Sociological Perspectives
Vol. 41, No. 1, pp. 1-26

ISSN 0731-1214

FORTY YEARS OF SPOTTED OWLS? A LONGITUDINAL ANALYSIS OF LOGGING INDUSTRY JOB LOSSES

WILLIAM R. FREUDENBURG*
LISA J. WILSON
University of Wisconsin-Madison

DANIEL J. O'LEARY
Widmeyer-Baker Group

ABSTRACT: *The protection of habitat for an officially designated "threatened" species, the Northern Spotted Owl, is widely seen as having endangered the survival of a very different "species," namely the rural American logger. In spite of the widespread agreement on this point, however, it is not clear just how many jobs have been endangered, over just how long a period, due to the protection of spotted-owl habitat and of the environment more broadly. In the present paper, we analyze longer term employment trends in logging and milling, both nationally and in the two states of the Pacific Northwest where the spotted-owl debate has been most intense, to determine the length of time over which such environmental protection efforts have been creating the loss of logging and milling jobs. There are three potential key "turning points" since the start of high-quality employment data in 1947—the 1989 controversy over the federal "listing" of the Northern Spotted Owl under the Endangered Species Act, the earlier increase in environmental regulations accompanying the first Earth Day in 1970, and the still-earlier "locking up" of timber after the passage of the Wilderness Protection Act in 1964. We also examine the effects of two other variables that have received considerable attention in the ongoing debates—levels of U.S. Forest Service timber harvests and the exporting of raw logs. We find that the 1989 listing of the spotted owl has no significant effect on employment—not even in the two states where the debate has been most intense. Instead, the only statistically significant turning point came with the passage of the Wilderness Act in 1964. The direction of the change, however, was precisely the opposite of what is generally expected. Both nationally and in the Pacific Northwest, the greatest decline in timber employment occurred from 1947 until 1964—a time of great economic growth, a general absence of "unreasonable environmental regulations," and growing timber harvests. The period since the passage of the Wilderness Act has been one of increased complaints about environmental constraints, but much less decline in U.S. logging employment. If logging jobs have indeed been endangered by efforts to protect the environment in general and spotted-owl habitat in particular, what is needed is a plausible explanation of how the influence of the owls could have begun more than forty years before the species came under the protection of the Endangered Species Act.*

*Direct all correspondence to: Dr. Freudenburg: Department of Rural Sociology, 1450 Linden Dr., #336, University of Wisconsin, Madison, WI 53706; *e-mail*: Freudenburg@ssc.wisc.edu.

INTRODUCTION

While logging has been an important part of the Pacific Northwest economy ever since European Americans arrived in the region, only recently has the activity received increased attention from sociologists. Much of that attention has come in response to growing concerns over environmental regulations—specifically including efforts to list the Northern Spotted Owl as a "threatened" species—which have caused many loggers in the region to argue that they, not the owl, are "endangered" (Satchell 1990). The loggers' concerns have been echoed by many of the scholars who have examined the issue most closely (see especially Brown 1995; Carroll 1995; Lee 1993); in addition, government officials, timber industry executives, and the mass media (see Rice 1992; Fitzgerald 1992; Levine 1989) have joined the scholars and the loggers, predicting that spotted owl protection would lead to economic and social havoc in rural timber communities. In spite of the widespread nature of the concerns, however, it is not entirely clear just how many jobs have been lost, over just how long a period, due to the limitations imposed on logging through efforts to protect spotted-owl habitat and to provide other forms of environmental protection.

That is precisely the gap the present article is intended to fill. The article is divided into four main sections. The first provides a review of both the scholarly literature and the more popular assessments that have been offered to date on the spotted-owl issue. The second section summarizes our efforts to compile the most reliable data available, doing so in a way that permits comparisons between the national level and the two-state region of Washington/Oregon where spotted-owl disputes have been most intense. In the third section, we subject the available data to straightforward multiple regression analyses that, despite their simplicity, explain over 90% of the variance at the national level, and over 80% of the variance at the regional level. In the fourth and final section, we offer alternative explanations for job losses and discuss the implications of examining "what everyone knows," noting the need for increased sociological attention to the changing dynamics of the relationships between societies and their natural resource bases.

EXISTING ASSESSMENTS

While scholarly writing on the spotted-owl issue is a relatively recent phenomenon, this recent writing both reflects and grows out of a much larger body of work that has dealt with society-environment relationships more broadly. Some of the best known analysts of society environment relationships, including Catton (1982), Schnaiberg (1980), and O'Connor (1988), have characterized economic growth as a major threat to environmental protection—and vice versa. More recently, the work of Schnaiberg and Gould (1994) has characterized the relationship between society and environment as involving an "Enduring Conflict," with the "major argument" of the book being that there is a "conflict between economic growth and environmental protection" (1994:94).

In many respects, the debates over logging in the Pacific Northwest would appear to provide a particularly clear empirical example of the environment-

versus-economy expectation—a point that is underscored by the ways in which the spotted-owl issue has been discussed in the sociological literature to date. Lee (1993), for example, argues that efforts to preserve old growth forests and spotted owls have not only limited economic growth, but created "a severe economic and social impact" (1993:1; see also Greber *et al.* 1990; Conway and Wells 1993). Similarly, Humphrey *et al.* (1993:159) trace "the potential impoverishment" of forest products workers in the Pacific Northwest to "growing concern for old growth forests and their ecological structure," particularly given what these authors characterize as "the growing power of a national elite dedicated to environmentalism." While loggers were once seen as veritable folk heroes, Humphrey *et al.* (1993:161–62) argue, the newer views involve "images such as 'buffalo hunters,' 'tree murderers,' and 'rapers of the land'"—with the newer images being used to justify the exclusion of loggers from continued access to the trees and to their traditional basis for earning a living (see also Lee 1994; Carroll 1995).

Academic researchers, however, are only a small fraction of the people paying attention to the "enduring conflict" in the Pacific Northwest. Not surprisingly, a number of the more forceful statements have come from representatives of the timber and lumber industries (see Flynn 1991; Bland and Blackman 1990; *Forest Industries* 1991), who blame owl protection (and environmentalists) for job losses, timber shortages, and higher timber prices. Yet the tendency to blame owls and environmentalists also goes well beyond timber industry publications: In recent years, headlines in a variety of popular periodicals have spoken of "The Great Spotted Owl War" (Fitzgerald 1992), have noted claims that "The Spotted Owl Could Wipe Us Out" (Levine 1989), and have referred both to "The Endangered Logger" (Satchell 1990) and to a battle of "Owl vs. Man" (Gup 1990).

The message of the headlines is generally reinforced by the articles themselves. Fitzgerald (1992:93), for example, writes that, "[T]he wheels of government and the federal courts have been set in motion to protect the owl. The result has been havoc for people." Gup echoes this assessment, arguing that "[T]he nation's reinvigorated environmental movement is about to collide head on with economic reality" (Gup 1990:58), leading to extensive job losses and social disruptions in the Pacific Northwest (see also Easterbrook 1994; Fisher and Schubert 1992; Rice 1992).

Liebler and Bendix (1994) find that the characterization of the issue as involving "jobs versus owls" is one that holds for the broadcast media as well. As they note (1994:7), environmentalists and logging representatives have generally presented competing "frames" on the story, with environmentalists portraying the timber industry as destroying the forests, and with "the timber industry responding with economic and human impact frames: owls versus people." Despite the widespread claim that the mass media have an "anti-industry" bias (for a review of the relevant literature, see Freudenburg *et al.* 1996), it was the timber industry approach, rather than the environmentalists' approach, that was generally adopted by television reports. An outright majority of the news stories presented on the evening news broadcasts of the three major networks stressed the "jobs" side of the controversy over the environmental side, adopting and reinforcing the "jobs versus owls" frame of reference (Liebler and Bendix 1994:10).

While the periodicals of environmental groups have been more likely to state the case for saving the owls and their habitat, even these publications reflect the prevailing belief that efforts to protect owl habitat are likely to prove a major source of dislocation for the region's workers. In the official magazine of the Sierra Club, for example, Tisdale (1992), a self proclaimed "tree-hugger," describes posters asking "A spotted owl needs hundreds of acres to live—why can't I have some of that land to live on? Am I important?" (see also Mitchell 1990; Mitchell and Lamont 1991). A number of environmentally oriented analysts, however, have argued that the loss of jobs should instead be traced to the fact that so much lumber is being exported to other nations in the form of raw logs, rather than first being transformed into finished products such as furniture (see Anderson and Olson 1991; Brown 1995; Foster 1993; Glick 1995).

Considering the emotional salience of the issue, perhaps it is not surprising that the "jobs-versus-owls" debate—and "the enduring conflict" more broadly—have come to occupy prominent roles in policy debates. One of the most concise statements, in fact, came from the re-election campaign of George Bush, who predicted that an environmentally minded Democratic administration would mean, "[W]e'll be up to our necks in owls, and outta work for every American" (Devroy 1992:A1, A16). Yet concern over the issue in the policy world is by no means a new phenomenon. As noted by Hibbard and Elias (1993), policy discussions in the U.S. have long reflected the view that community stability, particularly in forested rural regions of the country, depends on continued timber harvests from public lands. While recent studies have begun to cast doubt on the expectation for a positive relationship between harvest levels and community stability (see e.g. Machlis *et al.* 1990; Force *et al.* 1993; Heberlein 1994; see also Yoho 1965; Freudenburg 1992; Freudenburg and Gramling 1994b; Peluso *et al.* 1994), the expectation continues to be highly influential in policy discussions involving timber harvesting in the Pacific Northwest (see Lee 1993).

Still, despite the widespread agreement, there are at least two important problems, in empirical terms, with the tendency to blame the logging industry job losses and attendant socioeconomic disruptions on environmental protection efforts. The first has to do with the matter of turning points: Even if there is agreement that environmental protection is to blame for job losses, there is considerably less agreement about the time when this effect should be seen as having begun. While many analyses point to the 1989–90 "listing" of the spotted owl as an officially "threatened" species, any number of authors have identified earlier starting points, with two dates having received particular attention. Many authors single out the importance of 1970, the time of the National Environmental Policy Act and the first "Earth Day" (see e.g. Dunlap 1990; Freudenburg and Gramling 1994a; McCloskey 1992; Mitchell, Mertig and Dunlap 1992). Other writers have singled out the earlier turning point of September, 1964, when the Wilderness Protection Act was officially signed into law (Nash 1982:226; Runte 1987:240). Final Congressional action on this bill came only after years of debate—according to the Wilderness Society (1996), for example, the Act went through 66 rewrites and 8 years of legislative battles—largely due to the bitter objections of many senators and representatives from forest-dependent regions, particularly in the western U.S., who

feared that the Act would "lock up" valuable forest lands and end the virtual "Golden Age" of booming timber demand that had characterized the first two decades after the end of World War II. One memorable example is provided by Colorado Congressman Allott's speech against the proposed legislation in September of 1961, three years before the Act became law (as recorded in the *Congressional Record* for Sept. 5, vol. 107, part 3, p. 1080): "We can't permit the West to cling on the vine and stagnate...we must develop our forests if we expect to go forward." Despite the intensity of the objections, however, the Act did ultimately pass; when it did, the Act established a National Wilderness Preservation System, starting the process of Congressional wilderness designations with 9.1 million acres of U.S. Forest Service land, mainly in the western U.S.

Aside from the matter of differing views on turning points, the second problem is that, while agreement on the jobs-versus-environmental-protection assessment is clearly widespread, it is not a matter of complete consensus. At least within the research community, a number of respected authors have argued that the job losses should be seen as resulting from other factors, such as mechanization, the exporting of "raw" or unprocessed logs, or the fact that most of the giant old trees had already been cut before the spotted-owl issue erupted. These arguments are often overlooked in the noise of the ongoing debate, but they deserve careful consideration nevertheless. Roughly a decade before the spotted-owl issue came to widespread public awareness, for example, Young and Newton (1979) called attention to the widespread closing of sawmills in the Pacific Northwest, noting that the closures had been particularly extensive in the rural regions where the spotted-owl protests would later become the most intense. More broadly, any number of other analysts have expressed the concern that, in the words of Love's concise assessment of employment trends (1997:217), "[T]he owl controversy has been masking ongoing changes in the Northwest timber industry" (see also Beuter *et al.* 1976; Brunelle 1990). Even the figures used by the official "Forest Service Ecosystem Management Assessment Team" or FEMAT (1993) show annual timber industry employment in the spotted owl region to have declined significantly, from roughly 168,000 to roughly 151,000 jobs, between the early 1970s and the "pre-owl" late 1980s—despite the fact that wood exports from this region rose more than 50%, from about 3.2 billion to about 5 billion board feet, over the same period (FEMAT 1993: vi23).

FROM ARGUMENT TO ANALYSIS

In short, despite the pervasive belief that the loss of logging and logging related jobs in the Pacific Northwest can be traced to environmental concerns, there is less than full agreement over just when those environmental concerns—and which such set of concerns—should be seen as having begun to exercise an effect. This question, however, is an inherently empirical one, and it is to the answering of this question that we now turn.

Any such empirical examination needs to begin with the recognition that arguments about the negative impact of environmentalism on employment apply mainly to the logging and milling sectors of the timber industry, rather than to

"forest-dependent" communities and populations more broadly. As Beckley (1994) has noted, the broader range of forest-dependent activities also includes subsistence, tourism, recreation, amenity dependence, and other societal uses of forests, many of which could well be enhanced rather than harmed by increased environmental protection. The analyses in this paper, accordingly, will be limited to the areas of employment that are generally expected to be most negatively affected by spotted owl protection and related mill closures, namely commercial logging and sawmill employment. Next, given that much of the recent discussion of the issue has focused on timber harvests on the lands managed by the U.S. Forest Service, we will include Forest Service harvest levels among the independent variables being considered. Finally, based on the claims that the exporting of raw or unprocessed logs also leads to the "exporting" of jobs, log exports will also be included among the independent variables.

National employment data have been drawn from the U.S. Bureau of Labor Statistics (BLS). These figures have been adjusted in several minor ways since we began our research on the topic; in the interest of simplicity and replicability, we will draw all of our statistics from the most comprehensive of the available recent reports, *Employment, Hours and Earnings—United States, 1909–1994* (U.S. Department of Labor 1994). Employment data for the states of Washington and Oregon, which are calculated in the same way as are the national data series, were obtained by contacting each state's employment agencies. Both at the national level and in the Washington/Oregon region, we will use the full range of years for which data are available, namely from 1947 to 1993. Similarly, for all the analyses that follow, we use data from the categories of Logging (Standard Industrial Classification category 241) and of Sawmills and Planing Mills (SIC 242).

The best data on log exports are those from the Demand, Price and Trade Analysis Group of the U.S. Forest Service. Given that we were unable to obtain all of this group's original data reports back to 1947, we turned to publicly available sources that also report the relevant figures. We have used *Historical Statistics of the United States, 1900–1970* (U.S. Bureau of the Census 1970) for data from 1947 to 1970, while turning to appropriate editions of *Statistical Abstracts of the United States* to obtain data from 1970 to 1988 (U.S. Department of Commerce, various dates); for data from 1989 to 1993, we drew on *Wood Products Trade and Foreign Markets: Asian Market Profile Issue* (U.S. Department of Agriculture 1994). For data on Forest Service harvests, we turned to appropriate editions of *Statistical Abstracts*. In all cases where we have found discrepancies in figures, we have used the data from the most recent item published.

OPERATIONALIZATION AND ANALYTICAL APPROACH

In the interest of avoiding any confusion, we have attempted to keep our analyses as straightforward as possible. Two sets of regressions were performed and will be reported one, using national-level data and two, using data from the Washington/Oregon region. Each set of regressions will be reported in two ways—as a standard or "Ordinary Least Squares" regression, and as a time-series analysis. In both sets of analyses, the dependent variable will be total employment in logging, saw

mills and planing mills (Standard Industrial Classification categories 241 and 242), in thousands, first for the nation as a whole, and then for the two-state region of Washington and Oregon, over the entire period for which comparable data are available, namely the years from 1947–1993.

One potential challenge involves the functional form to be used: While the oversight is perhaps understandable, those who have discussed spotted owls and environmental constraints on employment, at least to date, have tended not to specify the functional form of the statistical effects they would hypothesize. Overall, however, it appears that the expectations would not be well captured by a traditional or 0–1 dummy variable; such an operationalization would involve only a one-time break in an otherwise linear trend, implying the continuation of preexisting trends in employment, but at higher or lower levels. The concerns that have been expressed over employment/environment relationships, meanwhile, are often based in part on the view that years such as 1964, 1970, and 1990 were instead "turning points." The Wilderness Act of 1964, for example, merely *began* the process of setting aside land for Congressional wilderness protection—it did not end the process. While the initial legislation set aside 9 million acres of Unites States Forest Service land (Runte 1987:240), the U.S. would come to have more than ten times that much land devoted to designated Wilderness Areas—roughly one hundred million acres, or 170,108 square miles—within the three decades to follow (World Resources Institute 1994:641). Analytically, as a result, the need appears to be for what is technically known as a knotted-spline function, such that a given year does in fact serve as a "turning point" in preexisting trends.

Both for analysis of national-level trends and of regional trends in the Pacific Northwest, we will consider the effects of each of the three potential turning point years identified above. The 1964 passage of the Wilderness Act did not begin to exert an effect until late in the year, so this influence will be represented by AFT64, which takes on the value of zero for all years up through 1964, then taking on values of 1 for 1965, 2 for 1966, 3 for 1967, and so on. The 1970 turning point, by contrast, is seen by many observers as having involved the majority of the year of 1970 (the National Environmental Policy Act was actually passed by Congress in 1969, for example, and the signing of this law was Richard Nixon's first official act of 1970) so this potential point of transition will be represented by AFT69, which takes on the value of zero for all years through 1969, 1 for 1970, 2 for 1971, etc. For the third and latest turning point, a number of authors (e.g., Liebler and Bendix 1994) emphasize the importance of the 1989 announcement by the U.S. Fish and Wildlife Service that the agency would reverse its earlier decision and list the spotted owl as a threatened species, even though the listing of the owl was not actually finalized until 1990. Under the circumstances, the influence of the spotted-owl era will be represented by AFT89, which has a value of zero for all years through 1989, taking on a value of 1 for 1990, 2 for 1991, and so forth.

The two substantive independent variables are the U.S. Forest Service (USFS) "cut" (the total harvest of logs on U.S. Forest Service lands, in millions of board feet) and the Net Exports of raw or unprocessed logs (as measured in millions of cubic feet of roundwood equivalent).[1] The figures for Net Exports are negative for most years through the mid-1950s, during which time the U.S. was importing

slightly more logs than it was exporting, but the early trend was soon to be reversed, with Net Exports eventually growing to a level of several hundred million cubic feet per year. The final independent variable, representing any overall, linear trend in employment that may exist, is YEAR.

Strictly speaking, the data being analyzed here represent a universe, not a sample, and hence some readers of prior drafts of this paper have argued against the use of measures of statistical significance. We have chosen to follow the more conservative course of reporting the levels of statistical significance, however, partly for the convenience of readers who have become accustomed to using such reports to assess the strength of statistical associations, and partly because the use of YEAR, in combination with the spline variables noted above, creates a need to be alert to the potential for multicollinearity.

The potential for multicollinearity will be handled in the analyses that follow through three relatively standard methods, the first of which is the practice of *backward elimination*—a process that, as noted by statistical textbooks such as Hamilton (1990:581–582), involves "simplifying a regression by dropping nonsignificant variables." As Hamilton notes, it is best to drop variables carefully, one at a time, checking the consequences of each elimination. In this case, nonsignificant variables were indeed dropped from the analysis one at a time, beginning with those that were furthest from achieving statistical significance, and continuing until all remaining variables met standard levels of statistical significance ($p<.05$). The second form of safeguard is related, involving attention to the coefficients that remain in the equation, being on the alert for wild fluctuations. The third form of safeguard is more formal, involving the explicit consideration of tolerance statistics; the standard rule of thumb is to exclude a variable from the analysis if its tolerance level drops below 0.01, or if it causes the tolerance of other variables to drop below that same level. As might be expected, tolerance statistics did indicate reasons for concern in the full or saturated models—that is, before the "nonsignificant" variables were removed through the process of backward elimination—but by the time the elimination process had been completed, all remaining variables had tolerance statistics that were at least double the cutoff level. As will be noted below, there was one case in which the combined application of the first and second techniques indicated a potential for concern; this case, however, involved the intercorrelations between the USFS harvest levels and net log exports, rather than involving any of the knotted-spline variables. In this one case, as we will note, the results should be interpreted with caution, but the adjusted R^2 values are enough higher with the Net Exports variable included and the USFS harvest levels excluded (rather than vice versa) to make it clear that the final specification is the superior one.

Table and Figure 1 present the findings for the national-level analyses. The analysis proceeded in three steps, which are represented by the three columns of Table 1. For the convenience of readers who are not accustomed to time-series analyses, the first column presents the results from a standard linear regression, in "saturated" form—that is, including all independent variables. The second column reports the results of the second or reduced-form regression, including only those variables that remain statistically significant at the usual levels ($p<.05$) after the

backward elimination process described above. Third, given that the Durbin-Watson statistics indicated the presence of significant serial correlation even after the backward elimination, the same steps were repeated in a set of time-series analyses that included Prais-Winsten estimates of *Rho*, the autocorrelation coefficient. These same steps led to the same reduced-form specification, but with slightly different coefficients, and with an improved Durbin-Watson statistic, as reported in the third column of the table.

As can be seen, none of the turning-point variables exert a significant effect when all variables are included simultaneously, although one of them—the knotted-spline variable representing the period that began with the passage of the Wilderness Act in late 1964—does come quite close to the standard cutoff for measures of statistical significance in a sample (in this case, $p<.07$). More importantly, as can also be seen, once the clearly insignificant variables have been removed through the process of backward elimination, a clear, three-variable solution emerges; the three statistically significant variables are AFT64, USFS harvest levels, and YEAR. The results in this table also show that, far from displaying the kinds of wild fluctuations that might have indicated reasons for concern, the coefficients show a predictable pattern of change, with the effects of the remaining variables becoming somewhat stronger as the nonsignificant variables are removed from the equation. Based on the adjusted R^2, the reduced-form equation explains 96% of the variance in national logging and milling employment, but the Durbin-Watson statistic shows enough evidence of serial correlation that the results of the time-series analysis, which are reported in the third column of the table, need to be seen as statistically superior. Again based on the adjusted R^2, this final equation explains over 90% of the variance, doing so with the same three variables—YEAR, AFT64, and USFS harvest levels.

Notably, there is no statistical evidence for a spotted-owl effect in any of the three sets of results—indeed, as can be seen from the first column of Table 1, even when the equation includes the variable for the spotted-owl effect, that variable (AFT89) had the lowest *beta* (.014) of any item in the equation. The analyses also show no evidence for an effect from "Earth Day" (AFT69) or from the exporting of raw or unprocessed logs. Intriguingly, while correlation statistics not reported in Table 1 showed USFS harvests to have a strongly negative zero-order correlation with total logging/milling employment (-.783), the same USFS harvest variable has a weak positive association with employment once the overall time trend and the effects of the post-Wilderness-Act era are statistically controlled, with each million cubic feet of Forest Service harvests being associated with approximately six jobs in the time-series analysis (or approximately four jobs if the reduced-form regression coefficient is used). If the larger of these two unstandardized coefficients were to be interpreted literally, the total of all timber harvests on all National Forest land in the U.S. (5.9 billion board feet in 1993) would have been associated with approximately 36,000 of the 252,000 logging/milling jobs in the nation that year. Another way to interpret the magnitude of this coefficient is that those 36,000 jobs would be roughly equivalent to the number of jobs lost every two years between 1947 and 1964.

The effect of central interest in Table 1, however, is the one turning-point variable that is statistically significant, namely AFT64, the variable representing the era that began with the passage of the Wilderness Act in 1964. This variable is strongly significant ($p<.00000005$), but the effect is precisely in the opposite direction from what the standard expectations would suggest. Controlling statistically for the autocorrelation and the two other statistically significant variables—USFS harvest levels and the overall time trend of roughly 18,000 logging and milling jobs being lost each YEAR—the net effect of the passage of the Wilderness Act is actually an *increase* of roughly 17,000 milling and logging jobs per year, relative to

TABLE 1
Regression Results: National Employment in Logging and Milling Unstandardized and Standardized Regression Coefficients

Variable	*Model One*[+]*: Linear Regression, Saturated Model*	*Model Two*[+]*: Reduced-Form Linear Regression*	*Model Three*[+#]*: Time- Series Results*
Constant	33304.509	34378.344	36066.711
	—	—	—
	(11.932)****	(14.274)****	(11.755)****
USFS Harvest	.003	.004	.006
	.099	*.128*	*.191*
	(1.070)	(2.093)**	(2.556)**
Net Exports	.051	—	—
	.147	—	—
	(.779)	—	—
After 1989	1.634	—	—
	.014	—	—
	(.273)	—	—
After 1969	5.511	—	—
	.474	—	—
	(1.418)	—	—
After 1964	9.490	15.804	16.795
	1.006	*1.675*	*1.709*
	(1.870)*	(10.774)****	(8.661)****
Year	-16.812	-17.365	-18.235
	-2.462	*-2.543*	*-2.577*
	(-11.718)****	(-14.038)****	(-11.579)****
R^2	.965	.963	.922
Adjusted R^2	.960	.961	.915
Durbin-Watson	1.335	1.224	1.809
Rho	—	—	.418

Notes: [+] For each variable, the statistics in the first line of each cell are B coefficients; the italicized statistics are the Betas, and T-statistics are reported in parentheses.
[#]Model Three is a Prais-Winsten Time-Series Analysis
*$p \leq .10$
**$p \leq .05$
***$p \leq .01$
****$p \leq .001$

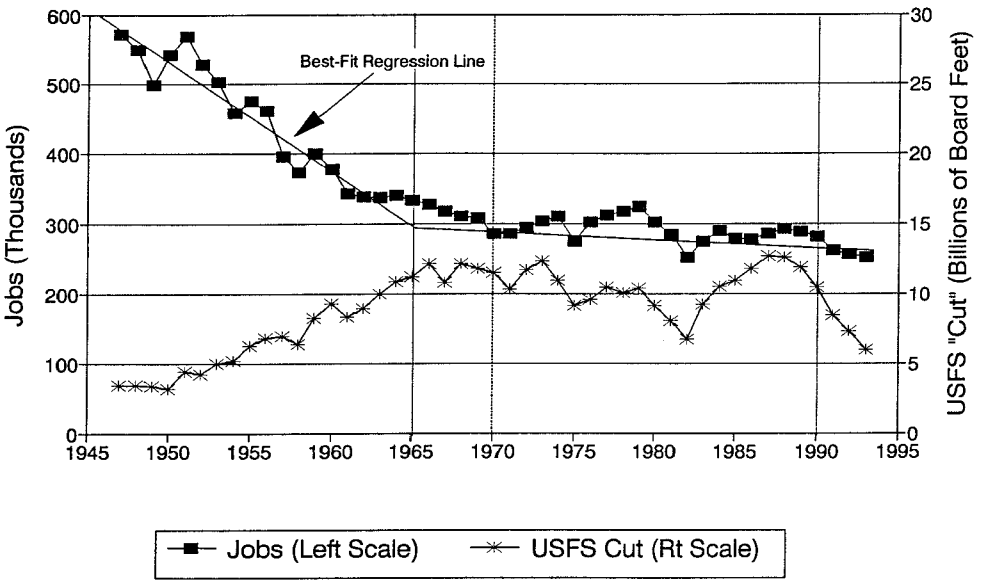

Figure 1
Total U.S. Logging/Milling Employment and USFS Harvests, 1945-1993

prior trends, or to put the matter differently, a net reduction of roughly 90% in the prior rate of job loss.

The nature of the effects can perhaps be understood most easily by examining Figure 1, which shows the three dependent variables. For the period that many analysts appear to see as a "golden era" for logging—the years of booming demand for timber that began with the surge of home-building that followed World War II and ended with the passage of the Wilderness Act in 1964—the actual trend is not an increase, but a clear and continuing decrease in logging and milling employment. By contrast to this strongly negative early trend, the overall rate of job losses dropped by more than 90% during the era that started with the passage of the Wilderness Act in 1964—declining from more than 18,000 to just 1440 jobs per year (18,235–16,795), according to the time-series results (or to [17,365–15,804 =] 1561 jobs per year according to the linear regression coefficients in the second column). If the unstandardized coefficients were to be taken literally, the net effect of the era since the passage of the Wilderness Act in 1964, relative to preexisting trends, would actually be an overall *increase* of roughly half a million logging and milling jobs, or an equal magnitude of reduction in the prior rate of decrease: 16,795 jobs per year, multiplied by the 29 years that passed between the signing of the Wilderness Act in 1964 and the year of the most recent employment data available at the time of this analysis, namely 1993, for a total of 487,055 jobs.

While these initial results strongly contradict the taken-for-granted assumptions in the academic and popular discussions that were summarized above, the national-level trends may or may not reflect the changes taking place in the Pacific

Northwest. The distinction may be important: Unlike earlier environmental constraints, such as the passage of the Wilderness Act and of the National Environmental Policy Act, which might be expected to have exerted an influence on logging and milling employment for the nation as a whole, the spotted-owl controversy has reached its greatest level of salience and intensity in the Pacific Northwest. While Washington and Oregon have accounted for roughly a quarter of all the logging and milling employment in the nation in recent years (73,200 of the nation's 283,800 logging/milling jobs in 1990,[2] for example), it is entirely possible that the regional trends are significantly different from the national ones. Table and Figure 2 examine this possibility.

In Table 2, as in the previous Table, the first column presents the saturated model, with all independent variables being considered, while the second column summarizes the reduced-form regression analysis that keeps only the significant variables, and the third column provides the results from the comparable, reduced-form time-series analysis. As can be seen, there are a number of relatively subtle differences, but these differences do not include any significant changes in the overall trend—or in the lack of significance for the spotted-owl variable, AFT89, which achieves a *beta* of just .021 ($p>.80$). Instead, the differences involve USFS harvest levels and the Net Exports of raw or unprocessed logs. While the controversy over U.S. Forest Service logging policies has been particularly intense in this region, USFS harvest levels prove not to be a significant predictor of logging/milling employment in the Northwest region (*beta* = .117, $p>.50$, in the saturated model).

As noted earlier, the precautionary process of backward elimination yielded slightly different results when applied both to the linear regressions and the time-series analyses, but the differences involved USFS harvest levels and net log exports, rather than the knotted-spline variables. In the equation that had been reduced to just YEAR, AFT64, USFS harvests and Net Exports of raw logs, the regression results showed Net Exports to be significant and USFS harvests to be insignificant, while for the time-series analysis, these results were reversed. On the other hand, when USFS harvest levels and net log exports were each removed from the analysis, one at a time, with the other variable being included in the equation, both the regression results (reported in the second column of Table 2) and the time series results (reported in the third column) pointed to the same conclusion: The equation reported in Table 2, with just YEAR, AFT64, and Net Exports, provides the best overall "fit." The time-series analysis that includes Net Log Exports achieves an adjusted R^2 of .681—a level of explained variance that is significantly higher than the adjusted R^2 (.522) for the time-series analysis that includes USFS harvests instead.

Notably, however, in the time-series analysis summarized in the third column of Table 2, which provides the best overall fit to the data, the variable for log exports is statistically significant in a direction opposite to the claims of environmentalists, with each million cubic feet of Net Exports being associated with an *increase* of approximately 31 logging/milling jobs in the Pacific Northwest. A plausible interpretation of the difference between the national and the regional figures would be that a significant fraction of the total export of unprocessed logs involves trees

TABLE 2
Regression Results: Washington and Oregon Employment in Logging and Milling Unstandardized and Standardized Regression Coefficients

Variable	*Model 1[+]: Linear Regression, Saturated Model*	*Model 2[+]: Reduced-Form Linear Regression*	*Model 3[+#]: Time-Series Results*
Constant	5933.235	6462.021	5686.526
	—	—	—
	(5.809)****	(10.744)****	(6.536)****
USFS Harvest	-0.725		
	-.117		
	(-.655)		
Net Exports	.048	.044	.031
	.736	*.671*	*.427*
	(2.012)**	(4.307)***	(2.501)**
After 1989	-.470		
	-.021		
	(-.215)		
After 1969	1.660		
	.932		
	(-.033)		
After 1964	1.660	1.985	1.783
	9.32	*1.114*	*.893*
	(.894)*	(6.250)****	(3.424)****
Year	-2.979	-3.251	-2.855
	-2.311	*-2.523*	*-1.988*
	(-5.674)****	(-10.573)****	(-6.418)****
R^2	.869	.867	.709
Adjusted R^2	.850	.858	.681
Durbin-Watson	1.211	1.081	1.955
Rho	—	—	.497

Notes: [+] For each variable, the statistics in the first line of each cell are B coefficients; the italicized statistics are the Betas, and T-statistics are reported in parentheses.
[#]Model Three is a Prais-Winsten Time-Series Analysis
*p ≤ .10
**p ≤ .05
***p ≤ .01
****p ≤ .001

from the Pacific Northwest. In 1988, for example, 95.8% of U.S. raw log exports involved softwoods (U.S. Department of Agriculture 1990), and according to calculations by Cleaves (1994: 3), Washington and Oregon accounted for roughly 3.7 billion of the 4.3 billion board-feet of softwood logs exported that year, or over 80% of the total of *all* U.S. exports of raw logs. It might well be, accordingly, that the exporting of raw logs might be associated with increased regional employment, at least for loggers. Such an interpretation, however, would not necessarily contradict the environmentalists' claims about job losses; those arguments have generally focused instead on the *overall* level of employment that might have been created for regional workers if the logs had been "processed" in the region—being

turned into finished products such as furniture—rather than being shipped out as raw logs. According to estimates from *The Economist* (1994), for example, the process of turning old-growth trees into boards created about three jobs for every 1,000 trees; if the same wood were used to make components for furniture or molding, by contrast, it would support 20 jobs, and if it were actually turned into furniture and/or moldings, it would support 80.

In terms of the broad sociological arguments about an "enduring conflict" between employment and environmental protection, however, as well as in terms of the more specific debates over spotted-owl habitat in the Pacific Northwest, the most significant finding in this Table has to do with the overall trend in logging and sawmill/planing mill employment, which can perhaps best be seen from Figure 2. One point of difference from Figure 1 is that the second line in Figure 2 represents not the U.S. Forest Service "cut," but Net Exports of unprocessed logs. As noted earlier, the Net Export figures are slightly below zero for years prior to the mid-1950s, representing the fact that the U.S. was a net log importer during those years. The upper line represents regional logging/milling employment, again with the sole statistically significant turning point being associated with the passage of the Wilderness Act in 1964. Overall, the time-series results show an average loss of 2,855 jobs per year in milling and logging in the two-state Pacific Northwest region from the beginning of available statistics up through 1964. This overall rate of job loss, however, was cut by more than 60% in the years associated with the *end* of the supposed "golden era," once Congress began to set aside land

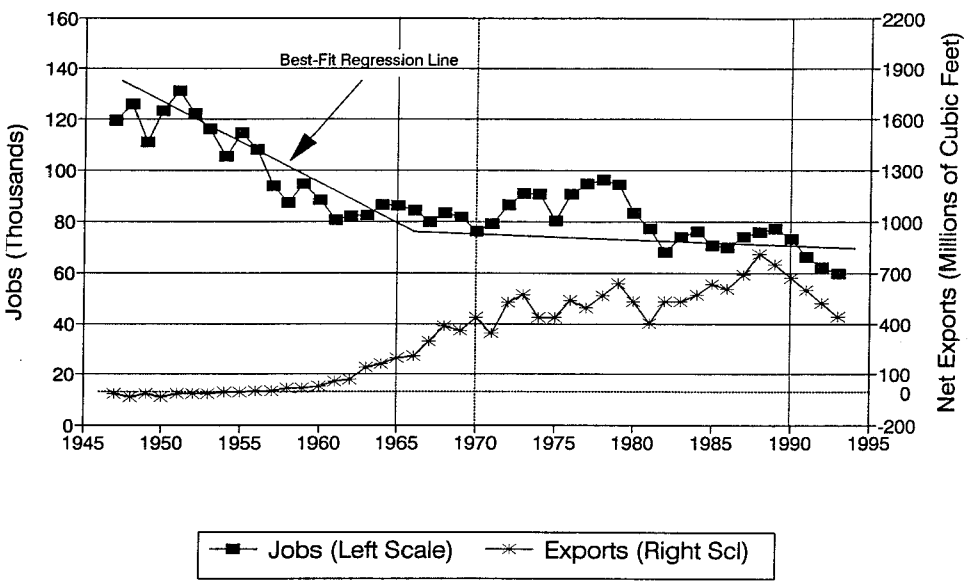

Figure 2
WA-OR Logging/Milling Employment and Net Log Exports, 1945-1993

for wilderness protection. The net effect of AFT64, in other words, is an *increase* of 1,783 logging/milling jobs per year, relative to preexisting trends. Even in the Pacific Northwest region, accordingly, the net statistical effect of the environmental era, in the 29 years that passed from 1964–1993, proves to be an *increase* of over 50,000 logging and milling jobs (1,783 x 29 = 51,707), relative to the earlier trends.

DISCUSSION

Despite the widespread and apparently heartfelt conviction that the jobs of rural loggers and primary wood processors in the Pacific Northwest are being endangered by federal protection of the spotted owl, and by environmental protection more broadly, quantitative analysis provides a very different picture. Based on straightforward longitudinal regression analyses and time-series analyses of the best available data on employment in logging and milling, whether in the Pacific Northwest or in the nation as a whole, there is simply no credible evidence of a statistically believable job-loss effect. This conclusion holds whether the measurement is done at the national or at the regional level, and whether the focus is on the period associated with spotted-owl protection in 1989–1990 or on the period since "Earth Day" and the passage of the National Environmental Policy Act in 196970.

By contrast, there is clear evidence of a major *reduction* in the prior rate of job losses—a change that is strongly significant statistically—beginning at about the time when U.S. National Forests began to be "locked up" under the Wilderness Act of 1964. While this Act is sometimes associated with what many proponents of resource extraction tend to see as the end of a "golden era" of logging—the exuberant era of booming home construction, subject to few significant environmental constraints, that stretched from the end of World War II to the time when the Wilderness Act was passed in 1964 (Hirt 1994; see Catton 1982)—the statistical effect of this turning point is in precisely the opposite of the "expected" direction: There is a 90 percent reduction in the prior rate of job losses at the national level, and roughly a two-thirds reduction at the regional level, even after controlling for other statistically significant effects. Indeed, had there been a continuation of the rates of job losses that existed before the passage of the Wilderness Act, total logging and milling employment would have dropped to zero, both nationally and in the Pacific Northwest, before 1990.

One reviewer has suggested that the improvement in the employment picture after 1964 may have been due to an increase in housing demand, given that the first members of the postwar "baby boom" generation would have been starting to reach their twenties at about that time. While the suggestion has an apparent plausibility, however, it is not borne out by the actual statistics: While housing starts were relatively stable across the early 1960s, remaining at 965,000 for 1965, they actually *declined* in the next several years, dropping by more than 15%, to 811,000, by 1969 (U.S. Department of Commerce, 1971). Another of the possibilities that has been put forth by colleagues is that it might be possible to discern a spotted-owl effect in other employment figures from the Pacific Northwest, due to "economic multiplier" effects, although none of these colleagues has yet been able to specify what figures might show such a trend. At least hypothetically, however, even

though it is not possible to identify a statistically believable spotted-owl effect in logging and milling employment, perhaps enough such workers were laid off, and perhaps their paychecks would have been sufficiently important for *other* types of regional employment (e.g., local businesses and services in forest-dependent communities), to have led to a drop in the economy more broadly. We have not been able to locate any economic data that support such a line of speculation, but based on the analyses we have been able to perform to date and on the observations that have already been offered by others, it would appear to be highly implausible. Far from being a period in which the Pacific Northwest region has been "outta work for every American," the period since the listing of the spotted owl has actually been one of soaring job growth in the Northwest; as noted not just in environmentally oriented publications such as Glick (1995), moreover, but also in the mass media more broadly (see Egan 1994), at least some of the new jobs appear to have been attracted in part by the prospect of increased environmental protection in the region. Even in the forests themselves, as noted by Love (1997:215), "Signs are emerging that the market value of recreational uses of federal forests may exceed the market value of logging them."

All in all, if the regression coefficients from this study's analyses were to be taken literally, they would indicate that, after controlling for other statistically significant variables, the Wilderness Act was associated with an *increase* of roughly 500,000 logging and milling jobs in the nation as a whole, and more than 50,000 jobs in the states of Washington and Oregon, over the past 29 years. Clearly, we would *not* argue for such a literal interpretation; that would make nearly as little sense as have some of the past assessments that have blamed environmental protection measures for varying but apparently precise assertions about purported job "losses" (see Kazis and Grossman 1982; Freudenburg 1991). What may make the least sense of all, however, is to argue that the actual employment data should continue to be ignored, and that analyses and policy decisions should continue to be based on assertion instead of evidence.

Perhaps the most important questions to emerge from this analysis are two in number, and they are interrelated. The first has to do with what factors might do a better job of accounting for job losses than might environmental protection measures; the second has to do with how and why spotted owl protection could have been embraced so readily as the alleged cause of job losses, when the widespread assertions are so clearly at variance with the available empirical evidence. Based on the information available at present, the most reasonable answers would appear to be, first, that the job losses are best understood in terms of changes in the forest-products industry and in the natural resource base that remains available for supporting that industry, and second, that the failure to give fuller recognition to these well documented trends in the ongoing spotted-owl debates would appear to be due to a remarkable level of historical and perhaps also political naiveté.

CHANGES IN TECHNOLOGY AND NATURAL RESOURCE BASE

As will be clear to anyone who has spent a significant amount of time in timber-dependent communities or who has read the sensitive reports on the region by

sociologists such as Brown (1995; see also Carroll 1995; Lee 1994), timber workers are suffering emotionally painful changes associated with the decline of the logging industry; importantly, moreover, so are their families, friends, neighbors, and communities. It will also be clear that the workers and their communities have a substantial level of entirely understandable anger about their plight. What is not so clear is whether that anger is directed at the actual causes of the pain.

Sociological authors such as Lee (1993, 1994), Carroll (1995) and Humphrey *et al.* (1993) have devoted a good deal of attention to the argument that loggers have recently been subjected to "moral exclusion"—being depicted in politicized debates as socially or morally unworthy of continued access to old-growth forests. Such arguments do provide an accurate depiction of the feelings in timber country, but as discussed at greater length in the review of this literature by Freudenburg and Gramling (1994b), the arguments do not appear to provide an accurate rendering of the ways in which loggers have actually been discussed, whether by the mass media in general or by environmental publications in particular. As indicated by the literature review at the start of this paper, the vast majority of the actual discussions in environmental publications, as well as in the mass media more broadly, have portrayed the loggers and their families in a highly sympathetic light.

To the extent to which any portrayals of loggers have been unflattering, moreover, an examination of the historical record shows that such portrayals are anything but a recent phenomenon—and that they are by no means limited to the views that have been expressed from outside of the forest-products industry. An examination of forest-products publications such as *Journal of Forestry* or *Forest Products Journal* quickly reveals industry spokespersons to have expressed significant levels of concern about logging and milling employment since well before the emergence of concerns over the spotted owl, or even over the protection of wilderness areas. Most of the earlier expressions of concern, however, had to do with levels of employment that were considered to be too *high*, not too low. Authors such as Simmons (1947) and Compton (1956) fretted openly over what they saw as a tendency for timber-related jobs to be attracting a different (and in their view, "less desirable") sort of worker than had been available during the depression-era years before World War II. Compton (1956:19), for example, worried that "the sawmill owner or operator seems to have adopted a pessimistic attitude toward employees: that he will accept men of lower work capabilities... [and] that men for the sawmill occupations need not be as intelligent, physically fit or socially acceptable as for other fields of endeavor." Others worried that, with the growing availability of alternative forms of employment, only the "less desirable" employees were being attracted to timber industry jobs; Simmons (1947:345), for example, saw the timber jobs as appealing mainly to the types of workers characterized by "a strong back and a weak mind." Such lines of argument appear to have virtually all of the characteristics that authors such as Lee describe as "moral exclusion," save for the fact that they were being expressed by some of the leading spokespersons *inside* of the forest products industry, not by the critics on the outside.

The concerns about "less desirable" workers appear to have been joined by a number of more tangible concerns about reducing costs and increasing the

productivity of labor, as well as about easing "labor shortages" (Batori 1957; Kendrick 1961; for a more critical analysis, see Young and Newton 1979). Similar concerns continued to be expressed even during the late 1960s, during the period after the passage of the Wilderness Act but before the enactment of the National Environmental Policy Act; McConnen (1967:10), for example, noted that "the cost of forest labor has increased very rapidly," and Wambach (1969:108) noted that, while new capital investments in mechanization often proved expensive, "the investments can be justified by ... lower labor requirements" and other factors (for a comparable recent assessment, see Greber 1993). The employment statistics considered in this paper, which show national employment to have dropped from 572,000 jobs in 1947 to just 342,000 jobs by 1964, can provide some indication of just how widely accepted such arguments evidently proved to be.

It is still possible, of course, that case studies will be able to identify specific locations where job losses can be blamed on specific environmental constraints; in fact, it would be remarkable indeed if absolutely no such cases could be identified. At least to date, however, most of the arguments about spotted owls, or about environmental protection more broadly, have not been depicted as involving a small scattering of isolated or atypical locations. Instead, not just in the mass media, but also in serious arguments by widely respected scholars, the preservation of old-growth forests has been depicted as posing threats such as "the potential impoverishment of at least 48,160 forest products workers in the Pacific Northwest" (Humphrey *et al.* 1993:159), and creating "a severe economic and social impact" throughout the communities of the region (Lee 1993:1), all while exemplifying an "enduring conflict" between economy and environment, more broadly (Schnaiberg and Gould 1994). Even for arguments about job losses in specific locations to be taken at face value, moreover, it may be necessary to ignore the inconvenient findings about broader trends that have been summarized in this article—as well as to ignore the fact that more detailed analyses of the Pacific Northwest have tended to mirror the types of findings that have been reported here. When Young and Newton (1979) did a more detailed analysis of the State of Oregon, for example, they found that over 33% of the state's large sawmills were closed during the period from 1948–1962, while among the smaller sawmills—which tended disproportionately to be located in the rural regions that have been at the focus of spotted-owl debates—over 85% of the mills closed during the same period of 1948–1962. All of these changes, in other words, were not merely underway, but had been largely completed, not just before the emergence of the spotted-owl controversy, but more than a quarter of a century earlier, before the passage of the Wilderness Act of 1964.

If we truly want to understand the ways in which the environment has affected logging industry job losses, accordingly, we may need a different analytical approach—one that includes attention to the physical environment itself, and not simply to the battles over the environment. One possibility that has received far too little attention, to be more specific, is that the job losses may ultimately have resulted not from "excessive" environmental protection efforts of the past several years, but from *insufficient* environmental protection over the past century or more.

To note a fact that is obvious enough to require little additional emphasis, while trees are a "renewable" resource, they are nevertheless not an infinite resource (see Dunlap and Catton 1979; Catton and Dunlap 1980). This point applies with particular force to old-growth forests of the sort that have been rapidly disappearing from the Pacific Northwest: While the U.S. Pacific Northwest may well have been the "logging capital of the world" during the past several decades, it is only the most recent of the many rural regions to have claimed such a distinction. To limit the illustrations simply to the United States, similar claims have previously been staked by the regions surrounding scores of other communities, including Bangor, Maine; Williamsport, Pennsylvania; Muskegon, Michigan; Eureka, California (Wood 1971) and Menominee/Marinette, Wisconsin/Michigan (Connor 1978; Freudenburg, Frickel and Gramling 1995). Even an examination of back issues of logging region newspapers (see *Aberdeen Daily World* 1980) could show a widespread recognition of the fact that the sawmills being shut down in the region over the years have often been those that had been designed for large, old-growth forests—most of which had already disappeared well before concerns over spotted owls began to receive wider attention. Rather than being a reflection of efforts to protect the environment, ironically, a significant fraction of the long-term job loss in the rural areas of the Pacific Northwest may thus be due to nearly the opposite phenomenon—to the very speed and vigor with which the old-growth trees had been cut down in earlier years (see also Hirt 1994). In short, the problem may ultimately be traced to the fact that, across the decades preceding the spotted-owl issue, as noted in the title of one book (Van Syckle 1980), *They Tried to Cut It All*—and that by the late 1980s, "they" had so nearly succeeded in doing just that.

THE IMPORTANCE OF QUESTIONING THE TAKEN-FOR-GRANTED?

Given the lack of credible quantitative evidence for job losses associated with environmental protection, plus the extensive and well-documented evidence of earlier, systematic efforts to reduce labor requirements and shut down the small sawmills in rural areas—not to mention the fact that all previous "logging capitals of the world" appear to have experienced similar fates—how is it that so little attention would have been devoted to the rate at which large corporations have been cutting down trees and laying off workers, relative to the rate at which small owls have led to the laying down of paperwork by federal agencies?

One important part of the answer would appear to reflect the continued relevance of Thernstrom's classic warning (1965) on "the dangers of historical naiveté." Social scientists have often learned, with good reason, to have high levels of respect for the insights and expertise of the citizens who live in areas we study, but as Thernstrom long ago pointed out, there is a significant difference between treating those views with respect and treating them as definitive—a distinction that proves to be particularly important when there is a need to understand historical antecedents of long-term trends. Affected local people are often highly knowledgeable not just about their own experiences, but also about the nature of the world they inhabit; at the same time, however, they may be no more likely to be infallible than are the social scientists who study them, whether in what they