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ABSTRACT

Whose Skills are Demanded? An Empirical Study of the Distributional Impacts of U.S. Forest Service Policies on Local Job Markets

James Baskett and Harry Ayer

Estimates are made of the impact of alternative U.S. Forest Service policies on the distribution of jobs, among skill levels of people, in local rural communities. The analysis uses primary data, and employs several refinements of interindustry analysis. Policy implications pertaining to the income (skill level) distribution problem are given.

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Whose Skills are Demanded? An Empirical Study of the Distributional Impacts of U.S. Forest Service Policies on Local Job Markets

James Baskett and Harry W. Ayer*

Introduction

The purpose of the research reported here is to determine the impact of various U.S. Forest Service policies (or those of other governmental agencies) on the distribution of job opportunities among skill levels of people in local, rural communities. Emphasis is placed on the distribution of job opportunities among skill levels because employment by skill level is inextricably linked to the income distribution problem. The policies investigated include those which alter cattle production, timber sales, tourism and/or retirement settlement.

The distribution of employment opportunities are estimated by utilizing and extending interindustry analysis to consider several important sub-issues. The analysis accounts for (1) very short run, short run, and long run impacts; (2) the differential impacts among contiguous rural areas, resulting from a region-wide policy; (3) a growing regional economy (such as is occuring in many rural areas) and possible changes in capital-labor ratios in the region's business sectors; and (4) the seasonal impacts of alternative policies. The analysis utilizes primary data collected by questionnaire from regional businesses and thus avoids problems created by utilizing national input-output coefficients.

Problem Statement and Setting

The availability of jobs and the skill level of those jobs is intimately bound to the more general income distribution problem. Solutions to the income distribution problem will most likely involve changes in the structure of the job market. That is, changes in the supply of or demand for people with particular skill levels will result in changes in employment and the distribution of income among a region's people. In the research reported here, focus is on the

demand side of the job market, and more explicitly, the impact of primarily regulatory policy (vs. taxing or spending policy) on job and hence income distribution. Although regulatory policy may be of potential equal importance with taxing and spending policy in affecting income distribution, knowledge pertaining to its effect is insufficient.

The distribution issue is an important one. Rivlin, in her 1974 address to the American Economics Association, cites four reasons why the distribution issue is important and will be of increasing concern. For at least the last thirty years the relative shares of the nation's income has remained about the same, thus increasing the real income gap between the rich and the poor. Mass and instant communication have increased the awareness of what some have - and what others don't have. Moreover, special interest groups with increasing political sophistication and clout will draw attention to and shape the distribution issue. Finally, important demographic-social forces are working to heighten the distribution problem.[1/]

Rural area income has been more unevenly distributed than in urban areas[2/]; this distribution was in part the cause of the rural-to-urban migration (and associated problems) which occurred until the 1970's.

One recognized function of government is to affect the distribution of income.[3/] Redistribution is accomplished through taxing, spending and regulatory functions. Because of the importance of government in our economy, the distributional impacts can be substantial.[4/] In several regions of the U.S., governmental agencies control large amounts of land [5/] and their land management policies affect not only products derived from the land, but also incomes and general welfare within nearby communities. In recognition of land-management impacts of the Forest Service, Bureau of Land Management, and other governmental agencies on the welfare of local communities, a body of law and directives has evolved, especially since 1970, which requires that regional/local economic impacts be taken into consideration. The "Principles and Standards" of the Water

Resources Council, the Rural Development Act of 1972 (Talmadge), and the Forest and Rangeland Renewable Resources Planning Act of 1974 (U.S. Department of Agriculture) all contain clear mandates for planning agencies to improve rural community welfare and better the distribution of rural incomes. To date, little account has been taken of the income distribution issue, although, as we have argued, account should indeed be taken.

In the study reported here, estimates are made of the impact of primarily regulatory policies of the U.S. Forest Service on the demand for different skill levels of people in the Salt-Verde Basin of Arizona. The Basin encompasses approximately 22 million acres (nearly one-third the land area of Arizona), most of which is under U.S. Forest Service control. The region is rural in nature with some 26 scattered communities whose populations range from 100 or less to roughly 30,000. For analytic and "local" policy purposes, the Salt-Verde region was divided into five subregions. The subregions are of near-equal size and their boundaries were based on jurisdictional boundaries and economic similarities. Lumbering, grazing, tourism, mining, retirement settlement and government account directly or indirectly for most jobs in the region. One important indication of an income distribution problem is the incidence of poverty. In 1969, the proportion of families with incomes below the poverty threshhold ranged from nine to over 45 percent of the families in the counties contained in the study region (U.S. Department of Commerce). We believe the environmental and economic structure of the area is similar to many other regions of government ownership, especially in the West. Where close regional similarities exist, policy implications from the Basin study should have important applications elsewhere.

Methodology

The study used and refined from-to analysis in making estimates of the distributional impacts (among skill levels of jobs) of alternative land use policies. From-to (or "rows only") analysis is very similar to input-output

analysis, the primary difference being that no information is required on the amount of inputs purchased by the endogenous industries from the exogeneous or "primary inputs" sector. The principle disadvantage of from-to vs. input-output analysis is that a cross check of interindustry transactions, by determining that row totals are equal to corresponding column totals, is precluded. However, nearly all the analytic power of the input-output model is retained, and from-to analysis has a very significant advantage over input-output analysis. The data requirement is substantially less, and the data that is not required is precisely some of the most difficult and costly to obtain. It was felt that primary data was vital to the present study because we wished to study small local regions, and because secondary data and national or large-region technical coefficients for I-O studies were unsatisfactory. The latter data sources fail to adequately account for "leakages" experienced by local communities, are outdated and/or overlook structural differences in the regions' economies.

While a cross-check of rows and columns was sacrificed with from-to analysis, numerous measures were taken to gain statistical reliability of questionnaire data. A carefully structured, 15 page questionnaire was sent to a stratified sample of 4,181 of the regions' 5,392 businesses. Information was obtained on employment by skill level, monthly employment, and the <u>proportion</u> of respondent total sales derived from each of the region's other business categories plus various final demand sectors in 1973. Estimates were also obtained on the expected change in employment and capital investment given hypothetical sales increases of 10, 25, 50 and 100 percent respectively. Percentage estimates rather than dollar receipts were requested to boost questionnaire response. Technical coefficients within transactions matricies are therefore not dollar, but labor coefficients, and facilitate investigating employment impacts. Finally, response was increased by a carefully structured and previously tested (Buse) procedure, including an advance mailing and publicity with figurehead

approval, personalized letters, repeat mailings, and follow-up long distance telephone calls by a skilled interviewer. Valid questionnaires were received from roughly forty percent of potential respondents comprising over 25 percent of the entire business population. Some 58 percent of the region's total work force was represented by firms completing valid questionnaires. Given the questionnaire sophistication and confidentiality of the data requested, the response rate is considered excellent. Kalter, for example, obtained a 32 percent response from potential respondents in his from-to analysis of Walsworth County, Wisconsin.

The basic methodology for input-output analysis is well documented (Chenery and Clark, Miernyk) and commonly employed, including, among many such studies, those of the rural sector by Moore and Peterson; Bromely, et al.; and Kelso, Martin and Mack. Key studies employing the from-technique are by Kalter and Tiebout. Both input-output and from-to analysis account for direct and indirect impact--the multiplier affect--on regional employment (or income) as an initial change in sales from one or more sectors to final demand ripples through the region's economy.

In this study, several new extensions, besides gathering and analyzing data on job distribution by skill level, or previously developed extensions of the basic technique, were employed. First, the analysis developed multipliers for what we term the very short run, short run, and long run. In the very short run only inter-industry transactions occur and account for the multiplier impact. In the short run, the household sector is assumed endogenous, and consumer expenditures are assumed to change in response to changed local employment and incomes. In the long run, the household sector and several other sectors are endogenized to reflect changes in local investment by businesses (plant and equipment), non-retired households (local residential investment), and in all expenditure changes (i.e., both current and investment) by governmental agencies and private, non-profit institutions.

A second refinement was the division of the Salt-Verde Basin area into five subregions, and the development of separate interindustry models for each. This is important because although Forest Service policy may apply to the entire region (such as a region-wide grazing permit policy), the impacts among local communities may be quite different. Most previous empirical work has not made this important breakdown.

Third, account was taken of the effect of general regional growth on the technical coefficients of the model. Such an adjustment is important because the region investigated is expected to grow in the future, and because, in a more general sense, the recent urban-to-rural migration turnaround makes such an analysis especially relevant. Each business was asked to estimate changes in labor employed given hypothetical sales increases of 10, 25, 50 and 100 percent respectively. Individual firm responses were then reaggregated into sector totals to form new transactions matricies for each growth level. Resulting employment estimates for each growth level were made relative to 1973 sales and 1973 employment and multipliers recomputed. To the best of our knowledge, this refinement has not been incorporated into previous studies. Finally, Account was also taken of the seasonal impact of alternative policies on employment. Clearly, tourism is seasonal, and in determining policy such an impact should be considered. This was accomplished by asking each firm for its monthly employment, and then relating the monthly employment to the annual change in employment suggested by the multiplier analysis. Again, little empirical evidence has been available on the season impact of land use policies.

Finally, employment elasticities were developed and used in the analysis instead of relying on the more commong multipliers developed in interindustry studies. Elasticities were derived from the multipliers, and show the percentage change in total area employment (both direct and indirect effects) resulting from a one percent change in sector(s) sales to final demand. Elasticities were developed for two reasons. First, our interindustry data was on the proportion of sales made

by each industry to various sectors and not the absolute dollar value. And second, businesses and policy making institutions often find it convenient to consider percentage changes in business activity rather than the absolute change.

Results and Policy Implications

Results are summarized in the form of employment elasticities for each skill level for two of the five subregions studied. These elasticities are presented for four categories of land use poliicies: those affecting cattle production, lumber production, tourism and retirement settlement. Besides showing the relative impact by policy for different skill levels, the analysis also investigates the very short run, short run and long run effects; the differential impacts among subregions; the "dynamic" effect of a growing region and resulting changes in technical coefficients; and seasonal impacts of the alternative policies on employment. Policy implications are given.

Policy Effects

The relative effect of alternative policies on employment by skill level is given in Table 1. The elasticities of Table 1 indicate the percentage change in the area's total employment resulting from a 1 percent change in the final demand policy variables listed at the left. Thus, for Local Area 1, policies (such as grazing regulations) which increase sales to final demand from cow-calf production by 1 percent result in the long run, in professional, skilled, semi-skilled and unskilled employment increases of .011, .009, .013, and .011 percent respectively of the area's total employment. The cumulative elasticity, over skill levels, is .044.

In Local Area 1, the greatest impact is derived from policy affecting the lumber-wood products sector. A one percent increase in timber sales results in a long run increase of nearly .23 percent in total Local Area employment. Of the increase in total employment, nearly half is for unskilled labor. Accordingly, if there is underemployment of the area's unskilled labor force, and one objective of policy is to improve employment (and hence income) opportunities, timber cut regulations or similar policies should receive strong consideration. Should there be constraints on timber supply, tourism, as an alternative policy

able 1. Elasticity of Employment * to U.S.F.S Policies Affecting Cow-Calf Production, Lumber Sales, Retirement Settlement and Tourism; by Skill Level; Very Short Run, Short Run, and Long Run; Salt Verde Basin, Local Areas 1 and 4, 1973.

olicy, Final emand Sector **	Skill Level												Sum of Skill Level Elasticities
	Professional			Skilled			Semi-Skilled			Unskilled			
Local Area I	VSR	SR	LR	VSR	SR	LR	VSR	SR	LR	VSR	SR	LR	LR
ow-Calf production	.008	.010	.011	.006	.008	.009	.009	.012	.013	.008	.010	.011	.044
umber-wood products	.008	.018	.021	.026	.034	.039	.021	.044	.047	.107	.116	.119	.226
ocal retired HH (C)***	.006	.008	.008	.005	.006	.007	.010	.013	.014	.006	.008	.008	.037
(I)	.001	.002	.002	.003	.003	.004	.001	.002	.002	.001	.002	.002	.010
ourists-seasonal (C)	.023	.029	.030	.020	.026	.028	.031	.041	.043	.028	.034	.036	.137
(I)	.002	.002	.002	.003	.004	.004	.002	.002	.003	.001	.002	.002	.011
Local Area 4													
ow-Calf production	.012	.016	.019	.006	.009	.014	.018	.024	.028	.016	.020	.022	.083
umber-wood products	.002	.003	.003	.001	.002	.003	.003	.004	.005	.005	.006	.007	.018
ocal retired HH (C)	.031	.041	.048	.022	.030	.042	.043	.056	.065	.025	.034	.039	.194
(I)	.007	.010	.012	.016	.018	.022	.008	.012	.015	.005	.008	.009	.058
ourists-seasonal (C)	.030	.040	.048	.017	.025	.038	.039	.052	.062	.040	.049	.054	.202
(I)	.001	.002	.002	.003	.004	.005	.002	.002	.003	.001	.002	.002	.120

Elasticity of employment refers to the percentage change in the area's average annual employment resulting from a 1 percent change in sales to final demand of the named policy variable. Annual average employment in Area 1 was 7500 and in Area 4 was 9796.

* Row titles in this table refer to final demand for different types of goods and services. Rows for cow-calf production and lumber-wood products represent demand of non-local businesses for local cattle and timber products. Rows for local retired HH (I) and tourist-seasonal (I) represent consumer demand for local residential construction. Rows for local retired HH (C) and toruist-seasonal (C) represent current consumption expenditures affecting many different types of endogeneous local businesses.

** Rows designated with a "C" indicate that the change in final demand is for current expenditures.
Rows designated with an "I" indicate that the change in final demand is for capital or investment expenditures.

variable, also has an important impact in Local Area 1. However, the distribution of skill levels demanded by this policy are different; there is a much smaller impact on unskilled employment. It is notable that cattle production, which has been an historical major exporting industry, has less impact on all skill levels than either lumber production or tourism, reflecting that inter-industry purchases initiated by cattle producers tend to be relatively small. Finally, the estimates indicate that policies which affect retirement settlement and seasonal tourism have little impact on total employment through investments (such as in homes) which retirees or seasonal tourists make. Similar results were found in all five subregions.

Length of Run

Estimates were made of the elasticity of employment for the very short run, short run, and long run (defined earlier). Table 1 suggests that the very short run and short run elasticities capture most of the employment impact, with but few exceptions. For the two areas illustrated in Table 1, rather large differences between short and long run elasticities exist only in Area 4 for the "skilled" working class. This pattern existed in three of the five Local Areas. The implication for employment or distribution policy is that in general a policy must be justified on very short and short run effects, rather than on subsequent impacts of long run investment and government activity.

Differential Impacts Among Subregions

One purpose of the research was to illustrate differential impacts among Local Areas from region-wide policy (such as policy for a particular National Forest or Forests). A comparison of skill-level elasticities in Table 1 for Local Area 1 and 4 suggests the importance of disaggregating policy planning, or at least in recognizing and dealing with the differential impacts among subregions. For example, even though policy affecting final demand for lumber sharply affects demand for unskilled employment in Local Area 1, a corresponding 1 percent increase in final demand in Local Area 4 has very little impact on unskilled employment. In Area 4, retirement settlement and tourism have large impacts, relative to Area 1, with the distribution of job opportunities being generally evenly distributed among skill levels.

Changing Technology Over Time - The Dynamic Effects

The Salt-Verde Basin economy has been growing very rapidly in recent years, outstripping even Arizona's dynamic rate of growth. This Basin and many rural communities nationwide are expected to experience growth in the years ahead -- in part due to the urban-to-rural migration turnaround. Because of these factors, we wished to estimate the distributional impacts of U.S.F.S policies when regional business activity increases and Local Area businesses have had the opportunity to change their productive technology or utilization of productive capacity. To get at this growth effect, data were collected on expected changes in each sector's capital and employment should sales increase by 10, 25, 50, and 100 percent. Labor technical coefficients were calculated for each of these increases to re-estimate the from-to models and obtain new employment elasticities. The elasticities are given in Table 2. Each elasticity, for Nominal, 25% Growth and 50% Growth models, indicates the percentage by which employment would increase over the annual average employment in the area in 1973 (9,797), resulting from a 1 percent increase in sales, over sales in 1973, for the named sector. Thus, the elasticities are directly comparable not only among skill levels, but also among levels of hypothesized growth in the region's economy.

The estimates indicate that should the region's economy grow, as is expected, the marginal impact of most policy variables on regional employment (by skill level) will decrease. The exception is for the impacts of investment (expenditures by local retired households and seasonal tourists)--little if any decline is estimated in their elasticities. The reason for the diminishing marginal impact of most policy variables is that the regions businesses, in general, indicate that they have unused plant capacity, or that they will employ more capital intensive technology.[6/] Elasticity estimates for other areas follow the same pattern. No skill level is particularly worse off as a result of growth effects. That is, for any particular policy the declining elasticity with growth is experienced by each skill level, and the percentage decline is of the same order of magnitude. Thus, policy to affect the

Table 2. Elasticity of Employment to U.S.F.S. Policies Affecting Cow-calf Producting, Lumber Sales, Retirement Settlement and Tourism; by Skill Level; Short Run; Salt-Verde Basin, Local Area 4; For Nominal, 25% and 50% Regional Growth.*

Policy, Final Demand Sector	Skill Level: Professional	Skilled	Semi-Skilled	Unskilled	Total Over Skill Levels, Short Run
Nominal					
Cow-calf production	.016	.009	.024	.020	.069
Lumber-wood products	.003	.002	.004	.006	.015
Local retired HH (C)	.041	.030	.056	.034	.161
(I)	.010	.018	.012	.008	.048
Tourists-seasonal (C)	.040	.025	.052	.049	.166
(I)	.002	.004	.002	.002	.010
25% Growth					
Cow-calf production	.012	.007	.019	.016	.054
Lumber-wood products	.002	.001	.003	.004	.010
Local retired HH (C)	.036	.027	.049	.029	.141
(I)	.009	.017	.011	.007	.044
Tourists-seasonal (C)	.036	.022	.046	.043	.147
(I)	.002	.004	.002	.002	.010
50% Growth					
Cow-calf production	.011	.006	.016	.013	.046
Lumber-wood products	.002	.001	.002	.004	.009
Local retired HH (C)	.035	.026	.049	.028	.138
(I)	.010	.019	.012	.008	.049
Tourists-seasonal (C)	.035	.022	.046	.042	.011
(I)	.002	.009	.003	.002	.011

*Elasticities refer to the percentage increase in employment, over the annual average employment in 1973, (9797), resulting from a 1 percent increase in sales, over sales in 1973, from the named sector. Thus, all elasticities are directly comparable, not only among skill levels, but also among different growth models. See Table 1 for further explanatory notes.

distribution of jobs by skill level (income) need not be based on growth considerations (expected change in labor intensity). Again, distribution policy should be based more on the immediate effects and not longer run considerations.

Seasonal Impacts

The impact of U.S. Forest Service policy on the seasonal distribution of employment is a concern of local and other policy makers. Part of the policy maker's strategy may be to choose a policy which creates employment for those people who experience underemployment during particular seasons of the year. Quarterly employment elasticities are given in Table 3, and for expository purposes, only quarters 1 and 3 are given for two Local Areas.

The estimates indicate that the alternative policies have a moderate to rather large seasonal impact, and that the policies consistently raise employment more in the third quarter than in the first quarter. In all Local Areas and for all policies third quarter elasticities were at least 10 percent greater than first quarter elasticities, with the greatest seasonal variation being in Local Area 4. In that area, policies increasing investment by retired households & seasonal tourism by one percent result in a .028 percent increase in the area's employment in quarter 1 compared to a .044 percent increase in quarter 3. Table 3 also illustrates that the seasonal impact of the same policy variable may differ sharply among regions. For example, policies affecting lumber sales have a much greater seasonal impact in Local Area 4 than in Local Area 1 -- a 13 percent increase in the Local Area 1 elasticity vs. a 22 percent increase in Local Area 4. Of course, in evaluating the seasonal impact, it is important to determine not only the percentage difference in elasticities between seasons, but also the absolute value of the elasticity per se. For example, investment expenditures by seasonal tourists show a large percentage increase (50 percent or more) between seasons, but the absolute elasticity is small relative to several other policy variables.

The policy implication is that opportunity exists for changing employment (and hence income) distribution via policies which are season-oriented. Awareness

Table 3. Quarterly Employment Elasticities to U.S.F.S. Policies Affecting Cow-calf Production, Lumber Sales, Retirement Settlement and Tourism; Very Short Run; Salt-Verde Basin, Local Areas 1 and 4.

Policy, Final Demand Sector	Quarter 1	Quarter 3	Percentage Increase in Quarter 3 Elasticity Over Quarter 1
Local Area 1			
Cow-calf production	.026	.032	23
Lumber-wood products	.158	.178	13
Local retired HH (C)	.027	.030	11
(I)	.006	.008	33
Tourists-seasonal (C)	.099	.109	10
(I)	.006	.009	50
Local Area 4			
Cow-calf production	.227	.254	12
Lumber-wood procuts	.217	.265	22
Local retired HH (C)	.315	.363	15
(I)	.048	.065	35
Tourists-seasonal (C)	.514	.642	25
(I)	.028	.044	57

Note: Elasticities are with respect to annual average employment. Annual average employment in Area 1 was 7500 and in Area 4 it was 9796.

of the seasonal impacts may be used by U.S.F.S. officials in evaluating their policy before it is enacted on. Knowledge of the seasonal impacts may also be used by local officials in designing programs to cope with seasonal unemployment created by Forest Service policy.

Conclusions and Policy Recommendations

Salt-Verde Basin research suggests the following conclusions and guidelines for U.S. Forest Service and other agency policy-makers:

1. Alternative policies impact differentially on not only total regional employment, but also on the types of skill levels demanded. The distributional impact needs to be considered in maximizing policy benefits;

2. Virtually all the aggregate Local Area employment impact can be expected to be felt in the very short run or the short run as defined in this paper. Little additional impact is realized in the long run, and therefore should not be used in justifying policy.

3. Region-wide policy, such as timber cut (or grazing, tourism, or retirement settlement) pertaining to a multicounty forest area, has very different impacts among subregions of the area: large-region multipliers are simply unappropriate for understanding subregion economies and the impact of different policies on those subregions. Policy designed to change the distribution of employment (income) opportunities must reckon with this fact.

4. Regional economic growth (increased sales to final demand by all businesses) over time is expected to be accompanied by a decrease in labor intensity (labor/sales). The resulting decrease in employment elasticities is rather substantial for several of the policy variables. Each skill level is estimated to be affected by approximately the same proportional amount (by any particular policy variable). Accordingly, distribution policy can be based more on short run than longer run considerations for any particular policy variable.

5. Seasonal impacts of some policy alternatives are substantial. Forest agencies may use information on the seasonal impacts in evaluating current or pro-

posed polcies, and local officials may use information for the seasonal impacts of forest policies to adjust their own plans to meet seasonal unemployment problems created by other agency policies.

Author Identification

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Footnotes

1. For example, the tendency for people of like socio-economic backgrounds to marry and the current increases in families with both husband and wife earning incomes will tend to widen the income gap between low and high income families.

2. Data on the incidence of poverty in metropolitan and nonmetro counties is computed from U. S. Bureau of the Census data and given by Brinkman:

Percent of People in Poverty

Year	Metro Counties	Nonmetro Counties
1959	15%	33%
1968	10	18
1974	10	17

Footnotes (continued)

[3]The literature of public finance recognizes four economic roles of government: promote the efficient allocation of resources, stabilize prices, promote economic growth, and affect income distribution.

[4]Roy Ash, former director of the Office of Management and Budget and a Cabinet member of the Nixon and Ford administrations, states the proposition bluntly, "Obviously, the role of government has changed -- from one primarily of maintaining national security and domestic order to one that also massively redistributes income."

[5]The federal government controls approximately one-third, or 755 million acres, of the nation's land. Of federal land, some 470 million acres are under the Bureau of Land Management and 187 million acres are under the U.S. Forest Service.

[6]Growth model elasticities are based on the assumption that hypothesized production (sales) increases are produced under the less labor intensive (labor/sales) methods projected by the businesses in our sample. Of course, if regional sales increases come about through the addition of new firms, whose labor intensity is different than that projected by current businesses, the elasticities will be different.

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