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ABSTRACT

North-Central New Mexico has many of the problems common to other rural areas. Unemployment and underemployment rates tend to be high and per capita income relatively low. This study evaluated regional economic performance over a 19-year period (1949-1968) as compared to other regions and the nation. Shift analysis (a means of examining regional growth through study of relative shifts in economic activity) was used. This method of comparative-growth analysis measured regional performance against national standards by attributing regional employment growth to 3 basic effects: (1) national growth effect (the number of employees gained or lost by a local sector if employment in the sector grew or declined at the national total employment growth rate); (2) industry-mix effect (the region's commitment to either fast or slow growth industries); and (3) competitive effect (the differential rates of growth by industry in various regions in the country). Employment data by industry were obtained from the Bureau of Business Research "Income and Employment in New Mexico" reports. Missing data due to disclosure regulations were estimated according to U.S. Department of Commerce County Business Patterns statistics. Among the findings were: total regional employment increased more than expected (i.e., at greater than the national rate) and the most profound influence on regional employment was the increase in government employment. (NQ)

# A COMPARATIVE ECONOMIC ANALYSIS OF NORTH-CENTRAL NEW MEXICO



NEW MEXICO STATE UNIVERSITY

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AGRICULTURAL EXPERIMENT STATION RESEARCH REPORT 211

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# A COMPARATIVE ECONOMIC ANALYSIS OF NORTH-CENTRAL NEW MEXICO

Garrey Carruthers and Clyde Eastman[1]

The pattern and extent of economic growth in the United States has varied considerably among geographic regions. Some regions, such as the West Coast and in particular, southern California, have experienced unprecedented rates of growth during the post-war years, attracting capital, materials, and human resources from other regions in the country. Simultaneously other regions have been in various stages of relative decline. Regional economic performance is often reflected in differing rates of employment growth or employment reductions. Regional rate differentials may reflect varying impacts of technological change, changes in tastes and preferences, changing institutional influences, or depletion or discovery of resources. The objective of this study was to assess the relative economic status of north-central New Mexico and to suggest specific problem areas constraining economic growth. The method used--shift analysis--does not yield solutions to these problems but allows evaluation of the changing nature of a region's economy in relation to national economic trends.

## DELINEATION OF THE STUDY REGION

The study area, north-central New Mexico, encompasses the seven-county area outlined in figure 1. This region corresponds to Planning and Development District 2 as delineated by the New Mexico State Planning Office (9, p. 34). Criteria for regional delineation included retention of counties as sub-units of each region, existence of a regional services center, minimum population base, travel time from the regional center to the outlying hinterland, and homogenity with respect to several socio-economic characteristics such as economic structure, employment, income, resources, ethnicity of the population, and level of educational attainment (9, pp. 27-33). Each region is "a comprehensive planning unit, serving as an administrative district for various state governmental responsibilities, and providing the focus for concerted economic development efforts" (9, p. 27). Use of the state's regional delineation facilitates coordination of research and development action programs.

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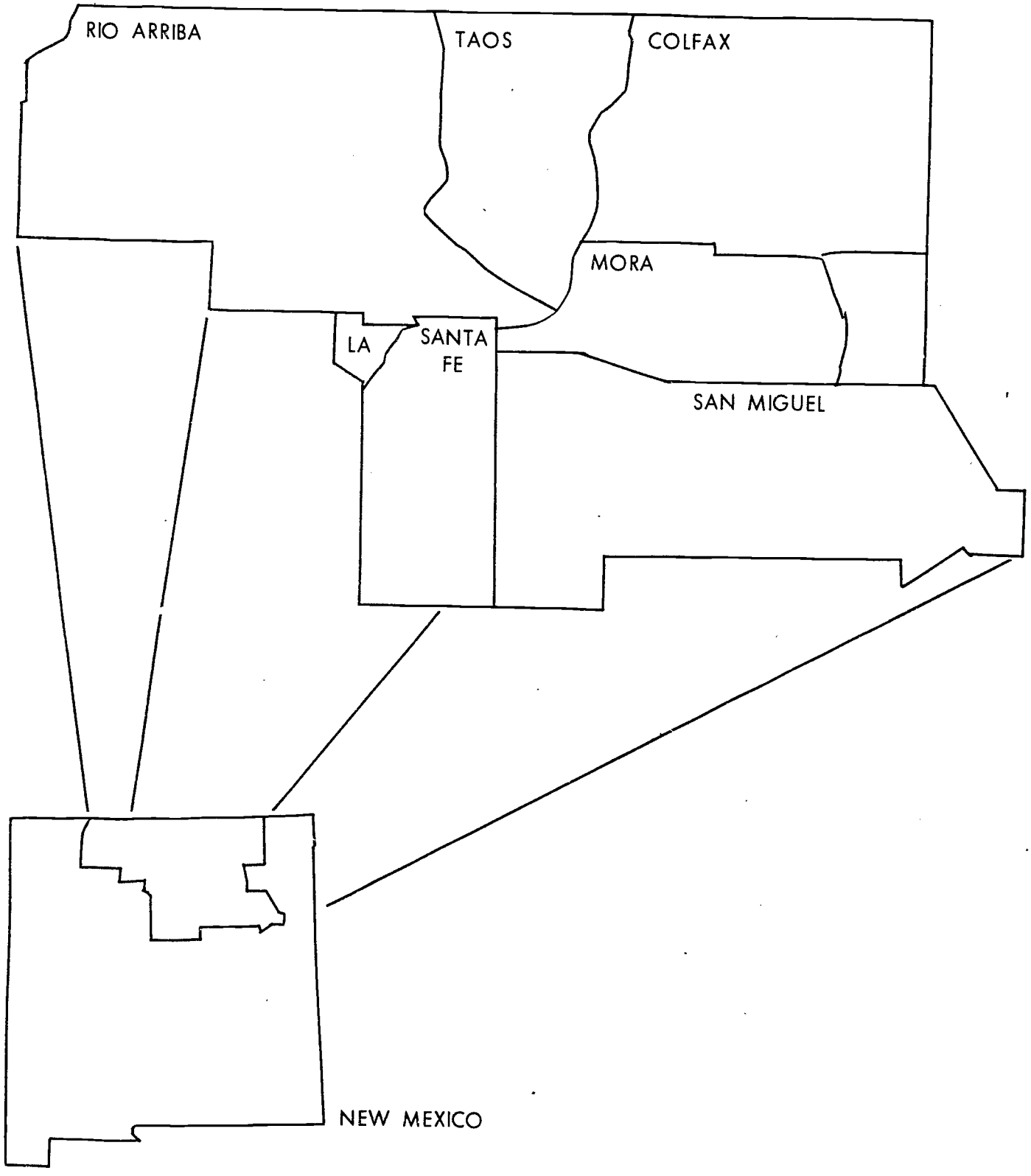
Fig. 1. North-Central New Mexico



## DESCRIPTION OF THE STUDY AREA[2]

### Physical Description

The western and central areas of the region are mountainous with interspersed valleys and basins and the eastern slope is undulating to rolling uplands interspersed with relatively smooth valleys and basins. The Sangre de Cristo Range extends northward from New Mexico through the central part of the region. The Arkansas and Pecos River basins form on the eastern slope of this range; the Rio Grande River Basin parallels the Range on the west. The western one-third of Rio Arriba County is on the western slope of the Continental Divide and drains into the San Juan River Basin.

Elevations in the region range from 3,600 feet in the plains area of Colfax County to 13,000 feet in the Sangre de Cristo Mountains. Average annual precipitation varies from 7-10 inches in the San Juan Basin to 16-30 inches in the southern Rocky Mountains (4, p. 6).

### Socio-Economic Description

The 1970 population of the region was 145,920, a 3.2 percent increase over the 1960 level. An increase in population from 1960 to 1970 occurred in four of the seven counties, Los Alamos (16.6 percent), Santa Fe (19.5 percent), Taos (9.9 percent), and Rio Arriba (4.0 percent) (4, p. 15).

Unemployment in 1968 ranged from 1.9 percent in Los Alamos to 15.5 percent in Rio Arriba County. Los Alamos and Santa Fe counties had unemployment rates below the state average, 5.1 percent. Four counties--Mora, Rio Arriba, Taos, and San Miguel--had unemployment equal to or greater than 10 percent (3, p. 33-35).

Per capita income levels for 1967 in six of the seven counties were below the state average, $2,419. Per capita incomes were particularly low in Taos ($1,392), Mora ($1,541), and San Miguel ($1,619) counties (3, p. 42). More than 15 percent of the population in Mora County, 14 percent in San Miguel and Taos counties, and more than 11 percent of the population in Rio Arriba County received welfare assistance in 1964 (4, p. 17).

The government, the major employer in the region, supplied 25.9 percent of the region's employment in 1949. In 1968, more than 42 percent of the regional employment was by state, local, and federal government agencies. More than half of all 1968 government employment was in Los Alamos County, the Atomic Energy Commission town site, and Santa Fe County, where the state capital is located. Service and miscellaneous trade, agriculture, and construction, although not approaching the employment level of the government, are other major employers in the region. Manufacturing offers relatively minor employment opportunities.

With the exception of Santa Fe and Los Alamos, the region's population is rural. Regional socio-economic problems are similar to those in many other depressed rural areas:

[2]For a more complete description of the study area, see Carruthers and Eastman, "An Inventory of Natural, Human, and Social Overhead Capital Resources in North-Central New Mexico", Agricultural Experiment Station Research Report 184, New Mexico State University.

low per capita income and educational achievement, unemployment and underemployment of resources, deficient social overhead capital, small agricultural units, and erosion and depreciation of natural resources.

Table 1. Employment by sector, north-central New Mexico, 1949, 1968

| County | Agriculture | Mining | Construction | Manufacturing | Trans., Comm., & Util. | Trade | F.I.R.E.[1] | Services & Misc.[1] | Government | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | number employed | | | | | | | | | |
| Colfax | | | | | | | | | | |
| 1949 | 500 | 760 | 250 | 210 | 510 | 800 | 60 | 620 | 550 | 4,260 |
| 1968 | 425 | 282[3] | 223 | 580 | 288 | 684 | 118 | 882 | 816 | 4,238 |
| Los Alamos | | | | | | | | | | |
| 1949 | 0 | 0 | 1,510 | 10 | 0 | 100 | 0 | 660 | 2,390 | 4,670 |
| 1968 | 0 | 0 | 236 | 7[4] | 45 | 519 | 74 | 1,407 | 5,641 | 7,929 |
| Mora | | | | | | | | | | |
| 1949 | 580 | 0 | 0 | 190 | 30 | 200 | 0 | 60 | 130 | 1,190 |
| 1968 | 386 | 0[4] | 3[4] | 7[4] | 7[4] | 32 | 4[5] | 176 | 233 | 848 |
| Rio Arriba | | | | | | | | | | |
| 1949 | 520 | 40 | 500 | 90 | 100 | 1,280 | 0 | 290 | 330 | 3,150 |
| 1968 | 500 | 79 | 533 | 220 | 262 | 691 | 94 | 816 | 1,438 | 4,633 |
| San Miguel | | | | | | | | | | |
| 1949 | 620 | 0 | 210 | 110 | 500 | 940 | 40 | 590 | 940 | 3,950 |
| 1968 | 648 | 26 | 157 | 132 | 289 | 859 | 116 | 576 | 2,502 | 5,305 |
| Santa Fe | | | | | | | | | | |
| 1949 | 380 | 220 | 940 | 470 | 810 | 2,980 | 200 | 1,710 | 3,020 | 10,730 |
| 1968 | 362 | 103 | 869 | 648 | 617 | 2,977 | 723 | 3,201 | 5,946 | 15,446 |
| Taos | | | | | | | | | | |
| 1949 | 220 | 0 | 50 | 190 | 100 | 610 | 10 | 310 | 360 | 1,850 |
| 1968 | 325 | 456 | 117 | 138 | 89 | 550 | 72 | 581 | 964 | 3,292 |
| Region | | | | | | | | | | |
| 1949 | 2,820 | 1,020 | 3,460 | 1,270 | 2,050 | 6,910 | 310 | 4,240 | 7,720 | 29,800 |
| 1968 | 2,646 | 946 | 2,138 | 1,732 | 1,597 | 6,312 | 1,201 | 7,579 | 17,540 | 41,691 |
| 1968-1949 | -174 | -74 | -1,322 | 462 | -453 | -598 | 891 | 3,339 | 9,820 | 11,891 |
| U.S. (thousands) | | | | | | | | | | |
| 1949[a] | 10,756 | 930 | 2,165 | 14,441 | 4,001 | 9,264 | 1,857 | 5,264 | 5,856 | 54,534 |
| 1968[b] | 4,746[c] | 625 | 3,259 | 19,740 | 4,348 | 14,111 | 3,357 | 10,504 | 12,202 | 72,932 |
| 1968-1949 | -6,010,000 | -305,000 | 1,094,000 | 5,229,000 | 347,000 | 4,847,000 | 1,500,000 | 5,240,000 | 6,346,000 | 18,398,000 |

[1] F.I.R.E. = Finance, insurance, and real estate

[2] Included self-employed, other non-agricultural workers

[3] Added 282 to mining as source has obvious error

[4] Disclosures estimated using data from 1968 County Business Patterns - number of firms reporting

[5] From County Business Patterns

Major Sources: "Income and Employment in New Mexico, 1949-1959", Bureau of Business Research, University of New Mexico, New Mexico Studies in Business and Economics No. 8, 1961.
New Mexico Statistical Abstract 1970, Bureau of Business Research, University of New Mexico, Volume I, February, 1970.

Other Sources: [a] "Employment and Earning Statistics for States and Areas, 1939-66", Bulletin No. 1370-4, U S. Department of Labor. Bureau of Labor Statistics.
[b] Statistical Abstract of the United States, 1969, U.S. Department of Commerce, Bureau of the Census.
[c] Agricultural Statistics, 1951 and 1969, published by U.S. Department of Agriculture.

## PROCEDURES

### Shift Analysis

Shift analysis is a means of examining regional growth through study of relative shifts in economic activity. "If one region grows faster than the nation, at least a significant portion of economic activity may be said to have shifted to that region, because the regional share of total activity has increased" (6, p. 1). In addition to providing a systematic means of comparing growth trends, shift analysis yields insights into the factors influencing regional growth or decline.

The analytical procedure followed in this study was that specified by Ashby and Matilla for the Regional Economics Division, Office of Business Economics, U. S. Department of Commerce (1, 7). This method of comparative-growth analysis measures regional performance against national standards by attributing regional employment growth to three basic effects: national growth effect, industry-mix effect, and competitive effect.[3]

National Growth Effect. The level and direction of national economic activity is a predominant factor influencing regional growth of performance. This effect is expressed as the number of employees gained or lost by a local sector if employment in the sector grew (or declined) at the national total employment growth rate.[4]

Industry-Mix Effect. The industry-mix effect reflects the region's commitment to either fast or slow growth industries. Electronics and aerospace industries have, in the recent past, been fast growth industries; agriculture, mining, and forestry are examples of slow growth industries. Regions that specialize in fast growth industries will have a positive industry-mix effect.[5]

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[3]Algebraically: $d_{ij} = g_{ij} + k_{ij} + c_{ij}$
where: $d_{ij}$ = actual change in employment, sector i, region j
$g_{ij}$ = national growth effect, sector i, region j
$k_{ij}$ = industry-mix effect, sector i, region j
$c_{ij}$ = competitive effect, sector i, region j
The total net effect is defined as the algebraic sum of the industry-mix and competitive effect, that is $N_{ij} = k_{ij} + c_{ij}$
where: $N_{ij}$ = total net effect, sector i, region j.

[4]That is: $g_{ij} = \beta_{ij} r_{..}$
where: $\beta_{ij}$ = employment base, sector i, region j
$r_{..}$ = rate of change in total U.S. employment
The national rate of change in employment is computed as follows: $r_{..} = \frac{{}_{t+n}E_{..} - {}_{t}E_{..}}{\beta_{..}}$
where: ${}_{t+n}E_{..}$ = total U.S. employment in the terminal period, $t+n$
${}_{t}E_{..}$ - total U.S. employment in the initial period, $t$
$\beta_{..}$ = U.S. base employment for the period of analysis.

[5]The industry-mix effect is defined as follows: $k_{ij} = \beta_{ij}(r_{i.} - r_{..})$
where: $k_{ij}$ = the industry-mix effect, sector i, region j
$\beta_{ij}$ = base employment, sector i, region j
$r_{i.}$ = rate of change in national employment, sector i
$r_{..}$ = rate of change in total national employment
The rate of change in national employment, industry i, is computed as follows: $r_{i.} = \frac{{}_{t+n}E_{i.} - {}_{t}E_{i.}}{\beta_{i.}}$
where: ${}_{t+n}E_{i.}$ = national employment, terminal year, industry i
${}_{t}E_{i.}$ = national employment, initial year, industry i
$\beta_{i.}$ = national base employment, industry i

The factors underlying the rate of growth of industries ($r_{i.}$) may be generalized as follows: demand characteristics, technological developments, and institutional factors.

Demand characteristics of primary importance are income elasticity of demand and factors influencing the demand for products, tastes, and preferences. Manufactured goods and most services have relatively high income elasticities of demand, hence; as national income rises, greater increments are spent on these items. Agricultural products, on the other hand, have low income elasticities of demand and, as a result, when national income rises, agricultural regions often do not receive the stimulus that manufacturing regions do.

Changes in tastes and preferences of consumers and technological developments are often related. The development of plastics and the subsequent improvement of their quality have resulted in a shift of preference to plastic products and away from steel and glass. Regions having plastic-producing and manufacturing plants have prospered at the expense of regions with only glass and steel industries. In addition, technological developments may result in production cost reductions and subsequent product price declines often resulting in increased sales and subsequent rapid expansion within a particular industry.

Institutional factors influencing the rate of growth of industries include not only the expansion of the government sector but institutional legal changes directly affecting non-government-affiliated industries. The aerospace industry has grown rapidly in the recent past as a result of governmental expenditures for space exploration. On the other hand, the rate of growth of the tobacco industry will undoubtedly be influenced by legislation requiring warnings on cigarette packages and by curtailment of advertising.

Competitive (regional share) Effect. The competitive or regional-share effect reflects the differential rates of growth by industry in various regions in the country. Although growth of an industry may occur in all regions, this growth in some regions will exceed that in others. A positive competitive effect implies that a region is receiving "more than its share" of an industry's growth; a negative effect implies that, although growth is occurring in the local sector, other regions are producing a greater share of the industry's total industrial output.[6]

The nature of the region determines, for the most part, the magnitude of the sector growth rates and hence the direction of the competitive effect. Specifically, the competitive effect may be attributed to accessibility to regional and national output markets and to regional and national input markets. Access to output markets are conditioned by transportation systems' adequacy, distance to markets, and proximity to regional and national cities. Accessibility to input markets is related to adequacy of transportation systems, resource base and availability, and perhaps quality of productive resources.

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[6] This effect is defined as: $c_{ij} = \beta_{ij}(r_{ij} - r_{i.})$

where: $c_{ij}$ = competitive effect, sector i, region j
$\beta_{ij}$ = employment base, sector i, region j
$r_{ij}$ = rate of change in employment, sector i, region j
$r_{i.}$ = rate of change in national employment, sector i

The rate of change in regional employment, sector i, is computed as follows: $r_{ij} = \frac{{}_{t+n}E_{ij} - {}_{t}E_{ij}}{\beta_{ij}}$

where: ${}_{t+n}E_{ij}$ = employment, sector i, region j, terminal period
${}_{t}E_{ij}$ = employment, sector i, region j, initial period
$\beta_{ij}$ = base employment, sector i, region j

Input-output access is best summarized in figure 2. For example, in the schematic, Region 4 would have little prospect for growth; region 13 would have unsurpassed growth potential. Regions 1, 2, 3, 8, 12, and 16 would be a little better off than 4; regions 6, 7, 10, and 11 would be next; and regions 5, 9, 12, and 15 would be next in growth potential (8, p. 30).

Base Employment. Matilla argues that "the arithmetic form of the (1/2 - 1/2) convex (employment) base yields the best practical approximation to the values which would be obtained if one could measure the various employment effects as resultants of a continuous growth process" (7, p. 7). He demonstrates that the use of either terminal-period employment level as the base can result in a significant bias. Hence, employment base in this analysis is the sum of one-half of the terminal employment and one-half of the initial employment by sector and region.

Source of Data. The period of analysis was 1949 to 1968. Employment data by industry for these terminal years were obtained from the Bureau of Business Research "Income and Employment in New Mexico" reports (2). This source offers temporarily compatible employment estimates over the time period specified. Missing data due to disclosure regulations were estimated according to U. S. Department of Commerce County Business Patterns statistics (11).

## RESULTS

Some indication of regional performance is indicated in table 2. Only four sectors in north-central New Mexico--manufacturing, finance-insurance-real estate (F.I.R.E.), services, and government--had positive rates of change in employment over the 1949 to 1968 period compared to seven sectors nationally. Employment rates of change in manufacturing, services, and government within the region are comparable to those occuring nationally. Finance-insurance-real estate employment increased at a substantially higher rate in north-central New Mexico than in the U. S., probably reflecting the relatively low 1949 level of activity in this sector. Surprisingly, the rate of change in total regional employment was slightly higher than the national rate.

The continuing rural nature of the region is partially reflected in a comparison of the rates of change in agricultural employment; national agricultural employment declined .77538 of this sector's base employment. North-central New Mexico's agricultural employment declined by less than seven percent of regional agricultural base employment. Negative rates of change in regional transportation, communications and utilities, and trade employment further imply that the national transition from rural to urban economies has not occurred in this region.

The shift analysis results, presented in table 3, give added insights into the region's economy. Actual employment in north-central New Mexico increased 11,893 during the 19-year period specified. Assuming regional employment shifts equal to the national rate, employment in the region would have increased by 10,321, the total national growth effect. The

Fig. 2. A schematic presentation of types of regions that can exhibit different growth potentials

| | | Good access to basic inputs[1] from external regional and national sources | | Poor access to basic inputs[1] from external regional and national sources | |
|---|---|---|---|---|---|
| | | Good access to basic inputs in home region | Poor access to basic inputs in home region | Good access to basic inputs in home region | Poor access to basic inputs in home region |
| Poor access to external regional and national markets | Poor access to markets in home region | #1 II[2] | #2 I | #3 I | #4 0 |
| | Good access to markets in home region | #5 III | #6 II | #7 II | #8 I |
| Good access to external regional and national markets | Poor access to markets in home region | #9 III | #10 II | #11 II | #12 I |
| | Good access to markets in home region | #13 IV | #14 III | #15 III | #16 II |

[1]Not only basic resources, but important intermediate sources need to be considered.

[2]Roman numerals indicate number of "good" access dimensions and suggest relative over-all locational advantages or disadvantages.

Source: Perloff, Harvey S., "How a Region Grows: Area Development in the U. S. Economy", Supplementary Paper No. 17, Committee for Economic Development, 1963.

Table 2. Base employment and growth rates, 1949-1968, by sector, north-central New Mexico and the United States

| Industry | Regional Base Employment $\beta_{ij}$ | National Base Employment $\beta_i$ | Rate of Change in Regional Employment $r_{ij}$ | Rate of Change in National Employment $r_i$ |
|---|---|---|---|---|
| Agriculture | 2,733 | 7,751,000 | -.06366 | -.77538 |
| Mining | 983 | 778,000 | -.07527 | -.39203 |
| Construction | 2,799 | 2,713,000 | -.47231 | .40324 |
| Manufacturing | 1,501 | 17,091,000 | .30779 | .30595 |
| Trans., comm., util. | 1,824 | 4,175,000 | -.24835 | .08311 |
| Trade | 6,611 | 11,688,000 | -.09045 | .41469 |
| F.I.R.E.[1] | 756 | 2,608,000 | 1.17857 | .57515 |
| Services and misc. | 5,910 | 7,884,000 | .56497 | .66468 |
| Government | 12,630 | 9,029,000 | .77751 | .70284 |
| Total | 35,764 | 63,733,000 | .33248 | .28867 |

[1]F.I.R.E. = Finance, insurance, and real estate

Table 3. Shift analysis results, north-central New Mexico, 1949-1968

| Item | Agri-culture | Mining | Con-struction | Manu-facturing | Trans., Comm., & Util. | Trade | F.I.R.E.[1] | Services and Misc. | Govern-ment | Regional Employ-ment |
|---|---|---|---|---|---|---|---|---|---|---|
| National Growth Effect ($g_{ij}$) | 789 | 284 | 810 | 433 | 527 | 1,908 | 218 | 1,706 | 3,646 | 10,321 |
| Industry--Mix Effect ($k_{ij}$) | -2,908 | -669 | 321 | 25 | -375 | 833 | 217 | 2,222 | 5,231 | 4,898 |
| Competitive Effect ($c_{ij}$) | 1,945 | 311 | -2,451 | 3 | -605 | -3,339 | 456 | -589 | 943 | -3,325 |
| Actual Change in Employment ($d_{ij}$) | -174 | -74 | -1,320 | 462 | -453 | -598 | 891 | 3,339 | 9,820 | 11,893 |
| Net Effect ($N_{ij}$) | -963 | -358 | -2,130 | 29 | -980 | -2,506 | 673 | 1,633 | 6,174 | 1,572 |

[1]F.I.R.E. = Finance, insurance, and real estate

difference in actual (11,893) and expected employment change because of national growth is a positive 1,572 and may be attributed to industry-mix and/or competitive effects or, by definition, the net effect. This positive net effect is the result of a favorable total industry-mix effect (4,898) more than offsetting an unfavorable competitive effect (-3,326). In terms of the earlier discussion, the region had a commitment to some fast-growth industries but, overall, did not maintain its competitive position. A sector-by-sector evaluation is necessary for a complete assessment of this outcome.

The agriculture sector, nationally and within the region, lost employees over the period 1949 to 1968 (see table 1). The actual decline in agricultural employment within the region (-174) was considerably less than expected (-2,119), considering the national trend in this sector's employment. Regional agricultural employment would have increased by 789, the national growth effect, if none of the factors causing varying sector growth and regional growth rates had operated. The negative industry-mix effect, -2,908, reflects declining national employment in agriculture compared to total employment growth. The reason implied from this analysis for the relatively small decline in regional agricultural employment

was that the region's agricultural industry was able to acquire a larger share of the total market, i.e., the region had a positive agricultural competitive effect (1,945). Use of employment data, in this case, may yield a misleading implication. This positive industrial-mix effect may partially be attributed to a reluctance or inability of north-central New Mexico agricultural producers to leave the industry. Access to input and output markets, particularly for the livestock industry, has improved over the period and may have accounted for some of the positive competitive effects. Other evidence (4) suggests that the former reason is more acceptable.

Mining, construction, transportation-communication-utilities, and trade employment also declined over the period 1949-1968. Mining employment declined the least of four sectors (-74); this loss may be attributed to factors underlying the industry-mix effect or, specifically, to the rate of growth of mining nationally. The negative industry-mix effect for the region's mining sector (-669) was partially offset by a positive regional competitive effect (311). The opening of the Molycorp mines near Questa and oil, gas, and coal exploration and development in the region undoubtedly resulted in north-central New Mexico gaining a relatively larger share of the national minerals market. As noted earlier, resource discovery is one of the factors contributing to access and, hence, to a competitive edge.

Construction employment declined 1,320 during the period. The decline may be attributed from this analysis to an unfavorable competitive position (competiti effect is -2,451). One possible explanation is the lack of major construction firms in the region. Major construction projects were contracted by firms outside the region who withdrew their labor resources upon completion of the contract. The relatively high negative competitive effect in this sector was tempered somewhat by a positive industry-mix effect, thus reducing the net employment effect of this sector to -2,130.

Actual employment in transportation-communication-utilities in the region declined 453; the industry-mix effect was -375, the competitive effect was -605, thus yielding a net effect of -980. If these industries had progressed at the national sector rate of growth ($r_{i.}$), regional sector employment would have increased by 152 workers. The relatively high negative competitive effect for these industries may reflect increasing dependence of the region on outside suppliers for truck transportation, television and radio broadcasting, and power and other utilities. The region apparently does not have the population mass to justify internal production of these services. In terms of the earlier discussion, this may best be described as a problem of access to internal and/or external markets.

Expected increase in trade sector employment was 2,741, the sum of national growth and industry-mix effects. The actual decline in this sector's employment (-598) is attributed to an extremely high negative competitive effect (-3,339). The explanation here again may be access to both input and output markets. Wholesale trade firms tend to locate in larger cities; many of those serving north-central New Mexico may be headquartered in Albuquerque, thus substituting for sector employment within the region. Similarly, many of the inputs for trade firms may be acquired from suppliers located in the larger metropolitan areas. Agglomeration of the trade industry appears to be partial explanation of the declining competitive position of the trade sector in north-central New Mexico.

Positive employment shifts occurred in the manufacturing, finance-insurance-real estate, services and miscellaneous, and government sectors. By far, the most profound

influence on regional employment was the increase in government employment. Assuming the national government sector growth rate had prevailed, employment in this sector would have increased 8,877; the actual change in government employment was 9,820. The difference is attributed to a positive competitive effect of 943, primarily the result of accelerated state government activities in Santa Fe and increased employment at Los Alamos. Without expansion of government employment, the actual change in regional employment would have been 2,073 compared to 11,893.

The other three sectors are also considered fast growth nationally and hence have positive industry-mix effects. Employment in excess of that expected from national growth occurred in manufacturing (3) and F.I.R.E. (456). The services sector did not attain a positive competitive position (-589), although actual change in employment in this sector was relatively high (3,339).

The importance of government employment to the region is emphasized by shift analysis results for five of the seven counties (table 4), excluding Los Alamos and Santa Fe. Nearly 8,000 of the additionally employed within the region (11,893 from table 3) worked in Los Alamos and Santa Fe counties. Excluding these counties, base employment in the five-county sub-region was 16,360; the actual change in employment over the period was 3,916. Actual change in sub-region government employment was 3,643. Both the industry-mix and competitive effects for the sub-region were negative; the net effect was -807. These predominantly rural counties specialized in slow-growth industries; and the industries, in the aggregate, did not maintain a competitive position. Growth in employment in the sub-region is attributed primarily to the national growth effect.

Table 4. Shift analysis results; Colfax, Mora, Rio Arriba, San Miguel, and Taos counties, New Mexico: 1949 to 1968

| Item | Agri-culture | Mining | Con-struction | Manu-facturing | Trans., Comm., & Util. | Trade | F.I.R.E.[1] | Services and Misc. | Govern-ment | Regional Employ-ment |
|---|---|---|---|---|---|---|---|---|---|---|
| | number employed | | | | | | | | | |
| National Growth Effect ($g_{ij}$) | 682 | 237 | 295 | 270 | 314 | 959 | 74 | 699 | 1,193 | 4,725 |
| Industry--Mix Effect ($k_{ij}$) | -2,513 | -560 | 117 | 16 | -224 | 419 | 74 | 910 | 1,711 | -50 |
| Competitive Effect ($c_{ij}$) | 1,676 | 365 | -389 | 1 | -395 | -2,392 | 146 | -508 | 739 | -757 |
| Actual Change in Employment ($d_{ij}$) | -156 | 43 | 23 | 287 | -305 | -1,014 | 294 | 1,101 | 3,643 | 3,916 |
| Net Effect ($N_{ij}$) | -838 | -194 | -272 | 17 | -619 | -1,973 | 220 | 402 | 2,450 | -807 |

[1]F.I.R.E. = Finance, insurance, and real estate

## SUMMARY AND IMPLICATIONS

North-central New Mexico has many of the problems common to other rural areas of this country. Unemployment and underemployment rates tend to be high and per capita income relatively low. The objective of this analysis was to evaluate regional economic performance over a 20-year period compared to other regions and the nation.

Total regional employment increased more than expected, i.e., at greater than the national rate. Employment growth in north-central New Mexico, during the period, was attributed to a positive industry-mix effect, probably because the region specialized in fast growth industries. In fact, the region specialized in one particular fast-growth industry--government. The net employment effect of this industry's growth was 6,174. The service sector was the only other having a large net positive employment effect. The agriculture, mining, construction, transportation-communication-utilities, and trade sectors all had negative net employment effects and employment reductions during the period 1949-1968.

Three specific observations can be made:

1. The region has been extremely dependent upon government activity over the period. The state government can be expected to employ more people as the state's population grows. The facility at Los Alamos has offered relatively stable employment since its inception and appears to continue as an important sector of the region's economy. This research facility is, however, more susceptible to employment reductions because of shifts in national priorities.

2. The negative overall competitive effect for the region and for a number of sectors within the region may be attributed primarily to access problems, access to major output markets, and perhaps access to some input markets. It has been argued that the region is connected to northern and southern areas through the existing road transportation networks but has little relationship east and west because there are no major highways in these directions (4, p. 22). Some consideration has been given to a major road connecting north-central New Mexico to the San Juan Basin. Perhaps construction of such a facility would lead to expansion of market outlets for some industries in the region. Internal road systems need to be improved to enhance access to some of the region's inputs and to public and private services.

As with most rural areas, access is not the only reason for negative competitive effects--the distance to major population centers from the region constrains the development of a number of sectors. Construction and trade industries tend to locate in larger metropolitan areas; their development and growth in north-central New Mexico may await the existence of a critical population mass.

3. The positive competitive effect for the agriculture sector was inferred to be further evidence of the reluctance or inability of those employed in this sector to move to other industries. Negative net effects in mining, construction, and transportation-communication-utilities and a small positive net effect for manufacturing suggest there have been limited opportunities for these individuals to shift to other employment.

Future economic growth in the region may depend on continued expansion of the government sector. But with only two major employment opportunities--Los Alamos Scientific Laboratories and the state government--there is a limit to the economic stimulus from growth in this sector. Agriculture sector growth may be constrained by resource availability and current land ownership patterns;

trade, F.I.R.E., and service sector expansion is dependent upon growth in population. Growth potential, however, may exist for the mining and manufacturing sectors--the conditional element appears to be accessibility to markets. A more thorough evaluation of and solutions to access problems is necessary if economic opportunities in the region are to be improved.

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