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ETHNICS, PESTS, AND TOWNS: ECONOMIC DEVELOPMENT AND INCOME DISTRIBUTION ON THE WESTERN FRONTIER

by

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AND INCOME DISTRIBUTION ON THE WESTERN FRONTIER

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ETNICS, TOWNS, AND PESTS: ECONOMIC DEVELOPMENT AND INCOME DISTRIBUTION ON THE WESTERN FRONTIER

L. Dwight Israelsen

ABSTRACT

Careful studies of the distribution of income in nineteenth-century United States have been hampered by a paucity of available data. This study undertakes the analysis of factors influencing the distribution of personal income in the Great Basin region of the western United States during the period 1855-1900. The study utilizes estimates of full income by individual based on information contained in the General Economic Records of the Church of Jesus Christ of Latter-day Saints. Mean income and Gini ratios are calculated for the region for the years 1855, 1857, 1859, 1861, 1866, 1868, 1870, 1872, 1880, 1885, 18980, 1895, and 1900. The number of individuals included in the sample increases from 4,800 in 1855 to 51,000 in 1900, representing from one-third to two-thirds of all income earners in the region. Econometric analysis is undertaken to identify the impact on income distribution of changes in mean income, population, urbanization, crop destruction by grasshoppers, and the percentage of the population born in non-English speaking countries. The econometric results suggest that the regional economy of the Great Basin remained in the “early” stages of economic development throughout the territorial period (1850-1896). The problem of generalizing the results of this study to other frontier regions of the United States is also discussed.
Ethnics, Pests, and Towns: Economic Development and Income Distribution on the Western Frontier

L. Dwight Israelsen*

While economists have been able to undertake careful studies of the historical distribution of wealth in the United States based on data found in census, tax, probate, and other records, historical studies of the distribution of income across the U.S. population have been hindered by the paucity of available income data for eighteenth- and nineteenth-century Americans. Such studies as have been made are, of necessity, largely impressionistic or inferential. The 1862-1872 "Civil War" income tax, hitherto the primary source of nineteenth-century individual income data, required filing by only the top five percent or less of the income distribution, and was subject to evasion and underreporting.

The study which follows undertakes the estimation and reporting of the level and distribution of personal income among the Mormon population of the Great Basin for the period 1855-1895. The study utilizes estimates of full income by individual based on information reported to ecclesiastical authorities and contained in the General Economic Records of the Church of Jesus Christ of Latter-day Saints. Gini concentration ratios are calculated for selected years between 1855 and 1895, and a preliminary econometric analysis is undertaken to identify the impact on income distribution of changes in mean income, population, urbanization, crop destruction by grasshoppers, and the percentage of the population born in non-English speaking countries. The econometric results suggest that the regional economy of the Great Basin remained in the "early" stages of economic development throughout the territorial period (1850-1896). The problem of generalizing the results of this study to other frontier regions or to the United States as a whole is discussed, and areas of additional research are suggested.
I. The Data

The Latter-day Saints, more popularly known as "Mormons," entered the Great Basin under the leadership of Brigham Young in 1847 with the intention of developing a self-sufficient regional commonwealth, a policy which they pursued with varying success until Utah achieved statehood in 1896.\textsuperscript{4} The emphasis on centrally-directed policies of economic development that marked Mormon economic strategy during this period differentiates Utah's frontier experience from similar periods in other western regions. One of the most important economic institutions in the Great Basin was the Mormon tithing house. In addition to collecting and disbursing produce and livestock tithing, the tithing house provided a banking service, a merchandising service, and a circulating medium of exchange. The setting of uniform prices for the wide variety of produce, livestock, labor, and other goods paid as tithing made the tithing house an important instrument of economic stabilization throughout most of the second half of the nineteenth century in the Great Basin.\textsuperscript{5} The most basic function of the tithing office, the collection and valuation of tithes, makes possible the present study.

The practice of contributing one-tenth of the yearly "increase" or income to the church which had been instituted among the Latter-day Saints in the Midwest during the 1830s and 1840s was systematized after their arrival in the Great Basin. Individuals were asked to tithe income in the form it was produced, be it wheat, squashes, chickens, wolf skins, or labor, though in practice some leeway was allowed as to method of payment. Detailed records of contributions were kept at the local tithing offices, where tithing price lists--received from the Presiding Bishop's office in Salt Lake City--were used to value each commodity received. At the end of the year, each tithepayer met with his Ward Bishop, the local ecclesiastical authority, for an accounting. At that time, the total value of tithing contributions made by the individual during the year were compared to the total
value of tithing owed (one-tenth of each kind of income or net production) and a
settlement was made.\textsuperscript{6} Ward tithing records were summarized and delivered to
regional church authorities, and thence to the General Tithing Office in Salt Lake
City, where they eventually became part of the General Economic Records of the
L.D.S. Church.

The estimates of individual income used as the basic data in this study are
calculated as ten times the amount of tithing owed as indicated in the records.
Data has been collected for the years 1855, 1857, 1859, 1861, 1866, 1870,
1875, 1880, 1885, 1890, and 1895. Table 1 shows the sample size for each year
included in the study. As a fraction of the territorial labor force, the sample varies
from about two-thirds in the 1850s and 1860s to one-half in the 1870s, two-fifths
in the 1880s, and one-third in the 1890s. The sample comprises from fifty to
ninety percent of all Mormon workers, depending on the year. Maximum
likelihood estimates of territorial Gini ratios are calculated for each year, based on
the gamma distribution function.

Several problems associated with the use of tithing data should be noted.
First, whereas all of the records used indicated the value of tithing paid, not all
records indicated the value of tithing owed. In some years the percentage of a "full
tithe" paid, rather than the actual amount owed, was recorded. For those records,
the amount owed could be calculated by simple division. When a fraction of the
records for a particular year contained neither the actual amount of tithing owed
nor the percentage of a full tithe paid, but only the amount paid, the Gini ratio for
income was estimated by a two-stage process. First, the subset of records
containing information on tithing paid and tithing owed was identified, and an
adjustment factor consisting of the Gini ratio for tithing owed divided by the Gini
ratio for tithing paid was calculated. Then the Gini ratio for tithing paid for the full
set of records was multiplied by the adjustment factor to determine the Gini ratio

3
<table>
<thead>
<tr>
<th>Year</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1855</td>
<td>4,808</td>
</tr>
<tr>
<td>1857</td>
<td>6,585</td>
</tr>
<tr>
<td>1859</td>
<td>4,809</td>
</tr>
<tr>
<td>1861</td>
<td>8,139</td>
</tr>
<tr>
<td>1866</td>
<td>11,022</td>
</tr>
<tr>
<td>1868</td>
<td>10,575</td>
</tr>
<tr>
<td>1870</td>
<td>10,867</td>
</tr>
<tr>
<td>1872</td>
<td>12,479</td>
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<tr>
<td>1875</td>
<td>12,996</td>
</tr>
<tr>
<td>1880</td>
<td>16,384</td>
</tr>
<tr>
<td>1885</td>
<td>20,805</td>
</tr>
<tr>
<td>1890</td>
<td>23,137</td>
</tr>
<tr>
<td>1895</td>
<td>25,701</td>
</tr>
</tbody>
</table>

Source: General Economic Records (MSS.), Church Archives, Church of Jesus Christ of Latter-day Saints.
for income in the territory. Implicit in this adjustment process is the assumption that the relationship between relative inequality of tithing owed and tithing paid for the entire sample is the same as that for the subset.

For some years, none of the records contained information on the amount of tithing owed or the percentage of a full tithe paid. Gini ratios for those years were calculated on tithing paid, then adjusted by a factor extrapolated or interpolated from adjustment factors determined for years in which necessary information was available. Mean income was estimated from tithing paid by a similar method when necessary. Fortunately, the relationship between Gini ratios from tithing owed and tithing paid seems to have been quite stable over time, and the adjustment factors were quite close to unity.

Arnold [1980] and Israelsen, McDonald and Newey [1984] have demonstrated analytically that with the assumption of independence between the size of income and the fraction of "true" income reported, the observed or reported income distribution will exhibit a degree of inequality greater than that of the underlying "true" income distribution when income is misreported. Preliminary testing of the relationship between the amount of tithing owed and the fraction of a full tithe paid has failed to reject the independence hypothesis. It is not unexpected, then, that in the present study the Gini ratio estimated from tithing paid ("reported" income) is in every case larger than the corresponding Gini ratio estimated from tithing owed ("true" income).

A second potential problem associated with the use of tithing data to estimate income is the possibility that tithing owed was seriously misreported. Although this possibility cannot be dismissed out of hand, the nature of the reporting procedure, the small communities in which production took place, the
highly visible agricultural production processes which made up a majority of income categories, the Mormon emphasis on careful record-keeping, the seriousness with which church authorities undertook the responsibility of collecting and settling tithes, and the Mormon belief in the inseparability of temporal and spiritual affairs suggest that tithing records were highly accurate. Though misreporting--inadvertent or deliberate--undoubtedly did occur on occasion, it is very likely that income estimates from tithing records are more accurate than are income estimates from tax data, or, for that matter, than are wealth estimates from census records.

A third consideration in the use of tithing records is the valuation method. The price lists used to value tithing commodities were designed to provide a uniform valuation method throughout the region. While tithing prices were adjusted yearly to reflect overall market trends, they eliminated the wide fluctuations in commodity prices that would be expected to occur in a frontier region dependent on marginal agriculture. Because of the pervasiveness of the tithing office in the economic life of the region, and because tithepayers could engage in profitable arbitrage if tithing price and market price relatives got very far out of line, tithing prices and average market prices moved together throughout the period studied. In setting uniform tithing prices, Mormon authorities helped the economy of the Great Basin avoid the periods of destabilizing commodity speculation characteristic of other western U.S. regions in the nineteenth century.9 Because tithing prices were pseudo-market prices for economic transactions in the territory before the completion of the transcontinental railroad (1869), and
because they followed market prices closely after the regional economy was integrated into the national economy later in the century, their use in the estimation of income presents no particular problem.

Table 2 shows the regional Gini ratios for personal income calculated as described above. The table also shows income per worker and income per capita as estimated from the tithing records. The income figures are presented in real terms (constant dollar) as well as in nominal terms (current dollar). The first measure of real income (YRT) uses a seventeen-commodity tithing price index as a deflator, and the second measure (YRTW) utilizes the tithing price index for years before 1869, linked with the U.S. wholesale price index for years after 1869. It is not certain which measure best represents real income for the Mormon population of the Great Basin, since the completion of the transcontinental railroad brought about only a gradual diminution of the dominance of tithing prices over outside market prices. The importance of the price level in influencing real income is shown clearly in figures 1 and 2, which graph nominal and real income per worker and per capita, respectively. While nominal income per worker declines after 1859, real income per worker based on the tithing price index increases from 1870 to 1890, then levels off. Real income per worker deflated by the linked index also increases after 1870, but peaks in 1885 and declines thereafter. The difference in the real income series can be attributed to the greater decline during the 1890s in the agricultural-oriented tithing price index than in the more broadly based U.S. wholesale price index. Unlike nominal income per worker, per capita nominal income remains relatively stable over most
<table>
<thead>
<tr>
<th>Year</th>
<th>Gini</th>
<th>Income Per Worker</th>
<th>Income Per Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Nominal</td>
<td>YRT(^a)</td>
</tr>
<tr>
<td>1855</td>
<td>.4636</td>
<td>384</td>
<td>385</td>
</tr>
<tr>
<td>1857</td>
<td>.4122</td>
<td>504</td>
<td>507</td>
</tr>
<tr>
<td>1859</td>
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<td>1866</td>
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<td>1870</td>
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</tr>
<tr>
<td>1895</td>
<td>.5322</td>
<td>232</td>
<td>827</td>
</tr>
</tbody>
</table>

\(^a\) Tithing price index used has 1855-1857=100.

\(^b\) Price index used is tithing price index 1855-1869 linked with U.S. wholesale price index 1870-1895.

Source: General Economic Records (MSS.), Church Archives, Church of Jesus Christ of Latter-day Saints. Israelsen [1981], table 4.
Figure 1. Nominal and real income per worker, Utah Territory, 1855-1895.

Figure 2. Nominal and real income per capita, Utah Territory, 1855-1895.
of the period, showing a large drop in 1895. The increase in the number of
workers per capita that occurred in Utah during the last half of the nineteenth
century accounts for the difference in the two series.12

Several characteristics of average income and inequality in early Utah are
evident from table 2. Perhaps most striking is the sharp and steady increase in
average income that followed the completion of the transcontinental railroad.
Between 1870 and 1890, YRT per worker increased by 96 percent, while YRT per
capita increased by 150 percent. YRTW increased by 55 and 88 percent,
respectively, over the same period. This period of income growth is in marked
contrast to the pre-railroad period and to the depression of the 1890s.

Also obvious from table 2 is the relatively high degree of income inequality
that existed on the Great Basin frontier. While Gini ratios fluctuate between .41
and .61 during the pre-railroad period, they do not fall below .53 after 1866.
These Gini ratios can be contrasted to those estimated for family income in Utah
for the post-WWII period, which average about .34.13 In the section which follows,
factors expected to affect the distribution of income in the Great Basin are
identified and tested econometrically for the 1855-1895 period.

II. Factors Influencing the Distribution of Income

Most empirical time series studies of developing economies have verified an
inverted U-shaped relationship between the Gini ratio for income and measures of
economic development, such as mean income. In the early stages of economic
development, more efficient techniques are introduced into one or a few sectors of
the economy, and the income gains from increased productivity are concentrated among a few. During this stage of development, increases in average income are accompanied by increases in income inequality. Eventually, however, the new technology permeates the entire economy, and productivity gains are reflected in broad increases in personal income. During these later stages of development, inequality is reduced as income increases. One would expect that the relationship between mean income and the Gini ratio in nineteenth-century Utah would depend on the degree of economic development achieved during the period in question. The regional Gini ratio for personal income, shown in figure 3, does exhibit the familiar inverted U shape for the period after 1860. Based on this information only, one might hypothesize that the "early" stage of economic development in the Great Basin ended around 1880. An implication of this hypothesis is a direct relationship between average income and inequality before 1880 and an inverse relationship after 1880. Evidence against the hypothesis is seen in figure 4, which shows an apparent positive correlation between the Gini ratio and real income per worker. The impact of various "exogenous shocks" on average income and on income inequality can also be hypothesized from figure 4. The worst "grasshopper year" in Great Basin history was 1855, when the destruction of as much as two-thirds of agricultural crops in the region resulted in abnormally low incomes. The crop produced in 1857, on the other hand, was the best in the history of the territory to that point, and is reflected in higher average incomes and increased equality. Incomes rose again in 1859, reflecting the lucrative contracts negotiated between Mormon suppliers and the army to help feed and equip the federal troops recently stationed in the territory. The reduction in income equality in 1859 likely was caused by the concentration of army contracts among relatively few suppliers. The troops were recalled from Utah in 1860-61, but incomes remained high, supported by the demand for Utah produce from mining camps in the Rocky
Figure 3. Gini concentration ratio for personal income, Utah Territory, 1855-1895.
Figure 4. Gini concentration ratio and real income per worker, Utah Territory, 1855-1895.
Mountain region. It might be inferred from the drop in the Gini ratio during this period that the mining boom benefited a broad segment of Utah's population. The Great Basin was again visited by grasshoppers in 1866 and 1870, a circumstance likely contributing to the decline in average incomes for those years. The 1890s were marked by severe depression, and average income in the region, after rising substantially during the 1870s and 1880s, fell sharply.

The positive relationship between real income and the Gini ratio implied by figure 4, particularly for the post-railroad years, suggests the hypothesis that the Great Basin economy remained in the "early" stage of development throughout the period of this study. Evidence as to the validity of this hypothesis might be obtained from econometric testing of a model of the determinants of income inequality. As part of the present study, a simple time series model of income inequality has been formulated and tested. The model includes as independent variables real income per worker (YRT or YRTW), the log of population (POP), percent of the population classified as "urban" (PURB), percent of the population born in non-English speaking countries (NES), and general grasshopper infestation during the previous calendar year (GHL). The Gini ratio for personal income in the Great Basin region is the dependent variable. Additional variables, such as grasshopper infestation during the current calendar year, percent of the population foreign-born, completion of the transcontinental railroad, and crop failure, were deleted from the original model because of degrees-of-freedom problems, and because initial testing revealed that they were not statistically significant determinants of income inequality and that they added little explanatory power to the model.

Population is a vital input to the process of economic development. Adequate population growth contributes to the expansion of markets and to economies of scale in production and marketing, with accompanying
improvements in productivity and real income. Insufficient growth of population can retard economic development by creating a shortage of labor and by slowing the growth of markets. Too rapid growth of population can also hinder economic development by increasing labor/land ratios and decreasing labor productivity to the point that agricultural surplus is no longer sufficient to pay for needed capital accumulation. While rapid immigration and a high rate of natural increase led to shortages of irrigable agricultural land in the Great Basin beginning in the 1870s, the rapid population growth also provided a labor source and a market for expanded regional manufacturing during the same period. Because a priori it is not clear whether changes in Utah's population resulted in broad increases in labor productivity and reductions in income concentration or the opposite, we are left without a pre-supposition as to the expected sign of the regression coefficient for POP. The situation is further complicated by the strong element of central planning and control evident in Mormon economic policy of the nineteenth century, and by the fact that much of the regional population growth throughout the period came through immigration of Mormon converts from northern and western Europe who came to Utah, at least in part, for non-economic reasons.

Two variables related to immigration were initially tested in the model. One, the percentage of Utah's population foreign-born, was deleted for the reasons mentioned previously. The second, the percentage of the population born in non-English speaking countries, would be expected to affect the distribution of income if non-English speaking immigrants had generally low incomes because of lower skills, more difficulty in transferring human capital, or because of problems related to communication or discrimination. If such were the case, an increase in the fraction of the population born in non-English speaking countries would be expected to increase relative income inequality. Based on this argument, the expected sign of the NES regression coefficient would be positive. This
expectation is bolstered by the apparent positive simple correlation between NES and the Gini ratio evident in figure 5.

In an economy well along the path of economic development, urbanization might be expected to reduce income inequality through the increased productivity of labor associated with larger concentrations of capital, through more efficient markets for goods and resources, and through increased availability of education and training. In a frontier region like Utah, however, the process of urbanization would likely increase income inequality in two distinct ways. First, urbanization would likely increase relative inequality between urban and rural incomes, as economic development and productivity increases would tend to be concentrated among the relatively small fraction of the population living in urban areas. Second, though average incomes within cities would rise relative to incomes outside cities, the distribution of income within urban areas would likely be less equal than that in rural areas, as a relatively few individuals were able to take advantage of monopoly positions created by imperfect, narrow markets, and by the high concentration of capital characteristic of early urbanization. That such a process occurred in the United States during the nineteenth century is suggested by Gallman's [1969] finding of greater wealth concentration in urban than in rural areas of the United States in 1860, and by Williamson's [1969] study which identifies substantial declines in income received by unskilled urban workers relative to skilled workers before the Civil War and between 1896 and 1914, with no offsetting gains during the interim. Based on the above arguments, the estimated regression coefficient for PURB is expected to be positive. While the model presented here cannot distinguish between the two effects of urbanization on income inequality identified above, but can only provide an estimate of the aggregate impact, an indirect indication of the importance of the first effect can be
Figure 5. Gini concentration ratio for personal income and percentage of population born in non-English speaking countries, Utah Territory, 1855-1895.
inferred from the apparent correlation between urbanization and real income per worker shown in figure 6.

Another factor which undoubtedly affected the distribution of income in early Utah was the marginal nature of agriculture in the Great Basin. With most individuals deriving most of their income directly or indirectly from agriculture, periodic disasters such as grasshopper invasions, late and early frosts, droughts, floods, and plant diseases would have a devastating effect on agricultural income in affected areas. While these disasters might decrease income disparity within communities as all incomes, large and small, were driven toward zero, for the territory as a whole income disparity would be expected to increase, since such events ordinarily affected only part of the population of the region. Because the agricultural year includes parts of two calendar years, grasshopper infestation, the most pervasive cause of crop failure, should be included both in current and lagged form. Interestingly, grasshopper infestation in the current year did not prove to be a useful explanatory variable in the model, and was, therefore, excluded in light of the limited degrees of freedom available. This unexpected result might be attributed to different effects on agricultural income of grasshopper infestation early and late in the agricultural year, or to cumulative effects of grasshopper infestation likely to occur because of the high degree of serial correlation in the grasshopper cycle. That is, grasshopper infestation this year might not have a significant impact on income distribution unless grasshoppers were also present in large numbers last year.

The final independent variable, mean income, has been found to be a significant determinant of income inequality in a large number of time series and cross-sectional studies of developing and developed economies. As the most widely-used proxy for the level of economic development, the relationship between real income per worker and the Gini ratio should correspond to the inverted U-
Figure 6. Percentage of population classified as urban and real income per worker, Utah Territory, 1855-1895.
shaped pattern associated with economic development. Since it is hypothesized that the Great Basin economy was in the "early" stage of development throughout the 1855-1895 period, the expected sign of the estimated regression coefficient is positive. Finally, the model contains a constant term, and is assumed to be linear.

Table 3 shows the results of econometric testing on two models, one for each of the measures of real income per worker. The regressions reported are Cochrane-Orcutt transformations, since the OLS regressions produced Durbin-Watson statistics that indicated significant autocorrelation in the data. All of the estimated coefficients are statistically significant at the .05 level or better, and the F-statistics for both regressions are significant at the .001 level. R² statistics are .995 for both models. The positive coefficients for real income indicate that over the period of the study, increases in the average level of income in the Great Basin were associated with increased concentration of income. This result is consistent with the hypothesis that the Mormon economy of the Great Basin was in the "early" stage of development throughout the pre-statehood period. The positive coefficient for the urbanization variable lends additional support to the hypothesis. The positive grasshopper infestation variable substantiates the notion that such events increased relative income inequality for the territory as a whole. Apparently, population growth in general reduced income inequality, but the fraction of the population born in non-English speaking countries had an independent positive effect on the Gini ratio, perhaps indicating that non-English speaking individuals typically received incomes near the bottom of the distribution. Other interpretations of this result are possible, and the exact manner by which increases in the non-English speaking proportion of the population increased relative inequality cannot be verified without further study.
Table 3

TIME SERIES REGRESSION RESULTS, 1855-1895. DEPENDENT VARIABLE: GINI RATIO FOR INCOME IN THE GREAT BASIN

<table>
<thead>
<tr>
<th>Model One</th>
<th>Model Two</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Independent Variables</strong></td>
<td><strong>t-statistics</strong></td>
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<td>YRT</td>
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</tr>
<tr>
<td>POP</td>
<td>-.5530747</td>
</tr>
<tr>
<td>PURB</td>
<td>.0247981</td>
</tr>
<tr>
<td>NES</td>
<td>.0858674</td>
</tr>
<tr>
<td>GHL</td>
<td>.1367644</td>
</tr>
<tr>
<td>Constant</td>
<td>5.3463407</td>
</tr>
</tbody>
</table>

| **Statistics** | | **Statistics** |
| R² | .9995 | R² | .9995 |
| F | 1813.1*** | F | 1698.5*** |
| D-W | 2.169 | D-W | 2.124 |

***Statistically significant at .001 level.
**Statistically significant at .01 level.
*Statistically significant at .05 level.
III. Can the Results be Generalized?

The results of this study are of interest for a number of reasons. First, the study utilizes reliable individual income data representative of an entire nineteenth-century regional population. Second, the data covers the entire forty-year period from 1855 to 1895 with eleven samples selected at intervals no longer than five years. Third, the study examines the distribution of income in a western frontier region. Finally, the effects on the income distribution of changes in important demographic and economic variables are identified through time series analysis. Because the individual income information used as the basis of this study is the only such data available for any broad nineteenth-century U.S. population, it would be very useful if the results could be generalized to the Rocky Mountain region, the entire western frontier, or better still, to the entire United States. The confidence with which such generalizations can be made depends to a large extent on similarities between demographic and economic characteristics of the Utah population and the characteristics of populations to which the generalizations are extended. While it is beyond the scope of this study to undertake extensive comparisons of various U.S. populations, some similarities and differences are easily identified. Table 4 gives a comparison of selected demographic characteristics of Utah, the West, the North Central region, and the entire United States. Over the period of the study, Utah's population had a sex ratio very close to those of the United States and the North Central region, but very different from that of the West. The age composition comparison reveals that Utah's population was younger than that of the West, the North Central states, and the United States, with the most striking differences being evident between Utah and the West. Utah does resemble the West in terms of the percentage of the population foreign-born, and differs substantially from the North Central region and the United States. The percentage of Utah's population classified as urban
Table 4
SELECTED CHARACTERISTICS OF UTAH, WESTERN, NORTH CENTRAL AND U.S. POPULATIONS

<table>
<thead>
<tr>
<th>Year</th>
<th>Sex Ratio (Males per 100 females)</th>
<th>Age Composition: Percent under 5</th>
<th>Age Composition: Percent under 15</th>
<th>Percent Foreign-born</th>
<th>Percent Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>1850</td>
<td>Utah 113.3</td>
<td>19.1</td>
<td>41.4</td>
<td>31.7</td>
<td>20.5</td>
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<td>N.C. 108.7</td>
<td>16.3</td>
<td>43.2</td>
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<td>U.S. 104.3</td>
<td>15.1</td>
<td>41.5</td>
<td>11.2</td>
<td>15.3</td>
</tr>
<tr>
<td>1860</td>
<td>Utah 101.2</td>
<td>23.7</td>
<td>44.1</td>
<td>31.7</td>
<td>20.5</td>
</tr>
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<td>17.0</td>
<td>13.9</td>
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<td>U.S. 104.7</td>
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<td>40.5</td>
<td>15.1</td>
<td>19.8</td>
</tr>
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<td>19.2</td>
<td>48.2</td>
<td>35.4</td>
<td>18.4</td>
</tr>
<tr>
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<td>12.9</td>
<td>33.9</td>
<td>31.6</td>
<td>25.8</td>
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<td>N.C. 107.1</td>
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<td>41.1</td>
<td>18.0</td>
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<tr>
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<td>14.3</td>
<td>39.2</td>
<td>14.4</td>
<td>25.7</td>
</tr>
<tr>
<td>1880</td>
<td>Utah 100.7</td>
<td>17.8</td>
<td>44.9</td>
<td>30.6</td>
<td>23.4</td>
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<tr>
<td></td>
<td>West 153.3</td>
<td>11.5</td>
<td>31.3</td>
<td>27.8</td>
<td>30.2</td>
</tr>
<tr>
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<td>N.C. 108.0</td>
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<td>38.2</td>
<td>16.8</td>
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<td></td>
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<td>13.8</td>
<td>38.1</td>
<td>13.3</td>
<td>28.2</td>
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<tr>
<td>1890</td>
<td>Utah 113.4</td>
<td>14.8</td>
<td>41.0</td>
<td>25.2</td>
<td>35.7</td>
</tr>
<tr>
<td></td>
<td>West 141.9</td>
<td>10.1</td>
<td>28.8</td>
<td>24.6</td>
<td>37.0</td>
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<tr>
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<td>35.3</td>
<td>18.1</td>
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<tr>
<td></td>
<td>U.S. 105.0</td>
<td>12.2</td>
<td>35.5</td>
<td>14.8</td>
<td>35.1</td>
</tr>
<tr>
<td>1900</td>
<td>Utah 104.9</td>
<td>15.1</td>
<td>41.0</td>
<td>19.4</td>
<td>38.1</td>
</tr>
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<td>West 128.1</td>
<td>9.8</td>
<td>28.6</td>
<td>19.6</td>
<td>39.9</td>
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<td>12.1</td>
<td>34.4</td>
<td>13.6</td>
<td>39.7</td>
</tr>
</tbody>
</table>

does not follow closely the pattern of any of the other regions examined over the period, though the percentages for all of the regions essentially converge by the end of the century. It appears that Utah is least like the West by this measure, however.

Table 5 compares selected occupational characteristics of Utah, other Mountain states, and the United States. In terms of the percentages of all gainfully employed engaged in agriculture, mining, and manufacturing, Utah clearly more closely resembles the United States than it does other Mountain states. From the evidence presented here, it appears that—with the exception of nativity—Utah's population and industrial structure were not similar to those of the West in general or to those of other Mountain states. Hence, one should be cautious about generalizing the results obtained for the Great Basin population to those regions.

While the above comparisons indicate that Utah Territory's demographics and industrial structure were in some sense "like" those of the United States, other factors specific to the Great Basin should be considered before the results of this study are generalized to the United States as a whole. First, Utah's agriculture differed from that of the rest of the United States during the nineteenth century, being heavily dependent on irrigation. Second, the economy of the Great Basin was part of a theocracy in which central direction and control played a very important role. Third, cooperative economic institutions were an integral part of the Mormon economy throughout the period studied. While it is not clear whether any or all of the factors mentioned had an independent impact on income inequality, or if they did, in which direction the impact went, the possibility must be considered. In the case of cooperative institutions, the supposition is that such institutions reduced inequality. The cooperative "United Order" movement, initiated in 1874, resulted in the organization of producer cooperatives in most
Table 5
SELECTED OCCUPATIONAL CHARACTERISTICS OF THE UNITED STATES,
UTAH AND OTHER MOUNTAIN STATES

<table>
<thead>
<tr>
<th>Year</th>
<th>State</th>
<th>Agriculture</th>
<th>Extraction of Minerals</th>
<th>Manufacturing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Utah</td>
<td>50.4 (60.3)</td>
<td>0.4</td>
<td>15.6</td>
</tr>
<tr>
<td>1850</td>
<td>United States</td>
<td>45.1 (53.8)</td>
<td>1.5</td>
<td>16.2</td>
</tr>
<tr>
<td></td>
<td>Mountain States</td>
<td>45.6 (63.2)</td>
<td>0.1</td>
<td>3.3</td>
</tr>
<tr>
<td></td>
<td>United States</td>
<td>40.8 (47.1)</td>
<td>1.9</td>
<td>17.3</td>
</tr>
<tr>
<td>1860</td>
<td>Mountain States</td>
<td>20.4 (29.6)</td>
<td>42.2</td>
<td>3.8</td>
</tr>
<tr>
<td></td>
<td>Utah</td>
<td>54.5 (63.4)</td>
<td>*</td>
<td>13.8</td>
</tr>
<tr>
<td></td>
<td>United States</td>
<td>47.4 (51.5)</td>
<td>1.3</td>
<td>14.7</td>
</tr>
<tr>
<td></td>
<td>Mountain States</td>
<td>28.9 (34.6)</td>
<td>22.6</td>
<td>8.3</td>
</tr>
<tr>
<td></td>
<td>Utah</td>
<td>48.5 (56.6)</td>
<td>2.7</td>
<td>10.5</td>
</tr>
<tr>
<td>1870</td>
<td>United States</td>
<td>47.4 (51.5)</td>
<td>1.3</td>
<td>14.7</td>
</tr>
<tr>
<td></td>
<td>Mountain States</td>
<td>28.9 (34.6)</td>
<td>22.6</td>
<td>8.3</td>
</tr>
<tr>
<td></td>
<td>Utah</td>
<td>36.3 (45.0)</td>
<td>6.6</td>
<td>12.3</td>
</tr>
<tr>
<td>1880</td>
<td>United States</td>
<td>44.1 (49.5)</td>
<td>1.5</td>
<td>15.6</td>
</tr>
<tr>
<td></td>
<td>Mountain States</td>
<td>18.6 (27.8)</td>
<td>21.3</td>
<td>8.9</td>
</tr>
<tr>
<td></td>
<td>Utah</td>
<td>29.9 (36.3)</td>
<td>5.7</td>
<td>11.5</td>
</tr>
<tr>
<td>1890</td>
<td>United States</td>
<td>37.2 (41.4)</td>
<td>1.8</td>
<td>17.0</td>
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<td>Mountain States</td>
<td>24.6 (31.1)</td>
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<tr>
<td></td>
<td>Utah</td>
<td>34.6 (39.9)</td>
<td>8.3</td>
<td>10.9</td>
</tr>
<tr>
<td>1900</td>
<td>United States</td>
<td>35.3 (39.8)</td>
<td>2.1</td>
<td>17.6</td>
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<tr>
<td></td>
<td>Mountain States</td>
<td>27.6 (33.5)</td>
<td>12.7</td>
<td>11.0</td>
</tr>
</tbody>
</table>

Figures in parentheses include one-half of unspecified laborers

*less than 0.05%

"Other Mountain States" include New Mexico in 1850, Colorado, Nevada, and New Mexico in 1860, and Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, and Wyoming for the remaining years.

Source: Calculated from Leonard J. Arrington, The Changing Economic Structure of the Mountain West, 1850-1950, Logan, Utah: Utah State University Monograph Series 10, No. 3 (June 1963), tables I-VI.
Mormon communities in the Great Basin by 1875. In an earlier econometric analysis (Israelsen [1985a]), I found that these producer cooperatives did, in fact, reduce income inequality in those communities in which they were established, *ceteris paribus*. An example of this effect is seen in figure 7, which shows the difference in income inequality between two southern Utah communities, one of which (Orderville) was organized as a producer cooperative of the communal type. As would be expected, the cooperative community shows a much lower degree of inequality than does the rest of the immediate geographical region (Long Valley). While producer cooperatives of the communal type reduced inequality in those communities in which they were established, and while producer cooperatives of the collective type normally also reduced income concentration, there may have been some exceptions. Figure 8 shows Lorenz curves and Gini ratios for Monroe, Utah for 1872, 1875, and 1880. The "Monroe United Order," a producer cooperative of the collective type, was organized in 1874, was in full operation during 1875, and had been dissolved by 1880. It is interesting to note the increase in income inequality for 1875 compared to the earlier and the later year. While the United Order movement had basically ended before 1880, other cooperative institutions preceded and followed it. If cooperative Mormon institutions normally reduced inequality within communities, their impact on regional income inequality is less certain. If those institutions affected the distribution of income in a way not captured by the model, or if they affected the relationships between independent and dependent variables, then inferences from the Great Basin model to other regions of the country become less reliable. In summary, then, the author suggests that generalizations from the results of this study to other regions of the United States, or to the United States as a whole, be made cautiously at this point. Hopefully, further research will answer some of the questions raised in this section.
Comparison of Lorenz Curves for Orderville and Long Valley, 1880

\[ \text{GINI}_A = .290 \]
\[ \text{GINI}_B = .576 \]

\(A = \text{Orderville}\)
\(B = \text{Long Valley}\)

Source: U.O. Accounts and General Economic Records (MSS), Church Archives, LDS Church.

Figure 7
Lorenz Curves for Monroe, 1872, 1875, 1880

\[ \text{GINI}_A = 0.485 \]
\[ \text{GINI}_B = 0.674 \]
\[ \text{GINI}_C = 0.509 \]

A = 1872
B = 1875
C = 1880

Figure 8
IV. Extensions and Conclusions

Because the data used in this study allows the identification of individuals by community, a natural extension of the research would involve a cross-sectional analysis of the impact of community size on income inequality, or a combination of time series and cross-sectional analyses which followed a large number of Great Basin communities through the process of urbanization. Additional research on the impact of nativity on income distribution, and on the effects of cooperative institutions on inequality should also prove valuable.

In conclusion, the findings of the study can be summarized as follows:

1. The degree of income inequality experienced on the Great Basin frontier was high by today's standards.

2. Fluctuations in income and inequality characteristic of the Great Basin economy in the 1850s and 1860s were not observed after the completion of the transcontinental railroad. The change was probably due to increased access to national markets, greater diversification in the regional economy, and economic growth, as evidenced by the rapid increase in mean income between 1870 and 1890.

3. Increases in population were associated with reductions in income inequality in the Great Basin, while increases in the proportion of the population born in non-English speaking countries, the proportion of the population classified as urban, and mean income were associated with increases in inequality. Grasshopper infestation increased relatively inequality in the region.

4. The Great Basin economy appears to have been in the "early" stage of development throughout the 1855-1895 period.

5. The distribution of income in the nineteenth-century Great Basin is probably not representative of income distributions on other western frontiers.
6. The slight decline in the Great Basin Gini ratio between 1866 and 1895 is consistent with Soltow's [1969] finding, based on income tax data, that concentration at the top of the U.S. income distribution was reduced between 1866-71 and 1894. The decline in the Great Basin Gini ratio seems attributable, in part, to the decline in mean income that resulted from the economic depression of the 1890s; there was a trend of increased inequality between 1861 and 1890.

Despite my cautions about generalizing the results of this study to other regions, I am willing to speculate, based on structural and demographic similarities, that income inequality in the United States was similar to that found for the Great Basin during the second half of the nineteenth century. More specifically, because there exists a supposition that Mormon cooperative institutions reduced regional inequality, Great Basin Gini ratios might usefully be viewed as lower bounds for corresponding U.S. Gini ratios, at least for the post-railroad period, and pending further study.18
NOTES

*Professor of Economics, Utah State University. The author is indebted to officials of the Historical Department and Archives of the Church of Jesus Christ of Latter-day Saints, without whose cooperation and assistance this study would not have been possible. He is particularly grateful to Leonard J. Arrington, formerly L.D.S. Church Historian, for generous encouragement and support. Data collection was funded by the Utah Income and Wealth Project, Brigham Young University.

1. See, for example, Soltow [1969], Williamson [1976], and Soltow [1971], 121-22.

2. A comparison of income tax records and Mormon Church economic records by the Utah Income and Wealth Project found that taxpayers in Utah Territory reported, on average, lower incomes to the government than to the church.

3. The information on which this study is based was collected by the Utah Income and Wealth Project. Access to the General Economic Records of the Church of Jesus Christ of Latter-day Saints, otherwise closed to researchers, was granted to the Utah Income and Wealth Project on the basis of procedures to protect the confidentiality of the records, and with the understanding that the summary statistical results of the research be made available to other qualified researchers. The present study meets these requirements.

4. For a discussion of the economic policies of Brigham Young, see Arrington [1958], Israelsen [1977], [1981], Israelsen and Nanto [1982], Israelsen [1985b], Israelsen [1997].


6. Arrington [1954], 27-28 gives an example of this process.

7. Since the Gini ratio is invariant to a scale change in all observations, the Gini ratio for tithing owed is also the Gini ratio for income.

8. Adjustment factors for Gini ratios range from .954 to .978, except for 1855 (.676), 1857 (.815), and 1861 (.845). Average adjustment is .914. For mean income, the adjustment factors range from 1.066 to 1.197, except for 1855 (1.674) and 1859 (1.823). Average adjustment factor for income is 1.216.


10. Construction of the tithing price index is detailed in Israelsen [1981].
11. Ibid. This study undertakes tests of the relative importance of tithing prices and outside economic influences in the Great Basin economy.

12. Workers per capita in Utah Territory fell from .236 in 1855 to a low of .208 in 1861, then increased steadily until a peak of .318 was reached in 1890. The ratio fell slightly to .310 in 1895.


14. Population figures are based on Wahlquist [1978] and on the U.S. Census. Urbanization figures are based on U.S. Census reports, as are the figures for percentage of the population born in non-English speaking countries. For non-census years, figures are interpolated or extrapolated when necessary by assuming a constant growth rate. Information on grasshopper destruction was compiled by the author from a large number of contemporary and historical accounts.

15. The regression result is also consistent with the hypothesis that non-English speaking people received incomes at the very top of the distribution, or with more complex hypotheses.

16. A "commune" is defined as a producer cooperative in which members share net income according to "need" or other criteria not directly related to work performed. A "collective" is a producer cooperative in which a member's share of income is determined by the amount of work he performs. Israelsen [1980].


18. Sale [1974] reveals that income inequality in Utah in the post-WWII period was lower than could be explained on the basis of mean income. Perhaps Mormon cooperative tendencies are still exerting an influence on the distribution of income in the Great Basin.
REFERENCES

General Economic Records, 1855-1895 (MSS.). Church Archives, Church of Jesus Christ of Latter-day Saints.


