28.8	64.0
K15B Resource receiving in the village				
No sharing	5.0	*3.0	8.8	*12.0
Pooled within the household	17.7	9.1	7.0	8.0
Occasional sharing	58.2	42.4	59.6	12.0
Regular sharing	19.1	45.5	24.6	68.0
K16A Resource giving between villages				
Personal use only, not shared	75.9	*54.5	52.9	36.0
Pooled within the household				
Occasional sharing w/other households	22.1	28.8	33.3	28.0
Regular sharing w/other households	2.1	16.7	13.7	36.0
K16B Resource receiving between villages				
No sharing	80.1	*58.1	55.1	50.0
Occasional sharing	17.7	24.2	30.6	25.0
Regular sharing	2.1	17.7	14.3	25.0
K19 Household composition/dynamics				
Open and fluid (traditional)	13.1	15.4	8.5	20.0
Infrequent change	12.4	13.8	33.9	36.0
Stable (Western)	74.5	70.8	57.6	44.0
K20 Rules for household dynamics				
(1) No standard rules (traditional)	12.8	*31.3	23.2	40.0
(2) Blend of 1 and 3	12.1	20.3	16.1	28.0
(3) Clear expectations (Western)	75.2	48.4	60.7	32.0
K23 Sodality membership				
No memberships in household	42.1	56.1	39.7	40.0
One membership in household	18.6	21.2	19.0	32.0
Two or more memberships in household	39.3	22.7	41.4	28.0

Table A1, KIP Frequencies by Native:Nonnative Contrasts, Cont'd

Key Informant Protocol Variables	Nonnat 1989 (N145)	Native 1989 (N67)	Nonnat 1991 (N61)	Native 1991 (N25)
K24 Political Participation in household at present				
No official capacities	90.3	75.8	89.8	72.0
One official capacity	5.6	13.6	6.8	24.0
Two or more official capacities	4.2	10.6	3.4	4.0
K25 Identification of political issues				
No issues correctly identified	6.3	14.1	6.7	8.0
One issue correctly identified	17.6	21.9	8.3	20.0
Two issues correctly identified	36.6	26.6	30.0	16.0
Three or more issues identified	39.4	37.5	55.0	56.0
K26 Religious participation in household				
Do not profess religion or participate	35.9	30.3	38.3	36.0
Attend ceremonies occasionally	31.0	31.8	26.7	24.0
Attend ceremonies regularly	33.1	37.9	35.0	40.0
K27 Extracurricular religious acts				
No extracurricular activities	53.8	47.0	60.0	60.0
One/Two on occasional basis	25.2	24.2	16.7	4.0
One/Two on regular basis	10.5	16.7	10.0	8.0
More than two regularly	10.5	12.1	13.3	28.8
K28 Ethical responsibility for attainment				
Seek success for self (personal)	38.5	*16.7	47.3	*8.3
Seek success for self & family	47.6	37.9	25.5	45.8
Seek success for family, network of kinspersons, elders, friends, village	14.0	45.5	27.3	45.8
K29 Ethics and significant environmental symbols				
(1) Resources are commodities	38.9	*30.2	30.8	*0.0
(2) Blend of 1 and 3	55.6	44.4	59.6	54.2
(3) Resources and environment have spiritual a/o cultural significance	5.6	25.4	9.6	45.8
K30 Ethics of personal cooperation				
(1) Personal competition for self-gain	22.4	*7.6	15.1	*4.0
(2) 1, 3, or 4, depending on situation	51.7	40.9	49.1	16.0
(3) Cooperation and competition	13.3	19.7	24.5	32.0
(4) Mainly cooperation-communitarian	12.6	31.8	11.3	48.0

**Table A1, KIP Frequencies by Native:Nonnative Contrasts, Cont'd**

Key Informant Protocol Variables	Nonnat 1989 (N145)	Native 1989 (N67)	Nonnat 1991 (N61)	Native 1991 (N25)
K31 Acculturation and gender distinctions				
Western acculturation and gender	86.6	*26.2	65.4	*16.7
Western and traditional are mixed	10.6	47.7	28.8	54.2
Traditional acculturation and gender	2.4	26.2	5.8	29.2
K33A Economic conflicts?				
No	13.4	*37.3	12.3	12.5
Yes	86.6	62.7	87.7	87.5
K33B Personal economic conflicts?				
No	22.7	*37.7	24.5	34.8
Yes	77.3	62.3	75.5	65.2
K35 Perceived objectives of services				
Correct identification of objectives	84.1	79.0	80.4	80.0
Incorrect identification of objectives	15.9	21.0	19.6	20.0
K37 Place respondent born and reared				
Outside the region/Alaska	83.8	*34.4	90.0	*37.5
In the region but not subregion	4.2	4.7	3.3	12.5
In the subregion but not the village	2.1	21.9	1.7	4.2
In the village of current residence	9.9	39.1	5.0	45.8
K37B Respondent's spouse was born and reared				
Outside the region/Outside Alaska	83.2	*37.5	77.5	57.1
In the region but not subregion	5.3	12.5	10.0	64.3
In the subregion but not the village	2.7	10.0	0.0	0.0
In the village of current residence	8.8	40.0	12.5	35.7
K39 Social services used by respondent				
(1) Avoid all services	27.6	15.4	14.0	0.0
(2) Health services	31.3	52.3	33.3	56.0
(3) Financial services	3.0	1.5	1.8	0.0
(4) Family and social services	11.9	3.1	5.3	0.0
(5) Health (2) and financial (3)	15.6	12.3	24.6	24.0
(6) Family-social (4) and two or more	10.4	15.4	21.1	20.0

**Table A2**  
**Frequency Distributions by Total Samples**  
**and by Native:Nonnative Contrasts,**  
**AQI Variables, Postspill Pretest**  
**(N=350, 1988–89) and Posttest (N=216, 1990–91)<sup>a</sup>**

	Pre N=350 %	Native N=100 %	Nonnat N=231 %	Post N=216 %	Native N=59 %	Nonnat N=129 %
Race? D28						
Alaska Native	30.2			31.4		
Other race	69.8			68.6		
Respondent sex RSEX						
Male	50.3	53.0	50.2	50.5	50.8	48.1
Female	49.7	47.0	49.8	49.5	49.2	51.9
Respondent age group (RAGES)						
18 to 34	37.6	45.0	34.9	38.5	33.9	44.1
35 to 59	46.8	39.0	49.3	50.7	57.6	44.9
60+	15.5	16.0	15.7	10.8	8.5	11.0
Age of respondent RAGE						
Mean	42.33	41.20	42.70	40.73	40.54	40.03
Respondent health? B1						
Very poor	.9	0.0	1.3	1.5	4.1	.8
Poor	1.4	2.0	.9	1.5	2.0	1.6
Fair	11.1	18.0	9.1	10.8	22.4	8.7
Good	42.3	46.0	40.7	34.3	26.5	36.2
Very good	44.0	34.0	47.6	35.3	32.7	33.1
NA	.3	0.0	.4	16.7	12.2	19.7
Where were you born? D24		*			*	
Outside Alaska	66.0	13.0	87.4	71.8	11.9	95.3
Alaska	11.1	28.0	4.8	7.4	20.3	1.6
This region	7.7	21.0	2.6	6.0	18.6	1.6
Here	13.7	37.0	3.9	13.9	49.2	.8
NA	1.4	1.0	1.3	.9	0.0	.8

<sup>a</sup>Tests of significance are calculated for dichotomous nominal data (proportions), ordinal data (Kolmogorov-Smirnov for independent samples), and interval data (t-test for independent samples). Differences at  $\leq .07$  are demonstrated by asterisks (\*). Asterisks in column 1 (PRE) represent differences between pretest and posttest, in column 2 (native) between native:nonnative in the pretest, and in column 5 (native) between native:nonnative in the posttest.

Table A2, AQI Frequencies by Native:Nonnative Contrasts, Cont'd

	Pre N=350 %	Native N=100 %	Nonnat N=231 %	Post N=216 %	Native N=59 %	Nonnat N=129 %
How many years have you lived in this village? D25		*			*	
Year or less	10.9	3.0	14.3	8.4	3.5	10.9
2 to 5 years	14.0	7.0	17.7	21.0	1.8	27.9
6 to 10 years	18.3	8.0	23.4	19.2	22.8	18.6
11 years or more	56.6	81.0	44.6	51.4	71.9	42.6
NA	.3	1.0	0.0	0.0	0.0	0.0
Respondent's home before locating in village? D26		*			*	
Beyond Alaska	47.3	11.5	59.6	53.6	11.3	69.0
Alaska	31.0	32.2	30.9	25.1	22.6	24.6
This region	6.0	11.5	4.3	10.1	26.4	4.8
Here	15.8	44.8	5.2	11.1	39.6	1.6
Currently married? D29		*			*	
No	37.2	44.9	33.3	39.8	54.2	29.5
Yes	62.8	55.1	66.7	60.2	45.8	70.5
Race of spouse D29A	*	*			*	
Alaska Native	36.4	83.1	11.8	26.0	66.7	12.8
Other race	63.6	16.9	88.2	74.0	33.3	87.2
Number of years of education completed C1		*			*	
1 to 8 years	9.2	24.2	3.5	5.6	11.9	3.9
9 to 12 years	39.9	52.5	33.5	45.1	55.9	36.7
College	39.7	18.2	48.3	40.5	30.5	47.7
Higher	11.2	5.1	14.8	8.8	1.7	11.7
Employment sector PPEMP	*				*	
Public	27.3	34.2	23.6	30.3	41.4	27.9
Private	72.7	65.8	76.4	55.8	41.4	59.0
NAs	0.0	0.0	0.0	11.6	17.2	13.1
Months employed last year C6M		*			*	
None	18.6	22.0	18.3	14.0	16.9	13.2
1 to 3 months	10.9	25.0	4.8	11.2	25.4	4.7
4 to 6 months	12.3	13.0	11.3	12.1	13.6	12.4
7 to 9 months	9.2	12.0	8.3	13.0	15.3	13.2
10 to 12 months	49.0	28.0	57.4	49.8	28.8	56.6

Table A2, AQI Frequencies by Native:Nonnative Contrasts, Cont'd

	Pre N=350 %	Native N=100 %	Nonnat N=231 %	Post N=216 %	Native N=59 %	Nonnat N=129 %
Household income D2		*			*	
<\$5,000	4.6	13.0	1.4	5.2	12.1	3.1
<\$10,000	9.2	22.8	4.1	10.4	22.4	4.7
<\$20,000	13.5	25.0	8.8	16.5	19.0	15.0
<\$30,000	15.1	15.2	14.3	15.1	15.5	13.4
<\$40,000	13.2	8.7	13.8	15.5	6.9	17.3
<\$50,000	12.3	7.6	14.7	12.3	12.1	12.6
>\$50,000	32.0	7.6	42.9	25.5	12.1	33.9
Number of rooms in house D8	*	*			*	
<3 rooms	5.8	11.1	3.9	9.3	1.7	11.6
3 to 4 rooms	19.3	24.2	18.3	32.4	28.8	33.3
5 to 6 rooms	29.4	30.3	27.9	31.0	32.2	29.5
7+ rooms	45.5	34.3	49.8	27.3	37.3	25.6
Household size HHSIZE						
1	18.3	17.0	16.9	21.3	13.6	20.2
2	27.4	26.0	29.0	20.8	27.1	15.5
3 to 5	45.4	47.0	45.0	51.9	50.8	58.1
6 to 8	8.9	10.0	9.1	5.6	8.5	5.4
9 to 11	0.0	0.0	0.0	.5	0.0	.8
Total composite activities in which respondents engaged last year TOTACT						
None	46.9	46.0	47.2	46.4	51.9	40.2
1 composite act	24.6	20.0	26.8	28.2	18.5	32.3
2 composite acts	16.9	19.0	15.6	15.3	20.4	15.7
3 composite acts	10.9	12.0	10.4	10.0	9.3	11.8
4 composite acts	.9	3.0	0.0	0.0	0.0	0.0
Household Type HHTYPE						
Single person	17.5	17.0	15.7	32.4	19.6	35.8
Conjugal pair	21.2	15.0	23.9	15.5	16.1	12.2
Nuclear	35.0	36.0	35.7	33.8	30.4	38.2
Stem	1.7	3.0	1.3	.8	0.0	.8
Sibling set	.3	1.0	0.0	1.9	5.4	.8
Non-sibling set	2.6	2.0	3.0	1.0	0.0	1.6
Single parent	5.7	12.0	2.6	7.2	16.1	4.1
Remnants	3.7	5.0	3.0	3.9	10.7	1.6
Mixed	12.3	9.0	14.8	3.4	1.8	4.9

**Table A2, AQI Frequencies by Native:Nonnative Contrasts, Cont'd**

	Pre N=350 %	Native N=100 %	Nonnat N=231 %	Post N=216 %	Native N=59 %	Nonnat N=129 %
Subsistence (wild) food part of meals yesterday? A28						
No	64.7	54.5	70.4	67.3	50.8	71.7
Yes	35.3	45.5	29.6	32.7	49.2	28.3
Subsistence food part of meals day before yesterday? A30						
No	63.8	54.1	68.8	72.1	67.8	70.3
Yes	36.2	45.9	31.2	27.9	32.2	29.7
Either day was subsistence food harvested by self or others? A31						
Self	36.3	33.8	36.9	47.4	45.5	47.4
Other, same household	24.6	23.1	27.2	19.6	21.2	19.3
Other, different household	39.1	43.1	35.9	33.0	33.3	33.3
Number meals eaten with relatives in other household last two days A32						
None	69.5	47.5	78.3	77.0	66.1	81.3
1 to 3 meals	22.7	36.4	16.8	21.1	32.2	16.3
4 to 7 meals	6.4	15.2	3.1	1.0	1.7	.8
8+ meals	1.5	1.0	1.8	1.0	0.0	1.6
Percent wild meat/fish in diet last year A33						
None	7.5	2.0	9.6	7.5	3.4	7.1
<50%	63.0	51.5	68.4	69.6	71.2	66.1
<75%	13.9	19.2	11.8	10.7	15.3	11.0
75%+	15.6	27.3	10.1	12.1	10.2	15.7
Game increase or decrease in last five years A26A						
Decreased	24.5	25.5	25.2	37.7	39.0	38.4
Stayed same	38.2	39.8	35.8	36.8	42.4	32.8
Increased	25.4	26.5	25.2	13.7	11.9	15.5
NA	12.0	8.2	13.7	11.8	6.8	13.6
Fish increase or decrease in last five years A26B						
Decreased	22.6	32.3	19.4	43.9	47.5	48.0
Stayed same	25.2	29.3	24.2	30.4	30.5	25.2
Increased	44.9	33.3	48.9	16.8	16.9	16.5
NA	7.2	5.1	7.5	8.9	5.1	10.2



Table A2, AQI Frequencies by Native:Nonnative Contrasts, Cont'd

	Pre N=350 %	Native N=100 %	Nonnat N=231 %	Post N=216 %	Native N=59 %	Nonnat N=129 %
Game available since <i>Exxon Valdez</i> spill A25A						
Decreased	29.7	38.3	27.1	39.2	53.3	34.4
Stayed same	48.7	39.5	51.2	45.8	37.8	49.5
Increased	2.7	2.5	3.0	3.6	2.2	3.2
NA	19.0	19.8	18.7	11.4	6.7	12.9
Fish available since <i>Exxon Valdez</i> spill A26A2						
Decreased	44.7	43.2	43.3	47.0	51.1	50.5
Stayed same	48.7	39.5	51.2	45.8	37.8	49.5
Increased	2.7	2.5	3.0	3.6	2.2	3.2
NA	19.0	19.8	18.7	11.4	6.7	12.9
Percent wild food in diet since <i>Exxon Valdez</i> spill A32B						
None	22.0	14.8	25.6	10.1	5.1	8.7
<50%	61.3	59.3	62.1	78.6	76.9	79.3
<75%	10.0	17.3	7.4	5.7	10.3	5.4
75%+	6.0	7.4	4.4	4.4	7.7	4.3
NA	.7	1.2	.5	1.3	0.0	2.2
Days visited friends/relatives in past week D13						
None	17.2	12.0	20.1	21.3	20.3	20.2
1 to 2 days	32.5	35.0	31.0	34.3	27.1	35.7
3 to 4 days	19.5	21.0	19.7	18.5	16.9	21.7
5+ days	30.7	32.0	29.3	25.9	35.6	22.5
Times visited friends/relatives in other communities in past year D27						
None	17.7	13.3	19.8	19.6	13.6	19.7
1 to 2 times	34.9	30.6	34.8	40.2	33.9	43.3
2+ times	47.4	56.1	45.4	40.2	52.5	37.0
Vote in most recent city council election? D19						
No	43.1	42.9	44.2	45.8	51.2	48.0
Yes	56.9	57.1	55.8	54.2	48.8	52.0

Table A2, AQI Frequencies by Native:Nonnative Contrasts, Cont'd

	Pre N=350 %	Native N=100 %	Nonnat N=231 %	Post N=216 %	Native N=59 %	Nonnat N=129 %
Vote in most recent statewide election? D20						
No	33.3	36.4	32.6	34.8	33.3	37.1
Yes	66.7	63.6	67.4	65.2	66.7	62.9
Number of public meetings attended last month D16						
None	66.2	66.7	67.5	63.7	67.2	60.5
1 to 2	19.5	24.2	17.3	23.7	24.1	24.8
3+	14.3	9.1	9.1	12.6	8.6	14.7
Vote in last village native corporation election? D22						
No	20.5	20.7	NA	19.5	17.5	NA
Yes	79.5	79.3	NA	80.5	82.5	NA
Vote in last region native corporation election? D23						
No	21.3	21.6	NA	18.5	17.0	NA
Yes	78.7	78.4	NA	81.5	83.0	NA
Employed last year? C6N						
No	18.6			15.7	20.3	14.7
Yes	81.4			84.3	79.7	85.3
Work away from your community last year? C12						
No	*	*				
Yes	87.4	92.0	84.8	78.9	82.1	75.0
	12.6	8.0	15.2	21.1	17.9	25.0
Months left village for employment last year C12M						
None	*					
1 to 3 months	76.2	74.7	75.8	84.7	83.1	83.7
4 to 6 months	12.2	16.2	11.0	8.3	10.2	8.5
7 to 9 months	5.8	7.1	5.7	4.6	6.8	3.9
10 to 12 months	3.2	1.0	4.4	1.4	0.0	2.3
	2.6	1.0	3.1	.9	0.0	1.6
Employment of house member due to Exxon Valdez spill? C13						
None	66.7	69.1	68.3	74.1	75.6	76.7
One job	23.3	19.8	24.1	16.9	11.1	16.7
Two jobs	7.0	8.6	6.0	6.0	11.1	5.6
Three or more jobs	1.7	2.5	1.5	1.2	2.2	1.1

Table A2, AQI Frequencies by Native:Nonnative Contrasts, Cont'd

	Pre N=350 %	Native N=100 %	Nonnat N=231 %	Post N=216 %	Native N=59 %	Nonnat N=129 %
Did spill-related employee leave village for work? C15	*	*				
No	57.0	51.2	66.6	81.0	71.4	80.6
Yes	43.0	48.8	33.3	19.0	28.6	19.4
Loss of employment due to <i>Exxon</i> <i>Valdez</i> spill? C16						
None	83.0	79.2	83.2	74.4	73.7	74.7
One job	13.5	13.8	13.3	18.6	26.3	15.7
Two jobs	2.5	7.0	2.0	4.8	0.0	7.2
Three or more jobs	1.0	0.0	1.5	2.2	0.0	2.4
Relocation due to <i>Exxon Valdez</i> spill? C18						
None	86.0	88.9	85.2	88.6	82.2	90.3
One time	2.3	1.2	2.5	1.2	2.2	1.1
Two times	.7	2.5	0.0	0.0	0.0	0.0
Three or more times	.3	0.0	.5	0.0	0.0	0.0
NA	10.7	7.4	11.8	10.2	0.0	0.0
Smallest monthly income required by household D4	*	*			*	
<\$500	11.1	24.7	5.0	8.9	16.9	7.1
<\$1,000	26.1	34.0	22.5	20.7	28.8	15.0
<\$1,500	18.6	16.5	19.3	22.1	30.5	18.1
<\$2,000	20.1	17.5	21.1	15.5	13.6	17.3
<\$2,500	8.1	2.1	10.6	13.1	5.1	18.1
\$2,500+	15.9	5.2	21.6	19.7	5.1	24.4
Is household better off now than five years ago? D6		*				
Worse now	20.2	22.9	19.0	27.9	32.2	27.3
Same	23.2	35.4	17.6	23.3	30.5	18.0
Better off	56.5	41.7	63.3	48.8	37.3	54.7
Adequacy of current income E29	*	*				
Not satisfied	25.0	36.4	20.0	32.6	39.0	27.3
Somewhat satisfied	42.8	40.4	43.5	46.5	40.7	50.8
Completely satisfied	32.2	23.2	36.5	20.9	20.3	21.9

Table A2, AQI Frequencies by Native:Nonnative Contrasts, Cont'd

	Pre N=350 %	Native N=100 %	Nonnat N=231 %	Post N=216 %	Native N=59 %	Nonnat N=129 %
Is respondent commercial fisherman or owner of business? D3	*					
No	57.9	55.5	61.9	68.7	65.3	68.2
Yes	42.1	44.4	38.1	31.3	34.7	31.8
Amount invested in commercial fishing or own business in past year D3A	*				*	
None	17.7	23.5	16.7	38.0	49.0	23.4
<\$2,000	12.7	22.2	9.9	7.0	8.2	6.4
<\$5,000	4.3	3.7	3.9	1.2	0.0	1.1
\$5,000+	18.0	16.0	18.2	12.9	4.1	20.2
NA	47.3	34.6	34.6	40.9	38.8	48.9
Will search for oil create more jobs for locals? E50	*					
No	27.4	28.3	25.4	34.0	40.7	33.6
Yes	72.6	71.7	74.6	66.0	57.6	66.4
How will search for oil affect fish and game? E51						
Reduce	47.7	45.7	45.8	51.6	61.5	52.2
No change	40.7	29.6	46.8	42.8	35.9	41.3
Increase	1.7	2.5	1.5	2.5	0.0	4.3
NA	10.0	22.2	5.9	3.1	2.6	2.2
Is the search for oil a good or bad idea? E52		*				
Bad	33.2	41.4	26.4	24.7	22.2	25.8
Mixed opinion	41.8	35.4	47.2	42.8	57.8	39.8
Good	21.2	12.1	25.5	30.7	17.8	32.3
NA	10.3	11.1	.9	1.8	0.0	2.2
Who is responsible for the <i>Exxon</i> <i>Valdez</i> oil spill? E58						
Unavoidable accident	3.3	2.5	3.4	4.2	6.6	2.2
Captain's error	17.7	32.1	13.3	22.5	26.7	21.5
Breakdown of ship's technology	.3	0.0	.5	0.0	0.0	0.0
Exxon Corp.'s negligence	10.3	9.9	9.9	4.8	8.9	2.2
State of Alaska's negligence	32.0	30.9	34.0	.6	0.0	0.0
Federal government's negligence	0.0	0.0	0.0	1.8	0.0	2.2
Combination of all but "unavoidable accident"	15.3	8.6	11.8	65.1	57.8	70.0
NA	21.0	2.5	27.1	3.0	0.0	1.1

Table A2, AQI Frequencies by Native:Nonnative Contrasts, Cont'd

	Pre N=350 %	Native N=100 %	Nonnat N=231 %	Post N=216 %	Native N=59 %	Nonnat N=129 %
Property lost due to <i>Exxon Valdez</i> spill C19						
None	95.7	95.1	95.6	95.2	93.3	96.8
One item	1.0	1.2	1.0	1.2	2.2	1.1
Two items	.3	1.2	0.0	0.0	0.0	0.0
Three or more items	1.3	0.0	2.0	1.8	0.0	2.2
NA	1.7	2.5	1.5	1.8	4.4	0.0
If respondent sustained a financial loss due to the spill, did Exxon compensate? C20						
None	46.0	60.5	40.9	64.6	60.5	54.7
Inadequate	10.7	7.4	11.8	29.1	21.1	43.8
Adequate	0.0	0.0	0.0	1.6	5.3	0.0
More than adequate	0.0	0.0	0.0	0.0	0.0	0.0
NA	43.3	32.1	47.3	4.7	13.2	1.6
Has Exxon compensated respondent for loss? C20A						
No				29.2	40.6	28.6
Inadequate				12.5	6.3	20.6
Adequate				3.3	6.3	3.2
More than adequate				0.0	0.0	0.0
NA				55.0	56.9	47.6
Did you gain (financially) from the oil spill? C20B						
No				90.8	96.8	85.7
Yes				8.4	3.2	12.7

## GLOSSARY OF METHODOLOGY TERMS

- Construct Validity.** The fit between measure and construct.
- Ecological Fallacy.** Attributing to sample B the results from sample A (see "Specification Error").
- External Validity.** Relative validity or the generalizability of a causal inference.
- History.** Responses conditioned by historical context in which some event affects a village or a group of villages but not all, or in which responses of several respondents are dependent or interdependent rather than independent from one another; this last is a special form of autocorrelation often referred to as Galton's Problem in the anthropological literature.
- Internal Validity.** The absolute validity of an inference.
- Item Reliability.** The proportion of variance in a measure due to the "true" construct.
- Nonresponse.** Differential subject loss.
- Panel.** A sample of respondents selected at random from a larger sample of persons initially interviewed in a "pretest" or "posttest." Panel respondents are reinterviewed in subsequent research waves.
- Reactivity.** A reactive response is a subjective response (see "Test Artifacts").
- Regression as a Threat to Validity in Panel Responses.** Statistical regression poses many threats, such as when respondents respond to high ranks on ordinal questions in one wave of research ( $t_1$ ) and lower ranks on the same questions in a subsequent wave of research ( $t_2$ ); contrariwise, persons who respond to lower ranks during the first wave respond to higher ranks in a subsequent wave. Regression of this type, a statistical phenomenon, is not easily attributed to any known factor, but regression is always to the population mean of a group and is always a threat to internal validity in a pretest-posttest design. The factors that account for regression or pretest and posttest measures on the same items by the same respondents (panel members) are not obvious, or "intuitive" (Cook and Campbell 1979: 53).
- Reliability.** Measures of whether persons give similar answers to similar questions on the same interview, on different interviews, to different interviewers, and so forth.

**Reliability, Item.** See "Item Reliability."

**Reliability, Over-time  $R_{13}$ .** Over-time reliability =  $r_{12}r_{23}/r_{13}$ . The reliability coefficient is an estimate of the reliability of  $r_{13}$ , free of the effects of temporal instability.

**Specification Error.** Attributing to A the responses of B without any measure to connect A and B. Also known as the "ecological fallacy."

**Stability.** The true stability of a variable over time is derived from an estimate of the reliability of the measure,  $r_{xx}'$ , free of the effects of temporal instability.  $r_{xx}' =$

$$\frac{r_{12}r_{23}}{r_{13}}$$

See "Stationariness."

**Stationariness  $S_{13}$ .** Over-time stationariness or stability =  $r_{12}^2/r_{12}r_{23}$

**Statistical Conclusion Validity.** The probabilistic basis of an inference.

**Test Artifacts.** Instrument reactivity wherein initial interviews bias responses to reinterviews of the same items by the same respondents. Test artifacts are "reactive."

**Test Effect.** An effect of pretesting and posttesting the same person with the instrument in which the pretest conditions the posttest response. Test effect is also known as a "Test Artifact," a threat to validity.

**Validity.** See "Construct Validity," "External Validity," "Internal Validity," and "Statistical Conclusion Validity."

#### SIMILARITY STRUCTURE ANALYSIS (SSA) TERMS

The **Centrality Index** indicates how central a given point is in a configuration of  $n$  points whose centroid is zero (see chapter 1). Points which have a lot in common with other points will tend to have smaller distances from the remaining  $n - 1$  points and, consequently, they will appear more centrally located in the hypersphere. The centrality index can be viewed as the nonmetric analogue of the communality notion in linear analysis.

The **Circumplex** is a circular ordering of points that is more complex than a simplex. It is a set of points doubly ordered in the real plane which define the corners of a convex, rectilinear polygon (in the limit a curvilinearly bounded area), such that

each point is carried back upon itself when the boundary is traversed in a given direction. Circles and ellipses are special cases of circumplexes. The circumplex requires convexity, i.e., if an arbitrary point is placed within the enclosed area, a straight line can always be drawn from it to every corner of the polygon without intersecting any boundary line. The  $n-1$  distances from each of the  $n$  corners of the circumplex follow a definite gradient which can be used to identify matrices (distances increase to a certain mode, then decrease when the points are taken in order around the circuit) (see James C. Lingo and Ingwer Borg, "Identifying Spatial Manifolds for Interpretation," in *Geometric Representations of Relational Data*, ed. Lingo, Borg, and Edward E. Roskam, Mathesis Press, 1979, pp. 127–48).

The **Conex** and the **Cylindrex** are common organizations when dimensionality higher than two is required to account for the structure of the data. The conex is two or more stacked pie-shaped disks whose circumferences decrease from the base to the top resembling a cone whose base is wide and peak is narrow. The cylindrex is a structure that resembles a roll of paper towels standing upright. Both have three organizing characteristics: (a) a polarizing facet that establishes in which direction a point lies from an origin; (b) a modulating facet that corresponds to the distance of the point from the origin; and (c) an axis along which these radexes are stacked.

**Hyperplane, Hyperspace, Hypersphere** Euclidian space—an infinite space—can be defined without a coordinate system (as defined by Euclid). Throughout this analysis, a coordinate-free approach using distance is employed. "Regions" in a hyperplane, hyperspace, or hypersphere are determined by distances in two or more dimensions. To each point  $x_i$ , there exists a set of points  $y_j$  ( $j=1, \dots$ ) such that  $f(x_i, y_j)$  is constant for all  $j$ . The points  $y_j$  constitute an *equivalence hyperplane* to  $x_i$ . The value of the hyperplane is  $f(x_i, y_j)$ . All items  $J_j$  that are mapped into  $y_j$  constitute an equivalence class for  $I$  mapped into  $x_i$ . For example, if  $f$  is a Euclidian distance function in three dimensions, then each sphere with midpoint  $x_i$  is an equivalence hyperplane to  $x_i$ .

A **Subspace** that consists of boundaries is a *boundary hyperplane*. At a boundary, the order relation between some  $f(x_i, y_j)$  and  $f(x_i, y'_j)$  is indeterminate. The boundary is identified by the points  $y_j$  and  $y'_j$ , on which  $f$  presents an indeterminate order relation given  $x_i$  in the boundary. For example, if  $f$  is a Euclidian distance



function in three dimensions, then a plane perpendicular to the line connecting  $y_j$  and  $y_j'$  and intersecting this line at the midpoint is a boundary hyperplane.

**Multiplex** refers to a family of regional forms (many shapes) induced by a Cartesian coordinate system. *Facets* may be continuous, finite, qualitative (nominal), or ordered (ranked). Among the distribution (“sharing”) variables (K11A–K16B), the facets distinguish location [within or outside the village], direction [donor or recipient], extensiveness [ordered from “self” to “kinsperson, friends, elders”], and frequency [ordered from “never” to “regular”].

A **Radex** appears as a combination of simplexes and circumplexes; that is, it appears as rings around a center, so that each item belongs simultaneously to a simplex and a circumplex where the simplex is not a substructure of the circumplex. The radex, unlike the circumplex and the simplex, cannot be defined entirely by its formal properties. It requires a substantively meaningful central point.

A **Simplex** is a simple unidimensional scale based on the contiguity principle that says items with similar structures should be fitted close together. The simplex can be seen in the coefficient matrix, or a matrix of distances, as well as in an SSA-I configuration. At the lowest level of point organization is an array of points orderable on the real line, i.e.,  $x_i < x_j$  ( $i=1,2, \dots, n-1; j>i$ ), for an arbitrary set of numbers satisfying the inequalities. Upon measuring the distances among the ordered set of points, the data matrix of coefficients,  $P$ , can be permuted by column and by row such that its elements will satisfy the condition  $p_{ij} \leq p_{i,j+1}$  and  $p_{ij} \geq p_{i+j,j'}$  i.e., the coefficients within each row and column will decrease toward the main diagonal. The simplex is often referred to as a simple Guttman scale.

## NOTES

1. Roy A. Rappaport provided extensive, helpful comments on a draft of this paper. I thank him for his generosity and counsel. I also thank other scholars for their comments on the draft. I benefited from suggestions by David F. Aberle, Richard Clemmer, Stephen McNabb, Lynn A. Robbins, and Eric R. Wolf. Four referees who responded to the editor’s request for comments on the journal made useful suggestions. I thank those persons, who remain any-

mous to me, as well. I also wish to thank James A. Fall, David S. Moyer, George Wenzel, and Richard G. Condon for the helpful criticisms of *SIS V* and *VI*, upon which this essay is based.

2. The principal litigation attorney for the native regional nonprofit corporation for Prince William Sound, Michael Hausfeld, of the firm Cohen, Milstein, Hausfeld & Toll, Washington, D.C., desired to control all information that might be collected from natives whose villages belonged to the regional corporation. Three months following the spill, access to the residents of Tatitlek, Chenega, Port Graham, and English Bay could not be obtained, although access was not hindered to residents of Valdez and Cordova-Eyak (in the Prince William Sound region) and all villages in other regions affected by the spill.

3. Stephen R. Braund & Associates, with P.J. Usher Consulting Services, "Effects of the *Exxon Valdez* Oil Spill on Alutiiq Culture and People" (Anchorage, AK: Stephen R. Braund & Associates, February 1993), 104, 105, 109 [Report prepared for Cohen, Milstein, Hausfeld & Toll and Sonosky, Chambers, Sachse, Miller & Munson].

4. The invalid logic and unwarranted empirical claims by the plaintiffs' attorneys are made painfully evident in the deposition taken by Ralph Shapira (attorney for the respondent) from Stephen Braund in regards to the *Exxon Valdez* Oil Spill Litigation in the United States District Court for the District of Alaska, Case No. A-89-095. (Anchorage, Alaska, 2–4 November 1993), 3 vols., 604 pages [Anchorage, Alaska: R & R Court Reporters].

5. See William Peterson, M. Novak, and P. Gleason, *Concepts of Ethnicity: Selections from the Harvard Encyclopedia of American Ethnic Groups* (Cambridge, MA: Harvard University Press, 1983); Nathan Glazer and Daniel P. Moynihan, "Introduction," in *Ethnicity: Theory and Experience*, ed. Nathan Glazer and Daniel P. Moynihan (Cambridge, MA: Harvard University Press, 1975).

6. Edward Burnett Tylor, *Primitive Culture* (London: Murray, 1871).

7. David F. Aberle. "Distinguished Lecture: What Kind of a Science is Anthropology?" *American Anthropologist* 89 (1987): 551–66.

8. When phenomena are defined and classified into mutually inclusive and mutually exclusive sets (known as possibility sets), we refer to the phenomena as "variables."

9. VECO is the corporation contracted by Exxon to oversee the chartering of boats, hiring of many of the personnel, and managing much of the logistics of the cleanup.

10. An exceptional treatment of relative deprivation in regard to the genesis and persistence of the peyote religion among the Navajo is found in David F. Aberle, *The Peyote Religion among the Navaho*, 2d ed. (Norman: University of Oklahoma Press, 1991), 315–51 [originally published in 1966 by the Viking Fund Publications, Wenner-Gren Foundation for Anthropological Research, Inc. and Aldine Press; 2d ed. published in 1982 by the University of Chicago Press.]

11. Paul J. Bohannon. Deposition Upon Oral Examination in regards to the *Exxon Valdez* Oil Spill Litigation in the United States District Court for the District of Alaska, Case No. A-89-095 (Visalia, California, 14 October 1993), 242 pages [Seattle, WA: Continental Reporting Services 206-624-DEPS (3377)].

12. See Braund & Associates with P.J. Usher, "Effects of the *Exxon Valdez* Oil Spill," 104–109.

13. Bohannon, Deposition Upon Oral Examination, 15.

14. *Gray literature* refers to reports prepared by or for government agencies or corporations. The reports may or may not be published. If published, the distribution is usually limited.

15. Bohannon, Deposition Upon Oral Examination, 13.

16. *Ibid.*, 14.

17. *Ibid.*, 15.

18. Bohannon uses the purposive word *need*, as in satisfying a need, rather than *contribution*. Each assumes that a part is necessary, if not sufficient, to the maintenance of a system.

19. Bohannon, Deposition Upon Oral Examination, 20.

20. *Ibid.*, 41–58.

21. Bohannon does not mention the Eyak-Athapaskans who reside in the spill area and who experienced early and constant contact with Russians.

22. Bohannon, Deposition Upon Oral Examination, 73.

23. *Ibid.*, 71.

24. At the end of this paper, there is a glossary of technical terms used here. *AQI* refers to the AOSIS Questionnaire Instrument (AOSIS is the acronym for "Alaska OCS Social Indicators System"). The initial instrument contained 232 questions. Each question had a finite set of choices for answers; hence, a questionnaire is a "forced choice" instrument; that is, the respondent must choose between, say, (1) "no" and (2) "yes," or choose one from among, say, (1) "easily," (2) "some difficulty," and (3) "great difficulty." Because every respondent is forced to choose from among a limited set of answers on each question, the questionnaire is "objective." *AQI* respondents were administered questionnaires (face-to-face) in the language preferred by the respondent by trained and experienced investigators.

*KIP* refers to the Key Informant Protocol instrument. The *KIP* is a list of open-ended questions (228), organized by topics. Researchers who administered the *KIP*s hold Ph.D.s in the social sciences, predominantly anthropology, and have extensive field research experience in Alaska and/or among Native American societies in the contiguous forty-eight states prior to conducting the social indicators research. Answers to *KIP* questions were elicited through discussion with informants, rather than forced choices, thereby requiring extensive note-taking by the interviewers. It was the *KIP* investigators' responsibility to assess the responses of the persons they interviewed to each question and, on the basis of that assessment, to create (that is, to define) a variable of mutually exclusive and inclusive categories (attributes) for each question. Next, the researcher "rated" the responses of each *KIP* informant for each question. That is to say, the researcher, rather than the person being interviewed, selected the appropriate category in which the interviewee's answer should be classified (rated). The *KIP* is more "subjective" than the *AQI*, because the investigators decided how to "rate" each informant's answers.

25. Traditional anthropological observations were made by the *KIP* investigators and all other senior research personnel and included focused discus-

sions using an institutional protocol with prominent persons in villages (elected leaders, persons appointed to public offices of all kinds, religious leaders, school teachers, business persons); conversations with persons on a catch-as-catch-can basis; collecting prices for goods and services; mapping the houses and other structures in the villages; attending and observing village activities; and reviewing histories, ethnographies, public records, and the gray scientific research literature about the village. Interviews with prominent persons were seldom hasty, allowing for open exchange of information.

26. The "Solomon Four Group Design," modified in our application through the addition of embedded panels, was inextricably tied to our pursuit of valid conclusions. The Solomon Four Group is the strongest design possible to eliminate threats to validity in survey research (see Donald T. Campbell and Julian C. Stanley, *Experimental and Quasi-Experimental Design for Research* (Chicago: Rand-McNally, 1966)). Our version of the design required three separate AQI "pretest" samples drawn at random (1987–89) and three separate AQI "posttest" samples (1988–91) drawn at random from the same villages as the pretest samples. Respondents from the pretest samples were not "replaced" into the pool of persons eligible to be selected for the posttest samples. It also required the selection at random of a 33 percent sample from each of the three AQI pretests. These three subsamples formed "panels" whose members were reinterviewed two or more times, one year separating each interview. Because we also used a protocol and sought to control for interinstrument and intra-informant reliability, the KIP pretest samples that we created prior to the spill were formed by drawing a 30 percent random sample from the AQI pretest sample for 1987 and a second 30 percent random sample from the AQI pretest for 1988. Following the spill in 1989, we created our KIP "postspill pretest" sample from a 70 percent random sample of the 1989 AQI "postspill pretest" sample. In 1991, we reinterviewed the entire KIP "postspill pretest" sample (thereby converting it to a panel) and contrasted the KIP responses from 1989 and 1991 of the "postspill pretest" respondents with the responses of the KIP "postspill posttest" sample of 1991 (which was selected from the AQI "postspill posttest" sample of 1991).

27. Complete descriptions of the methodology and the results of the reliability and validity tests appear in Joseph G. Jorgensen and Steven McNabb, *Social Indicators Study of Alaskan Coastal Villages II. Research Methodology: Design, Sampling, Reliability and Validity*, Technical Report No. 153, MMS Report Number 93-0035 (Anchorage: Minerals Management Service, 1993) (prepared by Human Relations Area Files for the U.S. Department of the Interior, Minerals Management Service Alaska OCS Region, Anchorage, Alaska)(*SIS II*); and in Jorgensen and McNabb, *Social Indicators Study of Alaskan Coastal Villages V. Research Methodology for the Exxon Valdez Spill Area, 1988–1992*, Technical Report No. 156, MMS Report No. 93-0071 (Anchorage: Minerals Management Service, 1993) (prepared by Human Relations Area Files for the U.S. Department of Interior, Minerals Management Service Alaska OCS Region, Anchorage, Alaska)(*SIS V*).

28. T. Brelsford, A. Fienup-Riordan, J. Jorgensen, S. McNabb, P. Petrivelli, and L. Robbins, *Social Indicators Study of Alaskan Coastal Villages I. Key Informant*

*Summaries. Volume 1: Schedule A Regions*, Technical Report No. 151, MMS Report Number 92-0031 (Anchorage: Minerals Management Service, 1992) (prepared by Human Relations Area Files for the U.S. Department of the Interior, Minerals Management Service Alaska OCS Region, Anchorage, Alaska)(*SIS I*); J. Endter-Wada, J. Hofmeister, R. Mason, S. McNabb, and J. Mulcahy, *Social Indicators Study of Alaskan Coastal Villages I. Key Informant Summaries. Volume 2: Schedule B Regions*, Technical Report No. 151, MMS Report Number 92-0031 (Anchorage: Minerals Management Service, 1992) (prepared by Human Relations Area Files for the U.S. Department of the Interior, Minerals Management Service Alaska OCS Region, Anchorage, Alaska)(*SIS I*); J. Endter-Wada, J. Hofmeister, R. Mason, S. McNabb, E. Morrison, S. Reynolds, E. Robbins, L. Robbins, and C. Takada Rooks, *Social Indicators Study of Alaskan Coastal Villages IV. Postspill Key Informant Summaries. Schedule C Communities, Part 1 (Cordova, Tatitlek, Valdez) and Part 2 (Kenai, Tyonek, Seldovia, Kodiak City, Karluk, Old Harbor, Chignik)*, Technical Report No. 155, MMS Report No. 92-0052 (Anchorage: Minerals Management Service, 1993) (prepared by Human Relations Area Files for the U.S. Department of Interior, Minerals Management Service Alaska OCS Region, Anchorage, Alaska)(*SIS IV*).

29. The final report for the spill area research, Joseph G. Jorgensen, *Social Indicators Study of Alaskan Coastal Villages VI. Analysis of the Exxon Valdez Spill Area*, Technical Report No. 157, MMS Report No. 93-0064 (Anchorage: Minerals Management Service, 1995) (prepared by Human Relations Area Files for the U.S. Department of Interior, Minerals Management Service Alaska OCS Region, Anchorage, Alaska)(*SIS VI*), contains an appendix with more than 120 pages of univariate frequency distribution tables for eighty-three AOSIS Questionnaire Instrument (AQI) variables and ninety-two Key Informant Protocol (KIP) variables for the prespill and postspill samples and for the panels for the research waves conducted during the winters of 1988 and 1989, the summer of 1989, and the winters of 1990 and 1991. There are another sixty-two tables of correlation matrices and various cross-tabulated and partialled (subclassified) data in the body of the report. For the sake of brevity, two univariate frequency distribution tables (tables A1 and A2) are provided at the end of this paper, one of AQI data and one of KIP data collected among the combined postspill pretest sample (some respondents interviewed five months and others ten months after the spill) and the postspill posttest sample (respondents interviewed twenty-two months after the spill). Less than half of the AQI and KIP variables are listed in these tables. Tables of panel data have also been omitted, principally because there were no significant differences between panel responses and sample responses. The items that are listed have been selected because of their relevance to the thesis presented here.

30. Jorgensen, *Social Indicators Study of Alaskan Coastal Villages VI. Analysis for the Exxon Valdez Spill Area, 1988–1992*.

31. This topic is too large to address here, but the most important congressional acts were massive social engineering projects whose goals were to instill Western ideology while creating individualistic market behavior among Indians. The key legislation was as follows: (1) the General Allotment Act of 1887

(also known as the Dawes Severalty Act), in which Indian reservations were allotted in severalty, unallotted land was placed in the public domain, and allottees were encouraged to convert their allotments to fee simple and relocate to cities, thereby gaining citizenship; (2) the Indian Reorganization Act of 1934 (also known as the Wheeler-Howard Act), in which tribes were incorporated (but not as shareholders), constitutions were ratified (sometimes charters were also ratified), and tribal officials were elected to manage tribal assets and other affairs of the tribe, although any or all of their decisions could be vetoed by the secretary of the interior; and, in the instant case (3), the Alaska Native Claims Settlement Act of 1971, in which for-profit regional and village shareholder corporations were mandated, claims to resources were extinguished, and village economies were expected to integrate, successfully, into the world market.

32. The Indian Reorganization Act as extended to Alaska in 1936 and the Alaska Native Claims Settlement Act of 1971 are the major acts that affected native resource bases and the political and legal means by which they were to develop economically.

33. The genesis of the Protestant ethic, according to Max Weber in *The Protestant Ethic and the Spirit of Capitalism*, was from fears of predestination, as articulated by John Calvin and the Pietists. An inner-worldly activism of Protestants caused them to develop the gifts that god had granted them as they engaged in a hopeless quest to determine whether they were called and, if called, whether they were chosen. Whereas any number of “gifts” could be developed—from singing to preaching—the accumulation of wealth (wealth which was soon invested and reinvested), for its own sake, was the activity from which capitalism grew forever more. The notions of predestination and inner-worldly activism are irrelevant to our use of the Protestant ethic, but the economic and ethical practices and social forms that accompanied and were subsequently nourished by capitalism in an obvious feedback relation are not.

34. Charles Perow, in *Normal Accidents* (New York: Basic Books, 1984), defines normal accidents, such as the foundering of the *Exxon Valdez*, the meltdown at Chernobyl, the leaking of radioactivity at Three Mile Island, and the accident at Union Carbide’s Bhopal chemical plant, as normal consequences of combinations of unanticipated system failures in complex technologies.

35. There were too few landlords and too few small business owner-operators in our samples to test our hypotheses about conflicts between landlords and tenants, employers and employees. The “ethnographic” evidence collected by our key investigators supports all of our hypotheses about conflicts between nonnatives as distinguished here. This evidence yields “concluding hypotheses” and informed our analyses of the AQI and KIP responses.

36. Although this is redundant, the reader is apprised that, prior to the spill, three waves of social indicator research were completed among thirty-one villages located from Kodiak Island to the Beaufort Sea (winters of 1987, 1988, and 1989). The research among the original thirty-one villages constitutes the “first phase” of the social indicators study.

37. Bohannon, *Deposition Upon Oral Examination*, 57.

38. *Ibid.*, 73–74.

39. *Ibid.*

40. See *SIS II* 1993: 130–39, 171–75, 209–12; *SIS III* 1994: 31–159, 265–331.

41. Jorgensen, *Oil Age Eskimos* (Berkeley, CA: University of California Press, 1990), 75.

42. I define commodities as anything from mineral rights to a human's productive capacities that is sold in the marketplace.

43. The results were not surprising, inasmuch as the economies of two Hub villages, Kenai and Valdez, are dominated by oil-related businesses and tourism, not commercial fishing. But commercial fishing is not the issue and does not explain why some respondents know a lot and most know very little about the environments in which they live.

44. Natives comprise about 30 percent and nonnatives about 70 percent of the aggregate 1989 and 1991 samples.

45. Reference here is to the thirty-one villages located from Kodiak Island northward to the Beaufort Sea studied from 1987 through 1990.

46. The box on page 32 provides examples of four variables from the KIP, in which the items (variables) that indicate traditional customs in village Alaska, the attributes (or ranks or variates) distinguish "Western" or nonnative customs from "Traditional" or native customs. In general, the variables are structured so that the presumed-Western attributes appear as the first attribute (dichotomous) or in lower ranks (ordinal), and the presumed-Traditional attributes appear as the second attribute or in the higher ranks. The same format for variable definitions is followed in the AQI. For example, the nominal variable A28 asks whether subsistence food was a large part of any of the meals the respondent ate yesterday: 0 = no, 1 = yes. Respondents understand "subsistence food" to be meat or plants of any kind procured from naturally occurring resources. If a person answers "yes" to A28, the response fits one feature of what we presume to be traditional among village dwellers. It is the case, of course, that many nonnatives residing in Alaskan villages extract and consume "subsistence" food, and many nonnatives, even a very few natives, do not extract and consume "subsistence" food. We therefore require several variables measuring features of the subsistence economy and several measuring communitarian customs to determine whether there is a "Traditional" structure and a "Western" structure and, perhaps, something in between in village life.

47. We conducted two research waves in 1989, one before and one after the spill. The KIP variable K4 measures household annual income. It is based on an estimate provided by the respondent for the aggregate income of all members of the household. The household comprises coresidents under a single roof but includes persons residing in attached housing whose domestic activities are integrated with those of the main residence.

48. The KIP ordinal variable K1 measures the household's subsistence harvesting expenses as an estimated percentage of total annual income. The expenses include the purchase and repair of equipment, purchase of fuel, purchase and repair of clothing, purchase of ammunition, food, and incidentals required for travel and camping. The ranks range from (0) None to (4) High (30

percent and over). The ordinal variable K2 measures the variety of naturally occurring resources harvested annually by the informant's family household. The responses are classified into five ranks in which (1) = no naturally occurring species harvested, (5) = more than three species in each of the following categories for which species are available in the respondent's local environment: land mammals, sea mammals, waterfowl or seabirds, marine invertebrates, fish (fresh, anadromous, and/or saltwater species), and plants (marine or land). Ranks (2) thru (4) measure intermediate amounts of varieties harvested.

49. The KIP ordinal variable K3 measures the proportion of naturally occurring harvested protein (wild meat) in the annual diet of the household. It is an aggregate estimate for household members and includes items that are harvested by members of the household as well as items that are received by household members through gifting, sharing, or exchange. The range is from (1) less than 25 percent to (4) 76 percent to 100 percent.

50. In 1989 and 1991, native panel respondents gained less of their diets from wild foods than did native pretest and posttest respondents during those same years. For example, in 1991, 50 percent of native panel respondents gained more than 25 percent of their diets from wild foods in 1991, whereas 75 percent of native posttest respondents gained more than 25 percent of their diets from wild foods.

51. Regular sharing within the village means that respondents, on a regular basis, donate or receive cash (K11A-B), labor-services (K13A-B), and goods-resources (K15A-B) from persons in households other than their own, not necessarily relatives. Regular sharing outside the village means that respondents donate to or receive cash (K12A-B), labor-services (K14A-B), or goods-resources (K16A-B) from residents of a village different from the respondents' on a regular basis. Sharing within the village is ranked from (1) "none," through (2) "pooled within the household," and (3) "occasional sharing with other households in the village," to (4) "regular sharing with other households in the village." There are three ranks for sharing with distant villages: "none," "occasional," and "regular."

52. There is a large literature that treats subsistence economics, such as the Alaska Native economy described here, as self-regulating systems that work to optimize native survival in places of unequally distributed and fluctuating resources. The actions of giving resources, labor, and the like by the participants in the system are unwitting, albeit crucial, elements in maintaining a system that regulates itself. There are no independent measures of the self-regulating system. It is an idea without empirical warrant, but, then, so is the invisible hand of the market.

53. "Taste" of "x" is widely used by natives in Alaska to refer to a food item, such as murre eggs, that they miss and would like to eat, even if only a "taste."

54. I remind the reader that a glossary of technical terms appears at the end of this paper.

55. Multidimensional similarity structure analysis (SSA) comprises a class of models that represent similarity coefficients among a set of objects by distances in a multidimensional space. Given a correlation matrix of twenty-



one KIP items (variables), as in table 6, SSA represents the items as points in a Euclidian plane such that two points are closer together, the higher the respective items are correlated. If the relation between correlations and distances is sufficiently precise, a picture of the similarities of these variables is obtained. The picture, also known as a “configuration of points” or a “solution,” is much easier to look at than table 6 and enables us to find patterns in the data that would otherwise remain hidden (see Ingwer Borg and James Lingoes, *Multidimensional Similarity Structure Analysis* [New York: Springer-Verlag, 1987]). The patterns in space, referred to as “structures,” that we seek to identify are well known to practitioners of multidimensional scale analysis (known as MDS as well as SSA).

56. The proportional reduction of error (PRE) coefficient employed here is Kendall’s  $\tau_b$  ( $t_b$ ) for ordinal data.

57. The sharing variables are items K11A–K16B.

58. The correlation matrices for the native and nonnative panels for 1989 and 1991 were tested for differences from the native and nonnative pretest and posttest samples. There are no significant differences between the panels and samples for the items analyzed here. The SSA configurations for the panels are similar to figures 1 and 2.

59. The native KIP solution for 1989 is very similar to the SSA solution obtained for the questionnaire (AQI) variables pertaining to subsistence organization for 1989. The AQI solutions for panels and samples, and the KIP solutions for panels, appear in *SIS VI*.

60. SSA has a special set of terms to identify regions in space. *Centrality* and *multiplex* are two such terms. *Cylindrex*, *conex*, *simplex*, *radex*, *circumplex* are other terms used to define specific structures in space. *Modulating*, *polarizing*, and *axis* are terms used to identify “facets” that account for the structures of cylindrexes, conexes and other complex multiplexes. A brief glossary of SSA’s specialized vocabulary appears at the back of this paper.

61. “Involution of sharing” implies that if a household shares food, it is also most likely to share equipment, labor, services, even cash. When commenced, sharing triggers further sharing—as donors and receivers. A web forms that appears to be ever more tangled as household A gives to B and C and receives from C, D and E. Involution of sharing also implies that if a person (household) does not share A, it does not share B or C either. This last phenomenon better accounts for nonnative sharing.

62. The proportion of respondents gaining 50 percent of their diets from naturally occurring resources was much smaller among panel respondents in 1991.

63. For readers who may have forgotten, VECO is the corporation contracted by Exxon to oversee the chartering of boats, hiring of many of the personnel, and managing much of the logistics of the cleanup.

64. See tables A1 and A2, and see *SIS VI*, part one.

65. Bohannon, *Deposition Upon Oral Examination*, 73.

66. Incomes are derived from weighted averages of AQI (questionnaire respondent) and KIP (protocol respondent) incomes. We did not create a new

posttest sample (without replacement) on Kodiak Island during the winter of 1989, although we reinterviewed our AQI and KIP panel members. The prespill AQI panel created during the first phase of the social indicators study comprises a 33 percent sample of respondents drawn at random from the AQI pretest sample of the previous year (1988 for Kodiak Island villages). The prespill KIP panel comprises all respondents in the KIP sample of the previous year (1988). Among panel members, native household incomes averaged \$26,000 and nonnatives \$47,000 for the 2/88–2/89 period. In obtaining these averages, AQI and KIP panel member incomes were weighted. In all comparisons of panel and nonpanel respondents between 1987 and 1991, panel respondents were more frequently employed, were employed for more months each year, and earned higher incomes than did nonpanel respondents. Employment, income, and income stability (earned or unearned) proved to be joint predictors of length of residence in a village. The selection of panel respondents from pretest samples, then, had the unintended effect of selecting persons with greater months of employment, higher incomes and/or greater stability of income, and greater stability of residence than the averages for the pretest samples from which they were drawn. That is to say, persons selected for the pretest samples whose situations in villages were most secure were most apt to be in the village during subsequent research waves when panel respondents were selected at random from the original pretest samples.

67. Income for 1989 tallies the period seven months prior to the spill and five months after the spill 8/88–8/89. Income for 1991 tallies the period 2/90–2/91.

68. The relative variation of incomes for the two populations are measured from the average (mean) incomes for each. The coefficient of relative variation is obtained from the standard deviation:  $CRVs = s/\text{Mean} \times 100$ .

69. The thirteen regional corporations are composed of an aggregate of about two hundred villages.

70. See Jorgensen, *Oil Age Eskimos*, 133–202.

71. The reader is referred to tables A1 and A2 for variable definitions and the frequency distribution for each variable.

72. *SIS V* 1994: chapters 10–11.

73. See *SIS VI* chapter 2.

74. See *SIS III*.

75. In the matrices (table 8) for figure 3, I have used Kendall's  $t_b$  rather than Goodman and Kruskal's  $\gamma$ . When every item in a matrix is ordinal,  $\gamma$  is a better PRE than  $t_b$  because its interpretation is comprehensible. The criticism of  $\gamma$  is that it does not correct for ties.  $t_b$  corrects for ties, but in so doing, it underestimates the ordered relations among pairs. For example,  $\gamma$  coefficients for the matrices accompanying figure 3, except for the scores near zero, are from 20 to 50 percent higher than the comparable  $t_b$  coefficients. I have used  $t_b$  here because several dichotomous variables are included in the matrices and because in a four-cell table,  $\gamma$  behaves as a coefficient of inclusion rather than a reversible measure. It also has the undesired characteristic of producing unities (1.00) for any four-cell table in which the frequency in any cell is zero. A matrix littered with unities plays havoc with SSA analysis. The PRE scores in the matrices conform to the

same order produced by the  $\gamma$  coefficients. I have forsaken higher PRE values, in general, to avert PRE values that are too high (1.00, -1.00).

76. ANCSA, alone, is not responsible for health, education, and other services provided to natives. The history of how and why those services came to be federal or state obligations is complex only as Indian law can be complex. I shall not provide that history here. These and other obligations owed to Alaska Natives grew from a mountain of federal legislation that variously dispossessed natives of their land and claims to resources. In brief, health and education services are obligations for the expropriations of native resources and for extending federal hegemony over natives (thus denying natives crucial attributes of sovereignty).

77. All things equal, if persons are educated, possess the franchise in democratic organizations, develop their skills so as to benefit themselves, delay gratifications, and economize scarce resources so as to maximize future benefits, they will be operating with a work ethic, or Protestant ethic, or democratic capitalist ethic, in its nature future-oriented.

78. In the native configuration for 1989 (figure 3), higher incomes (K4, B) correlate with larger (K17, C) and better informed and more politically active respondent households: One or more household members likely hold official political positions (K24, G), the respondent is knowledgeable of current political issues (K25, H), about disputes between commercial fishermen (Q16A, A), and about economic conflicts within the community and between persons within the community (K33A K33B, O P Q).

79. The higher income conexus also includes respondents who are skeptical that future economic developments in the local area will provide benefits locally or be controlled locally (K32, O). There are two reasons for larger households reporting larger incomes: The larger the income, the larger the households that can be supported, and the larger the household, the more likely that more than one person contributes to the household income, thereby allowing larger households to be maintained. The lower incomes are fitted with smaller households, recent changes in household composition (K19, D), lax expectations about household membership, some change in marital relations (K22, F), knowledge about the services provided by community agencies and relatively frequent use of the health and financial services (K35 K39, R U), frequent attendance at religious services and participation in extracurricular religious events (K24 K25, I J), and the communitarian ranks of the variables measuring the ethics of personal attainment and of competition or cooperation, ideas about whether the environment is viewed as commodity or as phenomena with cultural /spiritual significance, and whether acculturation is Western or traditional (K28 K29 K30 K31, K L M N).

80. The long-term areas in 1989 join lower incomes with recent changes in the compositions of some households, households in which some member is apt to hold some political office (K24 G), the greater proportions of the uses of social services (K39, U), knowledge of economic conflicts and personal economic conflicts within the community (K33A K33B, P Q), the claim that children are acculturated through a mixture of Western and traditional practices (K31, N),

with espousal of the ethics that a person should compete but also cooperate within the local economy (K30, M), attain personal skills for self but also for one's family and kinspersons (K28, K), and with a view of the environment that embraces its commodity value while recognizing its beauty (K29, L). The short-term area includes higher incomes (K4, B), skepticism of the benefits from economic developments that occur locally (K32, O), knowledge of political issues (K25, E), knowledge of social services (K35, R), explicit rules for household membership and behavior (K20, E) and other Western ideas and practices, relatively frequent attendance at religious services and participation in activities sponsored by church groups (K26 K27, I J), higher proportions of divorces (K22, F), and several recent changes in household composition (K19, D).

81. Attitudes, or opinions, can be "cognitive" (i.e., to know or to think), "affective" (i.e., to feel), or "instrumental" (i.e., to do). The original AQI contained more than sixty attitudinal questions, fifty "affective" and ten "cognitive." Of the affective questions, forty-five did not pass our reliability and validity tests and were eliminated from the study. All of the cognitive questions passed the tests and were retained.

82. Eighty percent of panel and 62 percent of postspill 2 native respondents were born and reared in the regions in which they were interviewed.

83. Although not shown here, these items occupy central places in the KIP panel solution, forming a simplex with knowledge of personal economic disputes and skepticism of the local benefits of economic developments that may occur locally.

84. The region on the left comprises several areas in which several relations overlap: In the left-rear quadrant, knowledge of the charges of social service agencies (K35, Q) predicts knowledge of interpersonal economic conflicts in the community (K33B, P). The latter is connected to explicit household membership rules (K20, E), whereas Q is not, but Q is connected to skepticism about local economic developments and to correct knowledge of several political issues (K25 K32, H N), whereas P is not. The region is complex and is organized on the basis of particular needs and circumstances.

85. The short-term higher income region comprises income (K4, B), household size (K17, C), respondents divorced one or more times (K22, F), occasional or regular attendance at religious meetings and extracurricular activities (K26 K27, I J), uses of many social services (K39, T), and espousal of the ethic that persons should cooperate as well as compete in their economic pursuits (K30, M).

86. Single-person households comprise large proportions of nonnative living arrangements in the commercial fishing villages, whether or not the respondent is married.

87. Differences in panel household arrangements are direct measures of change. Panel:postspill differences are not significant for 1991.

88. Frequently, the son or daughter is divorced or separated and coresiding with children—note that 27 percent of native households in both panel waves are single parents with children, and sometimes the son or daughter is married and coresiding in a conjugal pair arrangement.

89. *SIS III*.

90. The proportions of the native postspill 1 (1989) and 2 (1991) samples who recently ate several meals as guests are highlighted in table 10.

91. In 1989, 33 percent and, in 1991, 40 percent of nonnative postspill respondents attended public meetings during the month prior to the spill.

92. Nina Munk, "We're Partying Here," *Forbes* (24 October 1994), 90.

93. Jeff Wheelwright, *Degrees of Disaster: Prince William Sound: How Nature Reels and Rebounds* (New York: Simon & Schuster, 1994), and "Exxon is Right, Alas," *New York Times* (July 1994).

94. Roger H. Green and Charles H. Peterson, "Science and the Law: After the Oil Spill," *Toronto Globe and Mail* (19 August 1994).

95. *Ibid.*

96. Wheelwright, "Exxon is Right, Alas," wrote, "The plaintiffs' experts had no proof to explain the broad swings that occurred."

97. Green and Peterson, "Science and the Law: After the Oil Spill."

98. Exxon's worth was estimated at \$74 billion; the plaintiffs sought \$15 billion in damages (Rosanne Pagano, "Exxon Says It's Paid Enough; Lawyer Says It's Pay Back Time," *Salt Lake Tribune* (22 August 1994) (widely circulated Associated Press article).

99. *Ibid.*

100. Michael Parrish and Stuart Silverstein. "Emotions of Alaskans Are Mixed on Verdict," *Los Angeles Times* (19 September 1994).

101. Nina Munk, "We're Partying Here," 84-90.