ECONOMIC FORCES BEHIND COLORADO'S GROWTH

1870-1962

WITH PROJECTions TO 1970

UNIVERSITY OF DENVER
COLORADO SEMINARY

Denver Research Institute
University Park, Denver 10, Colorado

15 February 1963

Mr. Bernard E. Teets
Executive Director
Colorado State Department of Employment
1210 Sherman Street
Denver, Colorado

Dear Mr. Teets:

The attached report contains an economic analysis of the forces influencing the development of Colorado, together with a 1970 forecast of economic activity in Colorado. A separate and shorter report has been prepared, summarizing this one and containing additional data on markets which may be served from Colorado.

On the basis of this analysis, the economic future of Colorado appears quite favorable. Employment opportunities are expected to develop which should support continued population and income growth in the period to 1970, resulting in a generally high level of economic activity.

Many individuals have contributed to this study. We especially acknowledge the valuable assistance provided by Mr. Dwight E. Neill, Director of your Resources and Community Development Division, and his staff.

It is our hope that these reports will prove valuable to the state and to local governments in Colorado, and to the business community.

Sincerely,

John G. Welles, Head
Industrial Economic Division

JGW:cw

ECONOMIC FORCES BEHIND COLORADO'S GROWTH, 1870-1962 WITH PROJECTIONS TO 1970

Prepared for

Colorado State Department of Employment
Resources and Community Development Division

Prepared by

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February, 1963

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INTRODUCTION

The results of this study of the Colorado economy are published in two reports. The technical analysis and supporting data are contained in this report. A separate and shorter report summarizes the major findings presented in this report and includes many charts and graphs. The summary report is designed for wide distribution, whereas this report is written for those who have interest in the details of the analysis.

The major purposes of this study are to project the economy of Colorado to 1970 and to provide an understanding of how the state's economy has developed to date. It is hoped that the results will prove to be a useful guide to business and industry in projecting future demand for goods and services, and to government agencies for planning purposes. It is also hoped that the study will assist in creating employment opportunities in Colorado by broadening the factual base for sound industrial location decisions.

Part I of this report treats the economic history of Colorado, focusing attention on the nature of the economy today and on the why and how of its development. Part II develops forecasts of employment in the different economic sectors, and estimates population and income which stem from the employment forecasts.

The research project leading to publication of this report was sponsored by the Resources and Community Development Division of the Colorado State Department of Employment, which contracted with the Denver Research Institute to perform the study. The major portion of the research work was carried out in the spring and summer of 1962.

The report was not narrowly confined to the formal fields of economics and business. Examples are given of the often large influence of political and institutional changes on economic activity. Despite this, the report is limited inasmuch as its scope did not permit integrating broad sociological problems associated with the physical resources, cultural patterns, education and communication between the rural and urban areas.

James F. Mahar, Senior Economist, was Project Supervisor of this study. He was assisted by Dean C. Coddington and John S. Gilmore, Research Economists.

Many organizations, industrial firms, and individuals made important contributions to this study. Professor Charles Frush of the Colorado School of Mines prepared a study on the economics of Colorado's mining industry which served as the basis for the mining section of Part II. Professor Paul McElheney of the College of Business Administration of the University of Denver, and Mr. Gerald T. Boyle did much of the research concerning the development of the transportation industry in Colorado. A limited number of copies of both the Frush and McElheney reports are available from the Resources and Community Development Division of the Colorado Department of Employment.

Mr. Dwight E. Neill, Director, and Mr. Ronald Lemon, Industrial Research Director, Resources and Community Development Division of the Colorado Department of Employment, spent considerable time reviewing this report in its draft stages. Their comments and suggestions were very helpful and much appreciated.

Numerous Colorado businessmen participated in this study through completion of questionnaires and by granting us time to discuss their industry prospects and problems. Their contributions were invaluable, both in terms of anticipating future events and understanding the past.

PART I. ECONOMIC HISTORY OF COLORADO

INTRODUCTION

The primary purpose of Part I is to provide an understanding of Colorado's present economy by identifying and describing the long-run economic forces which have influenced the state. Many of them are still very much in evidence.

One of the basic concerns of this study is to identify the alternative directions of Colorado's future economic growth. Once these directions are identified, there is the further question: What can business and government do to influence the future economy in the desired direction? Economic history can assist in answering the latter question, because in a very real sense, economic history is economic experience.

The Approach Used in Part I

The analysis deals with three major economic factors — population, employment, and income. Figure 1, on the next page, shows population and employment in Colorado since 1870. Table 1 shows civilian employment in Colorado by industry group from 1870 to 1960.[1] In Table 2, total manufacturing employment is broken down into manufacturing groups.

Figure 2 shows the trends in income in selected industries, and compares per capita income in Colorado with the United States average. It is interesting to note, in connection with Figure 2, that per capita income in Colorado was well above the U. S. average until the 1920's. It fluctuated around the U. S. average from then until the last few years when it began to rise sharply.

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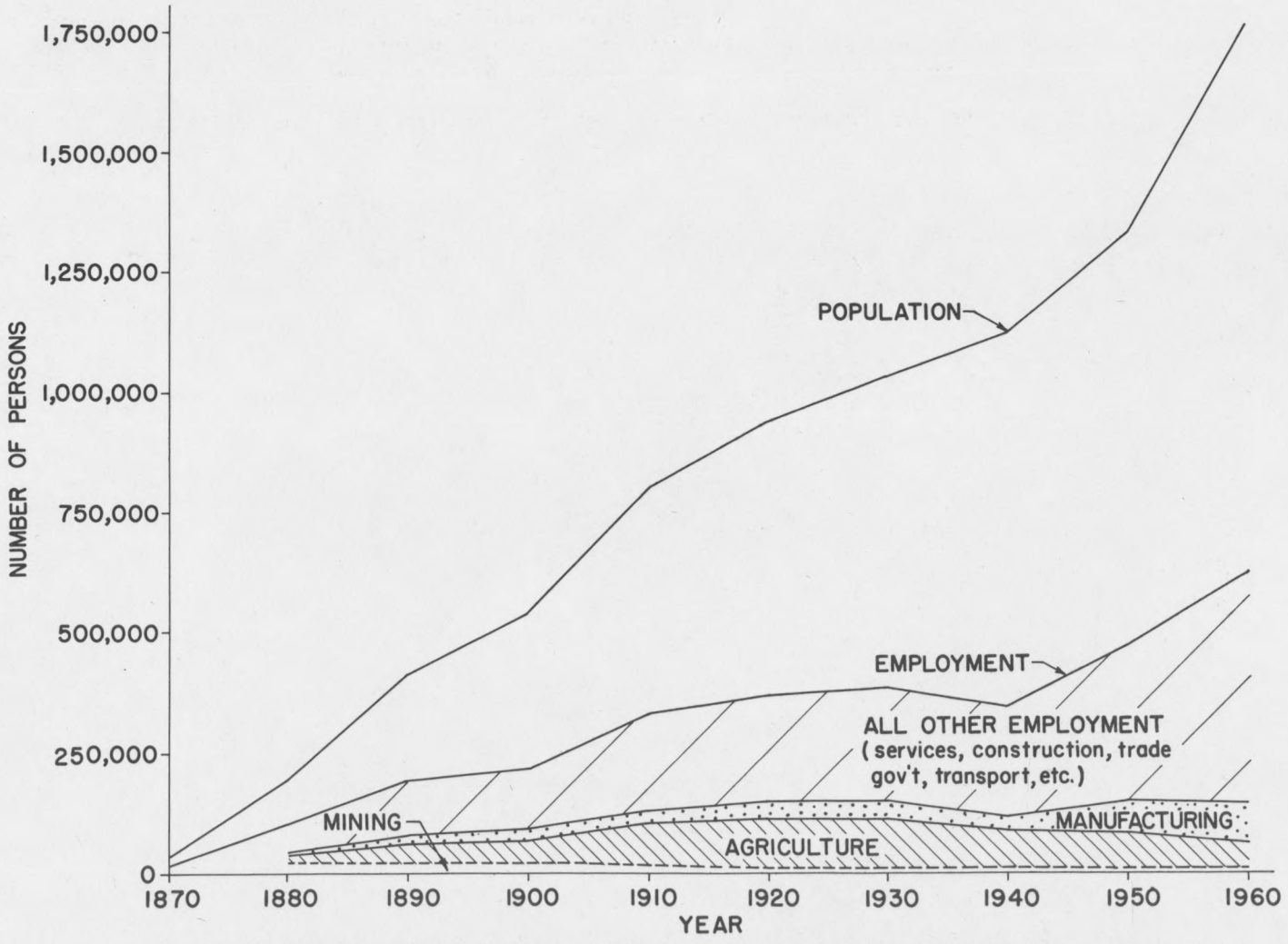
[1] Consistent employment and income data, particularly for the years prior to 1930, were impossible to find. The historical data presented in this report were derived from a variety of sources, many of which were conflicting. A methodology had to be developed to select useful data, particularly in the years prior to 1930. For a more complete explanation, see Appendix A, Technical Note on Employment Data.

FIGURE 1. POPULATION AND EMPLOYMENT IN COLORADO, 1870 TO 1960



Sources: Population data are from U. S. Department of Commerce, Bureau of the Census, Census of Population, various years. Employment data are from Appendix A, this report.

TABLE 1. EMPLOYMENT AND LABOR FORCE IN COLORADO, 1870 TO 1960

Industry Group	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960
Agriculture	7,353	16,336	43,552	49,457	85,704	100,153	104,413	73,911	72,419	48,660
Mining	2,478	34,675 (20,500)	24,195	34,936 (20,519)	28,376	23,382 (16,790)	20,702	15,897	10,275	14,250
Manufacturing	937	4,393	12,729	20,007	29,581	35,673	34,266	32,687	56,700	84,600
All Other	6,815	45,847	111,467	113,863	195,063	207,249	231,721	224,040	337,144	479,259
Construction							16,661	18,034	38,080	44,179
Transportation							30,297	20,730	27,100	26,600
Communications & Public Utilities							5,971	8,857	13,800	17,100
Wholesale & Retail Trade							55,525	67,201	99,783	127,900
Finance, Insurance & Real Estate							11,614	11,555	16,942	29,562
Services							75,530	54,982	67,991	103,036
Government							15,307	36,480	66,300	109,700
Other							20,816	6,201	7,148	21,182
Total Employed	17,583	101,251	191,943	218,263	338,724	366,457	391,102	346,535	476,538	626,769
Unemployed								71,758	21,004	26,036
Armed Forces								3,200	15,431	27,947
Total Labor Force	17,583	101,251	191,943	218,263	338,724	366,457	391,102	421,493	513,079	680,752

Note: The mining employment data shown in parentheses were used in certain income comparisons in Part I. No mining income data were available which corresponds to the higher employment figures.

Source: See explanation contained in text of Technical Note on Employment Data, Appendix A.

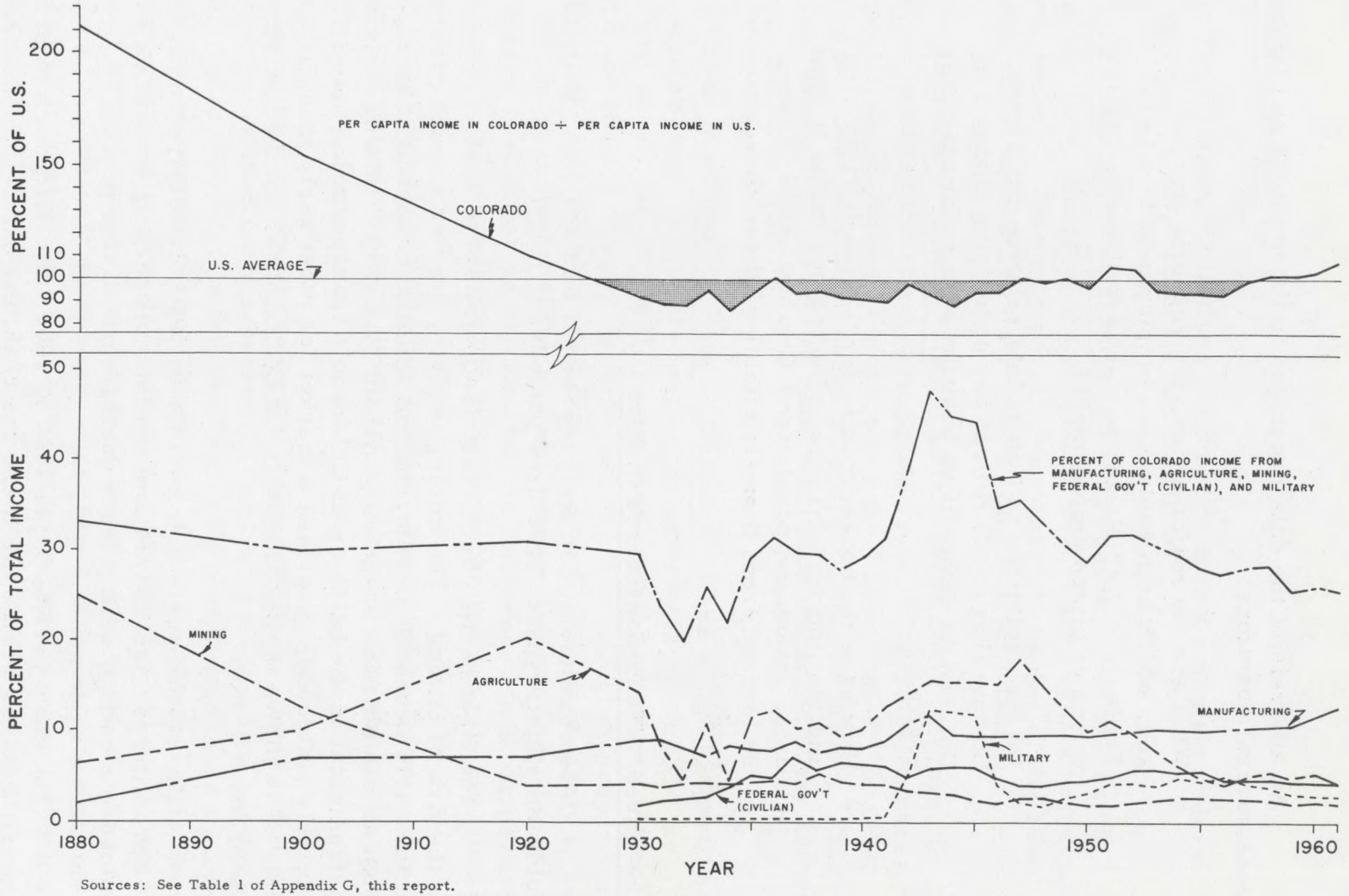
TABLE 2. COLORADO EMPLOYMENT IN MANUFACTURING, 1870 TO 1960

Industry Group	1870		1880		1890		1900		1910		1920		1930		1940		1950		1960	
	Employ-ment	% of Total	Employ-ment	% of Total	Employ-ment	% of Total	Employ-ment	% of Total	Employ-ment	% of Total	Employ-ment	% of Total	Employ-ment	% of Total	Employ-ment	% of Total	Employ-ment	% of Total	Employ-ment	% of Total
Food & Kindred Products	138	14.7	663	15.1	1,854	14.5	3,189	15.9	5,397	18.2	9,585	26.9	8,010	23.4	11,675	35.7	16,000	28.6	17,200	20.3
Textiles & Apparel	121	12.9	258	5.9	409	3.2	196	1.0	—	—	631	1.8	851	2.5	967	3.0	2,700	4.8	3,500	4.1
Lumber & Wood Products including Furniture	209	22.3	1,215	27.7	2,477	19.5	1,674	8.4	3,005	12.8	1,979	5.5	1,781	5.2	2,020	6.2	2,900	5.1	3,000	3.5
Paper, Printing & Publishing	57	6.1	235	5.4	1,522	12.0	2,448	12.2	3,775	12.8	3,732	10.5	3,864	11.3	3,261	10.0	5,800	10.2	7,600	9.0
Chemicals & Related Products	—	—	111	2.5	65	0.5	125	0.6	72	0.2	421	1.2	291	0.8	1,383	4.1	1,700	3.0	2,200	2.6
Leather & Leather Products including rubber	40	4.3	160	3.6	209	1.6	344	1.7	363	1.2	370	1.0	115	0.3	2,954	9.0	4,600	8.1	5,400	6.4
Stone, Clay & Glass Products	176	18.8	921	21.0	2,683	21.1	1,560	7.8	1,795	6.1	1,220	3.4	1,487	4.3	1,635	5.0	2,800	4.9	4,900	5.8
Metal Products	158	16.9	826	18.8	1,867	14.7	8,715	43.5	7,826	26.5	8,753	24.5	7,602	22.2	8,293	25.9	17,300	30.5	36,500	43.1
Miscellaneous Manufacturing & manufacturing N. E. C.	38	4.0	4	—	1,643	12.9	1,756	8.9	7,348	24.8	8,982	25.2	10,265	30.0	529	1.6	2,700	4.8	4,300	5.2
Total	937	100.0	4,393	100.0	12,729	100.0	20,007	100.0	29,581	100.0	35,673	100.0	34,266	100.0	32,687	100.0	56,700	100.0	84,600	100.0

Note: This category includes primary metals, fabricated metal products, electrical and nonelectrical machinery, transportation equipment, and ordnance and accessories.

Sources: 1870 to 1940 data are derived from Census of Manufactures, various years, as explained in text of Appendix A. 1950 and 1960 data are derived from U. S. Department of Labor, Bureau of Labor Statistics, "Estimated Nonagricultural Employment in Colorado," various years, mimeo.

FIGURE 2. COMPARATIVE INCOME TRENDS, 1880 TO 1961



Sources: See Table 1 of Appendix G, this report.

An analysis of the data presented in these tables and figures suggests several questions:

* What are the major underlying economic forces, if any, which help explain the employment trends in Tables 1 and 2? How important are these forces in terms of future employment?

* Do the variations in Colorado's relative per capita income (Figure 2) reflect any underlying changes in Colorado's competitive position with regard to other regions?

* How have the non-economic forces, such as politics and institutional changes, affected per capita income, employment, and population? Can any useful lessons be learned from the past effects of these non-economic forces?

The Three "Eras" Considered in Part I

It is convenient, for the purposes of this analysis, to divide Colorado's history into three time periods.

The first period, from 1880 (and earlier) to 1900, is referred to as the Era of Mining. The mining industry exerted a much greater force on the early economic development of Colorado than might be expected from an examination of the employment statistics. Mining activity was instrumental in the build-up of Colorado's transportation network (particularly railroads), provided a market for most early manufacturing, and, as is the case with any basic industry, created a host of service-type jobs.

The second period, from 1900 to 1940, is referred to as the Era of Agriculture. Agriculture and the food processing industries dominated Colorado's employment picture during most of this period.

The third period, from 1940 to 1960, is called the Era of Defense. The outbreak of World War II and the resulting build-up of Colorado's military installations and manufacturing facilities pulled the state out of the depression of the 30's. During the Korean War period, Colorado's economy received another boost. More recently, several manufacturing plants which produce products for the U. S. defense and space efforts have located in Colorado.

Definition of Terms

The following definitions are important to a complete understanding of much of the analysis which follows:

Per Capita Personal Income. Total personal income within a geographic area divided by the population of that area equals per capita personal income. This is generally considered to be one of the best available single measures of a region's economic well-being.

Labor Participation Rate. The ratio of persons employed to population is called the labor participation rate. Figure 3 compares labor participation rates in Colorado and the United States. In 1880, for example, over half of Colorado's population was employed. This compared to about 34 percent of total population employed in the United States in the same year.

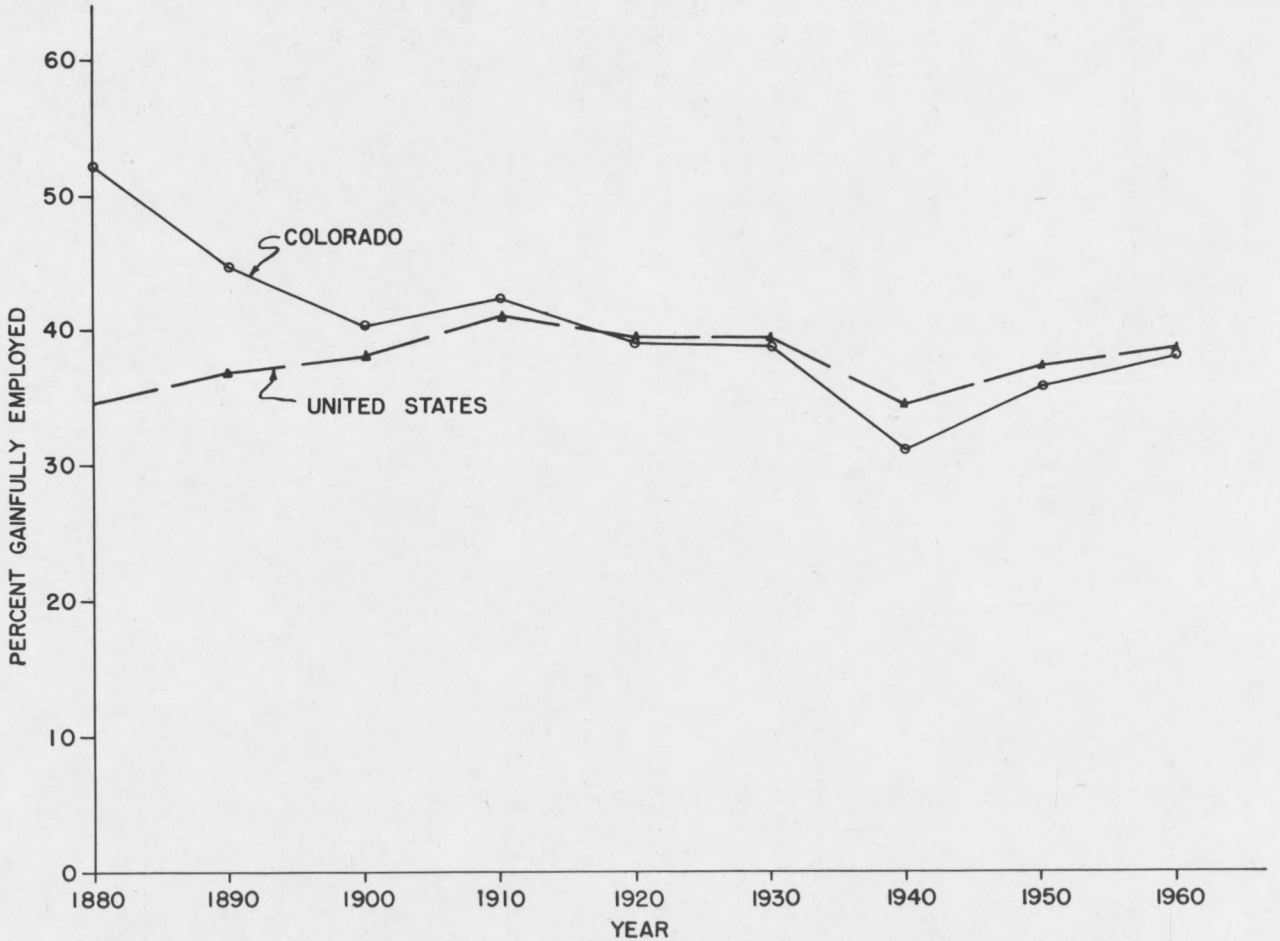
Labor Participation Rate Adjustment. When a high proportion of the population of a region is employed, per capita income for the region will be well above the U. S. average even though wages and earnings are not above average. In other words, when a higher proportion of the population is working, per capita personal income is likely to be high. To compare actual earning power between geographical areas, it is necessary to make an adjustment for the differences in labor participation rates. This is referred to as labor participation rate adjustment.

Actual Per Capita Earning Power. The residual, after making the labor participation rate adjustment, is called actual per capita earning power.

Industry Contribution to Actual Earning Power. Some industries contribute more than their proportionate share of income to a region's economy. For example, in the 1880's mining contributed more than its proportional share (comparing Colorado to the United States) of income to the economic well-being of Coloradans. Manufacturing, on the other hand, has never been as important in Colorado as in the U. S. The difference between what an industry contributes to Colorado's total income and what it might be expected to contribute if Colorado's economy were structured the same as the U. S., is referred to as industry contribution to actual earning power.

Basic Income. The amount of income flowing into an area as a result of the export of goods and services is called basic income.

FIGURE 3. PERCENT OF POPULATION GAINFULLY EMPLOYED, 1880 TO 1960



Source: 1880 - 1950 data computed from U. S. Bureau of Census, Census of the United States; 1960 data computed from U. S. Bureau of Labor Statistics, Monthly Labor Review; U. S. Department of Agriculture, Agricultural Statistics; and U. S. Bureau of the Census, Current Population Reports, various issues of all publications.

THE ERA OF MINING - 1880 TO 1900

As already mentioned, the first period in the economic growth of Colorado was dominated by the development of the mining industry. The mining industry, however, was even more important to Colorado than is apparent from looking at the employment statistics.

This section of the report will dwell in considerable detail on the effects of mining on other sectors of Colorado's economy. Attention will be focused on the direct economic effects of this industry. In addition, the mining industry provides some dramatic examples of the importance of institutional and political actions on the economic development of the state.

In Colorado these early institutional and political changes had a favorable effect on the mining industry. This was manifested in relatively high employment and high wages in the mining industry, which in turn had an important stimulating effect on the development of agriculture, railroads, and manufacturing.

Institutional and Political Effects

In the period 1859 to 1915 the precious metals dominated mining activity in Colorado (see Figure 4). The gold rush of 1858-59 marked the birth of mining in Colorado, and in the period 1857-67, over $25 million in gold and silver were produced in Colorado.[2] The early gold mining was usually a placer type of mining in which free gold or gold in the pure state was recovered simply by separating it from the sand and quartz in which it was mixed.

Even though gold existed (and still exists) in large readily available quantities, no gold would have been produced without the effective demand provided by the monetary institutions within the United States; and although the United States did not adopt the gold standard until 1900, the U. S. Treasury was also a prime purchaser of gold after the enactment of the Gold Coinage Act of 1834.

The Mining Act of 1866 provided a boost to mining by guaranteeing clear title to a discoverer of a mine on public domain, providing a

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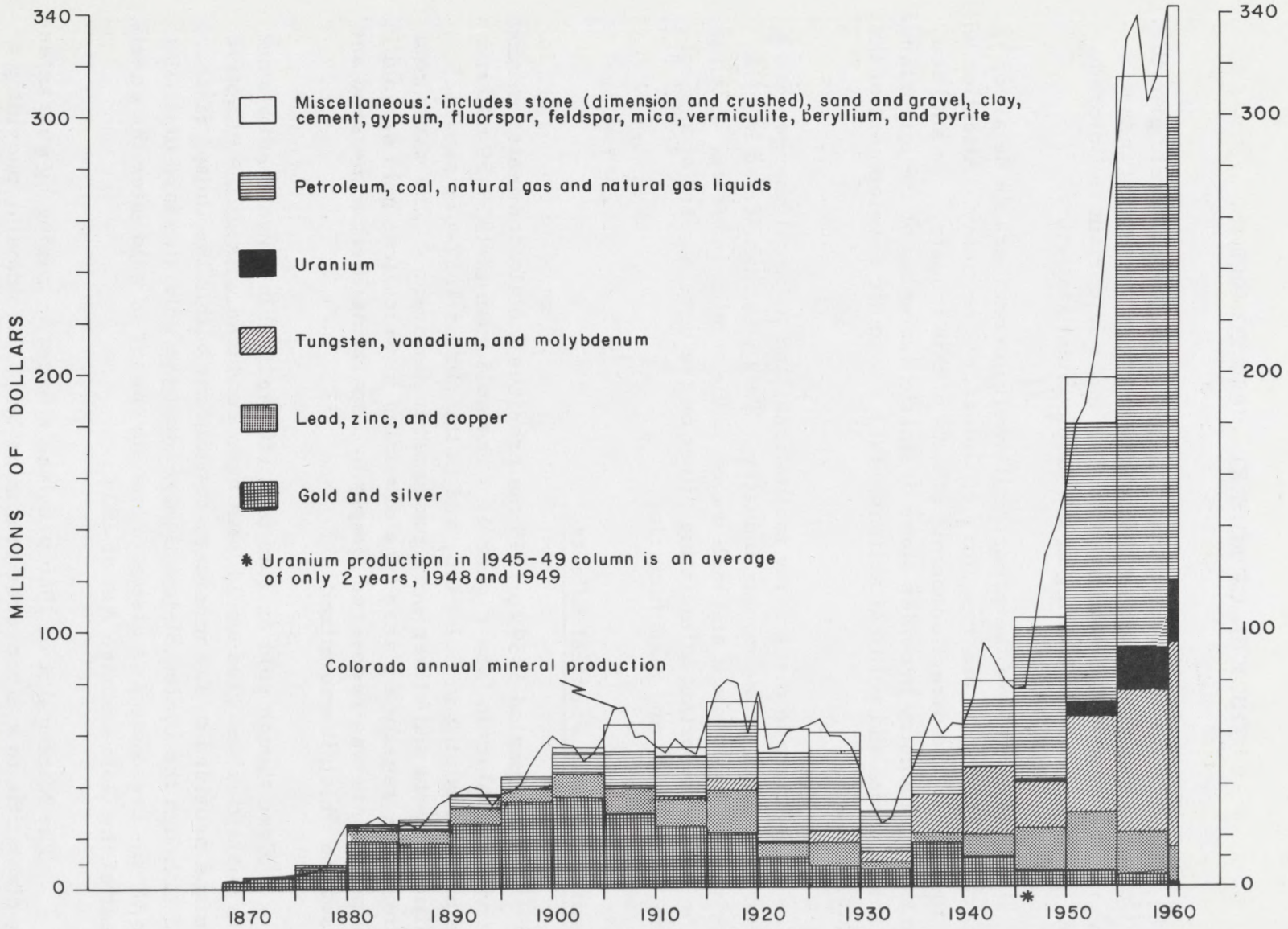
[2] Many statements made in this part of the report were drawn from standard sources and are not footnoted in detail. The bibliography at the end of the report lists many of these sources.

FIGURE 4. ANNUAL MINERAL PRODUCTION IN COLORADO, 1868 TO 1960



Source: A. H. Koschman, U. S. Geological Survey, Denver Office. Reproduced with the permission of the Colorado School of Mines Quarterly.

mine was developed to the extent of $1,000 (this was later reduced to $500). This law opened the mineral lands of the United States to all citizens for exploitation and encouraged the investment of capital by the assurance of title.

During the period in which mining was dominated by the precious metals, the total value of gold produced far exceeded the total value of silver. However, during the period of 1878 to 1897 the annual value of silver exceeded that of gold. The demand for silver was largely politically created and later politically killed. These actions afford a striking example of the interaction between politics and economics.

As a result of political action of Western silver interests, two Congressional acts were passed which assured the demand for silver. The first was the Bland-Allison Act of 1878, which required the Secretary of the Treasury to purchase silver worth not less than $2 million nor more than $4 million a month for coinage. The next act was the Sherman Silver Act of 1890, which was a concession to the Western silver interests for their support of the Republican's McKinley Tariff Bill. This law required the government to purchase 4,500,000 ounces of silver a month, about the total production of the country at that time.

In 1893 the large increase in supply and decrease in demand for silver, together with the severe financial panic of 1893, resulted in the rapid loss of the monetary value of silver and the repeal of the Sherman Act. The decline in the monetary demand for silver serves as an interesting example of how, even in those early days, the economy of Colorado was, to an appreciable extent, influenced by outside political and economic forces. The consequent decline in the monetary demand for silver was greatly increased when in 1893 the government of India, one of the most important silver using countries, suspended the free coinage of the silver rupee. At that time a panic broke out in the United States, partly over the uncertainty concerning the currency. (Prior to this, in the years 1871 to 1873, Germany had shifted to the gold standard; and in 1874 the Latin Monetary Union, including France, Italy, and several other smaller European nations with a by-metallic currency system, had suspended the free coinage of silver.)

During this period there were also other important changes in Colorado's mining law which made it possible to consolidate small area claims into larger areas, and thereby apply technological mining innovations which extended the size and increased the efficiency of these operations. To examine the impact of these changes in the mining law, it is necessary to briefly describe two main types of mining in Colorado.

Types of Mining in Colorado

Gold is found in two forms. Some is free gold, or gold in the pure state, which can be recovered simply by separating it from the sand and quartz in which it is found, but gold also occurs in physical or chemical combinations with other elements.

> The man who rushed across the plains to explore a gold mine had only the most simple equipment. A pick and shovel to loosen the gravel and a pan to wash the gold-bearing sands was the usual outfit. When veins were discovered, another problem arose. The gold-bearing quartz had first to be crushed before the gold could be washed out by panning or sluicing. In order to crush the ore, stamp mills as early as 1859 were freighted across the plains. The stamp mill crushed the ore by means of a series of stamps weighing 400-900 pounds each. The crushed ore then flowed over a trough or table covered with a blanket or over a plate coated with mercury to trap the precious metal. In the rich placers and in the veins near the surface, these methods worked satisfactorily. As the mines became deeper, more complex ores were encountered.[3]

It is significant that the early mining law was established to accomodate placer mining. For example, "Gulch claims shall be 100 feet in length from bank. Lead claims shall be 100 feet along the lead and 25 feet on each side."[4] Thus the area of a claim was extremely small and limited to what an individual might work, but the returns to the fortunate miners were large. The exhaustion of the comparatively easy accessible placer was largely responsible for the end of the Pike's Peak gold rush. And too, the cost of extracting a unit volume of ore became higher, as the mines became deeper, and the ore itself became more chemically complex.

In view of the above factors, it became necessary to recover smaller amounts of the precious metals from larger bodies of ore. For example, in the 1880's the average yield in Colorado by means of stamp

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[3] LeRoy R. Hafen, Colorado and Its People: A Narrative and Topical History of the Centennial State, Vol. II, New York: Simmons-Boardman Publishing Corp., 1948, p. 493

[4] Ibid., p. 489

mills was $25 a ton despite the fact that about half of the gold was lost. In 1925, when the recovery was nearly 100 percent, the Bureau of Mines estimated that the average recovery per ton of ore was approximately $6.82. Technological innovation made it possible to mine at a profit the much leaner veins, and to even rework many of the old mine dumps. Improvements in placer mining were equally impressive. An early day miner with his gold pan washed about half a cubic yard of gravel a day. In 1941, the South Platte Dredging Company built a dredge at Fairplay which was rated at being able to wash 17,000 cubic yards a day.

Technological Innovations in Mining

Through political action, which has already been mentioned in part, demand was established for Colorado's precious metals. In turn, this demand was a stimulus to technological innovations in the mining industry which offset increasing costs associated with the unique chemical and physical complexity of Colorado ores. These technological innovations had a stimulating effect which acted as a buoyant force on the growth of the Colorado economy.

Smelting. Smelting is a process of breaking up the complex structure of ores and concentrating metals by the combined application of oxygen chemical reducing agents and heat. Roasting is a special type of smelting which is designed to remove objectionable impurities, such as sulphur, in ore bodies. The innovation of smelting solved the problem of refractory ores and was a great stimulus to the mining industry in Colorado, and smelting had a profound influence on the profitability of silver and lead mining from the rich silver lead carbonate ores in Leadville. In 1879, lead became a million dollar industry, and from 1880 to 1892, the value of lead mined exceeded that of the gold mined. The boom in the Leadville area also boosted silver production above $16 million in 1880.

The cyanide process. Colorado was the first state to introduce a patented cyanide process, an important chemical method for extracting gold from complex ores. In this process, the crushed ore is mixed with a solution of potassium cyanide and a soluble potassium gold cyanide is formed. The gold can readily be extracted from this solution with zinc or by electrolysis.

Innovations in mining machinery. In addition to the above chemical innovations, the mining industry had an important stimulating effect on Colorado's early manufacturing industry. Many Colorado firms were

formed through technological innovation in mining machinery and equipment such as ore concentrators, sample grinders, steam hoists, and pulverizers.

Impact of Mining on Transportation

Colorado's mining industry had a pronounced stimulating effect on the railroad industry. It encouraged the construction of transcontinental railroads; it was a vigorous proponent of the extension of the railroads to Colorado because of other high transportation costs for importing bulky mining supplies and food products. Success was shown, in part, by the fact that by the end of 1870 Colorado had two major railways with Eastern markets, and one with those on the Pacific.

There was also a tremendous expansion of feeder rail lines within Colorado, and in the Mountain Region during the period 1870 to 1890 (see Table 3).

TABLE 3. RAIL MILEAGE IN COLORADO AND THE MOUNTAIN REGION

Year	Colorado Rail Mileage	Mountain Region Mileage
1870	157	873
1875	807	—
1880	1,570	3,236
1889	4,616	—
1890	—	9,330

Sources: Leroy R. Hafen, Colorado and Its People, New York: Lewis Historical Publishing Co., Vol. II, pp. 673-674; and Harvey S. Perloff, et al., Regions, Resources and Economic Growth, Baltimore: The Johns Hopkins University Press, 1960, p. 196.

Mining, Transportation and Services

As mentioned above, mining stimulated the development of the railroads in the mountain region. The effect of mining on the railroads in turn reverberated and had beneficial effects on other sectors of Colorado's economy.

The most direct effect of the railroads was on mining itself; through the reduction in transportation cost, mining equipment inputs

from the East were reduced in price, thereby increasing the profitability of mining operations. Also, within the mountain region itself, it was possible to economically transport mining supplies, personnel, food, and raw and concentrated ores within the rail network of mines, smelting centers, and distribution centers. Rail transportation, directly and indirectly, stimulated the integration of mining activities, leading to the growth of large mining corporations within the state. Railroads also had an important effect on coal mining, because they not only reduced the cost of transporting coal, but they were also large coal consumers.

Food prices were directly reduced through reduction in the transportation cost of food. An even greater effect on food prices was the stimulating effect of the railroads on the greater immigration of farmers (discussed later).

The railroads not only increased the immigration of farmers, but also the immigration of miners. This immigration of miners had a pronounced effect on the wage levels of miners.

Unfortunately it is not possible to observe the direct fall in the wages of miners for the period 1880 - 1890, because complete wage data for this period are not available. However, the following evidence supports the contention that there was a fall in the wage level of miners (especially the precious metal miners) during the period.

> From these statistics it appears that the labor employed in the actual production of the precious metals is both extremely well paid and very productive - better paid and more productive, in fact, than in any other industry thus far. It is well known that the average wages paid in mining throughout the western states have largely declined during the past ten years, owing to the reduced cost of living and the greater number of wage workers since railroads penetrated the mountain mining areas. [5]

Another piece of evidence on the fall of miners' wages during the period was the series of strikes over the wage reduction at metal mines throughout Colorado. There was a serious strike in Leadville on May 26,

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[5] U. S. Department of Commerce, Bureau of the Census, U. S. Census of Population, "Statistics on Gold and Silver Mines in the United States in 1889," Washington: U. S. Government Printing Office, 1890, p. 35.

1880, concerning the demand for an increase in pay and a uniform eight-hour day. Again in January, 1894, there were labor difficulties in the Cripple Creek area where management sought to reduce wages from $3 to $2.50 for an eight-hour day. Census data show that the average daily wage of metal miners in 1880 was more than $4 per day. Again, it is noted that at a later date (1896) there was labor trouble in Leadville. Sixty-five percent of the miners were receiving $3 per day and others were paid less. On May 25, 1896, the Union demanded that the $3 wage be made uniform.

Denver and its neighbors developed as a commercial and break-bulk center to serve the huge extractive industries located in the Rocky Mountains. As the railroad network in the Rocky Mountain regions developed, sectors of the service industries in Colorado, such as wholesaling, grew and became more basic in character. As shown in the following table, the percentage of gainful workers in the service industries was higher in Colorado than the corresponding percentage in the U. S. for the period, 1880 - 1900.

TABLE 4. TRADE, SERVICES, FINANCE, AND PUBLIC ADMINISTRATION

	Colorado		United States	
Year	Number of Employees	Percent of Total Employment	Number of Employees	Percent of Total Employment
1880	27,100	27%	4,279,600	25%
1900	76,100	35%	8,627,500	30%

Source: Colorado employment data are from Appendix A of this report. U. S. employment data are from Everett S. Lee, et al., Population Redistribution and Economic Growth in the United States, 1870 - 1950, Philadelphia: The American Philosophical Society, 1957.

Agriculture and the Food Processing Industries

In Colorado the mining industry around the 1860's created a demand for food which local agriculture was unable to supply. Goods and supplies were hauled from the Missouri River region, New Mexico, and Utah by great oxen trains. The American Railway Times of January 26, 1861, reported that during the preceding year 10,000 tons of freight were

carried from the Missouri River to the Rocky Mountains. Hafen states, "Nearly 12,000 men, 8,000 mules, 68,000 oxen and 6,900 wagons were employed in freighting on the plains. By 1865 the amount of merchandise carried overland was to amount to approximately 125 million pounds per year."[6]

A few of the more pertinent factors which facilitated the early growth of Colorado's agriculture are summarized below.

Political. As discussed, institutional and political forces were important in stimulating the demand for the mining of precious metals in Colorado. Political forces were also important in stimulating agricultural production in the mountain region. According to Garnsey:

> A political campaign led by the westerners and supported by the working class in the East, led eventually to the Homestead Act of 1862. This act provided for the free gift to every settler of 160 acres, the only condition being the payment of a small registration fee, and the requirement of residence and cultivation for a period of five years. Now the flood was in full tide, swelled by the ranks of Civil War veterans after 1865. From 1860 to 1890, the last West was settled and occupied, and by 1910, the last outpost of settlement was established. Free land in the West had drawn to it the men of the East who were to tame it to the plow, fence it in, and to make it a source of wealth and power for them and for the nation.[7]

Water Law. Today, as in the early pioneer days, the law in Colorado pertaining to the ownership and use of water has an important bearing on the cost and allocation of that scarce resource.

> The water law which the settlers brought with them was the common law doctrine of riparian rights. It limited the use of stream waters to the owners of the river banks and prohibited such use as would diminish or alter the stream flow. Obviously, such a legal

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[6] Hafen, op. cit., p. 188.

[7] Morris E. Garnsey, America's New Frontier, New York: Alfred A. Knopf, 1950, p. 14.

> principle was ill fitted to the needs of Colorado farmers. In the mountains the miners were following a legal doctrine that had evolved in the mining camps of California. This doctrine recognized the right of both riparian and non-riparian owners to divert the waters of a stream for beneficial use, and gave priority of right to the individual who had made prior diversion or appropriation. These principles became known as the doctrine of prior appropriation. They applied to water a principle of public land policy: first in time, first in right.[8]

In 1882, the Colorado Supreme Court gave a clear-cut decision establishing the doctrine of prior appropriation. In fact, Colorado became the first state to incorporate the doctrine of appropriation in its constitutional law.

Influence of the Railroads. The railroads, as mentioned earlier, were important in increasing the supply of farmers in the Mountain Region. In so doing, the railroads not only transported the individual farmer and his family to his homestead, but they also led to the establishment of whole colony towns such as Greeley and Longmont. The colony plan was adapted to the conditions in Colorado where successful farming often depends on cooperative irrigation projects. The railroads, with large tracts of land for sale, favored the colony movement since it tended to increase the volume of railroad traffic.

As discussed, Colorado's early agricultural products were directed toward supplying the mining communities. However, during the 1890's Colorado began to export agricultural products to other states; hence, at that time the degree of basicness of Colorado's agriculture began to increase, as shown by the following examples.

* The Arkansas Valley is known for its cantaloupe, alfalfa, sugar beets and livestock feed products. It is located in southwestern Colorado. As in the case of most Colorado produce, the first markets were in the mining towns, each individual shipping his own produce. In 1894 farmers shipped their first produce to Midwestern markets and organized the Mill and Growers Association of Rocky Ford. In 1897, they shipped 121 cars eastward, some of them reaching New York.

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[8] Hafen, op. cit., p. 125.

* The first agricultural products of Colorado to become famous outside of the state were the Greeley potatoes. The Greeley Mercantile Company was organized in 1886 by a number of Greeley settlers for the purpose of marketing potatoes outside the state. Within a few years, principal markets were developed outside of Denver and the mountain towns in Texas and Oklahoma. In the early 1890's Greeley "spuds" were shipped to Kansas, Nebraska, Iowa, and other states.

* Early agriculture on Colorado's Western Slope was concerned mostly with experimentation of varieties of fruits, such as apples, berries, and pears. The market for the period 1880 - 1890 was in the mining towns and in the irrigated communities on the Eastern Slope. The Grand Junction Fruit Growers Association was organized in 1891 for the purpose of developing more orderly marketing efforts and the association apparently first shipped out-of-state in 1892. Out-of-state shipments became common in the mid-90's.

The relatively important food processing industries in Colorado such as meat packing, and canned and frozen foods, are primarily resource oriented. Today these industries export a large percentage of their products and are therefore largely basic in character. That portion of Colorado's agriculture which supplies these industries is also largely basic since after transformation the products are exported out of the state.

Prior to 1900, the food processing industry chiefly served local markets. After 1900, the development of the inexpensive tin can, refrigerator car and further efficiency in railroad transportation contributed to the expansion of export sales from the food processors and consequently an increase in the basic pattern occurred in this industry. It follows that the agricultural sector indirectly increased its basic exports by supplying the food processing industry with farm produce. Prior to 1900, the leading sectors of the food processing industry in Colorado were flour and grist mills and slaughtering and meat packing establishments. These were supplemented by a number of various types of small

establishments which produced such commodities as catsup, vinegar, and pickles. Employment in the food processing industries increased from 663 in 1880 to over 3,000 in 1900; this corresponded to an increase from 15.1 percent to 15.9 percent of Colorado's total manufacturing employment (see Table 2 in Introduction to Part I).

The Significance of Manufacturing

Despite the relatively small amount of employment and low income derived from manufacturing, during the period from 1880 - 1900, there are indications that manufacturing in Colorado was of vital significance to the growth of the state's economy. Manufacturing employment in Colorado in 1880 totaled only 4,000 persons (see Table 1). This corresponded to approximately 4 percent of Colorado's total employment and to less than .3 percent of manufacturing employment in the U. S. In the same year, personal income derived from manufacturing amounted to only 2.6 percent of the total personal income in the state.

Although manufacturing had an important support function in the state's economy, manufacturing in the metal products industry (mining machinery, railroads, structural steel products) was of particular significance, even though employment in this industry group was only 826, or less than one percent of Colorado's total employment in 1880.

This industry was particularly important because it had direct and indirect effects on the economic progress of Colorado — effects far out of proportion to employment in the industry. The inventions or new products developed by Colorado firms benefited other industries, particularly mining. The effects of these firms on the mining industries are examples of the power of technological innovation. Some eastern machinery was not available to mining, milling, and smelting of Colorado ores; the innovations of the early Colorado manufacturers not only made these operations possible, but also helped to achieve economies of scale which thereby increased the rate of return on investment in mining operations.

Many of the new mining inventions were created by profit motivated inventors whom we call "product champions." These "product champions" are individuals who see a problem and solve it with an invention.[9]

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[9] James F. Mahar, and Dean C. Coddington, New Product Development - Reducing the Risk, Denver: University of Denver Research Institute, December 1961.

Hendrie & Bolthoff Manufacturing and Supply Company. The company was reincorporated in 1898 under its present name from its parent firm known as Hendrie Brothers and Bolthoff. Bolthoff was a mechanic and his mechanical genius was widely known, not only in Colorado, but in other countries as well. He was a "product champion" who invented the successful Bolthoff steam hoist and the Bolthoff sample grinder. In addition to manufacturing and repair work, the firm supplied services and general types of equipment to the mining industry. It is now engaged in diversified distribution of five major lines: automotive, industrial, electrical, engineering, and specialty products. In the earlier days, orders came for the firm's mining machinery from Mexico, Alaska, and other areas.

Mine & Smelter Supply Company. Organized in 1895 as a wholesale supply house, this firm later became interested in the manufacturing of mining machinery. A. R. Wilfley, the "product champion," became associated with the company in the capacity of a consulting engineer and director. Wilfley is known for the famous Wilfley concentrating table, which enabled the mining industry to use low grade ores, especially low grade copper ores. It is interesting that as of 1948, over 24,000 of these Wilfley tables, weighing in excess of 60 tons each, have been shipped to all parts of the world where low grade ores have been handled. Another "product champion," Frank E. Marcy, was also associated with this company. He developed the famous Marcy ball mill, which improved coarse crushing and grinding equipment, particularly stamp mills. Besides the Wilfley table and the Marcy ball and rod mills, the company manufactures numerous other types of mining equipment such as crushers, pulverizers, floatation machines and amalgamators.

Stearns-Roger. The company had its beginnings in Leadville, Colorado, in 1883, but was incorporated as the Stearns-Roger Manufacturing Company in 1891. The firm was engaged in several fields in its early history: general machinery manufacture, mining

machinery manufacture, and the erection of power plants, dredges, and metallurgical mills. Today the company's activities include many fields besides mining machinery, including sugar machinery, power machinery and general manufacturing.

Population in Colorado — 1880 to 1900

An increase in a region's population does not always add to the economic well-being of that region. Economic well-being is apt to be enhanced if people migrate into a region to take advantage of employment opportunities or to open new businesses. In these cases, needs are supported by purchasing power and are transformed into effective demand. At the other extreme, additional population may reduce the labor participation rate and result in a decline of per capita income.

Colorado's decline in per capita income between 1880 and 1900 was largely due to in-migration. In 1880, Colorado's labor participation rate was approximately one and one-half times the U. S. rate (see Table 6). By 1900, it had declined until it was only 1.06 times as great. This decline in the labor participation rate is largely the result of the decline of the high male to female ratio which had existed in Colorado (see Table 5).

TABLE 5. RATIO OF MALE POPULATION 10 YEARS AND OVER TO TOTAL POPULATION, COLORADO AND UNITED STATES, 1880 AND 1900

Year	Percentages of Colorado	Percentages of United States
1880	70%	51%
1900	56%	51%

Source: Everett S. Lee, et al., Population Redistribution and Economic Growth, Philadelphia: The American Philosophical Society, 1957, pp. 555 and 556.

The decline in Colorado's male population ratio and labor participation rates are related to the large increase in population (over 430 percent) between 1880 and 1900. The large population increase, in turn, is largely explained by the extremely high rate of net in-migration which occurred between 1880 and 1900 (see Table 7).

TABLE 6 LABOR PARTICIPATION RATE COMPARISONS, COLORADO AND UNITED STATES, SELECTED YEARS

	COLORADO			UNITED STATES			Ratio of Colorado to U. S. Labor Participation Rate
Year	Employment	Population	Labor Participation Rate	Employment	Population	Labor Participation Rate	
1880	101, 251	194, 310	52%	17, 392, 099	50, 155, 800	35%	1. 50
1900	218, 263	539, 700	40%	29, 073, 233	75, 994, 600	38%	1. 06
1920	366, 457	939, 600	39%	41, 614, 248	105, 711, 000	39%	. 99
1940	346, 535	1, 123, 000	31%	45, 070, 315	131, 669, 000	34%	. 90
1950	476, 538	1, 325, 089	36%	58, 998, 943	151, 323, 175	39%	. 92
1960	626, 769	1, 753, 947	36%	64, 639, 250	179, 323, 175	36%	. 99

Source: Colorado employment data are derived in Appendix A of this report. Colorado population data are from U. S. Department of Commerce, Bureau of the Census, Census of Population, various years.

United States population and employment data are from Everett S. Lee, et. al., Population Redistribution and Economic Growth in the United States, 1870-1950, Philadelphia: The American Philosophical Society, 1957, p. 329.

TABLE 7. COLORADO RATE OF MIGRATION

Decade	Net Migration Per 1,000 Population
1870-1880	+ 1,224
1880-1890	+ 576
1890-1900	+ 128
1900-1910	+ 274
1910-1920	+ 52
1920-1930	- 19
1930-1940	+ 1
1940-1950	+ 30
1950-1960	+ 123

Note: A plus (+) means net in-migration, and a minus (-) means net out-migration.

Source: Data for 1870 to 1950 are from Everett S. Lee, et al., Population Redistribution and Economic Growth in the United States, 1870 - 1950, Philadelphia: The American Philosophical Society, 1957, p. 117.

Data for 1950 and 1960 are from U. S. Department of Commerce, Bureau of the Census, Statistical Abstract, Washington: Government Printing Office, 1962, p. 40.

Per Capita Income Comparisons — Colorado vs United States

Per capita personal income is often considered to be one of the best available overall measures of the economic well-being of people. If the per capita income within a state, such as Colorado, is above the U. S. average, it is usually concluded that Coloradans are better-off economically than the average U. S. citizen.

In its early days, Colorado appeared to have offered its citizens a much higher per capita income than the U. S. as a whole. It would appear at first glance that Colorado's relatively high per capita income could be attributed to higher wages and greater earning power.

We find, however, in analyzing per capita income that the reason Colorado was much higher than the U. S. in 1880 was not necessarily the result of higher wages. In fact, most of the excess was due to Colorado's greater proportion of population working. In other words, Colorado's labor participation rate was high. To compensate for this difference in labor participation rates between Colorado and the U. S., we have made what is termed a "labor participation rate adjustment." The purpose of this adjustment is to allow more meaningful comparisons of individual earning power between Colorado and the rest of the United States.

Table 8 shows per capita income in Colorado and the U. S. for selected years from 1880 through 1961. (Per capita personal income can be quite volatile from year to year in an individual state, and therefore tenth and twentieth year data should be interpreted with caution.) In all the selected years except 1940 and 1950, Coloradans had higher per capita income than the U. S. average. The last two columns on this table show how much of this excess (or deficit in the cases of 1940 and 1950) was due to labor participation rates and how much was due to greater earning power. It is interesting to note that after the labor participation rate adjustment is made, Coloradans have always had greater earning power than the U. S. as a whole in all of the selected years. This was true even in the years 1940 and 1950.

The question arises: Why have Coloradans had higher earning power than U. S. citizens as an average? Relatively high earning power of Coloradans is particularly evidenced in 1880 and 1900. The next subsection attempts to answer this question by making an industry-by-industry analysis of income.

TABLE 8. PER CAPITA INCOME COMPARISONS, COLORADO VERSUS UNITED STATES, SELECTED YEARS

Year	Personal Per Capita Income in Colorado	Personal Per Capita Income in the U. S.	Difference Between Per Capita Incomes (Colo. - U. S.)	Difference Due to Labor Participation Rate Correction	Difference Due to Actual Earning Power
1880	$ 370.60	$ 174.30	$196.30	$124.10	$ 72.20
1900	318.70	202.50	116.30	17.30	98.90
1920	728.40	655.30	73.10	(6.30)	79.40
1940	551.10	596.30	(45.20)	(60.30)	15.10
1950	1,446.00	1,491.00	(45.00)	(51.00)	6.00
1960	2,325.60	2,230.60	95.00	(20.20)	115.20
1961	2,421.00	2,263.00	158.00	60.00	98.00

Sources: Colorado and U. S. per capita income data for 1880 to 1940 are from Everett S. Lee, et al., Population Redistribution and Economic Growth, Philadelphia: The American Philosophical Society, 1957; data for 1950 through 1961 are from U. S. Department of Commerce, Office of Business Economics, Personal Income by States, since 1929, and Survey of Current Business, August issue, various years. Data needed to make the labor participation rate correction were taken from Figure 3 of this report.

Industrial Sources of Income — Colorado vs United States

It is impossible to make direct comparisons of industrial sources of income without first reducing U. S. totals to a basis comparable for those of Colorado. We know, for example, that in 1880 Colorado's labor force was only .0058 of the U. S. total. By multiplying each source of U. S. personal income by .0058 it is possible to make direct comparisons.

Table 9 shows employment and income in both Colorado and the United States in 1880. The table also shows U. S. income by industry group after it has been reduced to make it comparable to Colorado. The table then makes direct comparisons between Colorado and the adjusted U. S. totals. These comparisons show, for example, that mining in Colorado contributed $18.3 million to the Colorado economy above what might be expected if Colorado's economy were structured the same as that of the United States. Manufacturing, on the other hand, did not make a positive contribution to Colorado's relatively high earning power. In fact, in 1880, manufacturing in Colorado fell $3.2 million short of what might have been expected had the Colorado economy been structured the same as that of the U. S. It is emphasized, however, that this relatively low earning power of Colorado's manufacturing industry belies the importance of the technological contributions to the mining and railroad industries.

In the services industries (which include all other types of employment) Colorado had an excess of $17.5 million. This is significant since Denver and other centers had become bulk-break points with higher than expected employment in trade and transportation.

Table 10 is similar to Table 9 in that it compares income by individual industrial source in Colorado and the United States. Table 10, however, is for the year 1900. Looking at the last two columns of the table, it is interesting to note that Colorado mining enjoyed approximately the same surplus that it had in 1880.

Colorado's negative contribution from agriculture decreased slightly over 1880 levels (it was minus $7.5 million in 1880, as opposed to minus $1.6 million in 1900). This improvement in the agricultural sector was in response to the local-regional demand for agricultural products and an increase in agricultural exports. Another contributing factor was the fact that the average annual returns to Colorado farmers were about 7 percent higher than in the United States.

TABLE 9. COMPARISONS OF PERSONAL INCOMES BY INDUSTRIAL SOURCES IN 1880, COLORADO VERSUS UNITED STATES

Industry Group	Employment: Colorado Amount	Employment: Colorado Percent	Employment: U. S. Amount	Employment: U. S. Percent	Personal Income (In $ millions): Colorado	Personal Income (In $ millions): U. S.	U. S. Personal Income Adjusted to Colorado Personal Income[1] (In $ millions)	Colorado Personal Income Less U. S. Personal Income After Adjustment (In $ millions): Surplus	Deficits
Mining	20,500	20.2	295,991	1.7	$ 18.9	$ 94.8	$ .6	$ 18.3	
Agriculture	16,366	16.2	8,631,000	49.6	4.0	1,968.0	11.5		$ 7.5
Manufacturing	4,393	4.3	2,540,000	14.6	1.8	870.7	5.1		3.2
Services and Other Defined Industries	59,992	59.2	5,925,108	34.1	43.3	4,439.0	25.8	17.5	
Property Income	—	—	—	—	4.0	1,367.0	8.0	—	4.0
Total	101,251	100.0	17,392,099	100.0	$ 72.0	$8,739.5	$ 51.0	$ 35.8	$ 14.7

Total Net Surplus Income (Colorado less U. S.) = $35.8 - $14.7 = $21.1 Million

Note: [1]The ratio of Colorado employment to U. S. employment times U. S. personal income

Sources: Colorado employment data, with the exception of mining, are from Appendix A of this report. The Colorado mining employment figure is establishment data from early U. S. Bureau of the Census Reports (see explanation in Appendix A).

United States employment data are from Harvey S. Perloff, et al., Regions, Resources and Economic Growth, Baltimore: The Johns Hopkins University Press, 1960, pp. 622 - 635.

Personal income data are from Everett S. Lee, et al., Population Redistribution and Economic Growth, Philadelphia: The American Philosophical Society, 1957, pp. 688, 753 - 757.

TABLE 10. COMPARISONS OF PERSONAL INCOMES BY SOURCES IN 1900, COLORADO VERSUS UNITED STATES

Industry Group	Employment				Personal Income (In $ millions)		U.S. Personal Income Adjusted to Colorado Personal Income[1] (In $ millions)	Colorado Personal Income Less U.S. Personal Income After Adjustment (In $ Millions)	
	Colorado		U.S.						
	Amount	Percent	Amount	Percent	Colorado	U.S.		Surplus	Deficits
Mining	20,519	9.4	581,985	2.0	$ 21.5	$ 376.0	$ 2.8	$18.7	$
Agriculture	49,457	22.6	11,410,480	39.2	18.0	2,613.0	19.6		1.6
Manufacturing	20,007	9.2	5,082,500	17.5	11.8	2,264.0	17.0		5.2
Services & Other Defined Industries	128,280	58.8	11,998,000	41.3	100.6	7,613.0	57.1	43.5	
Property Income	—	—	—	—	20.0	2,524.0	18.9	1.1	
Total	218,263	100.0	29,073,233	100.0	$171.9	$15,390.0	$115.4	$63.3	$6.8

Total Net Surplus Income (Colorado-U.S.) = $63.3 - $6.8 = $56.5 million

Note: [1]The ratio of Colorado employment to U. S. employment times U. S. personal income

Source: Colorado employment data are derived in Appendix A of this report. Colorado population data are from U.S. Bureau of the Census, Census of Population, various years.

United States population and employment data are from Everett S. Lee, et. al., Population Redistribution and Economic Growth, Philadelphia: The American Philosophical Society, 1957, p. 349.

Under the stimulus of mining, transportation, and population growth, Colorado's manufacturing industry increased its activity. Income rose from $1.8 million in 1880 to $11.8 million in 1900. This large proportional increase, however, was not enough to equal the proportional growth in personal income resulting from the rise of large scale mass manufacturing in the U. S.

In 1900 the services and other industry category had the greatest surplus — $43.5 million.

THE ERA OF AGRICULTURE - 1900 TO 1940

Agriculture and the related food processing industries dominated the economic development of the state during the 1900 to 1940 period. Colorado experienced relative gains in agricultural activity which tended to offset losses in mining.

Related to these gains in agriculture was an expansion of the food processing industries. This expansion made agriculture more of a basic industry since a greater share of Colorado's agricultural products were processed and then exported by the food processing industry. But outside of some increases in the food processing industry, the gains in Colorado's manufacturing activity were relatively insignificant.

In mining, there were several important developments including: the decline in gold and silver production, the rise and fall of coal production, and the beginning of a sharp rise in the production of petroleum and molybdenum.

The labor participation rate in Colorado fell sharply during this span of four decades. In 1900 employment was higher than the U. S. rate, whereas in 1940 it was below the U. S. rate.

The long run stimulating effects of mining were beginning to wear off in the 1900 to 1940 period. In a sense, the state's economy was saved by Post World War I prosperity in agriculture.

Agriculture — A Leading Industry

In the period 1900 to 1940, the ratio of Colorado to U. S. per capita income fell from 1.57 to 0.92. Perloff attributes this relative decline in Colorado's per capita income (and that of the Rocky Mountain region) to two main forces: (1) The relative decline of Colorado with respect to the U. S. in the higher income generating manufacturing sector, and (2) the growing importance of Colorado with respect to the U. S. in the relatively low income generating agricultural sector. [10]

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[10] Harvey S. Perloff, et. al., Regions, Resources and Economic Growth, Baltimore: The Johns Hopkins University Press, 1960, p. 190

While there is general agreement on Perloff's statement with regard to the influence of manufacturing, it is our contention that agriculture acted, not as a depressing, but as a buoyant force to the economy during this period.

The reason for this statement is that Colorado's agricultural economy had more than its share of the national agricultural prosperity. The percentage of total labor force engaged in agriculture in 1920 was about the same in Colorado as in the U. S. However, the percent of total personal income from agriculture in Colorado was 21 percent as compared with only 14 percent in the U. S. In brief, the average return to persons engaged in agriculture was higher in Colorado than in the U. S. ($1,420 in Colorado as compared to only $900 for the U. S. — see Table 11).

Why did Colorado have a relatively superior performance in agriculture from the period 1900 to 1920? The data are incomplete, but suggest that Colorado's advantage was due to a larger concentration of effort in the more profitable agricultural products of that period — wheat, hay, and cattle. For example, dry farming (after many unsuccessful attempts) was successful between 1910 and 1920. During this period, the value of Colorado's wheat crop increased from $70 million to $160 million, a 230 percent increase as compared to only a 60 percent increase for the nation.

The value of crops produced per acre is reflected in the value of land per acre. In 1920, the average value of Colorado's wheat land area was $24.84 per acre as compared to $19.68 in the U. S. Colorado cattle also commanded premium prices and between 1915 and 1920, the Colorado price per head was $5 to $10 above the average U. S. price.

Continuing to the 1920 to 1940 period, the golden years of agriculture were interrupted by a postwar depression during 1920 and 1921. Following this depression, there was a general rising prosperity in the nation, except in the field of agriculture. In agriculture, there was a decline in the prices of farm products relative to farm purchases. The U.S.D.A. index of prices received by farmers declined from $211 in 1920 to only $100 in 1940.

The depression in 1929, which lasted through the 1930's prolonged the adverse condition of the farmer. In Colorado the value of total personal income of persons engaged in agriculture declined from $142 million in 1920 to $67 million in 1940. This decline of about 47 percent was of approximately the same magnitude as the general decline of the farm price index.

TABLE 11. COMPARISONS OF PERSONAL INCOMES BY SOURCES IN 1920, COLORADO VERSUS UNITED STATES

Industry Group	Employment: Colorado Amount	Colorado Percent	U. S. Amount	U. S. Percent	Personal Income (In $ millions): Colorado	U. S.	U. S. Personal Income Adjusted to Colorado Personal Income[1] (In $ millions)	Colorado Personal Income Less U. S. Personal Income After Adjustment (In $ millions): Surplus	Deficits
Agriculture	100,153	27.3	10,669,309	25.6	$142.0	$ 9,421.0	$ 83.0	$ 59.0	
Mining	16,790	4.6	883,355	2.1	25.3	1,161.0	10.2	15.0	
Manufacturing	35,673	9.7	10,116,100	24.3	43.5	12,466.0	110.0		$66.3
Service & Other Defined Industries	213,841	58.4	19,945,484	47.9	356.2	33,059.0	291.1	65.1	
Property Income	—	—	—	—	117.0	13,170.0	116.0	1.0	—
Total	366,457	100.0	41,614,248	99.9	$684.0	$69,277.0	$610.3	$140.1	$66.3

Total Net Surplus Income (Colorado - U. S.) = $140.1 - $66.3 = $73.8 million

Note: [1]The ratio of Colorado employment to U. S. employment times U. S. personal income

Sources: Colorado employment data, with the exception of mining, are from Appendix A of this report. The Colorado mining employment figure is establishment data from early U. S. Bureau of the Census reports (see explanation in Appendix A).

United States employment data are from Harvey S. Perloff, et al., Regions, Recources and Economic Growth, Baltimore: Johns Hopkins University Press, 1960, pp. 622 - 635.

Personal income data are from Everett S. Lee, et al., Population Redistribution and Economic Growth, Philadelphia: The American Philosophical Society, 1957, pp. 688, 753-757.

Despite the decline in Colorado's personal income from agriculture, the condition of agriculture in Colorado in 1940 was relatively better than in the nation as a whole. This is evidenced by Colorado's personal income from agriculture which was proportionately about $24 million above the U. S. (see Table 12). This excess agricultural income was because of a slightly higher percentage of agricultural employment in Colorado than the U. S. (21.3 percent compared to 19 percent). Even more important was the fact that in 1940 personal income per person engaged in agriculture was about $910 in Colorado as compared to only $590 in the U. S.

There was a 35 percent drop in employment in Colorado agriculture between 1920 and 1940. This drop was caused largely by the increase in the technological efficiency of agriculture accompanied by an increase in output per man hour. The U.S.D.A. index of output per man hour for the Mountain region increased from 49 in 1920 to 67 in 1940 — a 36 percent increase in efficiency which corresponds closely to the percentage drop in farm employment.

During the period 1900 to 1940, it is important to observe that Colorado's agriculture became more basic because of its stronger link with the sugar beet and canning industries. These industries were, and still are, exporters of goods from Colorado.

The food processing industries accounted for 75 percent of the total gain in manufacturing employment in Colorado during this period. Some agricultural economists maintain that the income and employment multiplying effects of agriculture on other industries are underrated (e.g., food processing, agricultural services, chemicals, transportation, etc.). They point out that agriculture has natural comparative advantages, and to realize the benefits, these advantages should be developed.

Mining Decreased in Importance

During this period mining's percentage share of the value of Colorado's total output declined. However, the total value of products from the mining industry increased between 1900 and 1940 from $57 million to $63 million (see Table 13). During this period the industry experienced a rise and fall in the production of gold, which was followed by a rise and fall in coal production.

TABLE 12. COMPARISONS OF PERSONAL INCOMES BY SOURCES IN 1940, COLORADO VERSUS UNITED STATES

Industry Group	Employment: Colorado Amount	Employment: Colorado Percent	Employment: U. S. Amount	Employment: U. S. Percent	Personal Income (In $ millions): Colorado	Personal Income (In $ millions): U. S	U. S. Personal Income Adjusted to Colorado Personal Income[1] (In $ millions)	Colorado Personal Income Less U. S. Personal Income After Adjustment (In $ millions): Surplus	Colorado Personal Income Less U. S. Personal Income After Adjustment (In $ millions): Deficits
Mining	15,897	4.6	918,853	2.0	$ 22.0	$ 1,287.	$ 9.9	$12.1	
a. Bituminous & other coal mining					10.0	660.	5.1		
b. Crude petroleum & natural gas					1.0	336.	2.6		
c. Mining, quarrying except fuel					11.0	291.	2.2		
Agriculture	73,911	21.3	8,559,134	19.0	67.0	5,599.	43.0	24.0	
a. Wages & salaries					15.0	1,031.	7.9		
b. Proprietors					52.0	4,568.	35.1		
Manufacturing	32,687	9.4	10,670,087	23.7	54.0	16,320.	125.5		$71.5
Services & Other Defined Industries	224,040	64.7	24,922,241	55.3	342.0	40,147.	308.7		
a. Services	54,982	15.9	7,348,141	16.3	35.0	5,026.	38.6		3.6
b. Wholesale, retail trade	67,201	19.4	7,497,793	16.6	113.0	12,920.	99.3	13.7	
c. Finance, insurance & real estate	11,555	3.3	1,474,681	3.3	16.0	2,453.	18.9		2.9
d. Transportation	20,730	6.0	2,193,775	4.9	33.0	3,639.	28.0	5.0	
e. Communications & pub. util.	8,857	2.6	949,452	2.1	14.0	1,543.	11.9	2.1	
f. Contract construction	18,034	5.2	2,087,564	4.6	12.0	1,709.	13.1		1.1
g. Other industries	6,201	1.8	729,540	1.6	N. A.	106.	.8	—	—
h. Other labor income	—	—	—	—	6.0	687.	5.3	.7	
i. Government	36,480	10.5	2,641,295	5.9	80.0	8,258.	63.5	16.5	—
j. Proprietors	—	—	—	—	33.0	3,806.	29.3	3.7	
Property Income	—	—	—	—	96.0	12,709.	97.7		1.7
Transfer Payments	—	—	—	—	38.0	2,458.	18.9	19.1	
Totals	346,535	100.0	45,070,315	100.0	$619.0	$78,520.	$603.7	$96.9	$80.8

Total net surplus income (Colorado - U. S.) = $96.9 - $80.8 = $16.1 million.

Note: [1]The ratio of Colorado employment to U. S. employment times U. S. personal income

Sources: Employment data for both Colorado and the United States are occupational data as reported in U. S. Bureau of the Census, Census of Population, various years. The Colorado employment data are not the same as those derived in Appendix A. It was necessary to use Census statistics without adjustment in order to make the Colorado figures comparable with the U. S. figures.

Personal income data are from the U. S. Department of Commerce, Office of Business Economics, Personal Income by States since 1929, supplement to Survey of Current Business, Washington: U. S. Government Printing Office, 1956.

TABLE 13. VALUE OF PRINCIPAL MINERAL COMMODITIES PRODUCED IN COLORADO, SELECTED YEARS, 1858 TO 1960 (IN MILLIONS OF DOLLARS)

Year	Gold	Silver	Copper	Lead	Coal	Petroleum	Zinc	Natural Gas	Uranium Ore	Tungsten	Vanadium	Molybdenum
1858 to 1867	$25,022	$ 406			$ 34							
1870	3,015	660	$ 39	$ 15	27							
1880	3,253	16,557	184	3,567	1,041							
1890	4,151	19,740	559	4,914	4,344	$ 310	$ 17					
1900	28,762	12,609	1,299	7,228	5,858	323	716	$ 2	—	$ 3		
1910	20,506	4,595	1,062	3,347	17,027	243	4,163	—	—	536	$ 106	
1920	7,576	5,896	744	3,730	42,829	199	3,952	1	—	102	1,680	$ 0
1930	4,518	1,687	1,367	2,213	21,485	1,480	3,481	80	—	34	1,655	2,621
1940	12,857	6,905	2,746	1,148	16,644	1,480	638	100	—	711	2,425	15,949
1950	4,564	3,161	1,307	7,292	21,669	59,420	13,000	436	3,195	302	4,440	12,498
1955	3,100	2,509	3,225	4,710	20,100	144,800	8,696	4,866	7,907	4,079	10,410	45,195
1960	2,144	1,502	2,085	4,231	21,090	136,713	8,070	12,781	23,462	1,365	15,900	62,039

Source: Data taken from a table prepared by A. H. Koschman, U. S. Geological Survey, Denver Office.

In 1900, The U. S. officially went on the gold standard, an action well timed with the Cripple Creek discovery of gold. Gold production in Colorado reached a peak of $29 million in 1900; however, by 1920 production fell to about $7.5 million (see Table 13) only to rise again to nearly $13 million in 1940. This was the last peak; gold production declined to an ignominious $2 million in 1960. By 1960, the output of zinc, lead, and sand and gravel individually exceeded the output of gold.

The production of coal rose from $6 million in 1900 to a peak value of $43 million in 1920 (see Table 13). By 1940, however, production had declined to about $16.6 million chiefly because of the competition of natural gas and liquid petroleum for heating purposes.

Despite the small increase in the value of output in the mining industry, employment during the period declined from about 35,000 to 16,000. This fall in employment, accompanied by the rise of output, was a result of the technological innovations within the mining industry (see Figure 5). It could also be attributed to the change in the industry mix — particularly in 1940, which was the beginning of the sharp rise of Colorado's petroleum industry.

A few of the technological innovations during this period in mining were:

* During the period 1900 to 1920, the cyanide process was fully developed in gold mining.

* There were innovations in surface mining, with the application of heavy machinery in the strip mining of copper.

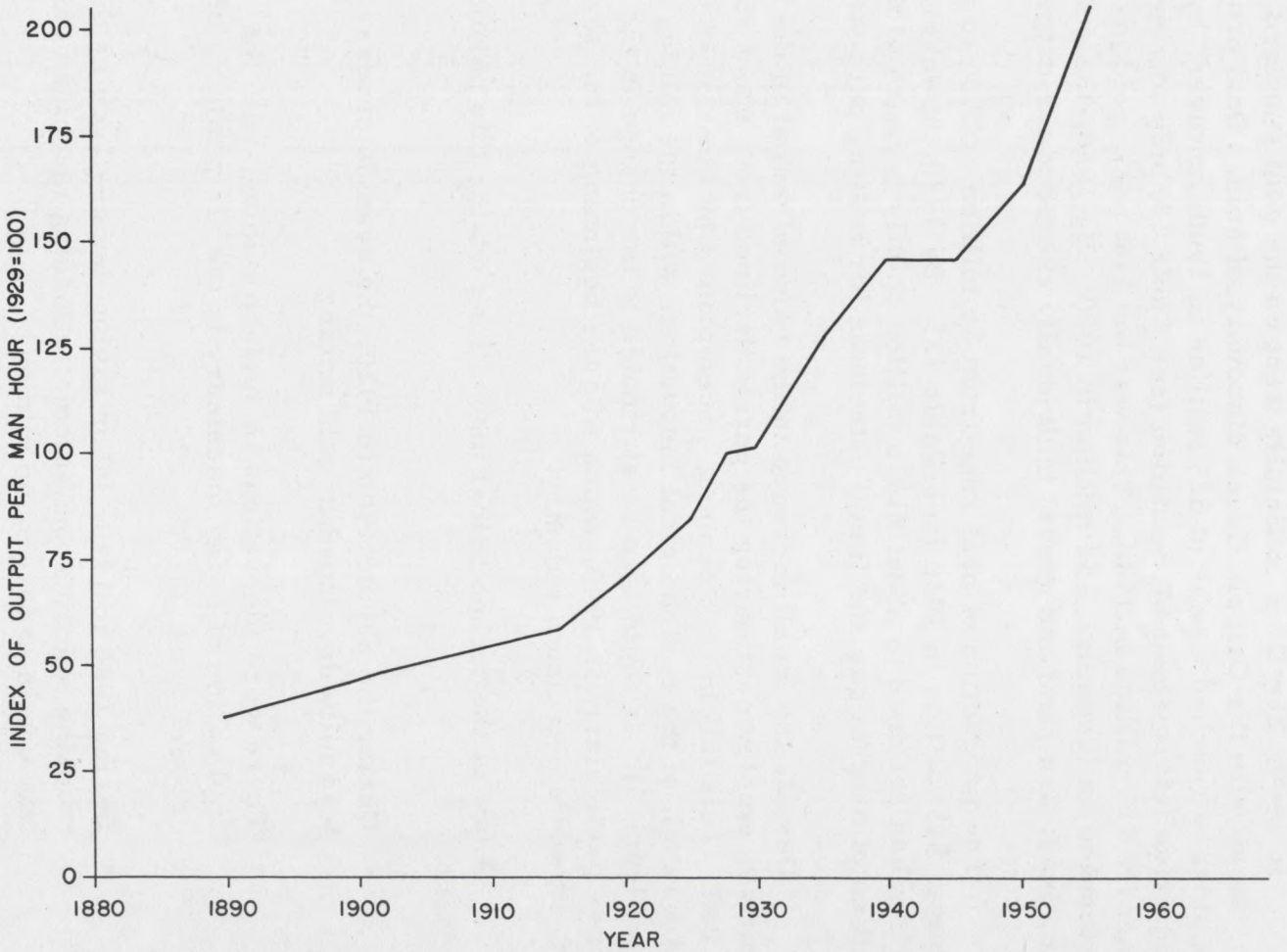
* During 1920 to 1940, labor saving devices such as the mucking machine and automatic loading machines came into use in underground mining.

* The technological efficiency of coal mining, which lagged behind metal mining, was given a large stimulus with the organization of the United Mine Workers Union in the 1930's.

Manufacturing Oriented Toward Food Processing

Colorado's income of persons engaged in manufacturing rose from $11.8 million in 1900 to $54 million in 1940, and the corresponding

FIGURE 5. MINING PRODUCTIVITY IN THE UNITED STATES PER MAN-HOUR, 1880 TO 1957



Source: U. S. Department of Commerce, Bureau of the Census, Historical Statistics of the United States, Colonial Times to 1957, Washington: U. S. Government Printing Office, 1960, p. 600.

manufacturing percentage of total personal income of the state rose from 6.3 percent to 11.2 percent (see Tables 10 and 12).

From first impressions, this increase in income may appear to be substantial. However, Colorado's comparative gains in income and employment in manufacturing were below the U. S. average. In the manufacturing centers of the U. S. this was an era of accelerated growth of big business in the mass producing industries, of capital equipment, and durable consumer goods. Related to the technological innovations in these industries were increases in size and efficiency of plants. During this 40 year period, manufacturing employment in the U. S. rose from 2.5 million to 10.5 million, a four-fold increase, while Colorado's employment increased only 12,600 (from 20,000 to 32,600). As noted the food processing industry alone accounted for 75 percent of Colorado's increased manufacturing employment.

Services and All Other Industries

The overall performance of Colorado's service and all other industries category was in some respects opposite to that of manufacturing. From 1900 to 1940, employment in Colorado of these industries almost doubled, increasing from 128,000 to 224,000. Personal income almost tripled, rising from $120.6 million to $342.0 million (see Table 13).

In 1940 there is, for the first time, a breakdown of the category "other industries," which is listed in Table 13. It is interesting to note that the role of government was beginning to show some significance since the government sector generated an excess income of $16.5 million. Also of significance was the growing importance of transfer payments which amounted to net excess income in Colorado of $19 million.

Population Continued to Increase

In the period 1900 to 1940, the greatest gain in Colorado employment and population occurred during the first 20 years. In these years employment increased from 218,263 to 366,457 — a gain of 68 percent. Population increased at an even greater rate — about 75 percent.

From 1920 to 1940, Colorado employment declined while the population increased. The loss of employment was greatest in agriculture which dropped from about 100,000 in 1920 to nearly 75,000 in 1940.

In this period there was very little net migration into Colorado. Hence, the gain in population may be ascribed primarily to natural increase.

The gain in population and decline of employment contributed to the continued decline of Colorado's labor participation rate (see Figure 3 in the Introduction to Part I). From this point on, Colorado's labor participation rate has been aligned much more closely to that of the U. S. as a whole.

THE ERA OF DEFENSE - 1940 TO 1960

Historical highlights of the Colorado economy during the 1940 - 1960 period follow:

* The most dominant feature was the influence of the Cold War on the rise in manufacturing income and employment as related to defense spending. For example, personal income from manufacturing increased from $200 million in 1950 to $501 million in 1960, an increase of $301 million. It is estimated that major defense oriented manufacturers accounted for 33 percent of this increase or about $100 million.

* Another significant feature was the rise of direct and indirect government expenditures.

* The composition of the mining industry showed drastic change — a huge increase in value of output and a simultaneous decline in employment. The output of agriculture also increased significantly, and was accompanied by substitution of capital for labor.

The analysis of the period will begin with a general historical treatment of the impact of defense spending on government and manufacturing income and employment.

World War II

World War II was a tremendous stimulant to Colorado's economy, as it was to that of the entire United States.

Personal income from agriculture in Colorado jumped 233 percent from 1940 to 1945 while such income was rising 152 percent for the entire United States. As a result, Colorado came out of the war with a bigger share of the nation's income from agriculture than it had in 1940.

Income from construction activities in Colorado spurted between 1940 and 1942 and then dropped back for the rest of the war. This followed the national pattern, although Colorado's increase was proportionately greater.

Colorado manufacturing activity was greatly augmented as existing steel, rubber, and food processing plants diverted output to meet wartime demands. The defense manufacturing boom was dramatized by the construction in 1941 of the Denver Ordnance Plant. Operated by the Remington Arms Co. and the Henry J. Kaiser Co., this ammunition plant reached a peak employment in 1943 of about 20,000 people. Other plants, both existing and new, concentrated on wartime markets (Figure 6 shows the surge in manufacturing employment during World War II).

Personal income from manufacturing in Colorado jumped 172 percent from 1940 to 1943, almost exactly duplicating the national experience. Colorado ended the war with about the same proportion of U. S. manufacturing activity (.3 percent) it had in 1940.

Military payrolls also became a substantial source of personal income in Colorado in the early 1940's (see Figure 2). With the activation of Camp Carson, the Rocky Mountain Arsenal, the Pueblo Ordnance Depot, and several air bases, personal income from uniformed military payrolls rose from $3 million in 1940 to $152 million in 1945 (see Figure 2). This, too, was an appreciably greater increase than was experienced in the country as a whole.

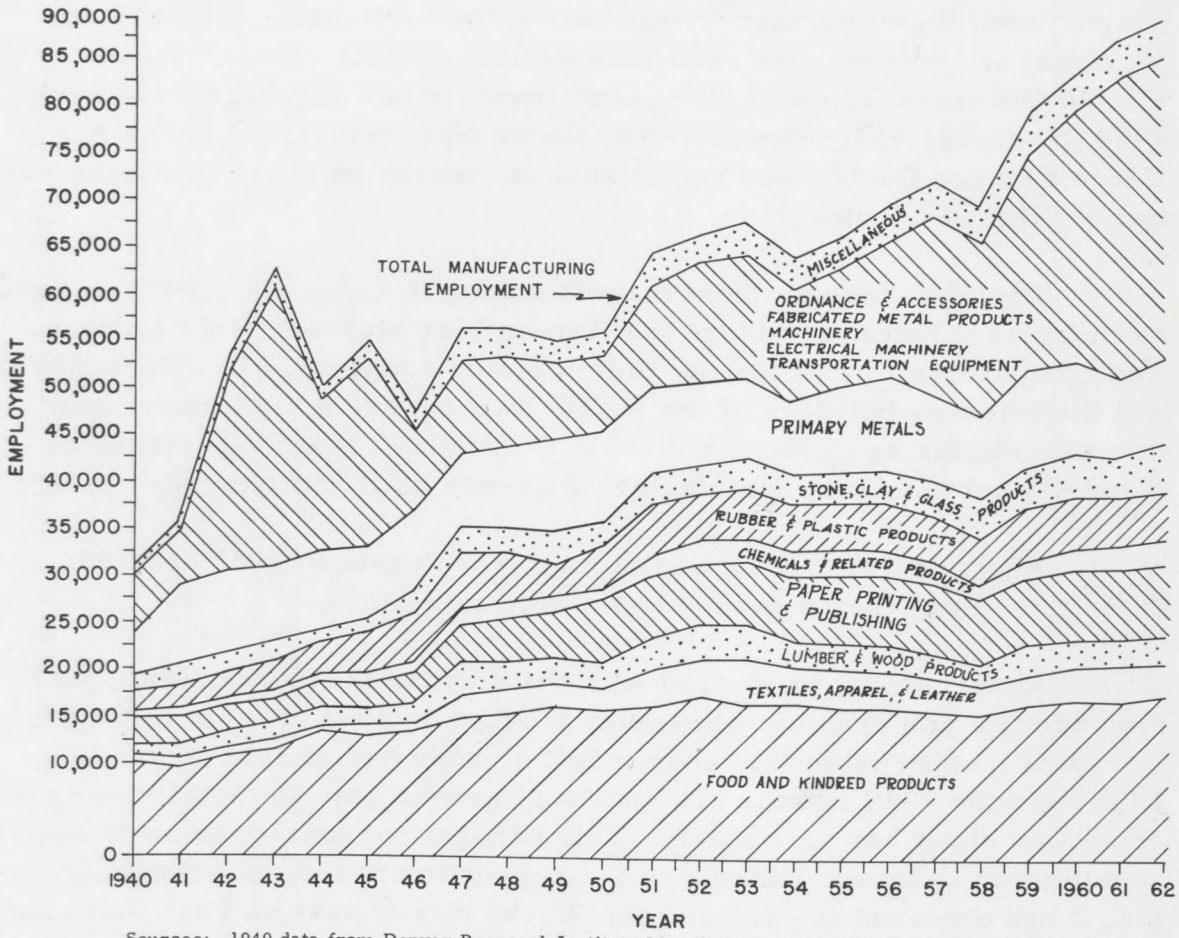
After the War

After 1945 defense activity dwindled rapidly. Military payrolls dropped to $33 million in 1948 as troop strength dwindled and most of the air bases in the state were inactivated. Specialized manufacturing of military equipment had largely ceased by the end of 1945, but postwar demand kept personal income from manufacturing at a stable or even rising rate (in current dollars, at least) after the war. Spurred by foreign aid and relief programs, agricultural income continued high until 1950 and was then given another boost by the Korean War demand.

The Korean War

When North Korean troops invaded South Korea in June of 1950, the United States and the United Nations moved immediately to resist the invasion, and by the end of 1950 the U. S. economy was supporting a limited war. This had a substantial effect on the Colorado economy.

FIGURE 6. EMPLOYMENT IN MANUFACTURING IN COLORADO, 1940 TO 1962



Sources: 1940 data from Denver Research Institute Manufacturing Employment Series, Table 5 of Appendix A; 1941 - 1946 data are from Table 4, Appendix D; 1947 - 1962 data are from U. S. Department of Labor, Bureau of Labor Statistics, "Estimated Non-Agricultural Employment for Colorado," 1947 - 1962, mimeo.

Within a year, military payrolls almost doubled in Colorado, as they did in the entire country. However, these payrolls continued to rise in Colorado and reached World War II levels in 1954 — a greater proportional rise than that for the entire United States. Military employment of civilians also rose substantially in this period. At the Pueblo Ordnance Depot, 1,887 people were on the payroll during early 1950; by early 1953, however, this figure was up to 7,652. The Air Force Finance Center was established in Denver in 1951, with substantial civilian employment.

Personal income from manufacturing in Colorado grew half again as much as it had been before the Korean War started. This increase was comparable to that for the United States economy. The Korean War and the military build-up of the NATO forces were a big influence on this manufacturing growth, but — in Colorado at least — defense demand did not dominate manufacturing growth as it had ten years before.

Agricultural income in Colorado rose again in 1951 and 1952. After this, however, a substantial slump came.

Metal mining prospered with the start of the Korean War, as molybdenum and uranium-vanadium production rose sharply in Colorado. Personal income from this source in Colorado had almost doubled by 1953 over the 1949 figure. The national growth rate in metal mining income was about half this much. This brought personal income from metal mining in Colorado back up to the proportion of total personal income that it had achieved in 1929 and the World War II peak of 1943 — in each of these years metal mining furnished about 1.2 percent of Colorado personal income.

The Cold War Through 1960

Defense expenditures in Colorado slumped slightly in 1953, as the Korean shooting stopped. They rose again in 1954, and have grown steadily since that time. Colorado payrolls derived from these defense expenditures rose 249 percent from 1950 to 1960 (see Table 14). These defense payrolls furnished about 7 percent of Colorado's productive personal income (including military pay) in 1950; they made up an estimated 11 percent in 1960.

Colorado defense payrolls come from four main sources: the military services, including both troop payrolls and those of civilian employees; defense manufacturing (firms whose output is almost entirely

TABLE 14. WAGE AND SALARY PERSONAL INCOME FROM DEFENSE ACTIVITIES IN COLORADO 1950 TO 1962 (MILLIONS OF DOLLARS)

	SOURCE OF INCOME								
Year	Dow (Rocky Flats)	Rocky Flats Construc-tion	AEC & Uranium Contractors	Military (uniformed)	Payrolls (civilian)	Military Construc-tion	Martin Company	Other Defense Mfg. (also site activation)	Total all Columns
1950	$ —	$—	$ 3.6	$* 60.	$*30.	$* 2.	$ —	$* 3.	$ 98.6
1951	.5	—	5.1	* 95.	*65.	*15.	—	* 5.	$185.6
1952	2.5	5.0	6.0	*100.	*75.	*10.	—	* 8.	$206.5
1953	5.0	7.0	10.1	* 95.	*65.	* 5.	—	*12.	$199.1
1954	5.4	—	13.1	*125.	*65.	* 5.	—	* 8.	$221.5
1955	6.2	—	14.1	*128.	*70.	*10.	—	* 6.	$234.3
1956	7.5	3.2	14.8	*138.	*75.	*20.	8.2	* 7.	$273.7
1957	9.1	3.0	16.8	115.8	66.4	*35.	25.5	*10.	$281.6
1958	10.2	—	19.9	117.8	76.3	*15.	41.1	*12.	$292.3
1959	11.9	—	21.1	125.5	76.3	*25.	56.2	*14.	$330.0
1960	12.9	—	20.0	*111.4	80.1	*30.	95.9	*17.	$367.3
1961	15.9	.6	*18.3	*117.	*84.	*20.	*98.0	*27.	$381.8
1962	*19.0	.9	*17.5	*133.	*87.	*20.	*90.0	*27.	$394.4

Note: * estimates

Source: The non-estimated figures were obtained primarily by correspondence with the agencies involved; secondarily from publications of the agencies involved and those of the Office of Business Economics, U.S. Department of Commerce.

devoted to products purchased by the government for military use), defense construction; and atomic energy operations, including uranium mining. Other industries whose employment may be substantially affected by defense needs, such as molybdenum mining, are excluded.

Military service payrolls in Colorado in 1960 were $111.4 million for uniformed troops and $80.1 million for civilian employees (see Table 14). This was about double the comparable 1950 figures. Military payrolls accounted for 4.7 percent of Colorado's personal income, compared with a national average of 2.9 percent.

Personal income from major defense manufacturers' payrolls in Colorado in 1960 is estimated at $120 million. No comparable total figure is available, but this is thought to be a five-fold to eight-fold increase over 1950. Employment in Colorado defense manufacturing in 1960 was about 18 percent of all manufacturing employment, while defense manufacturing employment accounted for 7.3 percent of all manufacturing employment in the United States.* Most of Colorado's defense manufacturing employment is provided by two firms: the AEC Rocky Flats plant operated by Dow Chemical Company; and the part Air Force, part Martin-Marietta plant operated by the Denver Division of the Martin-Marietta Company. [11]

Personal income from military construction in Colorado is estimated at $35 million for 1960, about 17 percent of the construction income in the state for that year. This is estimated to be five to ten times the amount of military construction personal income in 1950, although comparable figures are not available.

Atomic Energy Commission activities in Colorado have grown from practically nothing in 1950 to a substantial raw materials program as well as the Rocky Flats plant already mentioned. Uranium mining and processing payrolls in Colorado in 1960 are estimated at $20 million.

The payrolls noted thus far cover only direct employment. All of the defense institutions listed thus far are also substantial purchasers

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[11] For the purposes of this study, the Pueblo Ordnance Depot is not considered to be in the manufacturing category. It is included in Government Employment — see Appendix A for more detail on this matter.

* The percentage of employment in defense manufacturing is high in Colorado because the manufacturing employment base is relatively small.

of Colorado goods and services, and thus contribute to secondary employment. Purchases in 1960 from Colorado suppliers by some of the above industries include:

The Military - an estimated $50 - $75 million

Dow and Martin - about $50 - $75 million

Indirect Effects of Defense Spending

Since 1950, Colorado has received substantial economic benefits from other forms of defense spending. The Revenue Act of 1950 provided for the rapid depreciation of investment of plant facilities which could contribute to productive capacity useful in a future national emergency. Thus, industrial plants were built and partially paid for from earnings which would otherwise have gone into Federal income tax payments. In Colorado, over $171 million worth of industrial plants were built during the 1950's, subject to this incentive. While this was but a fraction of one percent of the rapid write offs allowed for the nation, it added substantially to Colorado's industrial plant capacity. The industries which were the major beneficiaries of this program were:

Electric light and power	$43.5 million
Molybdenum ore	23.0
Welded and riveted steel pipe	20.7
Business services	12.5
Ordnance	11.1
Uranium-Vanadium ores	8.8
Blast furnaces, steel works, and rolling mills	7.3
Natural gasoline	5.9
Coke ovens	5.2
Ammunition	4.7

In another example of indirect defense spending, the Defense Mineral Exploration Administration spent $2.7 million for minerals exploration in Colorado. These government payments were described as loans, but were repayable from royalties on production of the minerals discovered as a result of the government help.

Manufacturing Continues to be Resource-Oriented

The increase in manufacturing activity (especially from 1950 to 1960) is related to the influence of the Cold War in stimulating the growth of defense-oriented industries. Thus, from 1950 to 1960 Colorado's employment in manufacturing increased from 56,700 to 84,600 —an increase of approximately 28,000. Conservatively speaking, over half of this increase was in the defense oriented categories: ordnance and accessories, fabricated metal products, machinery, electrical machinery, and transportation equipment. The large relative growth of these industries is clearly seen in Figure 6.

Colorado's manufacturing has, in a sense, always been resource-oriented. In the period 1880 to 1900 it was oriented toward mining; from 1900 to 1940 the gains in manufacturing were in the food processing industry section; finally, from 1940 to 1960 the new resource orientation has been toward people.

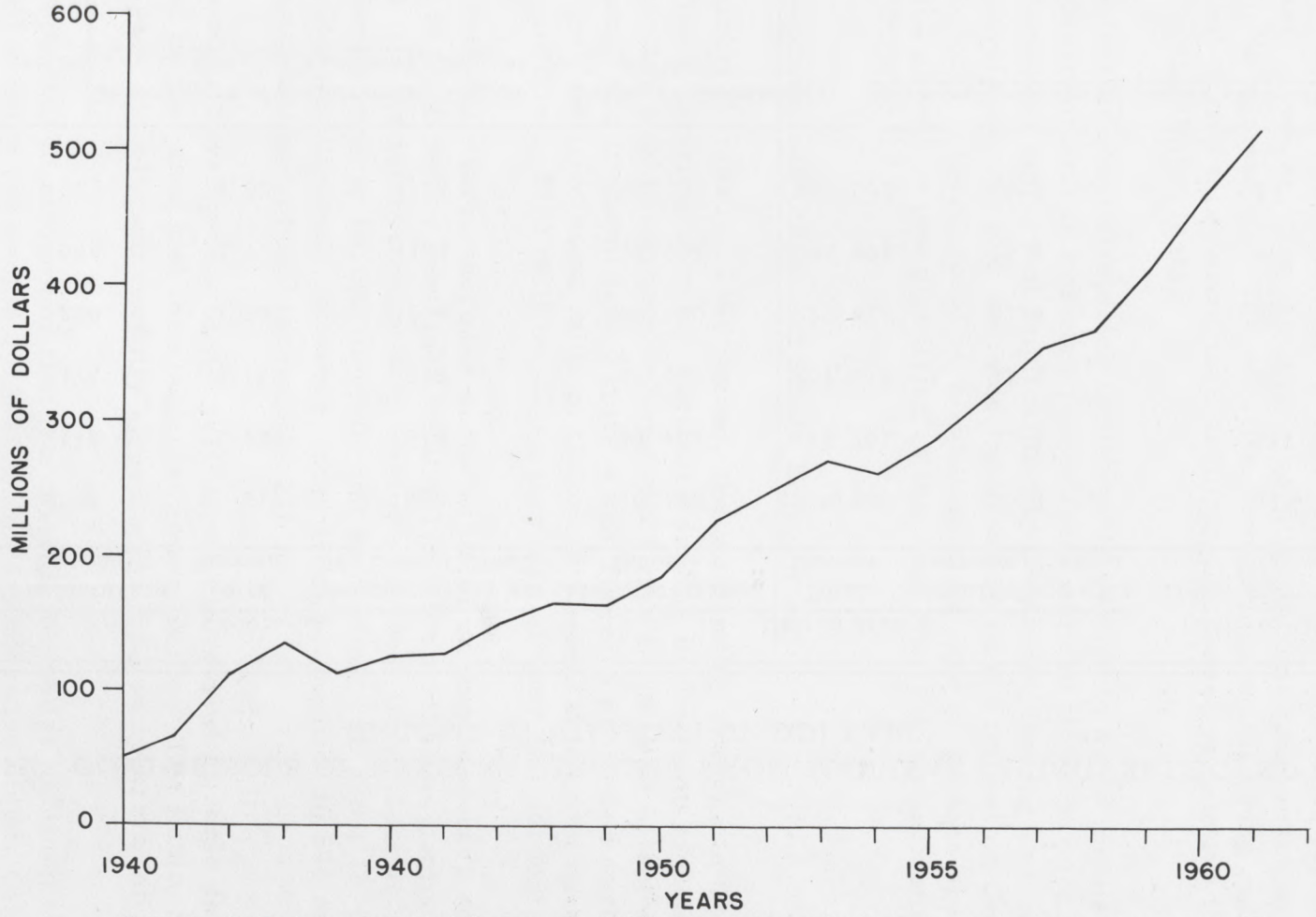
The type of people employed in the new defense-oriented industries are generally of two broad groups, (1) highly trained professional scientists, engineers, and managers, etc., and (2) labor with special types of skills or abilities. Colorado manufacturers report good experiences in attracting these types of people from the national labor pool.

Accompanying the growth in employment in Colorado's manufacturing is a rapid rise in personal income and wage and salary disbursements derived from manufacturing. This upward trend is shown in Figure 7.

Table 15 shows comparisons, between Colorado and the U. S. for selected years, of personal income derived from manufacturing. Between 1940 and 1960 Colorado's manufacturing personal income increased from $54 million to $501 million —an almost ten-fold increase. Also, manufacturing became more important to the Colorado economy — personal income from manufacturing as a percent of total Colorado personal income rose from 8.8 percent (1940) to 12.3 percent (1960). Furthermore, during this period the ratio of Colorado manufacturing income to the U. S. manufacturing income increased from 0.33 percent to 0.53 percent.

Even though manufacturing became much more important to Colorado's economy during the 1940 to 1960 era, the industry still did not contribute its proportional share to Colorado's total income. In fact,

FIGURE 7. WAGE AND SALARY DISBURSEMENTS FROM MANUFACTURING IN COLORADO, 1940 TO 1961



Source: U. S. Department of Commerce, Office of Business Economics, Personal Income by States Since 1929, and Survey of Current Business, August 1960, 1961 and 1962.

TABLE 15. COMPARISONS OF PERSONAL INCOME FROM MANUFACTURING, SELECTED YEARS (INCOME IN MILLIONS OF DOLLARS)

Year	Colorado			United States			Ratio of Colo. Mfg. Income to U. S. Mfg. Income
	Manufacturing Income	Total Income	Manufacturing as Percent of Total	Manufacturing Income	Total Income	Manufacturing as Percent of Total	
1940	$ 54	$ 617	8.8	$16,320	$ 78,522	20.8	.33%
1946	135	1,429	9.4	39,402	175,701	22.4	.34
1948	174	1,760	9.9	49,020	207,414	23.6	.35
1950	200	1,930	10.4	52,870	225,473	23.4	.38
1955	304	2,729	11.1	76,984	303,391	25.4	.40
1960	501	4,079	12.3	94,589	400,002	23.6	.53

Source: U. S. Department of Commerce, Office of Business Economics, Personal Income by States since 1929 and Survey of Current Business, August 1960 and 1961.

the manufacturing deficit became greater (see Table 16). It is strongly emphasized, however, that the larger negative income from manufacturing can be misleading. The negative income in manufacturing reflects the fact that during this period manufacturing increased in relative importance in the United States.

Colorado's manufacturing industry, however, is by no means solely defense-oriented, although recent trends are in that direction. This tendency has important implications in Colorado planning and industrial development. For example, what would be the impact on Colorado's economy if there would be a substantial decline in defense spending? Is the growth in manufacturing in the Cold War just another surge as in World War II?

Mining — Increased Output but Stable Employment

During the 1940 to 1960 period, the outstanding changes in Colorado's mining industry were the continued decline in the value of Colorado silver and gold production and the rapid rise in value of petroleum, molybdenum, and uranium (see Figure 4 and Table 13 presented earlier). Between 1940 and 1960 total value of Colorado's mineral production rose from $63 million to $323 million — an increase of over 400 percent. [12]

Despite the large increase in the value of mining products, employment in the industry remained relatively stable in 1960 as compared with 1940. In the intervening years employment went from about 16,000 in 1940 down to nearly 10,000 in 1950, and then back up to about 15,000 in 1960. Personal income, however, rose from $22 million to $96 million during this same period (see Table 17).

Another development of the period was the revival of some degree of interest in coal as a fuel for electrical power plants. The Public Service Company of Colorado recently signed a $65 million contract for the

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[12] It is important to remember that the value of the dollar declined substantially during the period 1940-60. Unless otherwise noted, dollar figures given throughout the report are current dollars and not constant dollars. Nevertheless, in this case the real value of mineral output had risen markedly by 1960, while employment remained relatively stable.

TABLE 16. INDUSTRY INCOME ANALYSIS — SUMMARY TABLE, 1940 TO 1960 (IN MILLIONS OF DOLLARS)

Industry	1940	1950	1960
Agriculture	+24.0	+ 61.7	+ 67.3
Mining	+12.1	+ 7.5	+ 48.8
Manufacturing	-71.5	-227.0	-416.5
All Services and Other Industries as Defined (Exclusive of Government and Trade)	+21.3	+139.9	+247.1
Government	+16.5	+ 71.2	+155.6
Wholesale & Retail Trade	+13.7	+ 53.7	+ 98.1
Total Net Excess	+16.1	+107.0	+200.4

Note: It is emphasized that the larger negative income contribution in manufacturing does not reflect Colorado's gains in manufacturing. The negative income differences in manufacturing are complex figures which among other things reflect changes in industry mix in both Colorado and the U. S.

Source: Tables 12, 20 and 21.

TABLE 17. MINING IN COLORADO, EMPLOYMENT AND INCOME, SELECTED YEARS

Year	Employment		Income		Value of Products
	Number of Employees	Percent of Total Employment	Income from Mining	Percent of Total Income	
1880	20,500	20.2	—	—	$ 24,652,000
1900	20,519	9.4	$21,518,167	12.5	57,223,000
1920	16,790	4.6	25,263,057	3.7	67,930,000
1940	15,897	4.6	22,000,000	4.6	63,480,000
1960	14,250	2.3	96,000,000	2.4	323,234,000

Sources: Mining employment data are from Appendix A of this report.

Mining income data for 1900 and 1920 were derived from U. S. Bureau of the Census reports.

Income data for 1940 and 1960 are from U. S. Department of Commerce, Office of Business Economics, Personal Income by States since 1929, supplement to Survey of Current Business, 1956; and Survey of Current Business, August 1961.

Value of products are from U. S. Bureau of Mines reports.

production and transportation of coal from near Steamboat Springs to Denver. It is anticipated that there will be further shifts from gas to coal as fuel for power.

During the 1940 to 1960 period, mining continued to make a positive contribution to total Colorado income, even though the industry had decreased in relative importance (income from mining dropped from 4.6 percent of total Colorado income in 1940 to 2.4 percent in 1960). On a relative basis, it is still more important to Colorado's economy than it is to the U. S. economy as a whole. This is the major reason for a continued positive contribution from the mining industry.

Much more could be said about the mining industry during the 1940 to 1960 period. However, the recent developments are discussed in considerable detail in Part II of this report.

Agriculture — Prosperous Years but Declining Employment

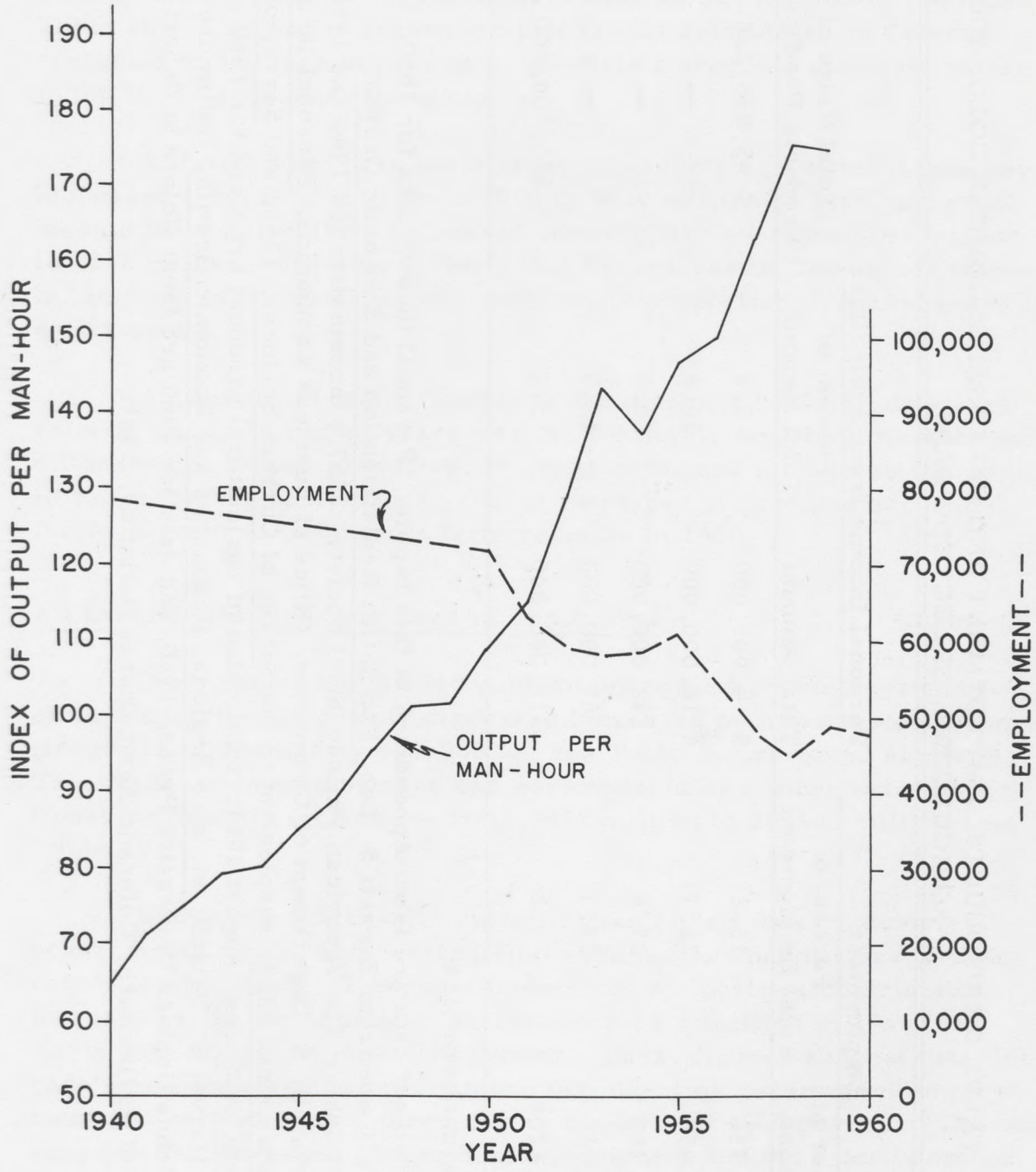
There was a continued improvement in an agricultural technology, particularly in livestock and grains during the 1940 to 1960 period. Accompanying this improvement in technology was the increase in agricultural productivity in terms of output per man-hour. Output per man-hour nearly tripled during the period (see Figure 8). Related to this rise in farm efficiency was a decline in farm employment from about 75,000 in 1940 to less than 50,000 in 1960 — a drop of nearly one-third.

In this same period the percentage of total Colorado personal income derived from agriculture dropped from 20.8 percent in 1940 to 5.2 percent in 1960 (see Table 18). Even though the relative proportion of total personal income from agriculture declined, the total increased from $142 million to $212 million (see Table 18).

A note of caution is in order here. Due to varying climatic and market conditions, Colorado agricultural income can vary considerably from year to year, and therefore, continuous trends are more meaningful than data for a few widely separated years. However, the long term trend during the 1940 - 1960 period was decidedly one of decreasing relative importance for agricultural income in the state.

During the entire 1940 to 1960 period, agriculture continued to be important enough to Colorado's economy to result in a positive contribution to the state's total income. In fact, the surplus in 1960 was even

FIGURE 8. EMPLOYMENT AND OUTPUT PER MAN-HOUR IN AGRICULTURE IN COLORADO, 1940 TO 1960



Sources: U. S. Department of Agriculture, Agricultural Research Service, Index Numbers of Farm Production Per Man-Hour, Mountain Region, 1939-59, July 1960; and Denver Research Institute Agricultural Employment Series described in Appendix A, this report

TABLE 18. VALUE OF PRODUCTS, EMPLOYMENT AND PERSONAL INCOME IN COLORADO AGRICULTURE, SELECTED YEARS

Year	Employment		Personal Income from Agriculture		Total Value of Products Produced
	Number of Persons	Percent of Total Employment	Total Amount	Percent of Total Income	
1880	16,336	16.2	$ 4,000,000	5.5	$ 5,035,228
1900	49,457	22.7	18,000,000	10.5	—
1920	100,153	27.4	142,000,000	20.8	—
1940	73,911	21.3	67,000,000	10.9	—
1960	57,620*	9.2	212,000,000	5.2	636,500,000

* Includes seasonal workers

Source: Employment data are from Appendix A of this report. Personal income data for 1880, 1900 and 1920 are from Everett S. Lee, Population Redistribution and Economic Growth, Philadelphia: The American Philosophical Society, 1957,; income data for 1940 and 1960 are from U. S. Department of Commerce, Office of Business Economics, Personal Income by States since 1929, supplement to the Survey of Current Business, 1956, and Survey of Current Business, August 1961: total value of agricultural products produced for 1880 are from Harvey S. Perloff, et. al., Regions, Resources and Economic Growth, Baltimore: The Johns Hopkins University Press, 1960; and data for 1960 are from Colorado Department of Agriculture, Colorado Agricultural Statistics, 1961.

greater than in 1940 — $67 million in 1960 vs $24 million in 1940 (see Table 16). The major reason for this is that agriculture in Colorado continued to be more important to the state's economy than agriculture is to the U. S. economy as a whole.

Although total cash sales from Colorado's agricultural industry increased from $483 million in 1950 to $639 million in 1960, personal income from agriculture increased only slightly — from $191 million to $212 million. It follows, then, that the returns to Colorado's farmers in the form of personal income were not in proportion to the increase in dollar output.

An important factor leading to the increase in Colorado's agricultural output in recent years was the relatively favorable weather conditions which helped produce good wheat crops and allowed an increase in range feeding of livestock. These two types of products accounted for 71 percent of Colorado's farm receipts in 1960.

All Other Industries Increased in Importance

During the 1940 to 1960 period employment in services and other industries previously discussed increased by more than two times (from 224,000 to nearly 479,000 — see Table 1, presented earlier). This increase in employment was accompanied by a more than proportional increase in income — from $432 million to $2,509 million (see Table 19).

Within the "catch-all" classification of "all other industries," government, trade, and construction were major contributors to Colorado's total income. The government sector's positive contribution increased from $16.5 million in 1940 to $155.6 million in 1960 (see Table 16), an almost nine-fold growth. These figures suggest that Colorado's economy was becoming more dependent on government employment and related expenditures during the 1940 to 1960 period. (The reasons for the increased government employment and the relative importance of Federal, state, and local government are treated in Part II.)

Retail and wholesale trade increased its positive contribution to total income from $13.7 million in 1940 to $98.1 million in 1960. In 1960, Colorado had a higher percentage of its total labor force in the trade category than did the United States — 20.4 percent as compared to 18.2 percent. The higher proportion of employment in trade in Colorado is probably due to two important factors: (1) Colorado's traditional

TABLE 19. SERVICES AND OTHER RELATED INDUSTRIES IN COLORADO - EMPLOYMENT AND INCOME, SELECTED YEARS

Year	Employment		Income	
	Number of Employees	Percent of Total Employment	Income from Services	Percent of Total Income
1880	60,022	59.3	—	—
1900	128,280	58.8	$ 120,645,000	70.1
1920	213,841	58.3	356,249,000	52.1
1940	224,040	64.7	342,000,000	55.2
1960	464,972	74.3	2,509,000,000	61.5

Note: Other related industries include: construction, transportation, communications, utilities, finance, insurance, real estate, retail and wholesale trade, services and government.

Sources: Employment data are from Appendix A of this report. Income data for 1900 and 1920 are from Everett S. Lee, et. al., Population Redistribution and Economic Growth, Philadelphia: The American Philosophical Society, 1957. This book gives total income estimates for the state of Colorado. To derive the figures shown above, it was necessary to subtract income estimates for agriculture, mining, and manufacturing from the total. Income data for 1940 and 1960 are from U. S. Department of Commerce, Office of Business Economics, Survey of Current Business, various issues.

position as a wholesale and retailing center for the surrounding states, and (2) the impact of tourism. (A more detailed analysis of these two factors is also presented in Part II.)

In 1940 the contract construction industry in Colorado produced a negative contribution to the state's total income (see Table 12). By 1950, the industry was contributing $13. 1 million; by 1960, the positive contribution from construction was $53. 3 million (see Tables 20 and 21). There are several factors behind this rise. Value of building permits increased from $156 million in 1950 to $324 million in 1960. Increased defense spending on construction projects also was a factor as were continued non-defense Federal, state, and local government construction projects. The majority of the increase in construction activity undoubtedly resulted from the increase in employment and population which occurred in Colorado during the 1940 to 1960 period.

Per Capita Income Increased Substantially

Per capita personal income in Colorado increased from $551 in 1940 to $2,421 in 1960 — a 440 percent increase (see Table 8, presented earlier). During the same 20 year period, per capita income in the U. S. as a whole increased 380 percent.

After making adjustments for differences in the labor participation rate, Colorado per capita income exceeded that of the U. S. by $98 in 1960, whereas in 1940, adjusted Colorado per capita income exceeded the U. S. by only $15. The question arises then: Why has adjusted Colorado per capita income been above the U. S. in these years?

The answer may be found in Table 21, which shows personal income by sources. We note that in 1960 the excess Colorado income was about $200 million. This surplus was due to the fact that there were increases in excess income from certain industries already discussed (agriculture, mining, government, trade, and construction).

TABLE 20. COMPARISONS OF PERSONAL INCOMES BY SOURCES IN 1950, COLORADO VERSUS UNITED STATES

Industry Group	Employment: COLORADO Amount	COLORADO Percent	U. S. Amount	U. S. Percent	Personal Income (In $ Millions): Colorado	U. S.	U. S. Personal Income Adjusted to Colorado Personal Income[1] (In $ Millions)	Colorado Personal Income Less U. S. Personal Income After Adjustment (In $ Millions): Surplus	Deficits
Mining	10,275	2.2	968,702	1.6	$ 33	$ 3,158	$ 25.5	$ 7.5	
a. Bituminous coal & other coal mining					13	1,524	12.3		
b. Crude petroleum & natural gas					5	969	7.8		
c. Mining & quarrying, except fuel					15	665	5.4		
Agriculture	72,419	15.2	7,141,327	12.1	191	16,009	129.3	61.7	
a. Wages & salaries					46	2,724	22.0		
b. Proprietors					145	13,285	107.3		
Manufacturing[2]	58,896	12.4	15,187,852	25.7	200	52,870	427.0		$227.0
Services and Other Defined Industries	334,948	70.3	35,701,062	60.5	1,105	113,018	912.9		
a. Services	82,967	17.4	8,900,136	15.1	114	13,656	110.3	3.7	
b. Wholesale & retail trade[2]	99,783	20.9	10,933,670	18.5	360	37,926	306.3	53.7	
c. Finance, insurance & real estate	16,942	3.6	1,948,979	3.3	41	5,806	46.9		5.9
d. Transportation	29,698	6.2	3,063,560	5.2	97	9,811	79.2	17.8	
e. Communications & public utilities	15,847	3.3	1,454,242	2.5	43	4,214	34.0	9.0	
f. Contract constrc.	38,080	8.0	3,743,183	6.3	77	7,913	63.9	13.1	
g. Other industries	7,148	1.5	1,539,400	2.6	1	318	2.6		1.6
h. Other labor income	—	—	—	—	24	3,823	30.9		6.9
i. Government	44,483	9.3	4,117,892	7.0	239	20,777	167.8	71.2	
j. Proprietor income[3]	—	—	—	—	109	8,774	70.9	38.1	
Property Income	—	—	—	—	256	28,308	228.6	27.4	
Transfer Payments[4]	—	—	—	—	143	12,111	97.8	45.2	
Totals	476,538	100.1	58,998,943	99.9	$1,928	$225,474	$1,821.2	$348.4	$241.4

Total net surplus income (Colorado - U. S.) = $348.4 - $241.4 = $107.0 million.

Notes: [1] The ratio of Colorado employment to U. S. employment times U. S. personal income.
[2] Including proprietors.
[3] This category includes: proprietors nonfarm income exclusive of manufacturers, farmers, and wholesalers, and retailers.
[4] Net of social security contributions.

Sources: Employment data for Colorado and the United States are from U. S. Bureau of the Census publications. The Colorado data are not the same as those presented in Appendix A of this report. It was necessary to use unadjusted Census data for Colorado in order to make these data comparable with U. S. employment figures.
Income data are from the U. S. Department of Commerce, Office of Business Economics, Survey of Current Business, various years.

TABLE 21. COMPARISONS OF PERSONAL INCOMES BY SOURCES IN 1960, COLORADO VERSUS UNITED STATES

Industry Group	Employment				Personal Income (In $ Millions)		U. S. Personal Income Adjusted to Colorado Personal Income[1] (In $ Millions)	Colorado Personal Income Less U. S. Personal Income After Adjustment (In $ Millions)	
	COLORADO		U. S.						
	Amount	Percent	Amount	Percent	Colorado	U. S.		Surplus	Deficits
Mining	14,250	2.3	654,006	1.0	$ 86	$ 3,832	$ 37.2	$ 48.8	
a. Bituminous coal & other coal mining					10	955	9.3		
b. Crude petroleum & natural gas					38	1,712	16.6		
c. Mining & quarrying, except fuels					38	1,165	11.3		
Agriculture	48,660	7.8	4,349,884	6.7	212	14,927	144.7	67.3	
a. Wages & salaries					47	2,956	28.7		
b. Proprietors					165	11,971	116.1		
Manufacturing[2]	98,887	15.8	17,513,089	27.1	501	94,589	917.2		$416.2
Services and Other Defined Industries	464,972	74.2	42,122,271	65.2	2,509	214,824	2,083.0		
a. Services	117,718	18.8	11,012,559	17.0	297	28,176	273.2	23.8	
b. Wholesale & retail trade[2]	127,900	20.4	11,792,635	18.2	703	62,385	604.9	98.1	
c. Finance, insurance & real estate	29,562	4.7	2,694,630	4.2	117	12,551	121.7		4.7
d. Transportation	29,726	4.7	2,739,913	4.2	156	14,577	141.3	14.6	
e. Communications & public utilities	20,222	3.2	1,718,234	2.7	93	8,152	79.0	14.0	
f. Contract constrc.	44,179	7.0	3,815,937	5.9	205	15,619	151.4	53.6	
g. Other industries	21,182	3.4	2,608,085	4.0	1	627	6.1		5.1
h. Other labor income	—	—	—	—	82	10,891	105.6		23.6
i. Government	74,483	11.8	5,740,278	8.9	603	46,144	447.4	155.6	
j. Proprietor income[3]	—	—	—	—	252	15,702	152.3	99.7	
Property Income	—	—	—	—	577	52,015	504.4	72.6	
Transfer Payments[4]	—	—	—	—	194	19,811	192.1	1.9	
Totals	626,769	100.0	64,639,250	100.0	$4,079	$399,998	$3,878.5	$650.0	$449.6

Total net surplus income (Colorado - U. S.) = $650.0 - $449.6 = $200.4 million.

Notes: [1] The ratio of Colorado employment to U. S. employment times U. S. personal income.
[2] Including proprietors.
[3] This category includes: proprietors nonfarm income exclusive of manufacturers, farmers, and wholesalers, and retailers.
[4] Net of social security contributions.

Sources: Employment data for Colorado and the United States are from U. S. Bureau of the Census publications. The Colorado data are not the same as those presented in Appendix A of this report. It was necessary to use unadjusted Census data for Colorado in order to make these data comparable with U. S. employment figures.
Income data are from U. S. Department of Commerce, Office of Business Economics, Survey of Current Business, August, 1961.

CONCLUSION TO THE ECONOMIC HISTORY

This section highlights some of the findings discussed in Part I. Emphasis is placed on those findings of particular importance to the forecasts of future employment, population and income, which are the subject of Part II.

* During the era of mining, political and governmental action was important in creating demand for certain of the precious metals. Today, as a result of the Cold War, government is creating demand for certain important Colorado industries. These industries include ordnance and accessories, manufacturing of transportation equipment and electrical machinery, and uranium processing, as well as others.

* In its early days, the products mined in Colorado tended to have a high value in relation to their weight. This was necessary because transportation costs became prohibitive when the value of product was low. Today, a high value per pound is still a common product criteria for many of Colorado's manufacturers, as well as the mining and agricultural industries.

* It was mentioned in both the era of mining and the era of agriculture that these two industries were instrumental in stimulating other economic activity in Colorado. Mining had important stimulating effects on manufacturing, transportation, agriculture, and, of course, the growth of population. Agriculture also had a stimulating effect on manufacturing, the service industries, and population growth. In the era of defense (which Colorado is still in), expenditures related to defense have had important stimulating effects on manufacturing, construction, trade, services, and population and income growth.

* In each of the three eras — mining, agriculture and defense — Colorado's economy has tended to be resource-oriented. The mining industry could not have been successful without the availability of mineral resources. Along the same lines, Colorado's

agricultural industry could never have prospered without adequate land, and favorable climatic conditions. The defense era is oriented toward Colorado's most important resource of all — its people — and its ability to attract people.

* As shown in Figure 8, Colorado's manufacturing industry has experienced three surges during the 1940 to 1960 period. These occurred during World War II, the Korean War and, currently, during the Cold War. The first two surges represent examples of an economy experiencing a stimulating effect and then, after removal of the stimulus, settling back somewhat into its prior position. The stimulating effects of mining and agriculture had some degree of permanence. The high level of activity in these industries helped Colorado develop other portions of its economy — manufacturing, transportation, services, etc. This discussion raises an important question: Will the stimulus of the Cold War have the same beneficial effect on Colorado's economy as did those of the mining and agricultural eras? Or, will there be a tendency to "settle back" if and when the Cold War eases?

* One historical force very much in evidence is the changing pattern of employment in Colorado. The percentage share of total employment in manufacturing and the service type industries has increased while the resource based industries — mining and agriculture — have decreased in relative importance. The future of these resource-based industries is dependent, to a large extent, on advances in technology and, perhaps more important, on government policies concerning subsidies and restriction of competition.

* There has been an important historical change in the nature, type, and complexity of decisions made by people and firms locating in Colorado. For example, in the Eras of Agriculture and Mining, the decisions to locate in Colorado were made largely by individual farmers, miners or businessmen. Today, such location decisions are not entirely an individual matter, but frequently are made by firms. In some cases, the decisions of firms to locate are outside the sphere of influence of the community. For example, they may depend on prior plant locations of the firms, or on government policies. In other industries, such as the aerospace industry, a community often can exert some degree of influence on location decisions by enhancing its scientific and cultural environments, upon which to a large extent rests the ability of a firm to attract scarce scientific skills. Strengthening these environments, however, depends on a number of complex and interrelated decisions by professional, business, and government groups. But even the existence of such environments may not be sufficient in the increasing interregional competition for new industry.

PART II. COLORADO INDUSTRY ANALYSIS WITH PROJECTIONS TO 1970

INTRODUCTION

Employment, population, and income projections for Colorado in 1970 are developed in this portion of the report. A study of economic growth in the detail required here calls for reliance mainly on employment data. Examination of the causes of changes in employment, industry-by-industry, provides the most helpful clues as to the causes of economic changes. Furthermore, employment data are available on more comprehensive and consistent bases than output data, which have been assembled only for selected industries. By building up industry-by-industry forecasts of employment, we can derive total employment estimates which, in turn, provide the bases for population and income projections.

In the industry-by-industry analysis which follows, the major emphasis is on the five major basic Colorado industries — agriculture, mining, manufacturing, government, and tourism. The historical development of mining and agriculture was treated in considerable detail in Part I. In the "Era of Defense — 1940 to 1960," the manufacturing industry and federal government expenditures were described in considerable detail. While incomplete data are available on tourism, efforts are made in this analysis to relate tourism to the trade and services sectors.

General Assumptions Made in the Industry Analyses

As mentioned in the Introduction to this study, the forecasts may tend to be conservative. This is due to an inability to forecast occurrences of major discontinuities. A "major discontinuity" is a break in continuity — or a major change either up or down affecting an existing trend. A recent example of a major discontinuity was the location of the Martin Company Titan Missile facility in the Denver area in 1956. It is quite possible there will be additional developments of this magnitude in the period to 1970, however, we did not consider it advisable to include such possibilities in this forecast since they are almost entirely unpredictable and therefore outside the realm of a formal forecast.

Our forecast of employment assumes that there will be minor recessions but no major depression between now and 1970. It assumes that there will be no major war; rather that continued tensions between the U. S. and the Soviet Bloc will call for defense and space expenditures at slightly increasing levels.

Our basic forecast assumes 1970 Gross National Product of $787.7 billion in 1960 prices. This was taken from the "Judgment Model" constructed by the National Planning Association.[1]

In our opinion, fairly significant changes in the 1970 GNP (up or down as much as $50 billion) would not have a serious effect on the forecasts developed here for Colorado. The Colorado economy differs in its composition from the U. S. economy in many important respects. For example, Colorado's relatively larger dependence on Federal expenditures (which directly affect the construction, manufacturing, and government sectors) tends to stabilize the situation within the state, and to make it less vulnerable than the U. S. economy to the normal ups and downs of the business cycle. Agriculture, as a second example, will probably remain relatively important as an industry in Colorado, and it is not likely that any changes in the estimated 1970 GNP of a magnitude just described would have a significant impact on employment in this sector. Climate, governmental policies and technological changes are all more important to agriculture than minor fluctuations in the U. S. economy.

Methodology Used in Analyses and Forecasts

Where data were available, efforts were made to first predict the output in dollar terms of an individual industry, and then to predict the output per man-hour in this same industry. By dividing forecasts of output by forecasts of output per man-hour, it is possible to estimate employment in the future.

In most cases, however, it was necessary to make direct employment estimates based on analysis and knowledge of industry trends in output and output per worker. Direct employment estimates were made in mining, manufacturing, transportation, communications and utilities, and government.

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[1] Gerhard Colm and Theodore Geiger, The Economy of the American People, Washington: National Planning Association, 1961, p. 197.

In those industries (finance, insurance and real estate, services, wholesale and retail trade, and construction) which are largely dependent on the basic industries, a slightly different approach was used. The basic elements of each of these industries (10 percent of total in most cases) were identified, and employment in this portion of each industry was estimated using the direct method just described. A ratio approach was used for the remainder of each industry. This approach compares the ratio of past employment of each industry to total Colorado employment, and then projections of this ratio to 1970 were made. U. S. trends were also considered in estimating the proportion of employment in each industry.

Throughout the forecasting process, efforts were made to obtain the opinions and viewpoints of qualified consultants and observers in specific industries. Such individuals were particularly helpful in agriculture, mining, selected manufacturing industries, construction, transportation, communication, public utilities, and tourism.

In most of the industries analyzed and projected into the future, a range of employment estimates is presented. The conservative and optimistic forecasts do not necessarily represent the extreme situation. There is always the chance that employment could either fall well below the mark or overshoot the optimistic estimate. However, if this happens it is expected that it will be due, in most cases, to major discontinuities which are impossible to forecast.

Limitations of the Colorado Employment Forecasts

There are several factors which complicate the accomplishment of this study. One of the most difficult to deal with is the impact of tourism on the Colorado economy. There are few data available which indicate how many jobs tourism creates in Colorado. If it is impossible to accurately analyze the present situation, forecasts into the future are even more tenuous.

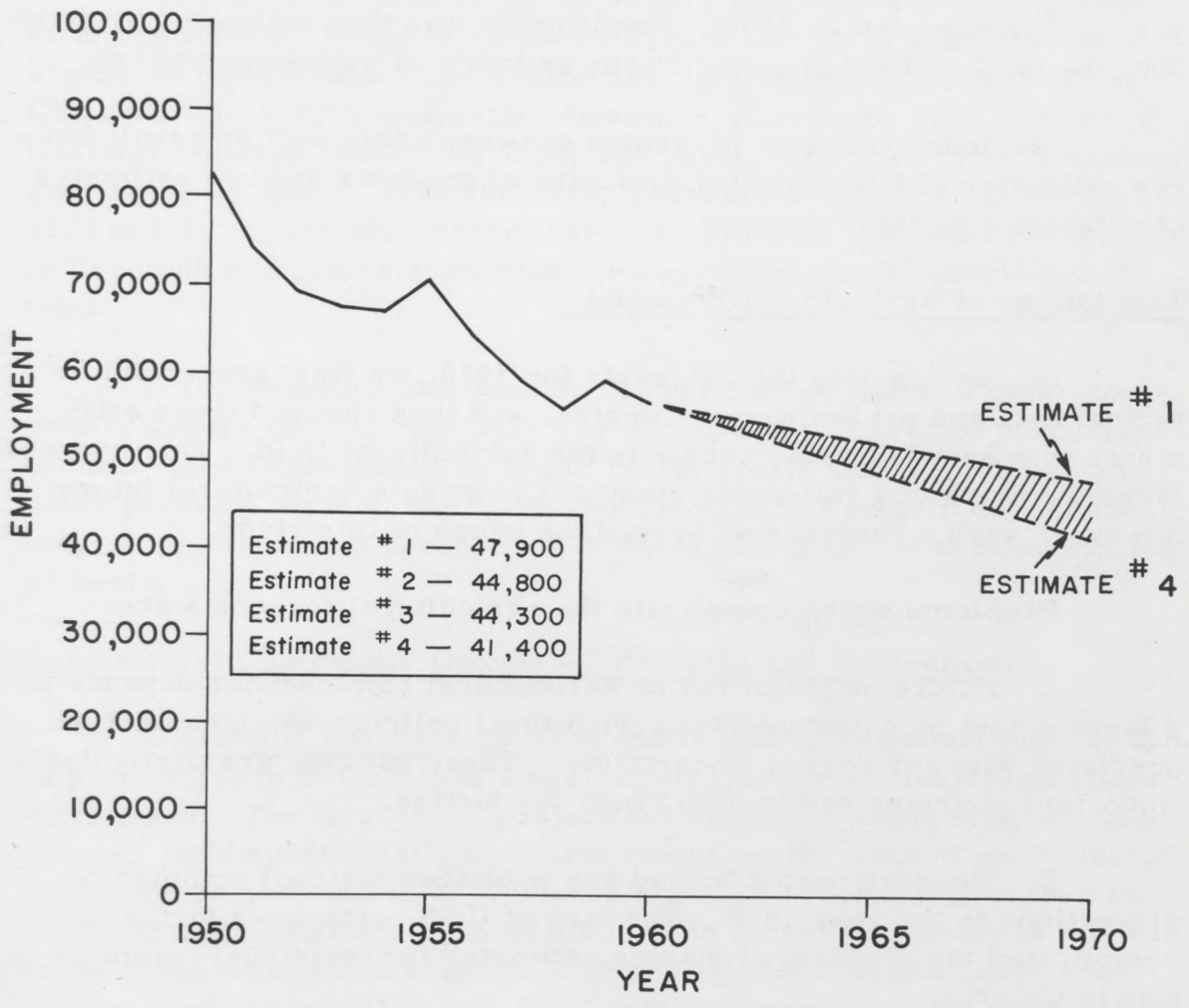
In the analyses of many industries (such as agriculture, construction and services) one handicap was the lack of reliable data, and by the fact that available data were not broken down in a useful fashion for forecasting purposes. For example, construction employment is not divided to distinguish among residential, commercial, and heavy construction. In all of these situations, it was necessary to construct crude estimates of past employment broken down as needed for the forecast. Consequently, it should be recognized by users of this report

that chances for error are present.

Another limiting factor should be noted. Many important decisions affecting the state are made by persons outside the area. This does not mean that Colorado is at the mercy of outsiders. On the contrary, the basic economic and locational criteria of certain types of manufacturing industries are satisfied by Colorado. In addition, local attitudes and actions have considerable influence upon whether outsiders will decide to locate their facilities in Colorado or elsewhere. But the fact remains that it is much more difficult to forecast economic growth which results from outside decisions to locate facilities in Colorado than it is to forecast the future growth of facilities which already exist within the state or which will be established with local capital.

Employment in agriculture in 1970 is expected to range from 41,400 to 47,900 workers. Figure 9 shows employment in the years 1950 to 1961 with a range of estimates in 1970.

FIGURE 9. AGRICULTURAL EMPLOYMENT, 1950 TO 1960 WITH ESTIMATES TO 1970



Procedure Followed in Making Employment Projections

Procedures used for projecting Colorado's 1970 agricultural employment were relatively straightforward. First, the outputs of major commodity groups, such as livestock, wheat and other grains, and sugar beets were projected to 1970 in dollar terms (using 1960 prices).

The projections of output were based on a combination of the opinions of experts in the field of agriculture and by the use of a ratio method. The ratio method utilizes forecasts of U. S. production (when available) in a specific commodity and then compares the output in that same commodity in Colorado. By analyzing past trends, the ratio of Colorado output in the commodity to U. S. production is projected to 1970.

The second step was to estimate the agricultural dollar output per worker expected by 1970. Employment was then estimated by dividing the total estimated output by the estimate of output per worker.

The four estimates presented earlier in this section result from two estimates of total value of agricultural products and two estimates of output per worker.

Limitations of Agricultural Forecasts

In constructing the forecasts for 1970, we first prepared historical data and preliminary estimates, and then checked these estimates with knowledgeable people in the agricultural field. This approach lacks the depth of a full-scale study of Colorado's agricultural future; however, such a project was beyond the scope of this study.

Problems which complicate the agricultural forecasts are:

1. Future output of major agricultural commodities depends to a large extent on governmental agricultural policies which can not be predicted with any degree of certainty. These policies are particularly important in grains and in sugar beet production.

2. We were unable to find any published national commodity projections to the year 1970. The lack of U. S. estimates further complicated the problem of making estimates for individual commodities in Colorado.

3. A major area of uncertainty in Colorado's agriculture is weather. The difference between favorable and unfavorable weather in Colorado could affect the forecast of both wheat and livestock production by as much as 30 percent.

4. To forecast a region's agricultural output by specific product, it is necessary to know the individual markets for these products.

These markets depend on interregional competition which, in turn, is related to a number of factors such as relative regional advantages of freight rates, quality of regional products, and shifts in regional population. To a large extent, detailed examination of these factors was beyond the scope of this study.

Background Data on Colorado's Agricultural Economy

Cash farm income from the sale of Colorado's major agricultural commodity groups is shown on Figure 10. It is evident from Figure 10 that livestock and grains are the dominant commodities in Colorado. In 1945 for example, livestock sales were 40.3 percent of total agricultural sales. By 1960, the percentage rose to 53.2 percent. For the same years, 1945 and 1960, percentage sales of grains were 15.4 and 17.9 percent, respectively. In 1960 the combined percentages of livestock and grains accounted for approximately 71 percent of the total.

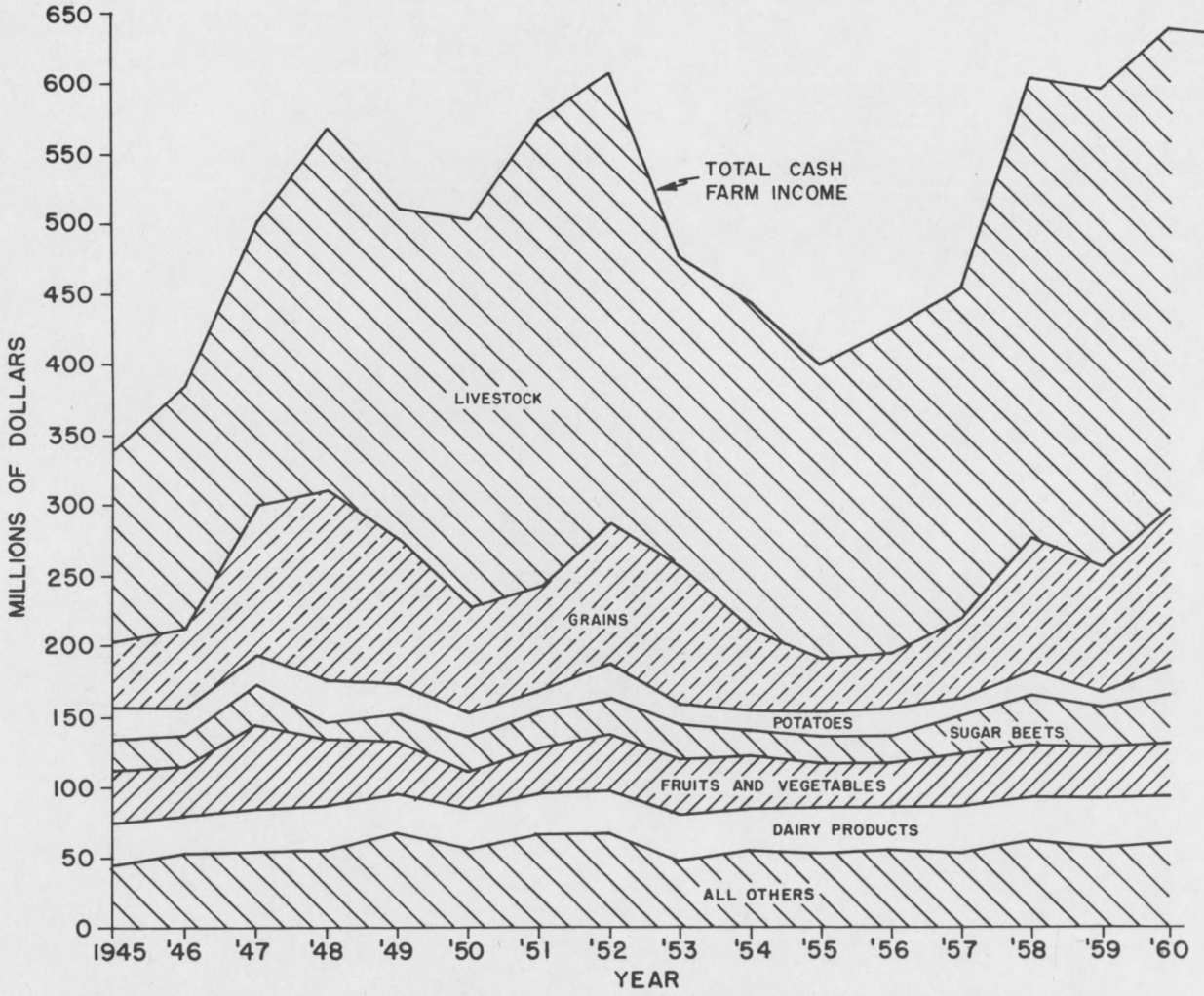
After livestock and grains, the percentage sales of other commodity groups decline rapidly. For example, in 1960, the percentage of total sales represented by sugar beets, fruits and vegetables, and dairy products were of the same general order of magnitude — that is, they ranged from 5.3 percent for dairy products to 5.8 percent for sugar beets.

Agricultural Commodity Groups — Analysis and Projections

Cattle and Calves. Because cattle and calves constitute the most important group in Colorado's agricultural economy, four projections were made. The first three projections, although using different techniques, yield substantially the same result — the amount and value of cattle and calves sold in 1970 will be about 25 percent higher than in 1960, or approximately $368 million. The fourth projection is slightly more conservative and projects a 15 percent increase in cattle and calf marketings by 1970, or a total value of approximately $339 million.

Projection No. 1 is based on the U. S. Department of Agriculture's projections on cattle and calves on farms in the U. S. These projections indicate that cattle and calves on farms in the U. S. are expected to increase from 64 million head in 1959 to 76 million head by 1965. This is a straight line arithmetic projection. Therefore, extending this projection into 1970 indicates that approximately 84 million head will be on U. S. farms. The ratio of Colorado to U. S. cattle and

FIGURE 10. CASH FARM INCOME FROM CROP AND LIVESTOCK SALES, 1945 TO 1960



Source: Colorado Department of Agriculture, Colorado Agricultural Statistics, 1955 and 1961. (See Appendix B for complete data.)

calves on farms averages about 3 percent (see Appendix B). Using this ratio and the U. S. projected amounts for 1970, Colorado's projected cattle and calves on farms is therefore 2, 520, 000 head (. 03 × 84 million).

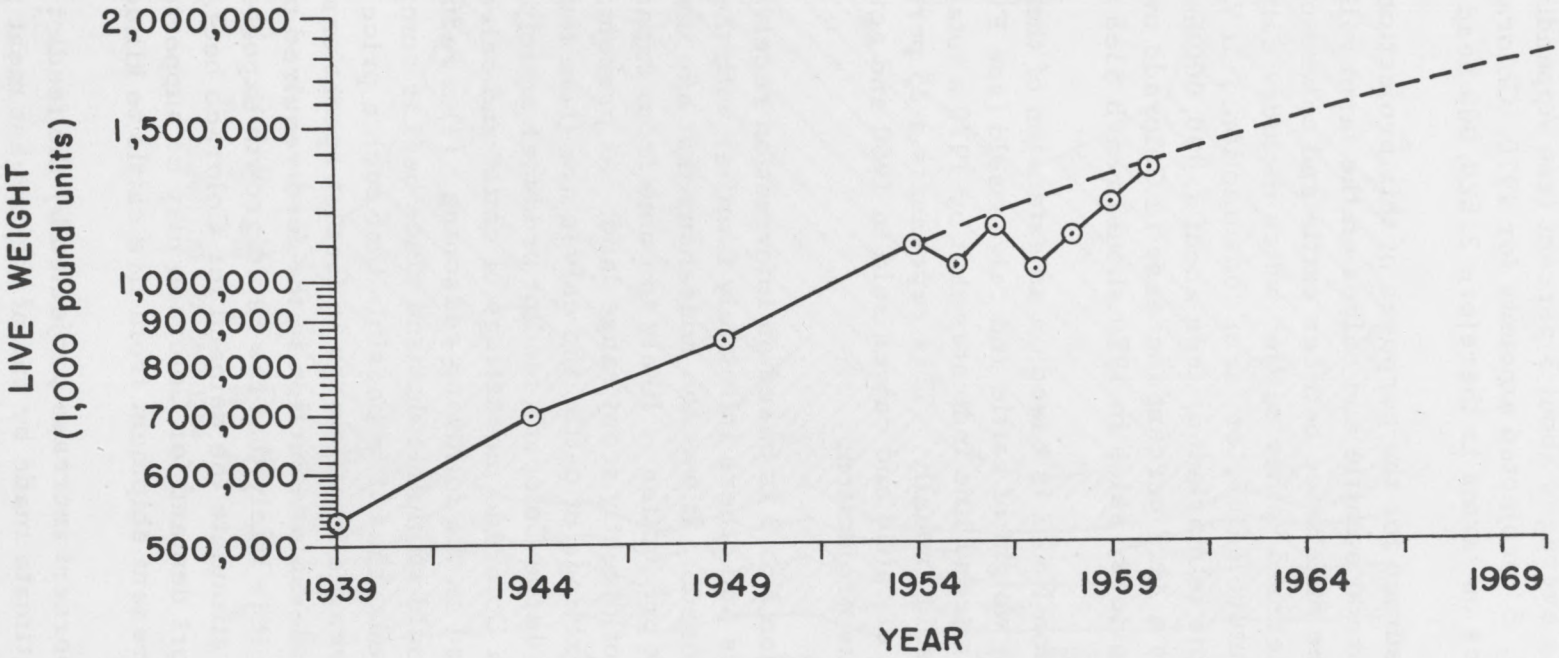
It is assumed for the purposes of this projection that about 75 percent of Colorado's cattle and calves on the farm will be marketed each year. (The difference between cattle and calves on farms and marketings is termed "other cattle" which includes cattle held as stock for breeding, future sales, or farm consumption.) If 75 percent of the beef on the farms is marketed, then about 1, 890, 000 head will be sold. This represents a 24. 7 percent increase in Colorado over 1960 figures. Based on 1960 prices, sales in 1970 should reach $368 million.

Projection No. 2 is based on an extension of the past trend for Colorado of live weight of cattle and calves sold (see Figure 11). The extension of this trend line indicates that by 1970 a total of 1, 666 million pounds will be sold annually. This represents a 25 percent increase over the total weight of cattle and calves sold in 1960 and agrees very closely with the previous projection.

Projection No. 3 is based on information received from agricultural consultants and others intimately familiar with the cattle and calf situation in Colorado. It was the consensus that any increase in Colorado's livestock production is likely to come from expanded feedlot activities and not directly from range land. At present, 50 percent of Colorado's marketings of cattle and calves are from feedlots (see Appendix B). One large Colorado feedlot producer anticipates a 25 percent increase in Colorado marketings of cattle and calves by 1970. His estimate is based on the following reasoning: (1) a reduction in price in beef cattle would stimulate demand since beef is competitive with certain other foods; thus it is possible that such a price reduction would force increases in efficiency in feedlot operations which could result in a considerable reduction in the feed required per unit weight of livestock; (2) it is likely that the rapid growth expected in the Pacific Coast area will stimulate the demand for Colorado beef. This expected increase in export demand for Colorado may be supported by a change in the form of present shipment from live cattle to killed beef.

The 25 percent increase projected by the feedlot operator coincides with an estimate made by one of the largest meat packing companies in the Denver area, and also checks very closely with Projections 1 and 2.

FIGURE 11. MARKETINGS OF COLORADO CATTLE AND CALVES, 1939 TO 1970



Source: See Appendix B, this report.

Projection No. 4 is also based on the opinion of knowledgeable persons in the cattle and calf industry. These individuals are less optimistic, but do expect a 15 percent increase in cattle and calf marketings by 1970. Their hesitation is based largely on a possible increase in the price of feed grain which would have a negative influence on livestock production. There was also concern over what was considered to be overstocking of cattle on Colorado's ranges due to unusually favorable weather conditions. They believe that a substantial reverse in the weather would reduce the above normal supply and therefore limit range and feedlot production.

Three of the four projections coincide with an estimate of $368 million in cattle and calf marketing in 1970. The low projection estimates $339 million (a 15 percent increase over 1960 levels).

Sheep and Lambs. No U. S. forecast was found for sheep and lambs; hence, the judgment of informed individuals was relied on in making a forecast of this industry group. These individuals were unanimous in forecasting a five percent decline in Colorado's production of sheep and lambs for the period 1960-1970.

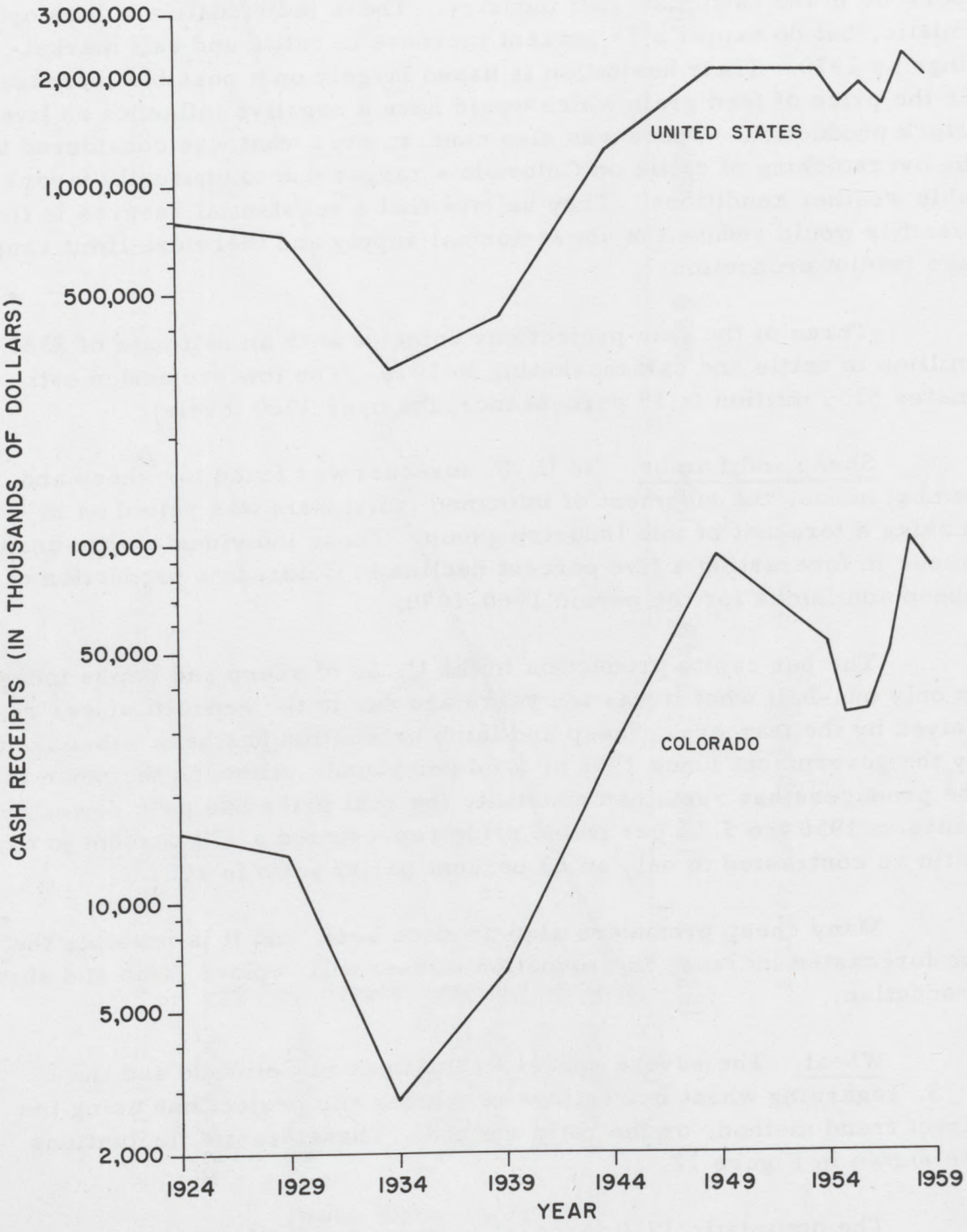
The per capita production in the U. S. of sheep and lambs today is only one-half what it was ten years ago due to the reduced prices received by the farmers. Sheep and lamb production has been subsidized by the government since 1956 at $. 62 per pound. Although the price to the producers has remained constant, the real price has gone down, because in 1956 the $. 62 per pound price represented a 110 percent parity ratio as contrasted to only an 83 percent parity ratio in 1962.

Many sheep producers also produce beef, and it is possible that the forecasted increase in production of beef will replace lamb and sheep production.

Wheat. The severe annual fluctuations in Colorado and the U. S. regarding wheat marketings precluded any projections using the direct trend method, or the ratio method. These drastic fluctuations are shown in Figure 12.

The optimistic 1970 forecast of wheat production represents a 20 percent decline over the average of 1958-1960 annual receipts. A 20 percent decline was projected because it appears likely that there may be additional government restrictions on wheat, and there is a possibility of an adverse change in weather conditions. A 20 percent decline to 5. 4 million bushels corresponds to $79. 4 million in wheat marketings.

FIGURE 12. COLORADO AND UNITED STATES FARM MARKETINGS OF WHEAT, 1924 TO 1959



Source: See Appendix B, this report.

According to a wheat producers association, the 10-year average of Colorado's annual wheat production represents a reasonable forecast for 1970. The average for 1950-1960 is 40,775,000 bushels which corresponds to 63.2 percent of Colorado's 1960 production. Translating this into 1960 prices, cash receipts from wheat sales may be expected to decline from $104 million to $65.8 million in 1970.

Milk Products. Before presenting the actual forecast of milk production it may be helpful to discuss some of the uncertainties which affect the forecast of this group of products.

1. Future price agreements could have a definite effect on future production and consumption of milk.

2. There is considerable uncertainty with regard to future per capita consumption of milk products in Colorado and the U. S.

3. The competition for the use of feed between dairy cattle and beef cattle is a factor which is important to the future supply and price of milk products.

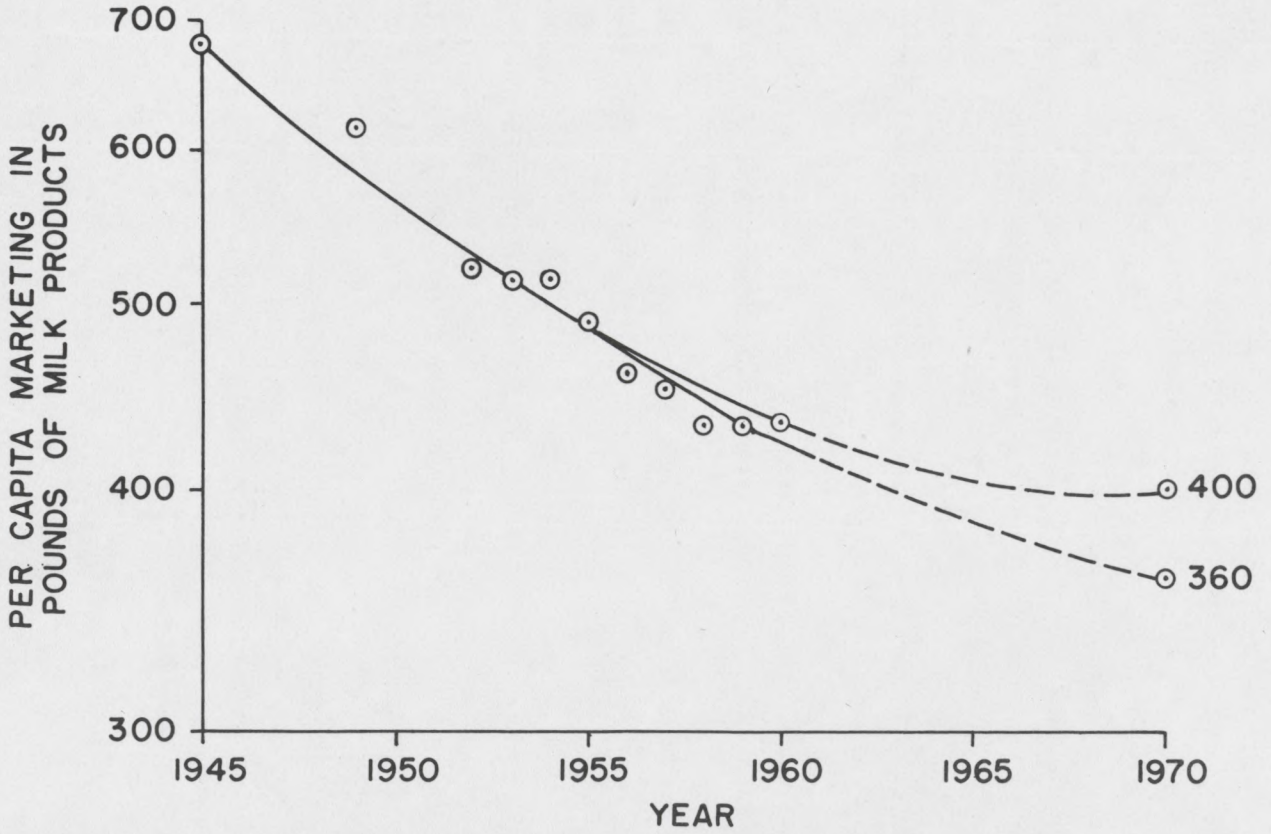
Bearing these uncertainties in mind, an effort was made to project future sales of dairy milk products in Colorado. These projections are based on Colorado's expected growth in population, and the trend in per capita milk consumption.

Figure 13 shows the past trends in per capita consumption of milk products. A continuation of the past trend indicates that annual per capita consumption may decrease to about 360 pounds. If this downward trend tends to level off, it is possible that per capita consumption might be as much as 400 pounds per year by 1970.

By using the 1960 sales of milk in Colorado of 775 million pounds as a base, the marketings of milk in 1970 in pounds was calculated from the increase in population and the projected per capita consumption. The projected increase in pounds was then transferred into dollar sales at 1960 prices. The higher estimate corresponds to 1970 consumption of 984 million pounds, or dollar sales of $42.2 million. The lower estimate produces a dollar sales estimate of $41.3 million.

Sugar beets. There are many uncertainties involved in the projection of Colorado's future sugar beet production and related farm employment. First, future production of Colorado's sugar beets depends largely upon U. S. foreign policy since 44 percent of the U. S. market is reserved for foreign countries.

FIGURE 13. ANNUAL PER CAPITA COLORADO FARM MARKETINGS OF MILK PRODUCTS



Sources: Population estimates in between Census years were obtained from Colorado State Planning Division, Colorado Yearbook, various years; and the Denver Research Institute files. Marketings of milk products data are from Colorado Agricultural Statistics, 1951, p. 103; 1955, p. 83; 1961, p. 101.

Second, the Colorado sugar beet producers export most of their sugar to Chicago and the Midwest area. Freight rate differentials between the Eastern and Western producers are important with respect to competitive pricing. It follows, therefore, that any adverse change in such differentials might have a deleterious effect on Colorado's future beet production.

Third, the availability of land for sugar beet production and the future developments which would affect the yields per acre are crucial factors to consider. Acreage available for sugar beet production in Colorado has been decreasing and is expected to decrease even further in the years ahead. However, it is quite likely that this decrease will be more than offset by increases in yields per acre.

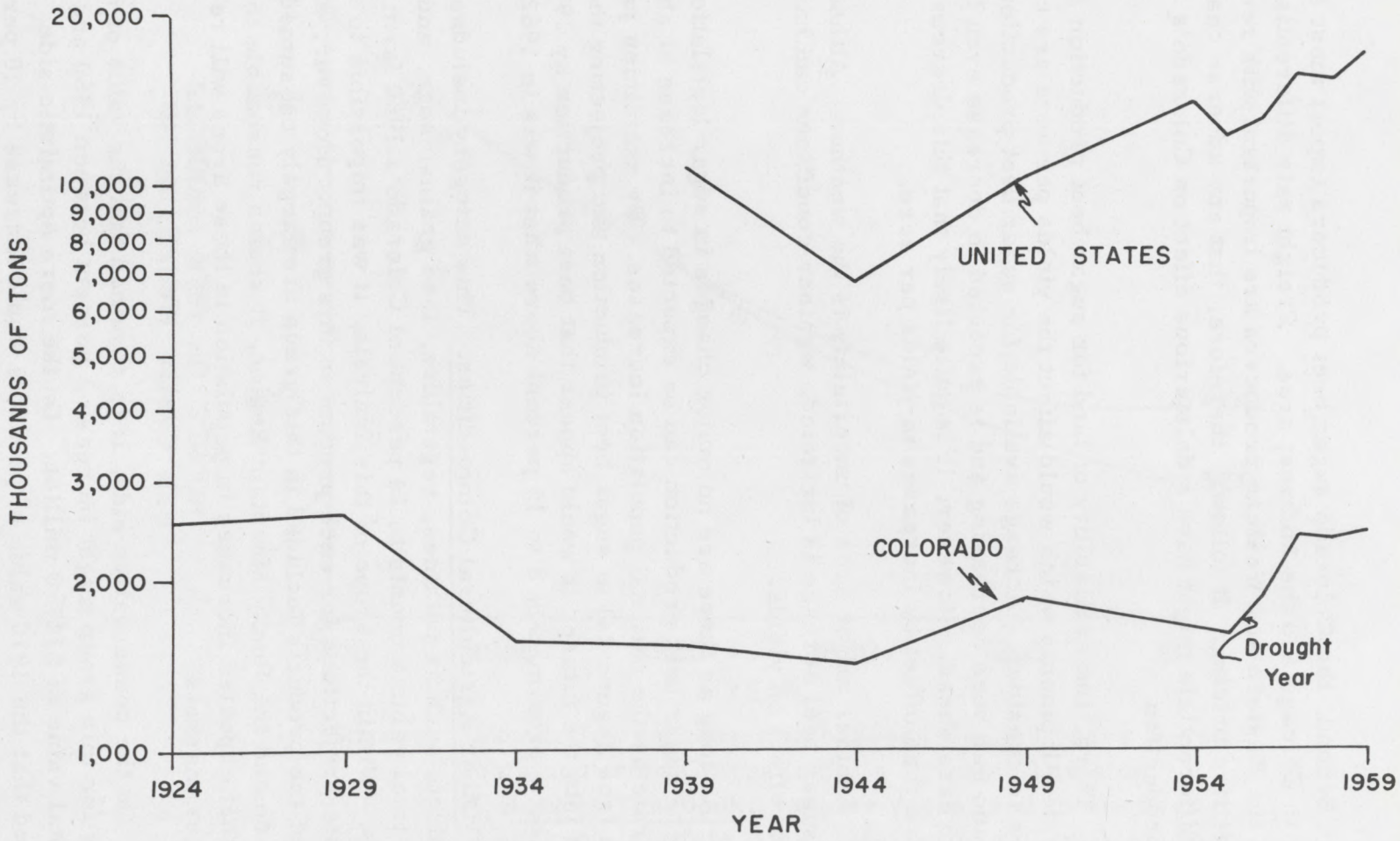
Another major area of uncertainty is the weather. Although most sugar beet acreage is irrigated, weather conditions can have a definite effect on yields.

As long as there are no major changes in sugar legislation or weather, sugar beet production can be expected to increase at about the same rate as the national population increases. By examining past trends (see Figure 14) in sugar beet production and projecting these trends into the future, it would appear that beet production by 1970 would be approximately 8 to 15 percent above what it was in 1962.

Other Agricultural Commodities. This category includes a host of products such as potatoes, vegetables, feed grains, hogs, and hay, whose total value amounts to 24 percent of Colorado's 1960 farm marketings. Within the scope of this analysis, it was impossible to make adequate projections for each product in this group. However, since many of the products included in this group are largely consumed in Colorado and the Rocky Mountain Region, it seems reasonable to conclude that expected increases in population in these areas will result in larger markets.

On the conservative side, it is assumed that the value of marketings for this group might increase 3 percent between 1960 and 1970 or a total value of $147.0 million. On the more optimistic side, it was assumed that the 1970 value of products would increase by 10 percent over 1960 or a total of $157.4 million.

FIGURE 14. PRODUCTION OF SUGAR BEETS IN COLORADO AND THE UNITED STATES



Source: Colorado Agricultural Statistics, 1948 and 1949, p. 47, 1953, p. 59 and 1961, p. 70.

Agricultural Employment Estimates — 1970 Output ÷ Output/Worker

A recap of the 1970 projections of agricultural outputs is shown below.

	Value of Major Farm Marketings		
Product	1960	1970 High Estimate	1970 Low Estimate
Cattle and Calves	$294, 580, 000	$368, 000, 000	$339, 000, 000
Sheep and Lambs	30, 030, 000	28, 500, 000	28, 500, 000
Wheat	104, 160, 000	79, 400, 000	65, 800, 000
Dairy Products	33, 250, 000	42, 200, 000	41, 300, 000
Sugar Beets	33, 970, 000	39, 100, 000	37, 400, 000
Other	143, 060, 000	157, 430, 000	147, 400, 000
Total	$639, 000, 000	$714, 600, 000	$659, 400, 000

Figure 15 shows the trend in agricultural output per worker over the past six years. The exact shape this curve will take in the future is uncertain. On the pessimistic side, as far as employment is concerned, we have projected a continuation of the past trend. On the more optimistic side, we have projected a leveling off of the trend. The annual value produced per worker, in terms of 1960 prices, ranges from $14, 900 to $15, 950.

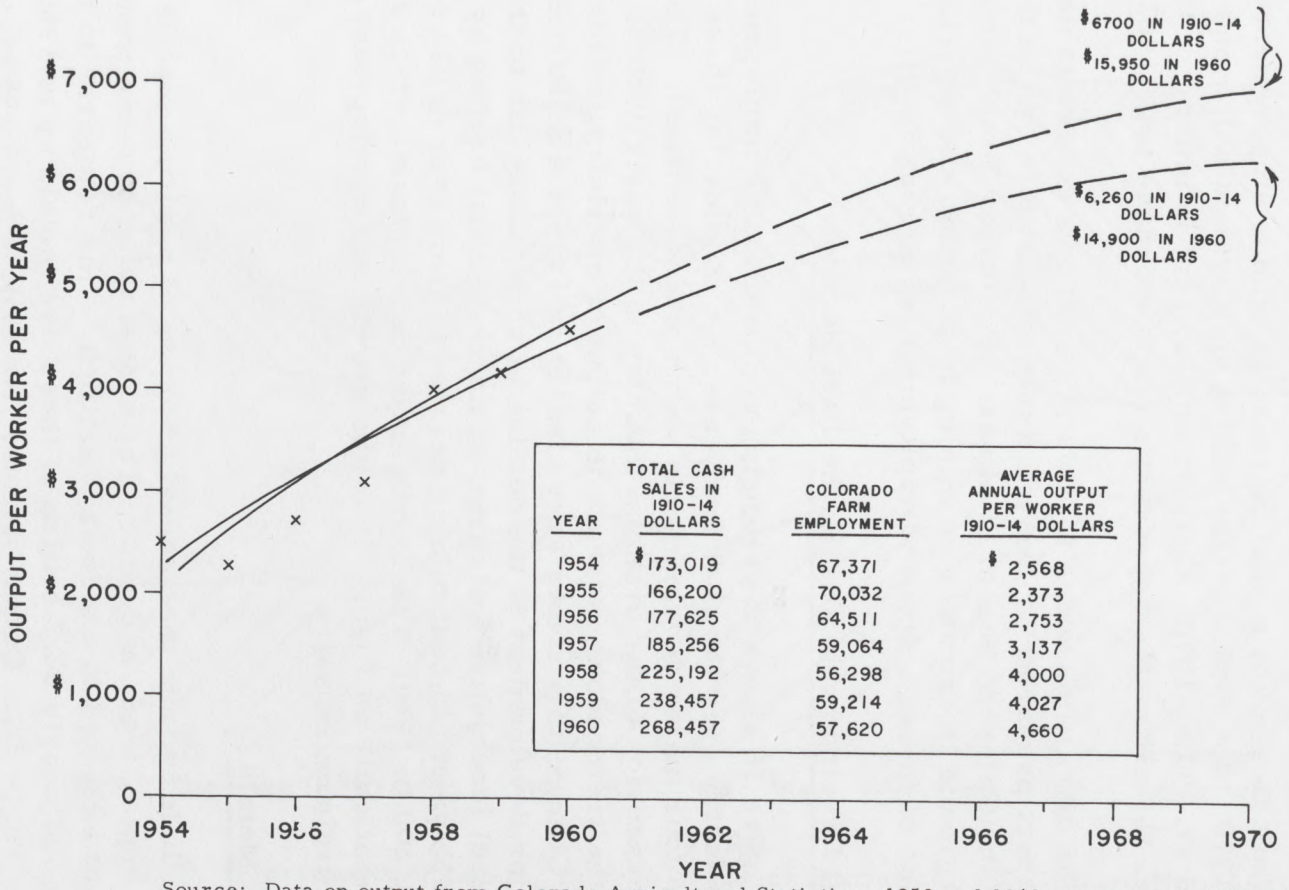
When estimated 1970 output is divided by output per worker, the anticipated employment in Colorado agriculture ranges from 41, 400 up to 47, 900. These estimates are from 17 to 28 percent below 1960 employment levels.

In a comprehensive study of the economy of the western United States, Arthur D. Little, Inc. estimates the agricultural employment

in Colorado will decrease to 48,000 by 1970.[2] This represents a 17 percent decline and corresponds closely to our optimistic estimate.

[2] Arthur D. Little, Inc., Future Economic Growth in the West and Prospects for Rail Freight, prepared for the Atchison, Topeka and Santa Fe Railway Co., Boston: A. D. Little, Inc., 1961.

FIGURE 15. AGRICULTURAL OUTPUT PER WORKER IN COLORADO



YEAR	TOTAL CASH SALES IN 1910-14 DOLLARS	COLORADO FARM EMPLOYMENT	AVERAGE ANNUAL OUTPUT PER WORKER 1910-14 DOLLARS
1954	$173,019	67,371	$ 2,568
1955	166,200	70,032	2,373
1956	177,625	64,511	2,753
1957	185,256	59,064	3,137
1958	225,192	56,298	4,000
1959	238,457	59,214	4,027
1960	268,457	57,620	4,660

Source: Data on output from Colorado Agricultural Statistics, 1959 and 1961 converted to 1910-14 prices. Employment data are from the Colorado State Department of Employment, and Appendix A, this report.

MINING IN COLORADO

Barring a major breakthrough in mining or processing methods, it is difficult to see any major increase in mining employment in Colorado by 1970. We estimate that mining employment will range from 14,000 to 17,000 by 1970. Current employment in mining is 13,100; therefore, the estimates represent a slight increase over 1962 levels.

The discussion which follows is based to a considerable extent upon a report prepared for Denver Research Institute by Charles O. Frush of the Colorado School of Mines.[3] Professor Frush provided us with background information on mining in Colorado and assisted in the projections of future output and employment for mining in 1970.

Important Developments During the Past Decade

Figure 16 shows the changing composition of employment in the mining industry over the past few years. In considering these changes, there are four major developments which should be noted. The first was the expansion of the uranium industry in the early 1950's. The second was the tremendous increase in output of molybdenum from the mines at Climax (this shows very clearly on Figure 4 in Part I). The third major development is the decline of coal mining due to the advent of the diesel locomotive and large-scale residential heating by natural gas. Employment in coal mining decreased from over 4,000 persons in 1950 to 2,200 in 1960. The fourth major development, which shows up very dramatically on Figure 4, is the growth and development of Colorado's petroleum industry.

Precious Metals

Included within the general grouping of precious metals are gold, silver, copper, lead, and zinc. The annual value of these minerals in 1970 is not expected to exceed $20 million. This compares to a total production of nearly $2.3 billion of these five metals up to 1960 in Colorado (see Table 22). Output of these five metals from 1955 to 1960 with projections to 1970 are shown on Figure 17.

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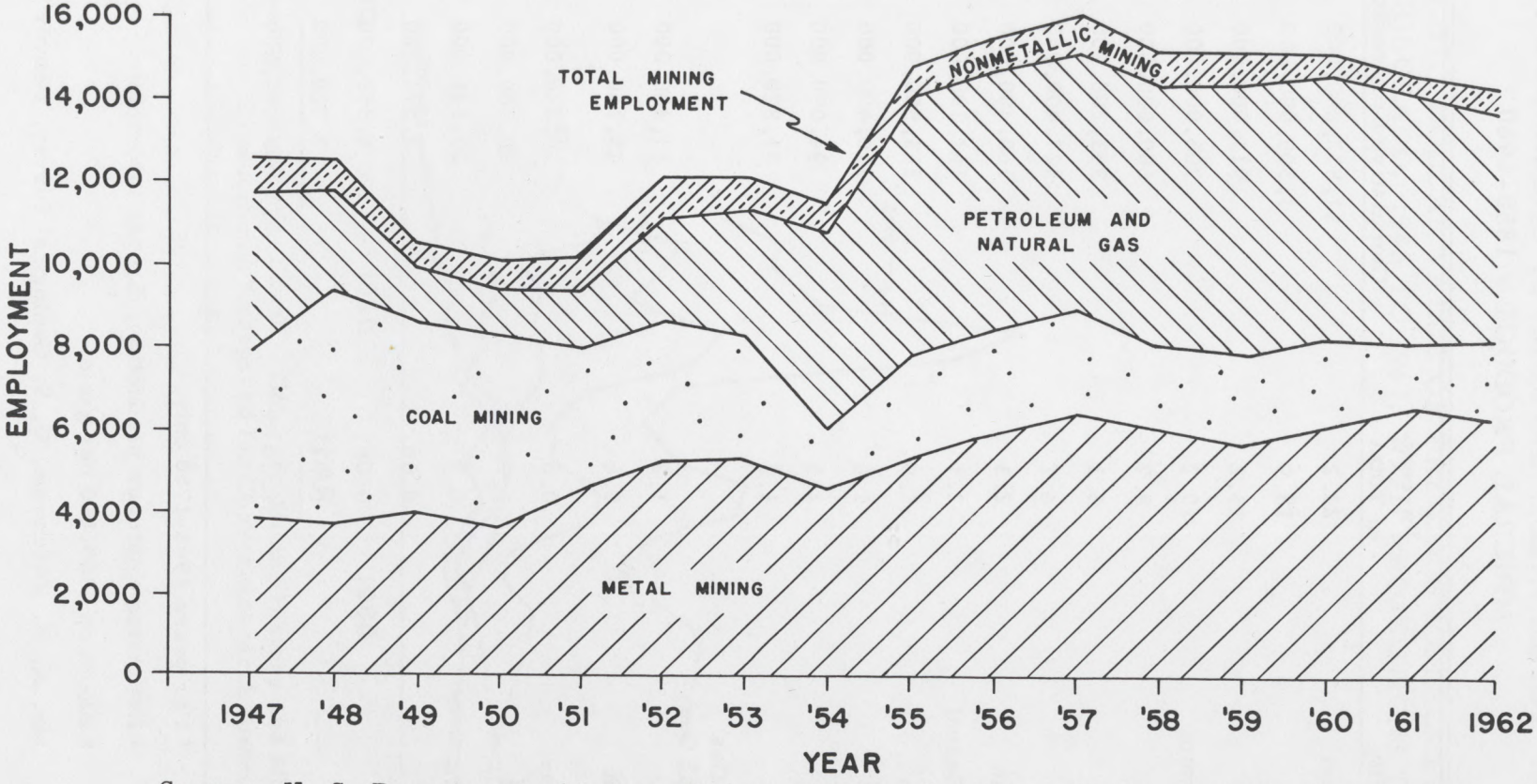
[3] Charles O. Frush, "Colorado Mining History and Mining Expectations," prepared for the Industrial Economic Division of the University of Denver Research Institute, September 1962.

FIGURE 16. EMPLOYMENT IN MINING IN COLORADO, 1947 TO 1962



Source: U. S. Department of Labor, Bureau of Labor Statistics, "Estimated Non-Agricultural Employment in Colorado," 1947 to 1962, mimeo.

TABLE 22. TOTAL VALUE AND RANK OF COLORADO'S PRINCIPAL MINERAL PRODUCT - 1858-1960

Commodity	Percent of Total	Cumulative Commodity Yields
Petroleum	22.2	$1,532,000,000
Coal	18.9	1,309,000,000
Gold	13.2	913,000,000
Molybdenum	10.2	706,000,000
Silver	8.7	600,000,000
Zinc	5.1	353,200,000
Lead	4.7	327,400,000
Vanadium	2.3	160,400,000
Sand & Gravel	2.1	151,100,000
Uranium[1]	1.9	133,500,000
Cement[2]	1.6	110,400,000
Copper	1.3	94,090,000
Stone	1.3	91,820,000
Natural Gas & Natural Gas Liquids	1.2	83,480,000
Tungsten	0.6	45,260,000
Fluorspar	0.5	36,220,000
Radium[3]	0.2	20,200,000
Clay[2]	0.2	19,846,000
Pyrite	0.06	4,371,000
Gypsum	0.06	4,352,000
Perlite	0.04	2,720,000
Total	96.36	$6,698,000,000

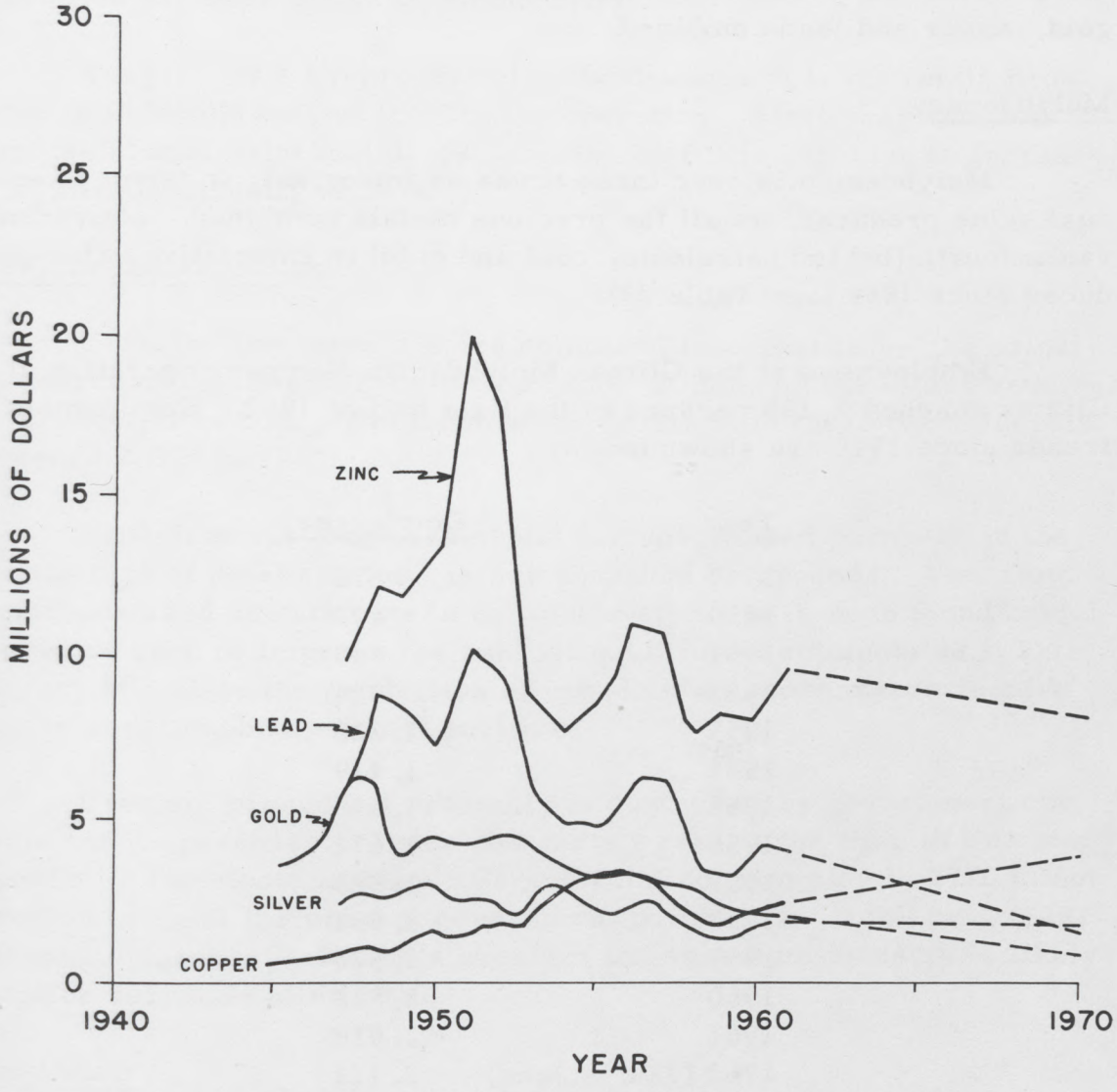
Notes : [1] For years 1948-1960 only.

[2] Estimated minimum production, figures incomplete.

[3] Based on $100,000 per gram.

Source: Mr. A. H. Koschman, U. S. Geological Survey, Denver Office.

FIGURE 17. DOLLAR VALUE OF PRECIOUS METALS PRODUCED IN COLORADO, 1945 TO 1961, WITH PROJECTIONS TO 1970



Source: Charles O. Frush, "Colorado Mining History and Mining Expectations," prepared for Denver Research Institute, September, 1962.

Lead, zinc, gold and silver occur together in complex ores in Colorado. This makes it difficult to predict the exact output of any one of the minerals since they are interrelated. Zinc is the most important metal occurring in these ores, accounting for more dollar sales than gold, silver and lead combined.

Molybdenum

Molybdenum is over three times as important, in terms of annual value produced, as all the precious metals combined. Molybdenum ranks fourth (behind petroleum, coal and gold) in cumulative value produced since 1858 (see Table 22).

Employment at the Climax Molybdenum Company operation at Climax reached 2,100 persons in the first half of 1962. Employment trends since 1949 are shown below.

Year	Employees
1949	572
1950	497
1951	749
1952	924
1953	1,226
1954	1,419
1955	1,476
1956	1,672
1957	1,828
1958	1,531
1959	1,570
1960	1,818
1961	2,018
1962 (Jan. - June)	2,111

Colorado now accounts for two-thirds of the U. S. production of molybdenum. At one time, the state had almost a monopoly in the production of this mineral.

Molybdenum is a metal with many uses, some of them rather exotic. However, about 90 percent of production is consumed by the steel industry. The employment table above shows the impact of the 1958 recession, which hit the steel industry very hard with a corresponding impact at Climax.

When the future demand, and technological and competitive factors are considered, 1970 employment in molybdenum production is expected to remain at about 2,000.[4] Increased demand and output is likely to be offset by an increase in productivity.

Tungsten is a by-product of molybdenum and is currently produced in Colorado only at the Climax operation. Since tungsten is a very useful industrial metal, demand and output is expected to increase to $5 million annually to 1970.

Uranium and Vanadium

Uranium and vanadium are combined in carnotite — the principal source of these minerals in Colorado. A demand for either requires the production of both. Employment in Colorado in these two minerals exceeded 2,500 in 1960.

Vanadium has long been useful for specialized purposes in the manufacture of steel and for various chemical compounds. Vanadium compounds used as catalysts in exhaust systems have been found useful in devices used to improve the exhaust qualities of automobiles. This use may stimulate the production of vanadium as more states require the use of automobile exhaust purifiers.

Uranium production presently is controlled by government contracts for its purchase. These contracts were, at the time of this study, expected to terminate in 1966. Commercial consumption in 1970 is not expected to equal the present government purchases. It follows, then, that employment in Colorado's uranium and vanadium industry is likely to suffer seriously after 1966.

Non-Metals

Included in this group of minerals are clay and stone for the production of cement, clays used for brick and tile manufacture, sand and gravel, and various kinds of rocks suitable for use in road construction. Major characteristic of the non-metals is their low value per pound which limits their use to local and regional markets. The future of this group of minerals is tied closely to the growth of Colorado since their

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[4] John S. Gilmore, Preliminary Economic Base Study and Forecast, prepared for the Leadville-Lake County Regional Planning Commission, Denver: University of Denver Research Institute, October, 1962.

use is tied closely to the local construction industry. The outlook, then, is for considerable increase in output (see Figure 18) and a slight increase in employment (technological improvements prevent labor needs from increasing as fast as production increases).

Coal

Colorado has large reserves of coal (4.5 percent of the U. S. total), but the industry has been declining in importance for a number of years. Employment dropped from 6,000 in 1947 to 2,200 in 1960. This decline has been largely due to the increased use of natural gas and oil for space heating and power generation. Most of the state's present coal production is consumed by large electric generating stations or is used for coking purposes. These and related uses are expected to provide the bulk of the market over the period to 1970.

The underground mines which presently operate in Colorado are expected to continue to operate in the years ahead with little reduction in employment. Strip mining, which is likely to be used more frequently in the future, requires relatively little labor, and increased demand in coal from strip mines will not require a corresponding increase in employment.

The 1970 outlook for the coal industry is increased output (see Figure 19) with no further decline in employment.

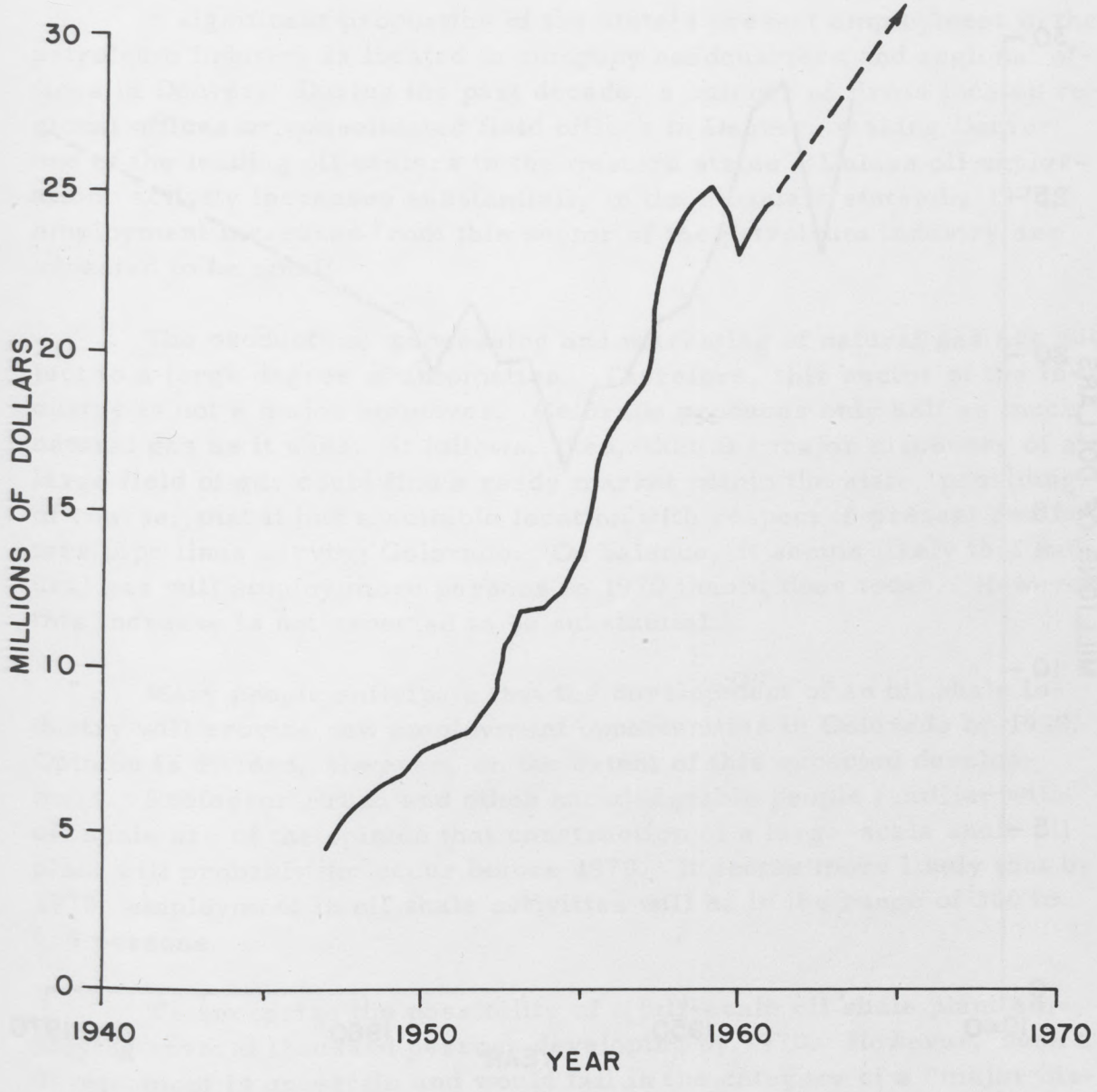
Oil and Gas

Employment in the oil and gas sector of Colorado's mining industry has increased from 1,800 in 1947 to 6,300 in 1960. It is believed that employment in this group will increase slightly by 1970.

Consumption of petroleum products in the U. S. has increased at an annual rate of 4 percent. To supply local needs, it seems likely that U. S. production will be increased. While costs of finding and bringing new wells into production have increased, it still seems likely that activity in this field will continue through 1970.

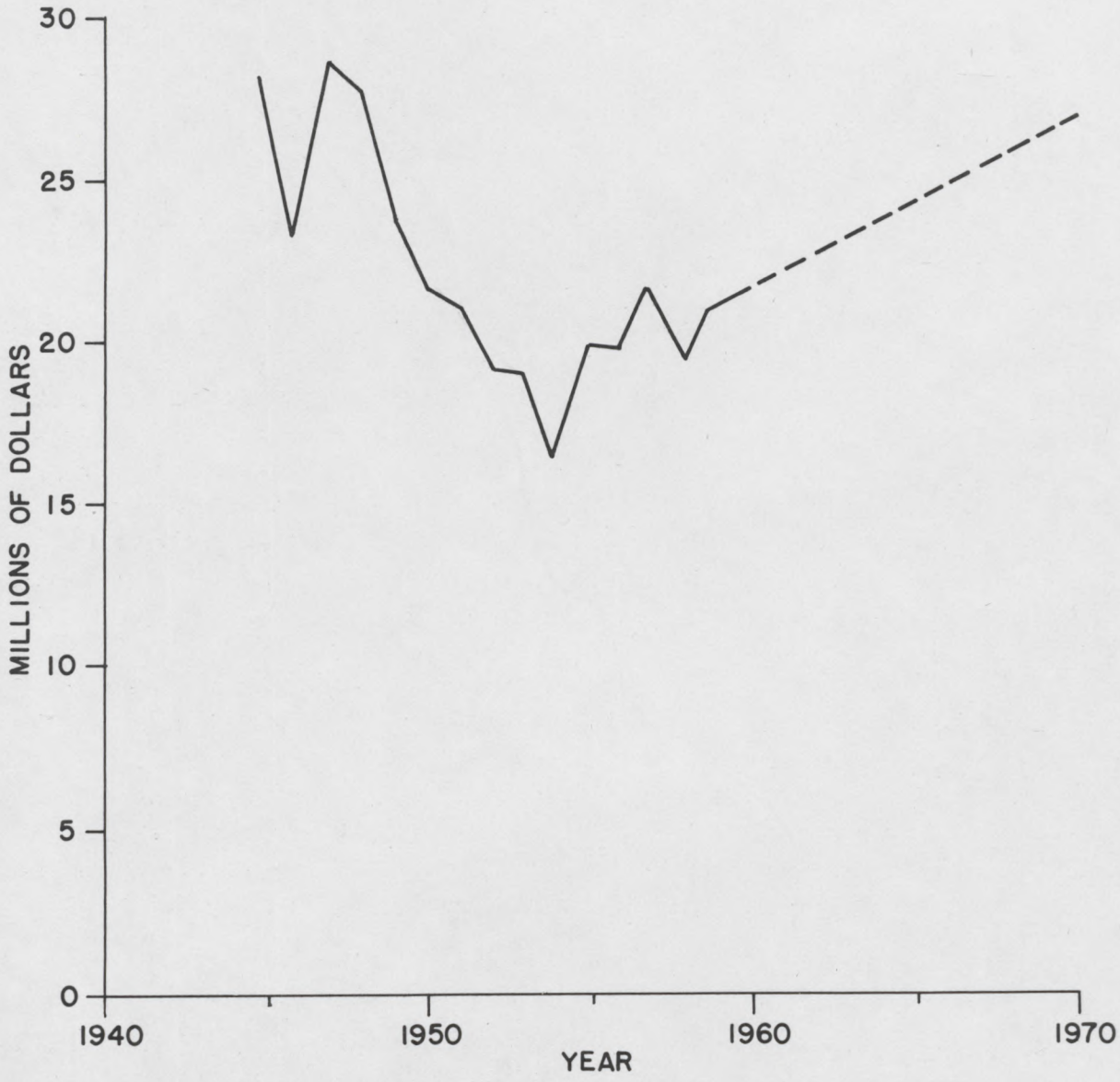
Although the petroleum industry is becoming more and more efficient in the use of manpower, it seems likely that further reductions in personnel will be increasingly difficult and expensive, particularly in the producing end of the operations. Therefore, it is expected that

FIGURE 18. COMBINED DOLLAR VALUE OF NON-METALLICS PRODUCED IN COLORADO, 1947 TO 1961, WITH PROJECTION TO 1970



Source: Charles O. Frush, "Colorado Mining History and Mining Expectations," prepared for the Denver Research Institute, September, 1962.

FIGURE 19. DOLLAR VALUE OF COAL PRODUCED IN COLORADO, 1945 TO 1960, WITH PROJECTION TO 1970



Source: Charles O. Frush, "Colorado Mining History and Mining Expectations," prepared for the Denver Research Institute, September, 1962.

the coming decade will see a slight increase in oil industry employment within Colorado. Any major discovery, of course, would result in larger increases.

A significant proportion of the state's present employment in the petroleum industry is located in company headquarters and regional offices in Denver. During the past decade, a number of firms located regional offices or consolidated field offices in Denver, making Denver one of the leading oil centers in the western states. Unless oil exploration activity increases substantially in the mountain states by 1970, employment increases from this sector of the petroleum industry are expected to be small.

The production, processing and marketing of natural gas are subject to a large degree of automation. Therefore, this sector of the industry is not a major employer. Colorado produces only half as much natural gas as it uses. It follows, then, that any major discovery of a large field of gas could find a ready market within the state, providing, of course, that it had a suitable location with respect to present and future pipe lines serving Colorado. On balance, it seems likely that natural gas will employ more persons in 1970 than it does today. However, this increase is not expected to be substantial.

Many people anticipate that the development of an oil shale industry will provide new employment opportunities in Colorado by 1970. Opinion is divided, however, on the extent of this expected development. Professor Frush and other knowledgeable people familiar with oil shale are of the opinion that construction of a large-scale shale oil plant will probably not occur before 1970. It seems more likely that by 1970, employment in oil shale activities will be in the range of 300 to 600 persons.

We recognize the possibility of a full-scale oil shale plant employing several thousand persons developing by 1970. However, such a development is uncertain and would fall in the category of a "major discontinuity" (discussed in Introduction to Part II).

Mining Employment in Colorado — Conclusion

Table 23 summarizes the product-by-product discussion just presented. This table briefly mentions the major areas of uncertainty, the plus and minus factors, and the outlook on balance.

In summary, barring any major discontinuities, mining employment in Colorado is not expected to vary much from 1960 levels. The estimated employment range for 1970 is from 14,000 to 17,000 persons.

TABLE 23. SUMMARY OF EXPECTED DEVELOPMENTS IN COLORADO'S MINING INDUSTRY

Product	Major Areas of Uncertainty	Plus (+) Factors	Minus (-) Factors	Outlook on Balance	Employment 1950	1960	1970
Metals					3,700	6,200	5,000 - 6,250
Gold	Prices	A by-product, therefore, more economical	Rising costs; prices artificially pegged	Downward trend in output and employment			
Silver	Lead & zinc production (silver is primarily a by-product)	Demand and increasing price	Possible foreign discovery of massive reserves	Output steady; little change in employment			
Copper	World conditions	Demand should increase	Foreign competition; low prices	No marked change			
Lead	Production of gold, silver, and zinc	Useful, versatile metal	Missouri competition, depressed prices	Continued decline			
Zinc	Price fluctuations characteristic	U. S. demand up; useful metal	Foreign competition, low profits to Colorado producers	Down slightly			
Molybdenum	Steel industry (90% to steel)	High value; competes all over world	More competition for Colorado producers	Output up and employment level			
Tungsten	By-product of molybdenum; continued tariff protection	Useful industrial metal	Most Colorado producers cost too high	Up slightly in Climax; no activity elsewhere			
Uranium & Vanadium	Commercial consumption; future R & D results; gov't. contracts	Possible new commercial uses	Better ores exist in other states; termination of present gov't contracts in 1966	Employment expected to drop			
Non-Metals	Competition between building materials	Expected growth of Colorado and surrounding areas	Low value; market area limited	Continued upward trend in output; slight increase in employment	600	500	500 - 750
Coal	Demand from various sources	Ample reserves; electrical power usage expected to increase	Other fuels; highly competitive strip mining is likely to become more dominant	No further decline in employment expected	4,500	2,200	2,000 - 3,000
Petroleum & Natural Gas	Development of shale oil; major new discoveries; international oil situation	Tremendous reserves, particularly in shale; regional market expanding	Costs of exploration increasing; prices not expected to increase	Slight increase in employment expected	1,300	6,300	6,500 - 7,000
				Totals	10,100	15,200	14,000 - 17,000

Source: Denver Research Institute analysis and interpretation of Professor Frush's report.

MANUFACTURING IN COLORADO

Colorado employment in manufacturing increased 27,900 between 1950 and 1960. Employment has increased another 6,200 since 1960 (in April 1962 it totaled 90,800). It is estimated that by 1970 employment in manufacturing will range from 96,200 to 116,200.

Colorado's rather dramatic rate of growth in manufacturing (3 times that of the U. S. between 1950 and 1960) has been due in large part to location in the state of a few relatively large facilities producing goods for the Federal government — primarily the Department of Defense. This was discussed in some detail in Part I of this report — The Era of Defense.

The change of industry mix which has occurred within manufacturing since 1950 tends to make this sector more stable over the short-run. Over the past decade, Colorado has not been seriously hurt by the recessions experienced in the United States, and the change in composition of manufacturing has been one important factor leading to this economic stability.

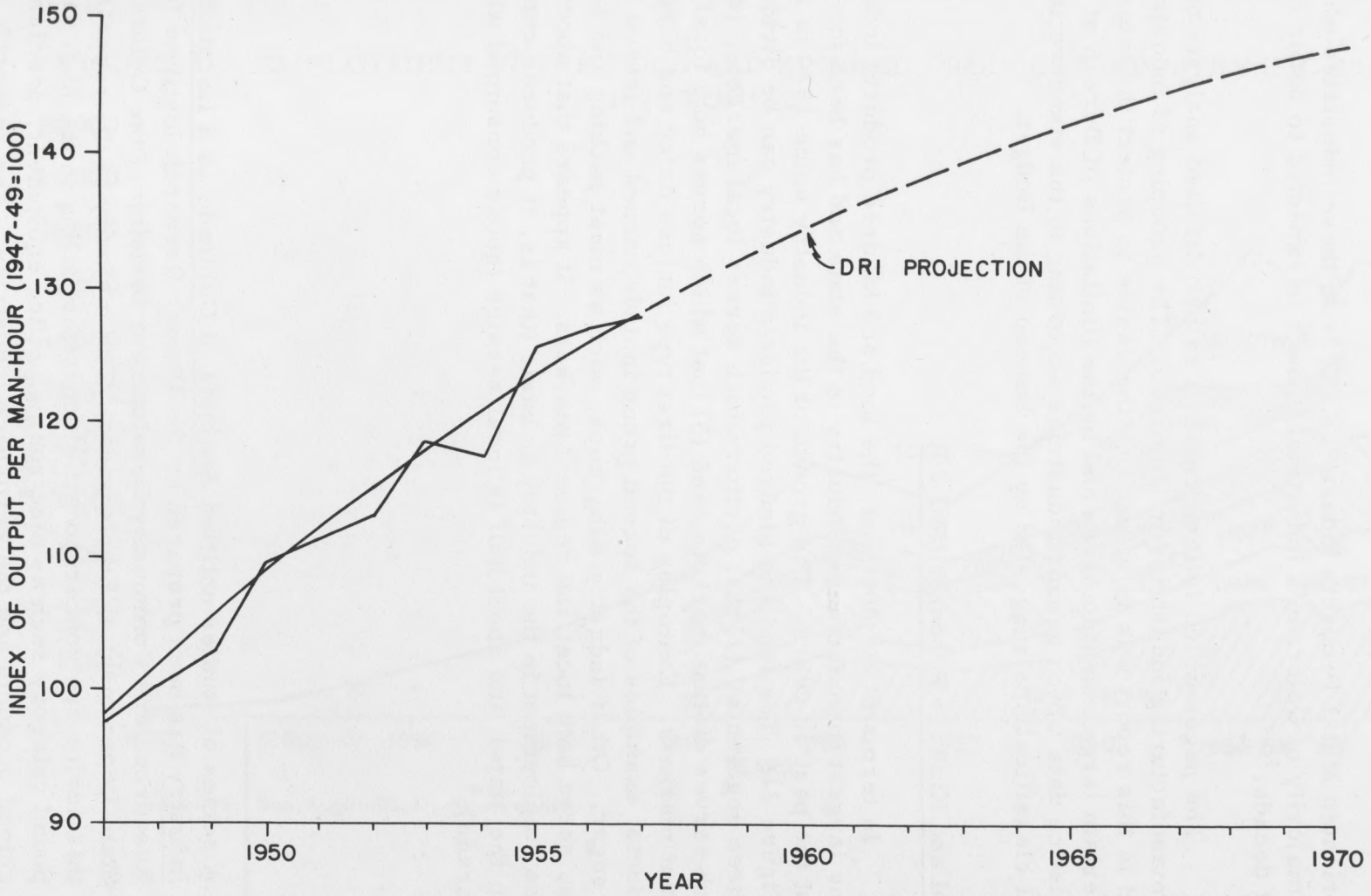
Manufacturing Output Per Man-hour

In interviewing Colorado manufacturing firms, we were impressed by the relatively large increases in output expected by these firms in the next decade. However, much of this increase is not expected to be accompanied by a proportional increase in employment due to continued improvements in output per man-hour (see Figure 20). The substitution of capital for labor (which increases output per man-hour) should be particularly marked in Food and Kindred Products, Printing and Publishing, Rubber, Leather and Primary Metals Industries.

New Industries Locating in Colorado

Because so many important decisions affecting manufacturing are likely to be made by persons not living in Colorado (see Introduction to Part II), it is extremely difficult to predict what may happen in the future. This is a particularly acute problem in analyzing the Ordnance, Transportation Equipment, Electrical and Non-Electrical Machinery and

FIGURE 20. MANUFACTURING OUTPUT PER MAN-HOUR, 1947 TO 1957, WITH PROJECTION TO 1970



Source: U. S. Department of Commerce, Bureau of the Census, Historical Statistics of the United States, Colonial Times to 1957, Washington: U. S. Government Printing Office, 1960, p. 600.

Fabricated Metal Products Industries. It is in these industries where the majority of Colorado's industrial growth is expected to occur in the next decade.[5]

The pages which follow contain a rather detailed analysis of major manufacturing industries in Colorado. The grouping of industries used in this report was influenced by the desire to protect the interests of certain large manufacturers and by the limitations of Bureau of Labor Statistics data which groups industries according to the standard industrial classifications suggested by the Bureau of the Budget.

Food and Kindred Products (SIC 20)

In terms of employment, the food and kindred products industry is the largest manufacturing industry in the state and has been for at least the past 50 years. The growth of the industry since 1870 is shown in Figure 21. The food and kindred products industry can be divided into three segments: (1) that portion which serves local markets, (2) that which serves distant markets, and (3) that which serves both local and distant markets. Examples of the first type include dairy and bakery products; examples of the second group include canned and frozen foods and sugar. Other industry subgroups, such as meat packing and beverages, serve both local and regional markets. It appears that about half of the employment in the industry is basic (that is, it produces exports from the state) and about half is local service (goods consumed within Colorado).[6]

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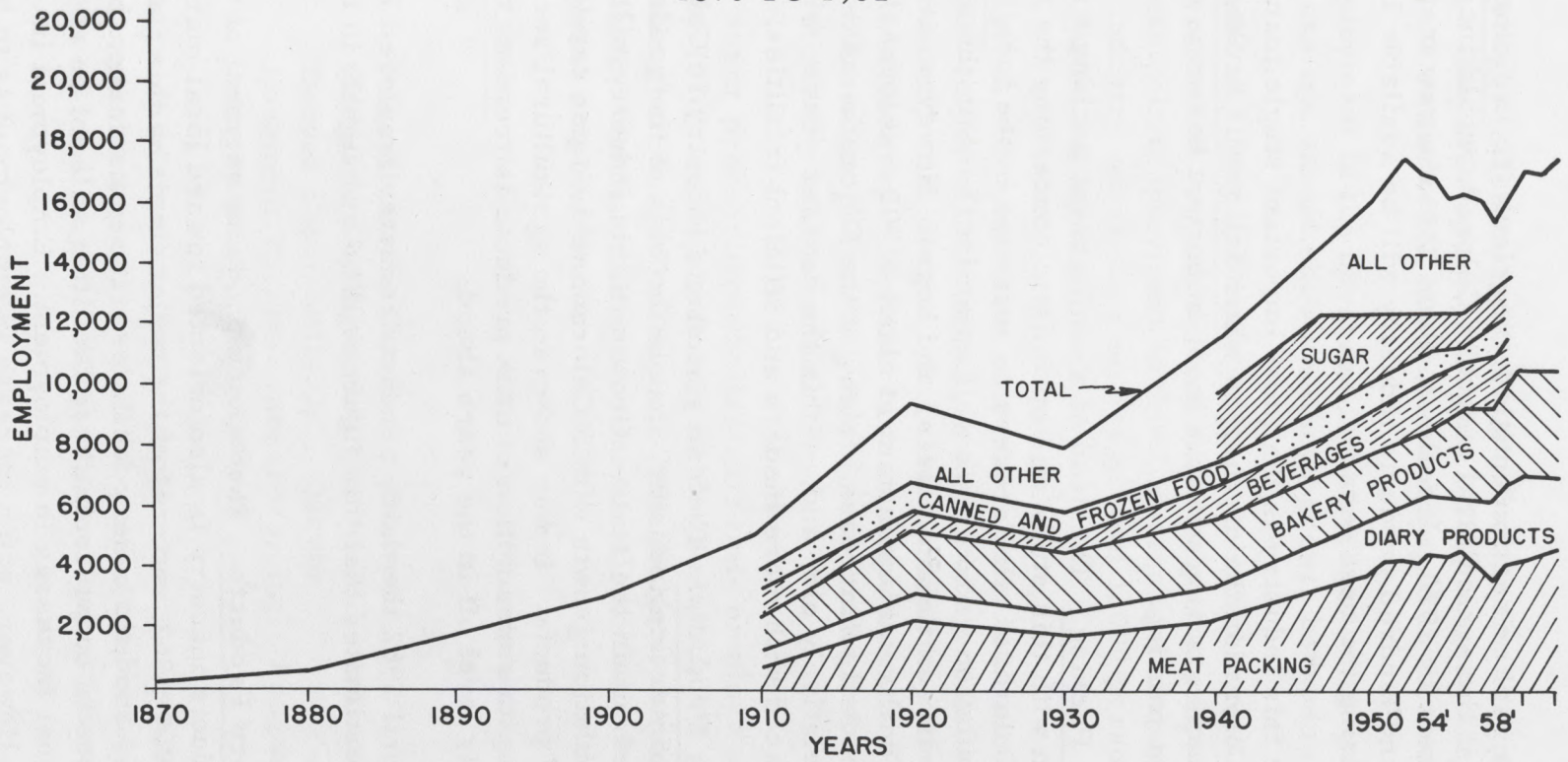
[5] A series of studies entitled Analysis of Colorado as a Location for Industry has been prepared by the Denver Research Institute for the Resources and Community Development Division of the Colorado State Department of Employment. The majority of the reports in this series are concerned with industries falling in the high value per pound category such as electronics, office equipment, precision machined products and the aerospace industries. The research which led to the selection of these industries indicates that the major growth opportunities for Colorado are in high value per pound products.

[6] This conclusion is based on a questionnaire sent by the Denver Research Institute to a sample of firms in the food and kindred products industry.

FIGURE 21. EMPLOYMENT IN THE FOOD AND KINDRED PRODUCTS INDUSTRY (SIC 20), 1870 TO 1962



Sources: See Appendix D, this report.

In the earlier section entitled, "Agriculture in Colorado," it was estimated that the agricultural output in Colorado would increase from 15 to 25 percent by 1970. It follows, then, that the raw materials used by the food and kindred products industry will be available in larger quantities during the next decade.

Since this industry is the most important single manufacturing industry in Colorado, the discussion which follows is broken down into seven subgroups starting with the most important in terms of employment — meat packing.

Meat Packing. The head of a major meat packing firm contacted in connection with this study was optimistic concerning the future of the industry in Colorado. He foresees an increase in the local markets in terms of population growth as well as an increase in the availability of raw material (cattle and calves, and hogs). However, it is likely employment will remain constant at about 4, 500 employees even though output is expected to increase. Many of the Colorado meat packing plants are relatively old, and, within the next ten years, will undoubtedly be replaced with more modern and efficient facilities.

Dairy Products. The dairy products industry in Colorado is definitely a local service industry, that is, the bulk of the goods produced are consumed within the state. Growth in this industry will be dependent upon population growth within Colorado and on per capita consumption of dairy products. It was shown in the agricultural section in Part II that per capita consumption of milk products is trending down, but the trend may level off in the years ahead.

In April 1962 the dairy products industry employed 2, 600 persons. It is estimated that this figure will be up slightly in the years ahead.

Bakery Products. The bakery products segment of the food and kindred products industry is also oriented toward local markets. During the period 1960-1962, several of the major firms in this industry constructed new, modern bakery facilities. It seems reasonable that further increases in output from these facilities will not be accompanied by proportional increases in employment. Employment in April 1962 was 3, 400. However, some increase in employment is to be expected by 1970.

Beverages. The major Colorado firm in the beverage industry is the Adolph Coors Company of Golden. This firm accounts for the majority of the estimated 1,600 persons engaged in the industry.

Employment in the beverage industry has increased steadily over the years and should show continued growth between now and 1970.

Canned and Frozen Foods. Although both the availability of raw materials (fruits and vegetables) and markets are expected to increase, major increases in employment in this industry are not anticipated by 1970. The industry currently employs around 1,000 persons and should remain at approximately that level.

Sugar. A representative of a major firm in this industry expects the total output of his company's plants to increase in the next decade. However, it is doubtful that this increase in output will be accompanied by a corresponding increase in employment. There are many areas within the sugar processing field for technological innovations which will reduce the manpower needs.

The sugar processing industry currently employs about 1,300 persons. By 1970, employment may be down slightly but it is unlikely that it will drop below 1,000 persons. (The field-work portion of the industry, which is included in agriculture, will suffer a much greater loss of seasonal employment.)

All Others. Major firms with over 100 employees in this category include:[7]

Russell Stover Candies of Denver
Colorado Milling and Elevator Co., Denver
Denver Flour Mills Co., Denver
Longmont Turkey Processors, Inc., Longmont
Jolly Rancher, Inc., Denver

This group of firms is too heterogeneous for analysis. However, a superficial examination of the types of companies included in this group reveals that the majority of them are oriented towards Colorado

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[7] University of Colorado, Bureau of Business Research, 1962 Directory of Manufacturers, Boulder: University of Colorado, 1962.

and regional markets. Since these markets are expected to increase in the years ahead, it seems reasonable that this group will at least maintain present employment, and perhaps increase employment slightly.

Conclusion. The food and kindred products industry in the United States has been relatively stable in terms of employment over the past decade.

On balance, it appears that markets served by this industry will continue to expand and that raw materials supplies will increase. Improved production techniques will, however, tend to reduce or cancel out corresponding increases in employment. Therefore, it seems reasonable to believe that employment in this industry will be approximately 18,000 by 1970 (up 600 from 1962 levels).[8]

Textiles and Apparel (SIC's 22 and 23)

Colorado's textile and apparel industry is not large, with estimated employment of about 2,200. There are approximately 65 firms in the industry, and only four of these employ more than 100 persons each.[9]

Many of the Colorado firms specialize in western wear or products which have a western motif. Denver is sometimes called the "Western Wear Capital of the United States."

The majority of Colorado firms in the textile and apparel industries are actually in the apparel side of the business. Important considerations for this industry include a pool of relatively low cost, adept female workers and fast, economical transportation to the major markets. The industry is highly competitive, mature, has excess

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[8] The National Planning Association in a mimeo, Economic Projections by States for the Years 1976 and 2000, May, 1961, expects U. S. employment in the food and kindred products industry to decline, but expects Colorado employment to increase slightly.

[9] U. S. Department of Commerce and U. S. Department of Health, Education and Welfare, County Business Patterns, First Quarter 1959, Part 9, "Mountain States," Washington: Government Printing Office, 1961.

productive capacity and is subjected to foreign competition. Ability to anticipate style changes is usually an important factor in the success or failure of companies in this industry.

Present manufacturers in Colorado are tending to take advantage of their western location by specializing in western-type products. The greatest opportunities for increased employment in this industry appear to be for present producers to prosper and expand, and for the entry of new companies with special products.

On balance, Colorado's apparel industry should expand gradually, with an increase in employment to about 2,500 by 1970.

Furniture and Wood Products Industries (SIC 24 and 25)

In April 1962, the furniture and wood products industries employed 2,800 persons or 3 percent of Colorado's total manufacturing employment.[10] Colorado firms in these two industries tend to be small with only six employing in excess of 100 employees and the majority in the 0-19 employees category.[11]

Value added in furniture and wood product manufacturing in Colorado is less than half of the U. S. average. In Colorado, these industries added $13.60 per person in 1958 (see Table 2, Appendix D). For the United States, the corresponding figure was $31.80 per person.

Three factors are of major importance to the success of furniture and wood products firms — adequate raw material, nearby markets, and low cost labor.

Colorado has practically no native wood which has been considered suitable for furniture or many wood products.

The local market for furniture and wood products is relatively small. However, as population in Colorado and the Mountain States

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[10] U. S. Department of Labor, Bureau of Labor Statistics, "Estimated Non-Agricultural Employment in Colorado for 1950-1960," Rev. 1961, mimeo.

[11] County Business Patterns, op. cit.

increases, new marketing opportunities should begin to appear with more regularity.

Colorado has no apparent labor advantages for these industries — wage rates and other labor costs are generally lower in Arkansas, parts of Texas, and other centers of furniture manufacturing.

On the positive side, there undoubtedly will be new products of wood which can be profitably manufactured in Colorado in the next decade. On balance, it is estimated that employment in this industry will be 3,500 in 1970 (up 700 over 1962 levels).

Paper, Printing and Publishing (SIC's 26 and 27)

Paper, printing and publishing employed 8,100 persons or nearly 9 percent of the manufacturing sector in April, 1962. The major components within these industries in Colorado include paper and allied products (11 percent), newspapers (46 percent), and commercial printing (26 percent). [12]

Employment and value added for these industries in Colorado and the United States are compared in Figure 22 and in Table 2, Appendix D. Colorado employment has shown an upward trend over the past 10 years. United States employment is also up and is expected to continue to grow. In Colorado, value added per person is about half the national average ($37.50 per person in Colorado versus $78.40 per person nationally).

Major factors which will determine the future growth of these two industries in Colorado include population increase, technological change in production techniques, and possible construction of facilities to produce paper products. Although paper and printing are normally considered to be basic or growth-inducing industries, their dependence upon population indicates that these industries follow rather than lead.

Since Colorado and the Mountain States are expected to increase in population at a higher rate than the United States as a whole, the paper, printing and publishing industries in Colorado should continue to add employment. Employment should reach 9,500 employees by 1970, or 1,400 more than were employed in April, 1962.

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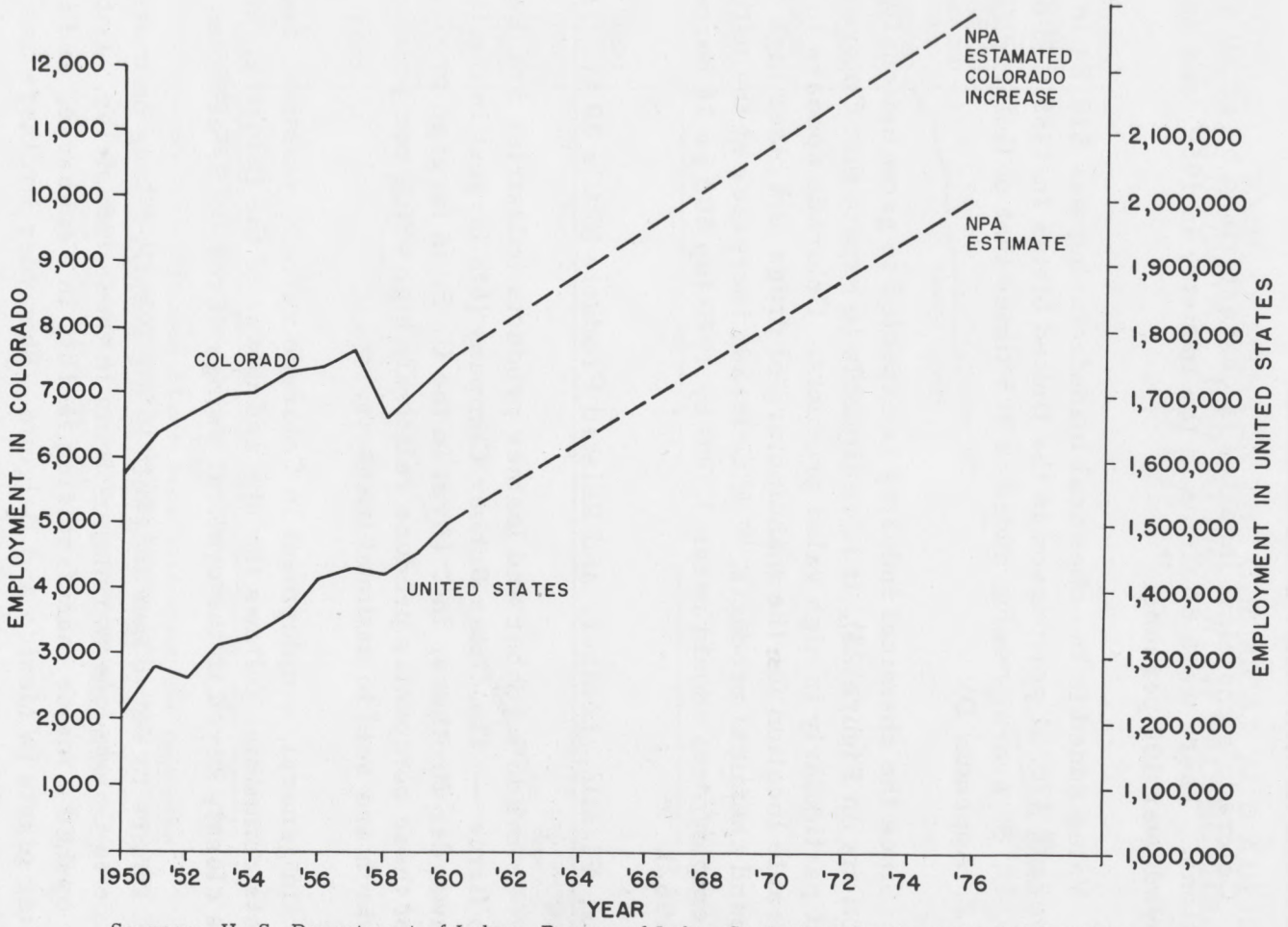
[12] County Business Patterns, op. cit.

FIGURE 22. EMPLOYMENT IN PAPER, PRINTING AND PUBLISHING INDUSTRY, 1950 TO 1960, WITH PROJECTIONS TO 1976



Sources: U. S. Department of Labor, Bureau of Labor Statistics, Employment and Earnings Statistics for the United States, 1909 - 1960, and "Estimated Non-Agricultural Employment in Colorado for 1950 - 1960," revised May 1961, mimeo; National Planning Association, Economic Projections by States for the Years 1976 and 2000, May 1961.

Chemicals and Allied Products (SIC 28)

Colorado's chemical industry is characterized by small scale operations. There were 86 firms in the industry in 1959, and only four employed over 100 persons. [13]

Value added in the chemical manufacturing was $19.84 in Colorado versus $70.51 per person in the United States in 1958. In other words, U. S. average value added is 3.5 times that of Colorado (see Table 2, Appendix D).

Since the chemical industry is expected to grow nationally (see projections on Figure 23), it is reasonable to expect that Colorado will benefit particularly in high value products. Colorado appears to be in a favorable location for the manufacture of drugs and other high value per pound chemical products. [14] If Colorado increases at the national rate, employment should reach 3,000 by 1970 (up 800 or 36 percent over 1962).

Rubber, Plastic, Leather, and Related Products (SIC's 30 and 31)

Colorado's rubber and leather products industries are dominated by two firms — The Gates Rubber Company (6th largest in the U. S.) and Shwayder Brothers, Inc. (first in the U. S. in luggage production). Both of these companies produce relatively high value per pound products which are sold to national markets.

In general, employment in Colorado rubber, plastics, and leather products companies follows the ups and downs of the industry, which in turn is closely keyed to the cyclical swings of the U. S. economy.

Desire to serve new markets is apparently taking on more importance to Colorado's two major firms in these industries. Gates recently opened a major manufacturing facility in Tennessee, and is constructing plants in Mexico and Belgium. Shwayder Brothers has plants in Michigan, Tennessee, and Canada.

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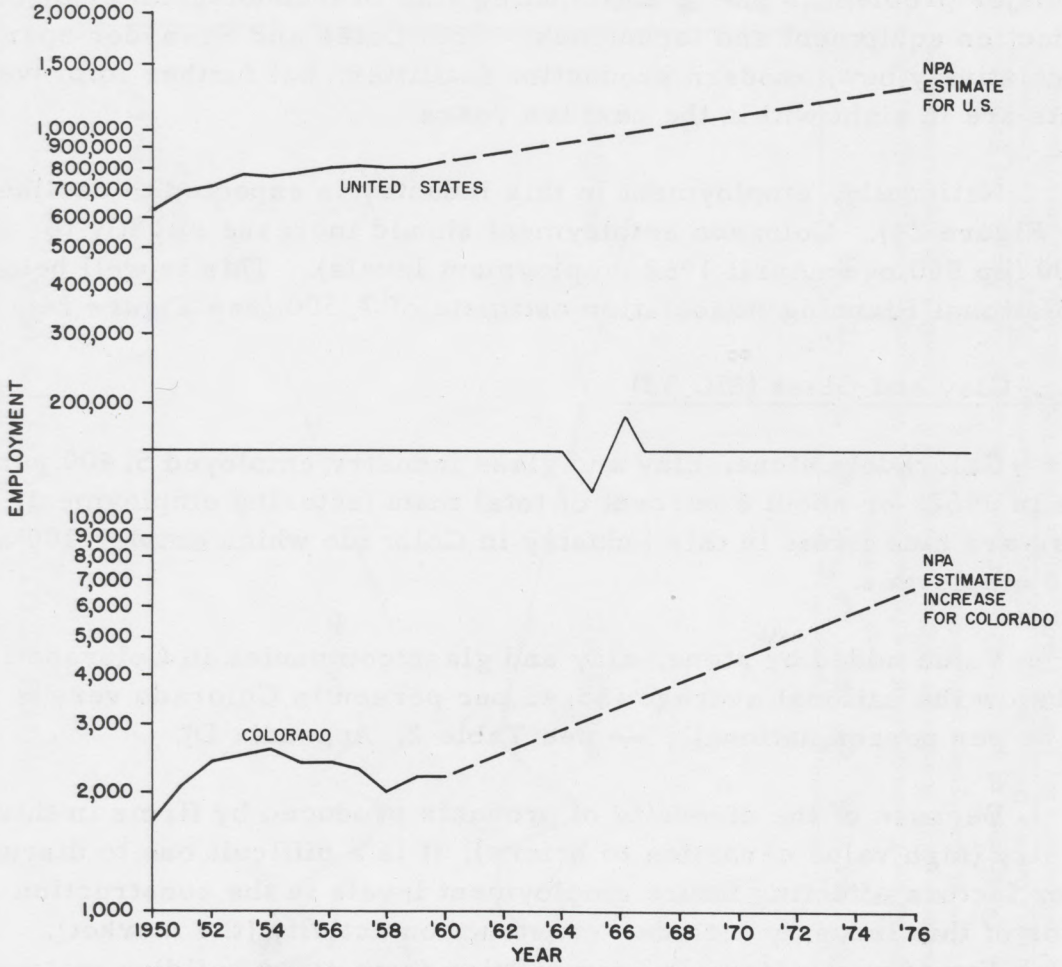
[13] County Business Patterns, op. cit.

[14] University of Denver, Denver Research Institute, Analysis of Colorado as a Location for Industry; The Drug Industry, October 1961.

FIGURE 23. EMPLOYMENT IN THE CHEMICAL AND ALLIED PRODUCTS INDUSTRY, 1950 TO 1960, WITH PROJECTIONS TO 1976



Sources: U. S. Department of Labor, Bureau of Labor Statistics, Employment and Earnings Statistics for the United States, 1909 - 1960, and "Estimated Non-Agricultural Employment in Colorado, 1950 - 1960," mimeo; National Planning Association, Economic Projections by States for the Years 1976 and 2000, May 1961.

Both Gates and Shwayder report satisfaction with labor and raw material availability in their Denver plants, and both plan to continue to operate major facilities in Colorado.

In attempting to estimate employment in these two industries, the major problem is one of anticipating rate of technological change in production equipment and techniques. Both Gates and Shwayder operate relatively new, modern production facilities, but further improvements are in sight within the next ten years.

Nationally, employment in this industry is expected to decline (see Figure 24). Colorado employment should increase slightly to 6,500 (up 500 over April 1962 employment levels). This is well below the National Planning Association estimate of 7,500 (see Figure 24).

Stone, Clay and Glass (SIC 32)

Colorado's stone, clay and glass industry employed 5,400 persons in 1962, or about 6 percent of total manufacturing employment. There are nine firms in this industry in Colorado which employ 100 or more employees. [15]

Value added by stone, clay and glass companies in Colorado is far below the national average ($8.45 per person in Colorado versus $31.80 per person nationally — see Table 2, Appendix D).

Because of the diversity of products produced by firms in this industry (high value ceramics to bricks), it is a difficult one to discuss. Major factors affecting future employment levels in the construction sector of this industry include: construction activity (the market), availability of raw materials, competition from other building materials, improvements in present product lines, and new production techniques.

Construction activity in Colorado and neighboring states has been at a relatively high level for the past 10 years, therefore, the market for many products in this industry has been active. Many products are limited in the distance they can be shipped economically. This industry, perhaps more than any other, must depend on growth of local markets for its growth.

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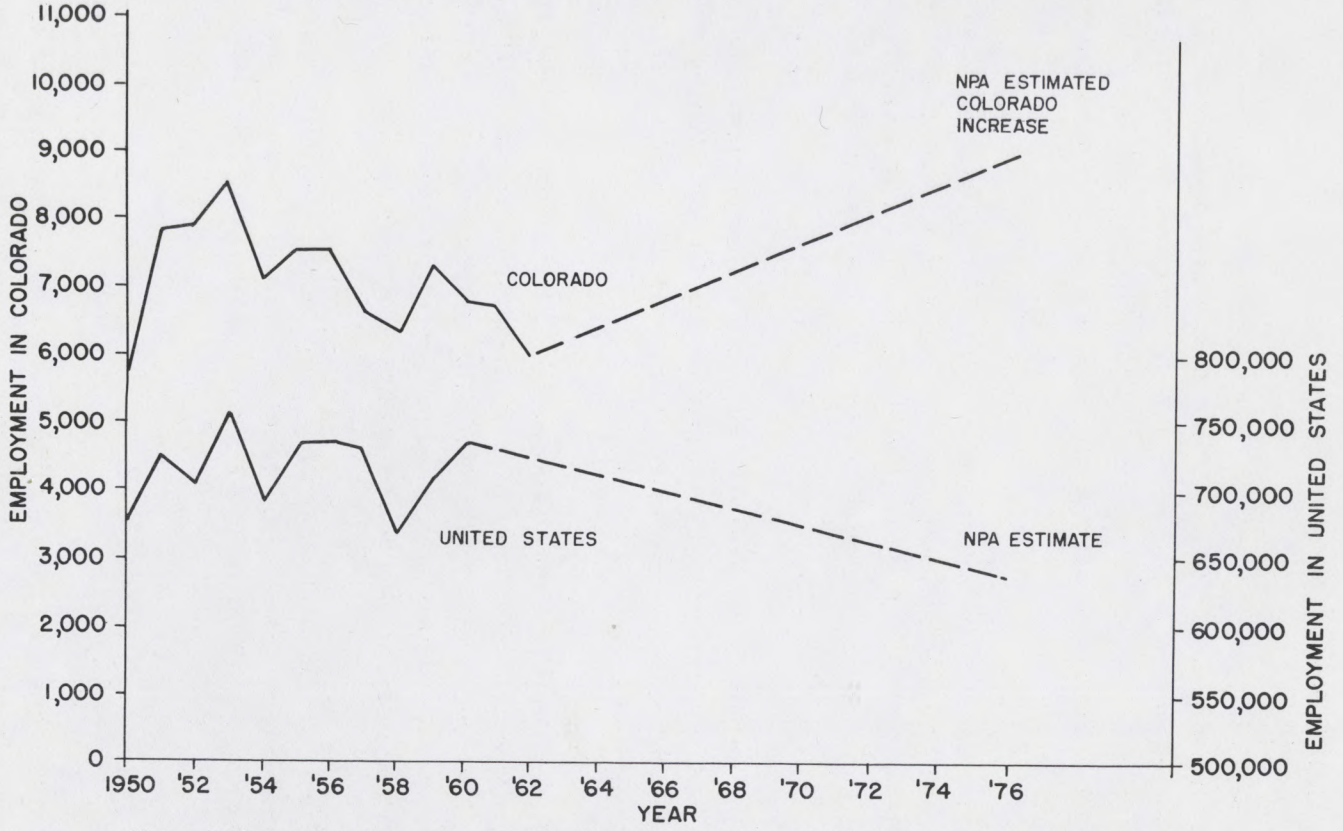
[15] County Business Patterns, op. cit.

FIGURE 24. EMPLOYMENT IN RUBBER, PLASTICS, AND LEATHER PRODUCTS, 1950 TO 1962, WITH PROJECTIONS TO 1976



Note: BLS data for Colorado combines leather products with textiles and apparel; therefore it was necessary to subtract estimated employment in textiles and apparel industries to arrive at employment data shown.

Source: U. S. Department of Labor, Bureau of Labor Statistics, Employment and Earnings Statistics for the United States, 1909 - 1960; "Estimated Nonagricultural Employment in Colorado for 1950 - 1960," revised May 1961, mimeo; National Planning Association, Economic Projections by States for the Years 1976 and 2000, May 1961.

Clays and other raw materials needed by the industry are available in large quantities in Colorado. This does not appear to be a limiting factor for this industry.

Other construction materials, such as steel, aluminum and wood do offer competition for stone, clay and glass products. However, there is no evidence which would indicate that these other materials are making appreciable inroads. There is some shifting going on constantly between materials, but the losses and gains in recent years have tended to offset each other.

Most firms in this industry are seeking improved or new products. For example, research has been going on for a number of years to develop a lightweight brick or building block which is easier and quicker to handle. The pre-fabricated brick panel is another development.

Firms in the industry are also making improvements in production techniques. For example, the continuous kiln for brick production is replacing the old beehive-type kiln. Other improvements in material handling are being made.

In summary, the positive factors for this industry appear to be a continued strong market, plenty of raw material and continued efforts to develop new and improved products. The major negative factor, as far as employment is concerned, is advances in production and materials handling techniques which reduce manpower needs.

On balance, it would appear that employment should continue to increase. Employment rose from 2,800 in 1950 to 5,400 in 1962 — up 2,600. It should go to 7,000 in 1970 (an increase of 1,600 over 1962 levels).

Primary Metals (SIC 33)

The primary metals industry in Colorado is dominated by the Colorado Fuel and Iron Corporation and its integrated plant in Pueblo. CF&I's facility reportedly employs in the neighborhood of 8,000 persons, or about 80 to 90 percent of all employment in the primary metals industry. There are six other firms in the industry which employ between 100 and 249 persons. [16]

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[16] County Business Patterns, op. cit.

Future employment at CF&I's Pueblo facility will be influenced by a number of factors including technological change in production methods, new products, foreign competition, and expansion of regional markets.

Regarding productivity or technological change, CF&I produced more sales in 1961 with 15,364 employees than it did in 1954 with 29,076 employees (these figures are for the whole corporation — separate data for Colorado are not available.)[17]

CF&I officials have publicly expressed concern over the impact of imports. "Companies manufacturing CF&I-type products are particularly hard hit by imports."[18]

The third factor which will determine CF&I's Colorado employment is expansion of regional markets, and the activity of the construction industry. In this respect, the future looks favorable.

Expansion of CF&I's market should more than compensate for losses in employment due to production efficiency increases and competition from foreign producers. On balance, it seems realistic to project 1970 employment of 10,000 (up 1,100 over April, 1962 levels).

The Defense-Oriented, High Value Industries
(SIC's 34, 35, 36, 37, and 19)

These industries have provided the major growth in Colorado's manufacturing sector in the period 1950 to 1962. This is shown in Figure 6 (Part I).

These five industries, fabricated metal products, machinery, electrical machinery, transportation equipment, and ordnance and accessories, are discussed as a unit for a number of reasons. Historically, they have been lumped, together with primary metals, under the general heading of metal products. Secondly, data were not available for the individual industries until 1958. Finally, these industries, as a group, represent some of the major opportunities for expansion within Colorado's manufacturing industries.

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[17] The Colorado Fuel & Iron Corporation, 1961 Annual Report, p. 12.

[18] Mr. A. F. Franz, President, CF&I as quoted in the September 18, 1961 issue of Blast.

The ordnance category has provided most of the rapid increase in Colorado employment in these industries in recent years (Martin-Marietta and Dow Chemical — see Figure 25).

Colorado employment in these five industries has increased at a more rapid rate than the United States during the past 12 years (see Figure 26). The difference has been particularly pronounced since 1955.

In analyzing this group of industries it is useful to examine them in terms of value per pound and market orientation (civilian vs. government).

Relationship of value per pound. Looking at Figure 25, the industry with the smallest increase (both actual and percentage-wise) is fabricated metal products. The companies included in this industry manufacture a relatively low value per pound product. [19]

The industry group showing the greatest growth — ordnance and accessories — produces the highest value per pound product. The electrical machinery and transportation equipment industries are dominated by firms which also produce relatively high value per pound products and these two industries have shown substantial growth. The machinery industry also leans toward high value per pound products, but not to the extent of ordnance, electrical machinery or transportation equipment.

In a previous study it was concluded that Colorado firms are competitive in the Midwest and Eastern industrial markets as long as their products are worth $2 per pound or more. [20]

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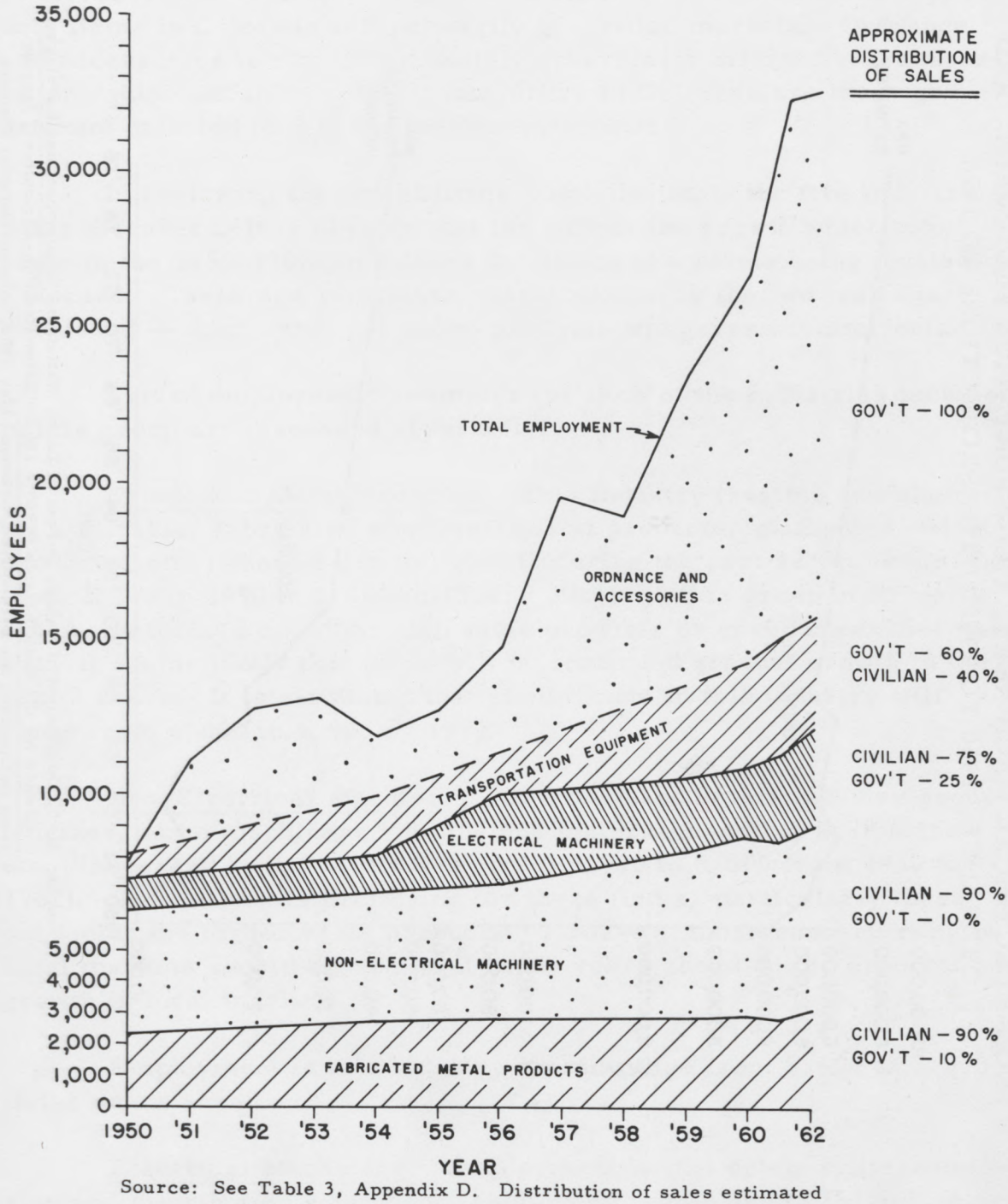
[19] Denver Research Institute personnel, in connection with prior research projects, have been in direct contact with nearly all the major Colorado firms in the five industries, and the information presented is based on knowledge gained from these firms.

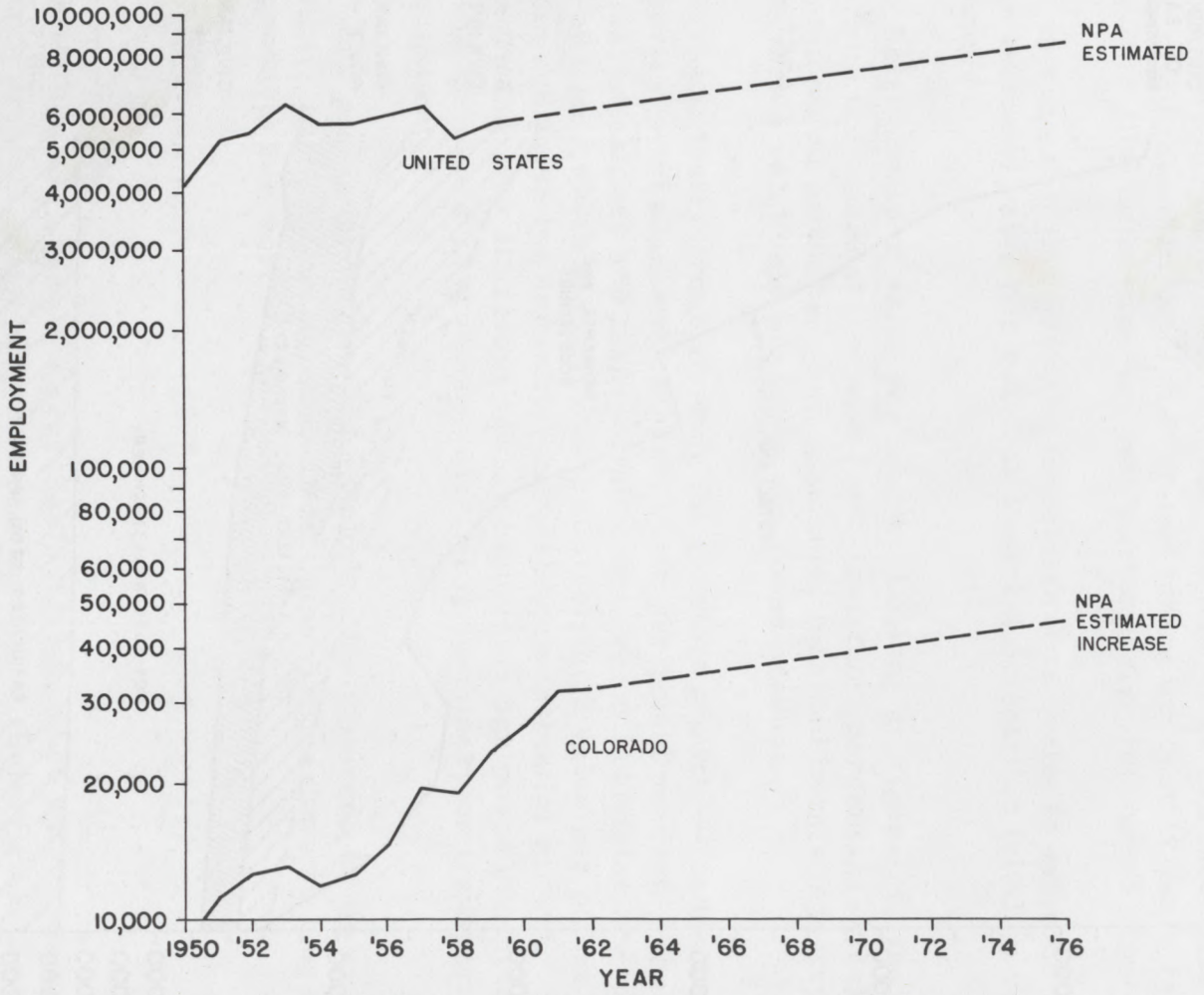
[20] University of Denver, Denver Research Institute, Analysis of Colorado as a Location for Industry: Precision Machined Products, Denver: Denver Research Institute, July 1960.

FIGURE 25. COLORADO EMPLOYMENT IN THE DEFENSE-ORIENTED, HIGH VALUE INDUSTRIES, 1950 TO 1962



Source: See Table 3, Appendix D. Distribution of sales estimated by Denver Research Institute.

FIGURE 26. EMPLOYMENT IN FABRICATED METAL PRODUCTS, ELECTRICAL AND NON-ELECTRICAL MACHINERY, TRANSPORTATION EQUIPMENT, AND ORDNANCE, 1950 TO 1960, WITH PROJECTIONS TO 1976



Source: U. S. Department of Labor, Bureau of Labor Statistics, Employment and Earnings Statistics for the United States, 1909 - 1960; "Estimated Non-Agricultural Employment in Colorado for 1950 - 1960," revised May 1961, mimeo; National Planning Association, Economic Projections by States for the Years 1976 and 2000, May 1961.

Market Orientation (Civilian vs. Government). Referring again to Figure 25, it is noted that increases in employment (as well as rates of increase) are related to market orientation. Fabricated metal products firms in Colorado sell primarily to civilian markets. Ordnance and accessories is almost completely government oriented. Transportation equipment and electrical machinery in Colorado are more government oriented than is the machinery industry.

In reviewing the list of firms which dominate the five industries being discussed, it is obvious that the bulk of the growth which took place in the 1950-1962 period was due to the new plants being located in Colorado. These new plants are characterized by the two traits just discussed — high value per pound products and government orientation.

Future employment estimates for each of the industries included in this group are discussed separately.

Fabricated Metal Products. This industry (heating and plumbing apparatus, fabricated structural metal products, stampings, wire products, etc.) showed gradual growth during the past 12 years (up from 2,200 in 1950 to 3,400 in 1962). Although this group of firms is not characterized by either high value products or government orientation, it seems likely that there will be continued gradual growth in the next 8 years. It is estimated that employment in this industry will range from 4,000 to 4,500 by 1970.

Non-Electrical Machinery. Employment in this industry group (engines, farm machinery, mining and material handling equipment, etc.) increased by 1,700 persons (from 3,900 to 5,600 from 1950 to 1962). The outlook is promising for these firms, particularly those producing the higher value products. However, those concentrating on local markets should also do well in the years ahead due to expected growth in local markets.

Employment in this industry should range from 6,500 to 8,000 in the years ahead.

Electrical Machinery. Employment in this category (transmission and distribution equipment, appliances, radio and television, electronic components, etc.) increased from slightly over 1,000 persons in 1950 to 3,300 in 1962. Since firms in this industry generally produce high value products and quite frequently serve government markets, the future employment prospects are bright. We estimate that employment in 1970 in this industry will range from 5,000 to 7,000 persons.

Transportation Equipment. Included in this category (aircraft and parts, automobile, trucks and railroad equipment, etc.) are several firms which located major facilities in Colorado in the 1950's. All of these facilities are characterized by high value per pound products. Since Colorado is a desirable and competitive location for firms producing high value transportation equipment, it would appear that the future of this industry is excellent.

Employment increased from nearly 1, 200 in 1950 to 3, 700 in 1962. It is estimated that by 1970 employment will range from 5, 000 to 8, 000.

Ordnance and Accessories. This industry was practically nonexistent in Colorado in 1950 and employed 16, 800 persons in April, 1962. The near future market for defense and aerospace products appears to be assured. However, Colorado's participation in these activities is substantially keyed to whatever success the Martin-Marietta Corp. may have in attracting new contracts following the present Titan I, II and III projects. Growth of the present Martin operation in Colorado may be limited by Martin-Marietta plant capacity elsewhere, company policy on Colorado employment levels, and by physical limitations on the size of objects or space vehicle airframes which can be completely fabricated in Martin's Littleton plant and transported to prospective launching sites. After considering all these factors it appears that Martin employment in Colorado will remain at present levels (about 13, 500) through 1965, but range from 10, 000 to 20, 000 by 1970.

Future employment levels of the other major producer in this industry, Dow Chemical Company's Rocky Flats facility, are difficult to evaluate since Dow's activities are classified. It is our assumption that present employment (around 2, 300) will continue until at least 1966, barring controls on nuclear arms production. In 1970, it is estimated that employment will range from 0 to 3, 000.

Employment in the ordnance and accessories industry is expected to range from 11, 000 to 23, 000 in 1970. These projections do not take into account the possible location of sizeable new facilities in Colorado.

Other Manufacturing

This catch-all grouping of manufacturing industries includes instruments and related products (SIC 38), petroleum refining and related products (SIC 29) and miscellaneous manufacturing industries (SIC 39).

In past years, "Other manufacturing industries" accounted for about 5 percent of manufacturing employment. It seems reasonable to conclude that this relationship will hold to 1970, therefore, this group should employ from 4, 700 to 5, 700.

Conclusion to Manufacturing Discussion

Table 24 summarizes the discussion of manufacturing employment estimates in Colorado. Employment in 1970 should range from 96, 200 to 116, 200.

TABLE 24. SUMMARY OF COLORADO MANUFACTURING DISCUSSION

MANUFACTURING INDUSTRY GROUP	MAJOR AREAS OF UNCERTAINTY	PLUS (+) FACTORS	MINUS (-) FACTORS	OUTLOOK (ON BALANCE)	EMPLOYMENT 1950	1962	1970
Food and Kindred Products (SIC 20)	1. Weather (as it affects raw material supplies)	1. Increased acreage under irrigation 2. Agricultural output increasing 3. Local market development	1. Technological change reducing employment needs 2. Industry declining in employment nationally	Slight increase in employment (Substantial increase in output)	16,200	17,400	18,000
Textiles and Apparel (SIC's 22 and 23)	1. Development of market for western wear 2. Foreign competition	1. Western location — makes western wear specialty possible	1. Lack of skilled, low cost female labor pool 2. Excess productive capacity in the industry 3. Industry declining in employment nationally 4. Foreign competition 5. Long distance from major market and sources of raw material	Slight increase in employment (Expansion of present producers using a western motiff to merchandise apparel)	1,600	2,200	2,500
Furniture and Wood Products (SIC's 24 and 25)	1. Ability of local producers and entrepreneurs to develop wood products of a high value/pound 2. Possible local production of paper products	1. Colorado and regional markets are expanding 2. Imports into the state are substantial — thus opportunities for substitution of locally produced products	1. Lack of adequate raw materials. Local woods not generally suited to furniture production 2. No significant labor cost advantages in Colorado 3. Shipping costs high on low value/pound wood products	Slight increase in employment (Growth should come from local market development + new products of high enough value to profitably reach national markets)	2,900	2,800	3,500
Paper, Printing and Publishing (SIC's 26 and 27)	1. Rate of technological change in production methods	1. Dependence upon Colorado and regional markets which are expected to increase at better than average rates	1. Technological change	Considerable increase in employment	5,800	8,100	9,500
Chemicals and Allied Products (SIC 28)	1. Decisions of outside firms to locate facilities in Colorado 2. Rates of new product development and impact of new products on existing facilities	1. Industry growing rapidly in U. S. 2. Possibility of finding base materials locally 3. Colorado has advantages to high value/pound producer	1. Local industrial and consumer markets too small to support full scale chemical plant 2. Freight rates on raw materials and finished goods	Fair possibilities (One or two medium sized plants would double present employment — possible chance of this happening)	1,700	2,200	3,000
Rubber, Plastics and Leather Products (SIC's 30 and 31)	1. U. S. economic conditions 2. Technological change in products and production techniques	1. Ability to serve large market areas from Colorado 2. Increased sales volume expected by major producers	1. Rubber and Leather expected to decline nationally in employment 2. Rapid rates of technological change in production	Slight increase in employment (Increased volume expected should more than compensate for reductions due to negative factors)	5,700	6,000	6,500
Stone, Clay and Glass Products (SIC 32)	1. Construction activity in Colorado and surrounding areas	1. Industry heavily dependent upon local market growth 2. Raw materials are readily available 3. Local producers protected by freight rates 4. New products being developed	1. Competition from other building materials 2. Technological change may reduce production jobs	Substantial increase in employment. (Continued market growth and construction activity should result in a substantial gain)	2,800	5,400	7,000
Primary Metals (SIC 33)	1. U. S. economic conditions 2. Competition — foreign and new products	1. CF & I serves growing market areas	1. Encroachment into CF & I markets by foreign producers 2. Technological change in production techniques 3. Competition from other construction materials	Slight increase in employment (Increased sales can be handled with substantially the same labor force)	9,400	8,900	10,000
Ordnance & Accessories Fabricated Metal Products Machinery Electrical Machinery Transportation Equipment (SIC's 19, 34, 35, 36 and 37)	1. Government decisions (these industries heavily oriented to defense contracts) 2. Ability of existing firms to compete in national markets and maintain present employment levels 3. International tensions	1. These industries grew rapidly in 1950-60 period 2. Colorado is favorable location for high value/pound products 3. Strong market in DOD and NASA in years ahead	1. Local industrial markets relatively small, therefore producers limited to high value/pound products 2. Heavy dependence on one customer — U. S. Government	Substantial increase expected	7,900	32,800	31,500 - 50,500
Other Manufacturing (SIC's 29, 38 and 39)				Expected to grow in proportion to manufacturing industries combined	2,700	4,400	4,700 - 5,700
				Totals	56,700	90,800	96,200 - 116,200

CONSTRUCTION IN COLORADO

Three major methods were tried for estimating construction employment:

(1) Forecasted value of construction, divided by per man-hour output to arrive at total employment.

(2) Trend analysis of construction employment.

(3) Ratio analysis of construction employment as a percentage of total employment in Colorado.

After working with all three approaches it was decided that, because of the limited availability of data, the last approach was the most realistic and workable.

Figure 27 gives a considerable amount of data on construction employment in Colorado, the eleven Western states, and the U. S. According to one study, U. S. construction employment should increase in relative importance slightly between now and 1970.[21] Arthur D. Little, Inc., in its admittedly conservative study of the economies of the eleven Western states, has assumed that construction employment in these states will remain at about the same proportion of total employment as it was in 1960.[22] This seems conservative in view of (1) the upward U. S. trend, and (2) the relatively rapid growth predicted for the eleven Western states.

It is difficult to estimate construction employment in one state. The higher the rate of population growth in a state, the more important construction employment tends to be relative to total employment, other things being equal. Considering this and on the basis of U. S. and Western state trends, there is little basis for believing that construction employment in Colorado will be any less important proportionately than it was in 1960. In that year, slightly over 7 percent of all persons employed were in construction. Therefore, as a minimum estimate we conclude that construction employment should not drop below 7 percent of total employment by 1970.

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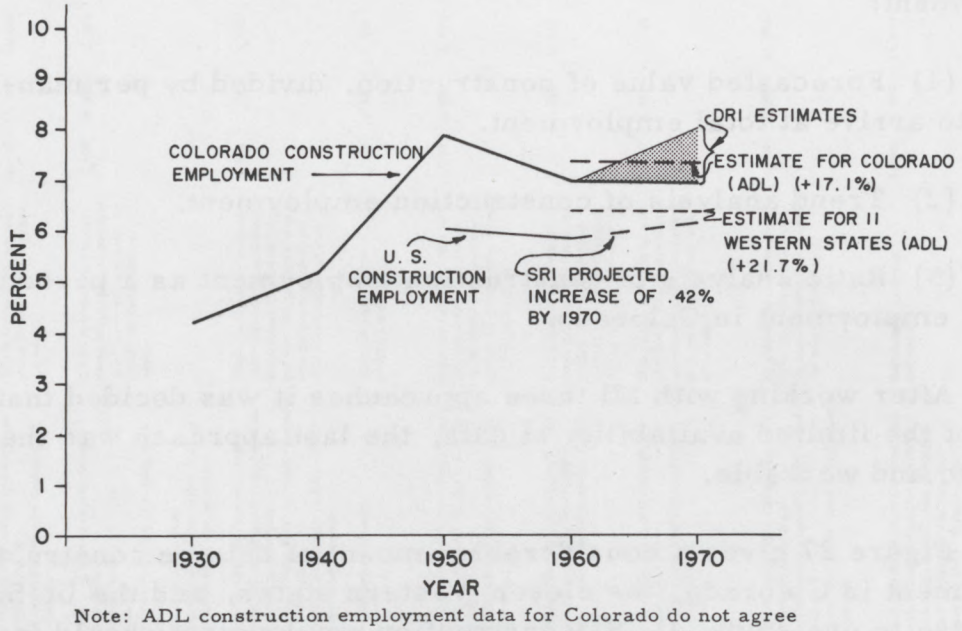
[21] Stanford Research Institute, Production Trends in the United States Through 1975, March, 1957.

[22] A. D. Little, op. cit.

FIGURE 27. CONSTRUCTION EMPLOYMENT AS A PERCENT OF TOTAL EMPLOYMENT, 1930 TO 1960, WITH PROJECTIONS TO 1970



Note: ADL construction employment data for Colorado do not agree with data used by the Denver Research Institute. However, the differences are not significant.

Source: Estimates for Colorado and the 11 western states are from a study prepared by Arthur D. Little, Inc., Future Economic Growth in the West and Prospects for Rail Freight, July 1961. Colorado employment data are contained in Appendix A. U. S. data on construction employment are from U. S. Department of Commerce, Bureau of the Census, 1960 Census of Population, General Social and Economic Characteristics, "U. S. Summary." Projections for the U. S. are based on data reported in Stanford Research Institute, Production Trends in the United States Through 1975, Menlo Park: Stanford Research Institute, March 1957.

On the more optimistic side, employment in construction could possibly reach 8 percent of the total labor force. This could be brought about in a number of ways. One factor of considerable importance should be the Interstate Highway program (scheduled for completion in 1972). Another factor which could cause construction employment to move upward in 1970 is the Frying Pan-Arkansas Project which is scheduled for completion in 1972. This heavy construction, coupled with continued activity in the commercial and residential construction field, generated by overall economic growth forces, could quite possibly push total employment in construction up to 8 percent of the work force by 1970.

Construction employment should range from 50,000 up to 69,400 in 1970.

TRANSPORTATION, COMMUNICATIONS AND UTILITIES

Employment in these industries in Colorado is expected to increase from 43,100 in 1962 to 46,800 by 1970. A discussion of the major factors influencing this forecast are contained in Table 25.

Major developments which occurred during the decade of the 1950's include a decline of 38 percent in rail employment. This was offset by an increase in employment in the motor freight industry. Employment in air transportation more than doubled. Employment in communications and utilities increased significantly with the extension of services and the increase in economic activity in Colorado and surrounding states. Figure 28 shows employment in this industry from 1947 to the present time.

In the paragraphs which follow, each subgroup within the transportation, communications, and utilities industry is discussed briefly.

Railroad Transportation

The railroad transportation industry is likely to see an improvement in its competitive position during the next ten years. Arthur D. Little, Inc., in its study of the railroad industry in the western United States (including Colorado), forecasts about a one-third increase between 1960 and 1970 in gross revenues of rail freight.[23] The ADL estimate may be conservative in that it does not allow for any improvement in the railroads' competitive position vis-a-vis the truck lines (ADL believes the railroad's competitive position will improve, but to keep its estimates conservative, it allowed for a continuation of past trends).

It is also possible that in the next decade the railroads will benefit from integration with other types of carriers, notably the truck lines. The introduction of "piggy backing" is one example of such integration.

Partially offsetting the increase in tonnage to be hauled will be a continuation of technological changes such as automation in freight yards and traffic control, and reduction in clerical staffs through improved systems and procedures.

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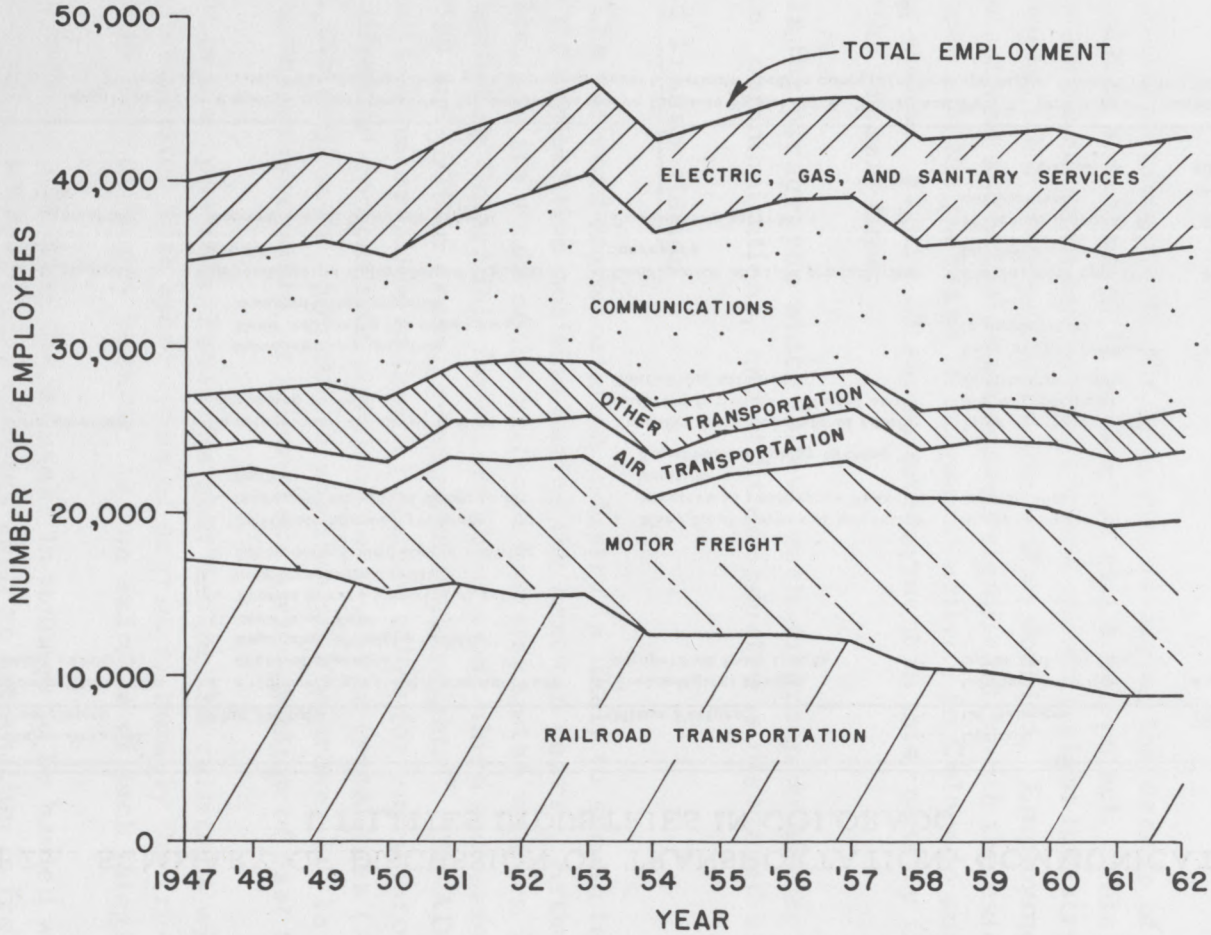
[23] A. D. Little, op, cit.

TABLE 25. SUMMARY OF DISCUSSION OF TRANSPORTATION, COMMUNICATIONS AND UTILITIES INDUSTRIES IN COLORADO

	Major Areas of Uncertainty	Plus Factors	Minus Factors	Outlook On Balance	Employment 1950	1962	1970
Railroad Transportation	Competition from other carriers	1. Evidence suggests RR may increase share of markets 2. Expansion of "piggy backing" 3. Growth of West 4. Trends toward lowering of rates thus increasing traffic 5. RR in better competitive position	Technological change, competition from trucks	Continued decline but at reduced rate	15,100	9,400	9,000
Motor Freight		1. Interstate highway program 2. Increased amount of cargo to be hauled	1. Many local owners of interstate carriers in precarious financial position 2. Expansion of "piggy backing"	Slight increase in employment	5,900	10,300	12,000
Air Transportation	Rate structures	Passenger and air cargo traffic increasing rapidly	Transfer from Colorado of administrative facilities of United and Continental airlines	Loss of employment due to United and Continental moves	2,000	4,500	3,500
Other Transportation (cabs, buses, pipelines)		1. Increases in population 2. Need increasing for urban mass transportation systems		Very slight increase in employment	4,100	2,100	2,300
Communications	Technological Change	Dependence on Colorado and regional growth	Continuation of rapid productivity increases	Employment expected to rise	8,600	10,100	12,000
Electrical, Gas, and Sanitary Services	Technological Change	Dependence on Colorado growth	Productivity increases	Moderate increase in employment	5,200	6,700	8,300
				TOTAL	40,900	43,100	46,800

Sources: This summary is largely based on a special report prepared for Denver Research Institute by Gerald T. Boyle, and Paul T. McElhiney "Transportation and Colorado," Summer, 1962. Supplemental information was obtained from past Denver Research Institute studies concerning transportation economics in Colorado.

FIGURE 28. COLORADO EMPLOYMENT IN TRANSPORTATION, COMMUNICATIONS, AND PUBLIC UTILITIES, 1947 TO 1962



Source: U. S. Department of Labor, Bureau of Labor Statistics, "Estimated Non-Agricultural Employment in Colorado," 1947 through April 1962, mimeo.

It appears that the railroads should not lose a significant amount of employment. Our projection for 1970, then, assumes that employment in railroad transportation will remain close to 1962 levels, or at about 9,000.

Motor Freight

Although the end may be in sight as far as the motor freight industry's penetration of the market (at the expense of the railroads), the increase in cargo to be transported should result in an increase in revenues and employment in this industry. The matter of technological change which has such a tremendous impact on other industries is not likely to be so important in this group. The completion of major sectors of the Interstate Highway program will reduce the travel time between major cities and may stimulate the development and manufacture of large vehicles. However, the net result of these developments by 1970 is not expected to effect a substantial shift in favor of motor freight.

On balance, it appears that the motor freight industry in Colorado should employ about 12,000 persons by 1970.

Air Transportation

The two major employers in this industry in Colorado are United Air Lines and Continental Airlines. These two firms accounted for about three-fourths of total employment in air transportation in 1960.

Unfortunately for Colorado, both of these firms have made decisions to reduce the size of their Colorado operations. The center of operations of United Air Lines, with the acquisition of Capitol Airlines, has shifted eastward and a decision has been made to move a sizeable portion of its Denver offices to Chicago. This move involves the transfer of more than 1,000 employees.

Continental Airlines recently announced the movement of its corporate headquarters to Los Angeles because of a shift in the company's major areas of business. About 350 persons are involved who formerly were headquartered in Denver.

The projected increases in air passenger and cargo activity to 1970 are not expected to generate sufficient employment opportunities to offset the loss of nearly 1,500 persons from the shifts by Continental and United. It is estimated that by 1970 air transportation will employ 3,500 persons, down 1,000 from 1962 levels.

Other Transportation

Included in this group are pipeline transportation, freight forwarding, arrangement of transportation, taxicabs and local and suburban transit. This group, as a whole, was reduced by 2,000 employees between 1950 and 1960. Because of increased population and business activity, the downward trend may be reversed. Our estimate for 1970 is employment of 2,300.

Communications and Utilities

These two industry groups are discussed together since they are both influenced by similar basic factors. The communications industry is dominated by the Mountain States Telephone and Telegraph Company with a small amount of employment in radio, TV, and in smaller telephone and telegraph firms. The dominant employer in utilities is the Public Service Company of Colorado.

Public Service Company forecasts a considerable increase in the 1970 electrical load expected by all utilities in Colorado. For example, PSC projects total maximum kilowatt demand in Colorado to increase from 1,023,000 in 1960 to 2,266,000 in 1970. It also expects the total number of electric customers in Colorado to increase from 602,158 in 1960 to 813,900 in 1970. The bulk of this increase in electrical energy will be supplied from large steam generating stations utilizing coal. In an earlier section on mining, it was mentioned that a slight increase in coal mine employment might be expected from the further development of strip mining to supply electric energy-generating stations.

R. D. Vaughan, Statistician for the Mountain States Telephone and Telegraph Company, predicts that employment in communications and utilities will increase 20.1 percent to 20,300 in 1970. These projections are based primarily on a continued favorable rate of economic growth in Colorado and on vertical penetration of the gas, electric, and telephone market via new product and service offerings. These gains in sales and revenues will be partially offset by continuation of the trend in productivity increases.

In summary, it is estimated that 1970 employment in the transportation, communications, and public utilities industries will be 46,800 persons.

FINANCE, INSURANCE, AND REAL ESTATE

This group of industries increased in both absolute and relative importance between 1950 and 1960. Employment rose from 16,942 in 1950 to 29,562 in 1960— a gain of over 12,000 or nearly 75 percent. Employment in this group accounted for 3.56 percent of total employment in 1950 and 4.72 percent in 1960. By 1970, it is estimated that these industries will employ from 4.75 to 5.25 percent of the total employment. Actual employment in 1970 should range from 34,000 to 45,595.

Degree of Basicness of Finance, Insurance, and Real Estate

A questionnaire concerning trade area and sales outside of Colorado was sent to many of Colorado's larger financial institutions and insurance companies. The results of the survey (see Appendix F) indicate that all of the larger financial institutions do some business outside the state's boundaries. The amounts are relatively small—usually less than 15 percent. Certain large insurance companies (All-State and State Farm Mutual, for example) either maintain or plan to establish regional offices in Colorado. Such regional offices do the bulk of their business (over 50 percent) outside the state. Although insurance agents and brokers and real estate firms were not included in the survey, it seems likely that most of their business is conducted within the boundaries of Colorado.

In another attempt to determine the degree of basicness of this industry, an analysis of the size of firm was carried out (see Table 26). It is obvious from looking at this table, that the bulk of the employment in this industry is in firms with fewer than 50 employees. If the larger firms in this industry do a small portion of their business outside the state, it seems logical to conclude that the smaller firms would do practically no business in areas other than Colorado.

It is concluded that finance, insurance, and real estate should behave, for the most part, as a following (or non-basic) industry. It is apparent that about 90 percent of the employment in this industry is engaged in local service type activities.

TABLE 26. SIZE DISTRIBUTION OF COLORADO FIRMS IN THE FINANCE, INSURANCE, AND REAL ESTATE INDUSTRIES

Industry Group	1959 Employment	Number of Reporting Units, by Employee-Size Class							
		0-3	4-7	8-19	20-49	50-99	100 to 249	250 to 499	500 or more
Banking	5,562	19	45	55	35	14	4	2	2
Credit Agencies Other Than Banks	2,982	209	113	65	20	8	1	-	-
Security and Commodity Brokers and Services	776	64	17	16	5	2	1	-	-
Insurance Carriers	6,628	122	70	72	44	20	8	3	-
Insurance Agents and Brokers	1,920	366	87	36	8	3	-	-	-
Real Estate	4,805	1,164	143	76	26	11	-	-	-
Miscellaneous	1,984+	293	66	29	10	2	4	-	-
TOTAL	24,823	2,237	541	349	148	60	18	5	2

Source: U. S. Department of Commerce and U. S. Department of Health, Education, and Welfare, County Business Patterns, First Quarter 1959, Part 9, "Mountain States", Washington: U. S. Government Printing Office, 1961, pp. 28-29.

Proportion of 1970 Employment in Finance, Insurance, and Real Estate

Shown below are the proportions of employment in this industry in Colorado and the United States.

Year	Colorado	United States[24]
1930	2.98	3.80
1940	3.34	3.82
1950	3.56	3.90
1960	4.72	4.32
1970	4.75 to 5.25	4.26

Until 1960, Colorado had a relatively lower proportion of its employment in finance, insurance, and real estate. By 1960, however, the Colorado proportion had increased to .4 of one percentage point above the U. S. average. This was due to the increased importance of Denver as a financial center for the Rocky Mountain Region, and because the rate of population growth in the state substantially exceeded that of the nation and hence tended to increase per capita expenditures in this category.

In view of Colorado's expected growth, and its position as a regional financial and insurance center, it seems reasonable to assume that the state will continue to maintain a slightly larger than proportionate share of employment in these fields. Therefore, Colorado employment in this industry should range from 4.75 percent to 5.25 percent of total employment in 1970. This represents employment levels of from 34,000 to 45,600.

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[24] Stanford Research Institute, op. cit.

WHOLESALE AND RETAIL TRADE IN COLORADO

Retail and wholesale trade is proportionately more important in Colorado than in the U. S. In Colorado in 1960, 20.4 percent of all employment was in retail and wholesale trade. This compared with 18.2 percent of U. S. employment in this industry. Colorado's higher proportion is probably due to two important factors: (1) its position as a wholesale and retailing center for surrounding states, and (2) the impact of tourism.

To better understand Colorado's position as a trade and distribution center (Part I describes Colorado's development as a trade center) a questionnaire was prepared and sent to over 160 firms in the wholesale trade industry. This questionnaire asked the firms to describe their primary trade area and to indicate what proportion of their business was carried out in Colorado. The trade areas as described by the firms which responded are reported in Appendix F of this report. As far as the proportion of business done outside of Colorado, the median (or most common) estimate is 25 percent. Conversely, 75 percent of the business of the firms surveyed is carried out within the state.

It is believed that the survey was biased towards the larger, nationally known firms who would be more likely to distribute their goods outside the state. Therefore, the estimate of 25 percent of these firms' sales going outside of Colorado could be slightly high.

It is impossible to measure the impact of tourism on the retail trade sector of Colorado's economy. However, an analysis of the individual items contained in the general category of retail trade (see Table 27) indicates that tourism has a significant impact on only two or, at the most, three of the categories. These three categories are eating and drinking places, automobile dealers and gas stations, and other retail trade.

In making a forecast of retail and wholesale trade in Colorado to the year 1970, employment was divided into two parts, each of which

TABLE 27. EMPLOYMENT IN WHOLESALE AND RETAIL TRADE IN COLORADO, 1947 - 1961

Industry Subgroup	Employment (in Thousands)															
	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Wholesale Trade	21.1	23.6	23.4	23.0	25.8	25.5	28.0	29.0	28.7	29.3	30.1	29.0	31.3	32.1	31.7	32.5
Retail Trade	60.3	62.5	62.4	65.5	69.3	73.9	75.3	74.1	78.6	82.0	81.8	79.0	85.0	89.7	88.9	91.4
Department Stores & Mail Order Houses	9.3	8.7	8.6	8.3	8.6	8.6	8.5	8.6	8.1	8.0	8.6	8.0	9.2	10.1	9.7	9.8
General Merchandise	7.2	7.5	8.2	8.5	8.0	9.5	8.6	8.8	9.3	9.3	10.0	9.0	9.6	10.4	10.2	10.3
Food Stores	7.2	7.5	7.6	8.3	9.4	9.8	9.4	10.1	11.8	12.3	12.3	11.8	12.6	13.3	14.0	15.1
Automotive Dealers & Gas Stations	8.7	10.0	10.5	11.3	11.8	12.6	13.1	12.7	13.2	14.2	14.3	14.9	14.8	15.4	14.8	14.8
Eating & Drinking	13.4	12.9	11.7	12.1	13.7	14.7	15.6	16.1	16.4	16.8	16.5	16.6	18.3	19.2	18.8	19.6
Other Retail Trade	14.5	15.9	15.8	17.0	15.7	18.8	20.0	18.3	19.9	20.8	19.7	18.7	20.5	21.3	21.4	21.8

Note: The data above are not used in other parts of this study because they are not as complete as Census data. However, the breakdown between retail and wholesale trade, and the subgroups under retail trade are of interest in analysis of the relative importance of each retail trade subgroup.

Source: U. S. Department of Labor, Bureau of Labor Statistics "Estimated Nonagricultural Employment in Colorado," mimeo, various years

was treated separately.[25] The first part was the 13,800 person surplus which may be accounted for by tourism and by wholesale trade outside Colorado. This employment can be considered basic in nature, and therefore independent of general employment levels in Colorado. The remainder of the wholesale and retail trade category (which amounts to 90 percent of the industry) was forecast using a ratio approach. In other words, an attempt was made to estimate the proportion of Colorado employment that will be in the non-basic side of wholesale and retail trade in 1970.

Estimates of Employment in the Basic Sectors of Trade

Although reliable data on tourism are limited, available evidence indicates increasing activity. Appendix E discusses trends in tourism and travel. The Forest Service, for example, anticipates a considerable increase in recreational visits to forest lands by 1976. Appendix E also contains historical data on skier visits and national park visits which show a steep upward trend. On the basis of favorable past trends and equally favorable expectations (notwithstanding the lack of reliable data) it seems reasonable to conclude that employment in wholesale and retail trade resulting from tourism will increase substantially by 1970.

It is easy to be optimistic concerning the future of that sector of wholesale trade which serves areas outside the boundaries of Colorado. Arthur D. Little, Inc., estimates that the populations of Wyoming, Colorado, and New Mexico (a common trade area served by many Colorado firms) will increase from 3,035,000 in 1960 to 3,682,000 in 1970.[26]

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[25] Walter Isard, in his book, Methods of Regional Analysis: an Introduction to Regional Science, John Wiley & Sons, Inc., New York, 1960, pp. 195-196, discusses the problems of treating industries which are "mixed" — that is, those having both basic and service components. Isard mentions that many studies have attempted to separate the basic and service components through the use of a "location quotient" which is similar to the ratio method used in parts of this study. We recognize the limitations of this method, and where possible, have attempted to combine the ratio approach to identifying basic income with additional analyses. For example, in the case of wholesale and retail trade, firms in the wholesaling industry were surveyed to determine the proportion of their business originating outside Colorado.

[26] A. D. Little, Inc., op. cit.

Total income in these three states is expected to increase from $6,511 million in 1960 to $10,304 million in 1970.[26] Expanding the trade area served from Colorado (and many firms do serve an area much larger than Wyoming, Colorado and New Mexico — see Appendix F) to include Montana, Idaho, Wyoming, Utah, Colorado, and New Mexico, ADL projected a population increase from 5,267,600 in 1960 to 6,283,000 in 1970, and expected income levels within this six-state region to increase from $10,823 million in 1960 to $16,577 million in 1970.

It is estimated that the so-called surplus jobs in wholesale and retail trade will increase from 13,800 in 1960 to from 16,000 to 20,000 in 1970. This is a rough estimate, based on favorable expectations for both the tourist industry and for Colorado's distribution firms serving out-of-state areas.

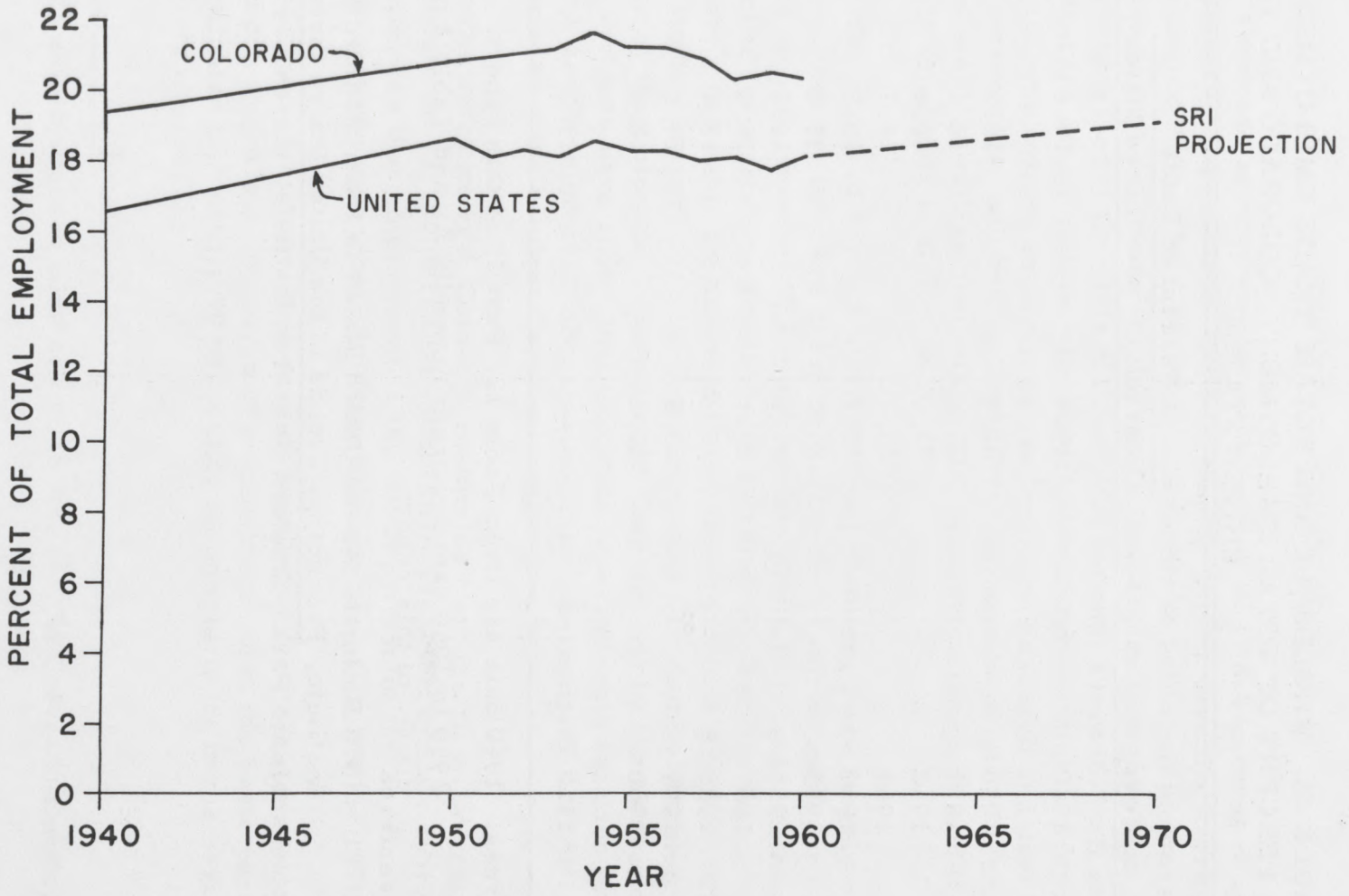
Employment in the Non-Basic Portion of Trade

Figure 29 shows that over the past 20 years Colorado employment in trade as a percent of total employment has followed about the same pattern as in the United States. In the period 1950 to 1960 trade declined somewhat in relative importance in both Colorado and the United States. However, it is expected to be slightly more important in 1970 than it was in 1960 (see Figure 29 and Table 28).

Since Colorado trade employment has followed the national pattern over the past twenty years it seems reasonable to assume that it will continue to do so in the period to 1970. Therefore, we estimate that employment in the non-basic portion of trade will increase in importance by one-half of one percent — from 18.7 percent to 19.2 percent of total employment.

When the basic and non-basic portions are combined it is expected that employment in wholesale and retail trade will range from 153,200 to 186,620 in 1970.

FIGURE 29. TRENDS IN PROPORTION OF EMPLOYMENT IN WHOLESALE AND RETAIL TRADE, 1940 TO 1960, WITH PROJECTIONS TO 1970



Source: See Table 28 which follows.

TABLE 28. WHOLESALE AND RETAIL TRADE EMPLOYMENT AS A PERCENT OF TOTAL EMPLOYMENT, COLORADO AND THE UNITED STATES

Year	Percent of Total	
	Colorado	United States
1940	19.4	16.6
1950	20.9	18.7
1951	21.0	18.1
1952	21.0	18.4
1953	21.2	18.1
1954	21.7	18.6
1955	21.2	18.3
1956	21.3	18.3
1957	21.0	18.0
1958	20.2	18.1
1959	20.5	17.8
1960	20.4	18.2
1970 Estimated	—	19.2

Sources: 1940 data are from Table 12, Part I, of this report.

1950 to 1960 data are from Appendix A, and Table 2 of Appendix G, of this report.

1970 Estimate for the United States is from Stanford Research Institute, Production Trends in the United States through 1975, Menlo Park: Stanford Research Institute, March, 1957.

SERVICES IN COLORADO

Colorado service employment in 1960 was 16.4 percent of total employment (see Table 29). This is slightly higher than the average for the United States (14.3 percent). In terms of actual employment, Colorado has 13,100 more employees in the service category than would be expected if the state followed the national average.[27] It seems likely that the major reason why Colorado maintains a higher proportion of its employment in services are tourism, research and development laboratories, and college and university employment. Portions of all of these activities are included in the service category and they are quite important in Colorado.

The group of service activities just mentioned are largely basic in nature; that is, they are not necessarily the result of local population and income growth. The future of this group is bright. Although no specific forecasts are available, it is relatively certain that tourism will exert a favorable influence in the years ahead (see Appendix E). Three studies prepared for the Resources and Community Development Division of the Colorado Department of Employment by the Denver Research Institute have shown that Colorado is a favorable location for research and development laboratories, medical research activities, and administrative headquarters and regional offices.[28]

The extra margin Colorado maintains over the U. S. average (2.1 percent or 13,100 persons) should increase substantially by 1970. It is estimated that employment in the basic portion of the services industry should range from 16,000 to a maximum of 20,000 by 1970.

The non-basic or local service portion of the "services industry" is far more important, in terms of employment, than the basic portion. It is estimated that nearly 90 percent of the employment in the services industry is non-basic.

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[27] Extra employment in Services = (16.4%-14.3%) Colorado Employment
= 2.1 % × 626,769
= 13,100 employees in 1960

[28] Denver Research Institute, An Analysis of Colorado as a Location for Industry, op. cit.

TABLE 29. SERVICE EMPLOYMENT AS A PERCENT OF TOTAL EMPLOYMENT, COLORADO AND THE UNITED STATES

Year	Percent of Total	
	Colorado	United States
1950	14.3	12.6
1951	14.9	12.2
1952	14.8	12.4
1953	14.5	12.3
1954	15.0	12.8
1955	14.9	13.1
1956	14.9	13.3
1957	15.4	13.5
1958	15.8	14.1
1959	15.7	14.1
1960	16.4	14.3
1970 Estimated		14.3

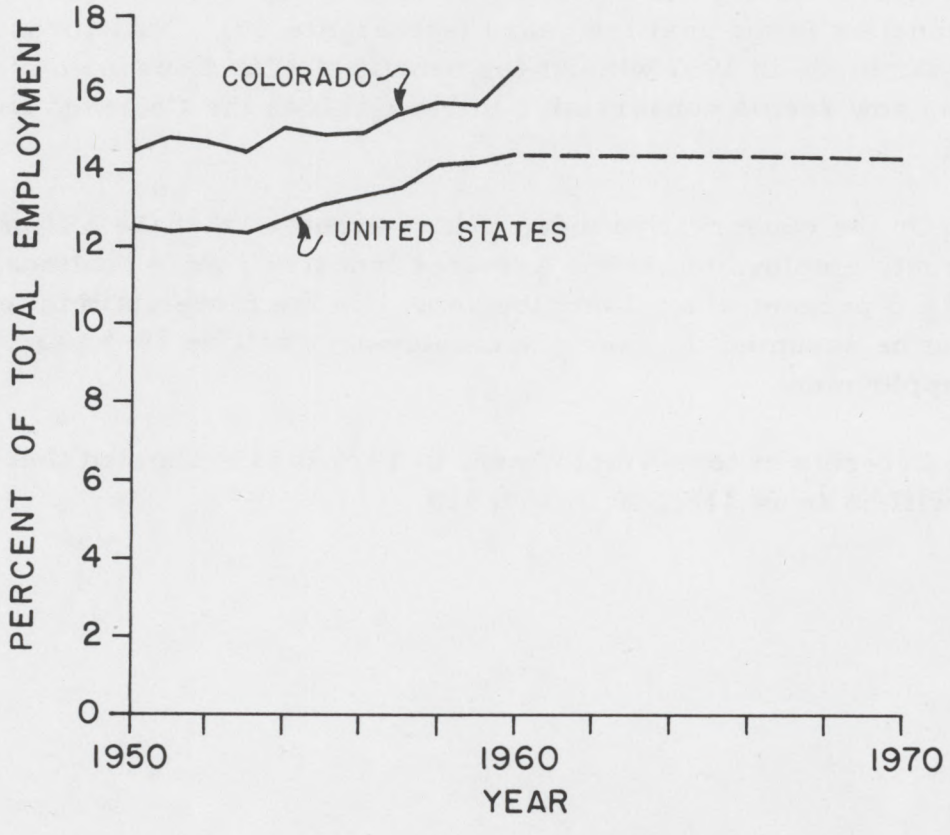
Sources: 1940 data are from Table 12, Part I of this report. 1950 to 1960 data are from Appendix A and Table 2 of Appendix G, this report. 1970 Estimate for the United States is from Stanford Research Institute, Production Trends in the United States through 1975, Menlo Park: Stanford Research Institute, March, 1957.

During the decade of the fifties the services industry increased in relative importance in both Colorado and the United States (see Table 29 and Figure 30). Stanford Research Institute, in its studies of production trends in the United States, has estimated that employment in the services industry (as a percent of total U. S. employment) will remain constant in the next ten years (see Figure 30). This forecast, which was made in 1957 without the benefit of 1960 Census employment figures, now seems conservative in view of both the Colorado and U. S. trends.

On the conservative side, if it is assumed that the SRI projection is correct, employment in the services industry should continue to be about 14.3 percent of total employment. On the more optimistic side, it might be assumed that service employment will be 15.5 percent of total employment.

In terms of total employment in 1970 it is estimated that the range will be from 118,300 to 154,510.

FIGURE 30. TRENDS IN PROPORTION OF EMPLOYMENT IN SERVICES, 1940 TO 1960, WITH PROJECTIONS TO 1970



Source: See Table 29 which follows.

GOVERNMENT IN COLORADO

Federal employment of civilians in Colorado amounted to about 1.2 percent of total Federal employment in the United States in 1950. This proportion rose to 1.5 percent by 1955 and has stayed at about that level since then. During the early 1950's, the Air Force Finance Center was manned and the work force at the Pueblo Ordnance Depot was built up substantially. During the latter part of the decade, Federal civilian employment in Colorado increased at about the same rate it did throughout the nation. This later, slower growth covers the period in which the Air Force Academy and the National Bureau of Standards Laboratory were established.

Armed services uniformed personnel in Colorado increased from approximately 15,000 in 1950 to about 28,000 in 1960. This was a generally constant 1.1 percent of total United States service personnel in those years. The Colorado military personnel figure was up to an estimated 45,000 by the end of 1962, amounting to 1.8 percent of the U. S. total. No forecast is attempted for the number of these personnel stationed in Colorado in the future, since total force levels and local military assignments and manning are subject to wide change.

It may be assumed that Federal employment will continue to increase at the rate of 500 to 1,000 per year, which has been the trend in recent years. However, about 40 percent of the Federal employees in Colorado work for the Army and Air Force (see Table 30) so any substantial change in military force levels would probably affect this sector of employment.

State employment in Colorado started to rise in the mid-1950's, and has continued to do so (see Table 31). Much of this growth has resulted from build-up of the state's hospitals and institutions, and needs for these and for state-supported higher education will probably continue to grow throughout the 1960's. Such expansion would indicate an increase of 500 to 1,000 full-time employees per year.

About three-fourths of the growth in local government employment during the 1950's was in elementary and secondary education. Substantial growth in school employment can be expected for several more years. The children of parents presently living in Colorado will boost the school population another 27 percent during the next ten years, and a continuation of the recent in-migration trend will add yet another

TABLE 30. FEDERAL CIVILIAN EMPLOYMENT IN COLORADO, 1960, BY AGENCY

Agency	Number of Employees
Total	33,909
Legislative Branch	
General Accounting Office	201
Government Printing Office	34
Judicial Branch	58
Executive Branch	
Office of Civil and Defense Mobilization	74
Department of Agriculture	1,864
Department of Commerce	1,340
Department of Health, Education & Welfare	406
Department of Interior	3,821
Department of Justice	302
Department of Labor	51
Post Office Department	6,238
State Department	2
Treasury Department	757
Department of Defense	
Army	6,220
Navy	3
Air Force	7,779
Atomic Energy Commission	233
Civil Aeronautics Board	3
Civil Service Commission	91
Federal Aviation Agency	587
Federal Communications Commission	5
Federal Deposit Insurance Corporation	4
Federal Home Loan Bank Board	8
Federal Medication and Conciliation Service	3
General Services Administration	886
Housing and Home Finance Agency	75
Interstate Commerce Commission	27
National Labor Relations Board	18
National Medication Board	1
Railroad Retirement Board	10
Securities Exchange Commission	32
Selective Service System	79
Small Business Administration	53
Veterans Administration	2,644

Source: U. S. Senate, "Additional Report of the Joint Committee on Reduction of Nonessential Federal Expenditures, Federal Civilian Employment by County," 87th Congress, 1st Session.

TABLE 31. DISTRIBUTION OF GOVERNMENT EMPLOYMENT IN COLORADO - ALL EMPLOYEES, FULL AND PART TIME

Year	Federal	State	Local	Education (includes State and Local Employees)
1950	24,900	12,000	34,600	23,700
1951		11,900		
1952		12,200		
1953	33,800	12,700	35,700	22,300
1954				
1955	32,600	15,100	39,300	22,500[1]
1956				
1957		16,700	45,000	
1958	34,800	18,400	48,100	26,700[1]
1959				
1960	33,900	21,000	57,100	
1961	35,400	22,000	55,800	32,700[1]

Note: [1] Full-time equivalent employees.

Source: U. S. Department of Commerce, Bureau of the Census, State Distribution of Public Employment, series for various years.

15 percent to school population. Even assuming limited labor-saving effects from school district consolidation and improvements in educational technology, employment in the schools will probably continue increasing. Municipal and county government and service requirements also appear to be growing. Therefore, local government employment is estimated to continue rising at a rate of 1,000 to 1,500 people a year, barring a major change in population migration patterns.

A combination of these components of government employment (civilian) gives an estimate of an average annual increase of 2,000 to 3,500 during the rest of the decade.

OTHER INDUSTRIES IN COLORADO

The employment category "other" (includes all nonclassifiable employment) included 21,182 persons in 1960, representing 3.38 percent of the total employment in Colorado.

This category has been increasing in relative importance over the past decade (from 1.50 percent in 1950 to 3.38 percent in 1960). Looking to the year 1970, it is assumed on the conservative side that the "other" category will account for about the same proportion of employment as in 1960 — about 3.4 percent. On the more optimistic side, it is assumed that the "other" group could employ as many as 4 percent of the total work force in 1970.

COLORADO EMPLOYMENT PROJECTIONS—1970

Thus far, 1970 projections of employment in Colorado by industry group have been presented and discussed. When all of the individual forecasts are drawn together, the final result indicates that employment in Colorado will range from 715,000 (up 14 percent over 1960) to 867,800 (up 38 percent). A breakdown of these total employment estimates is shown on Table 32.

It is interesting to compare the results of the preceding analysis with the recent forecasts made by the two organizations to which reference has already been made—Arthur D. Little, Inc., and the National Planning Association. Figure 31 compares the results of the three studies.

FIGURE 31. COMPARISON OF EMPLOYMENT PROJECTIONS

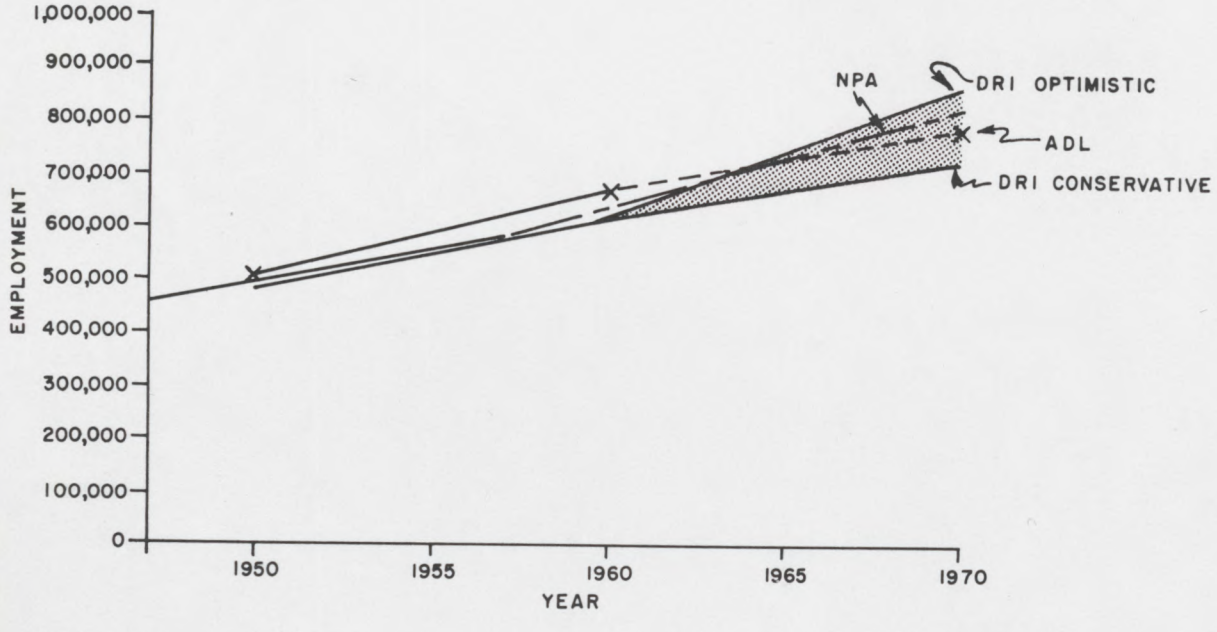


TABLE 32. ESTIMATES OF CIVILIAN EMPLOYMENT IN COLORADO IN 1970

Industry Group	Conservative Estimate			Optimistic Estimate			Most Probable Estimate
	Actual	Proportional	Total	Actual	Proportional	Total	
Agriculture	41,400	-	41,400	47,900	-	47,900	44,000
Mining	14,000	-	14,000	17,000	-	17,000	15,000
Manufacturing	96,200	-	96,200	116,200	-	116,200	110,000
Construction	-	7.0%	50,000	-	8.0%	69,425	60,000
Transportation Communications and Public Utilities	46,800	-	46,800	46,800	-	46,800	46,800
Finance, Insurance, and Real Estate	-	4.75	34,000	-	5.25	45,595	40,000
Trade	16,000	19.2	153,200	20,000	19.2	186,620	170,000
Services	16,000	14.3	118,300	20,000	15.5	154,510	140,000
Government	137,100	-	137,100	149,100	-	149,100	143,000
Other	-	3.4	24,000	-	4.0	34,710	30,000
Totals	367,500	48.65%	715,000	417,000	51.95%	867,800	798,800

Note: Total Employment (E_T) = Actual Employment (E_A) + Proportional Employment (E_p) × Total Employment (E_T)

$$= \frac{(E_A)}{1-(E_p)}$$

(1) Conservative $E_T = \frac{367,500}{1-.4865} = 715,000$

(2) Optimistic $E_T = \frac{417,000}{1-.5195} = 867,800$

In the opinion of the Research Director of the National Planning Association, economic studies of individual states tend to underestimate employment and population. The NPA approach is to first make an estimate of economic activity in the United States, and then break it down or allocate it state by state. This approach, according to NPA, tends to produce results which are a little more optimistic than one mormally finds from state or regional studies.

Arthur D. Little, Inc., in its study of the economy of the Western United States, has taken an admittedly conservative approach. The report states quite emphatically that nothing is foreseen in the near future which will replace the aerospace industries in stimulating the growth of the Western United States, particularly California. ADL's assumptions concerning the U. S. economy are very similar to those used by Denver Research Institute in this study.

Turning to the employment estimates discussed here, it is improtant to consider the meaning of the conservative, optimistic, and most probable projections.

The conservative estimate assumes that Colorado will lose employment in ordnance and accessories—an important component of the state's manufacturing sector. This estimate also takes into account a considerable reduction in farm employment—down to 41,400 from the 57,620 of 1960. The conservative estimate does not anticipate any significant change in mining employment, nor does it expect any increase in the relative importance of services—an important non-basic industry.

The optimistic estimate is based on increased employment in all sectors of Colorado's economy except agriculture, where the expected reduction is very slight. This estimate assumes increased employment in the defense oriented, high value manufacturing industries. It anticipates increases in the relative importance of services, construction and finance, insurance and real estate. This estimate allows for added government employment at the rate of 3,500 per year.

The most probable estimate represents our opinion of where, within the fairly broad range between the conservative and optimistic estimates, Colorado employment is most likely to be in 1970. Selection of the most probable estimate for the individual categories was done on a judgment basis, supported by knowledge gained in the course of working with the data for each industry.

COLORADO POPULATION PROJECTIONS — 1970

A decision was made early in the course of this study to place major reliance upon employment data as the primary measure of economic activity, as brought out in the Introduction to Part II. Employment estimates, along with estimates of the labor participation rate (discussed throughout Part I and in later paragraphs) provided the basis for the population estimates shown below:

	Projected Employment	Projected Labor Participation Rate	Estimated 1970 Population
Conservative	715,000	35.5%	2,010,000
Most likely	798,800	35.5	2,250,000
Optimistic	867,800	35.5	2,440,000

There are, of course, other methods for estimating population. One of these is the Cohort Survival Method which gives detailed consideration to birth, death and migration rates. It is used by the Bureau of the Census in making its estimates. Other methods include trend projections or the use of ratios; however, these methods do not take advantage of the detailed economic data developed in this analysis and were used only as background checks.

Population Estimates from other Sources

Table 33 was constructed for the purpose of comparing the Denver Research Institute estimates with those made by other groups.

TABLE 33. COLORADO POPULATION FORECASTS, 1970

Projected Population	Source and Remarks
2,010,000	DRI conservative estimate
2,250,000	DRI most probable estimate
2,444,000	DRI optimistic estimate
2,179,000	Bureau of the Census, Series II-2[1]
2,347,000	Bureau of the Census, Series II-1[1]
2,113,800	Arthur D. Little, Inc.
2,184,000 - 2,300,000	Colorado State Planning Commission
2,270,000	National Planning Association

Note: [1] Bureau of the Census estimates of population were prepared for U. S. Congress, Senate, Select Committee on National Water Resources, Water Resource Activities in the United States — Population Projections and Economic Assumptions, Washington: U. S. Government Printing Office, March, 1960, p. 29.

Labor Participation Rate*— 1970

The labor participation rate in 1970 for Colorado and the United States is expected to decline due to continuation of the downward trend in proportion to the percentage of people in the age group 16-64. Approximately 90 percent of this age group is in the labor force. Data concerning the proportion of population in this age grouping and its expected decline (percentage-wise) for the U. S. and the Mountain region are shown in Table 34.

* Whenever the term "labor participation rate" is used in this study, it refers to the proportion of the population actually employed. Employment is slightly less than labor force since labor force includes unemployed and armed forces in addition to employment.

TABLE 34. PROPORTION OF AGE GROUP 16 TO 64 IN TOTAL POPULATION

Year	1940	1950	1960	1976
U. S.	66.3%	63.6%	58.1%	56.4%
Mountain	64.3	60.9	55.7	54.3

Source: National Planning Association, Regional Projections for the States for the Years 1976 and 2000, Washington D. C., 1961.

On the basis of this trend, our historical analysis (Part I), and a study prepared by Robert O. Vaughan,[29] it is estimated that the labor participation rate in Colorado will decline slightly — down .5 percent to 35.5. It was 36.0 percent in 1960.

It is important to note that a small change in the labor participation rate can have a major influence on 1970 population estimates. For example, if the 1970 labor participation rate is 33.3 percent instead of 35.5 percent, population should reach 2,396,000 instead of 2,250,000. (Both population estimates are based on the Denver Research Institute most likely estimate of 798,800 employees.)

Population Distribution

According to the 1960 Census, Colorado's three standard metropolitan areas had a population of 1,191,832 — or 68 percent of the state's total population. In 1950, the metropolitan areas had 776,839 — about 59 percent of the total.[30]

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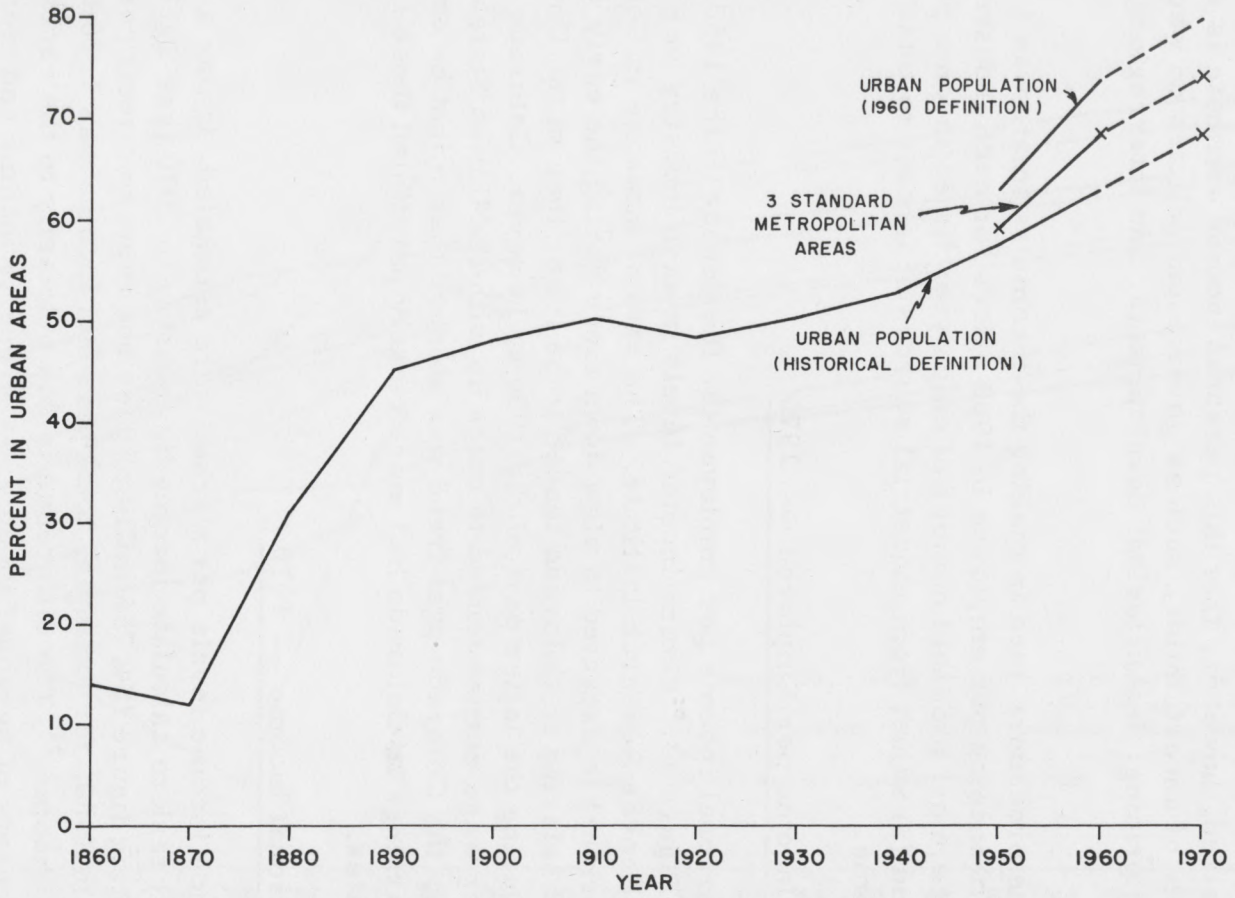
[29] Robert O. Vaughan, Denver Metropolitan Area — Economic and Social Profile, prepared for the Task Group on Post High School Education in Denver Metropolitan Area, 1962. Vaughan expects the labor participation rate in DMA to decline from 38.0 percent in 1960 to 37.6 percent in 1970. The expected decline in the overall labor participation rate in the DMA is cushioned by the expected increase in female labor participation in the 16-64 age group. In our opinion, Colorado as a whole will be less affected by an increase in female participation.

[30] U. S. Department of Commerce, Bureau of the Census, 1960 Census of Population, "Number of Inhabitants, Colorado," Final Report PC(1)-7A.

Following the national pattern, the Colorado trend is definitely toward a greater concentration of the population in urban and metropolitan areas (see Figure 32). With the expected decline in agricultural employment and the leveling off of mining employment, this trend is expected to continue. By 1970, it is estimated that 68 percent of Colorado's population will be in urbanized areas, and 74 percent will reside within the three standard metropolitan areas (see Figure 32).

The distribution of population in Colorado in 1920, 1930, 1940, 1950 and 1960 is shown in Figures 1 through 5, Appendix G. The past shifts in population away from rural areas into metropolitan areas is evident when the figures are compared.

FIGURE 32. TRENDS IN THE PROPORTION OF COLORADO'S POPULATION IN URBAN AND METROPOLITAN AREAS, 1860 TO 1960, WITH PROJECTIONS TO 1970



Note: An urbanized area contains at least one city of 50,000 population or more, as well as the surrounding closely settled incorporated and unincorporated places. In Colorado, there are three urbanized areas — Denver, Colorado Springs and Pueblo.

Source: U. S. Department of Commerce, Bureau of the Census, 1960 Census of Population, Number of Inhabitants, "Colorado," Final Report PC(1) - 7A.

COLORADO INCOME PROJECTIONS — 1970

Personal income in Colorado in 1970 is expected to be $6.1 billion (up 48 percent over 1960 levels) in terms of 1960 dollars. It should be emphasized, however, that this personal income estimate is subject to a variety of uncertainties, such as government policies on wages, taxing and pricing, technological developments, and interregional competition.

The procedure used in making the income estimate was to: (1) estimate 1970 income per employee in 1960 prices for each industry, (2) multiply the most probable number of employees times income per employee, and (3) adjust from industrial sources of income to total personal income.

Personal Income per Employee — 1970

Personal income per employee for the decade of the 1950's is shown on Figure 33. Future income levels in each industry were estimated by Denver Research Institute. The rate of increase in Colorado (in 1960 prices) is expected to slow down since during the early 1950's wages and salaries in Colorado tended to be lower than in the United States. During the latter part of the 1950's, however, Colorado average income per wage earner tended to catch up with the United States average. Therefore, the Colorado past trend was steeper than might be expected if wage earnings in Colorado had more closely paralleled those in the United States.

Total Personal Income — 1970

Once income levels per worker were estimated, it was a relatively easy task to calculate income by industry in 1970 (see Table 35). The resulting figure ($4,756 million) does not represent total personal income. In 1960, for example, total personal income was 1.28 times industrial income.[31] The difference is due primarily to the exclusion of two components of personal income — property income and transfer payments.

If the same relationship holds in 1970 (it has been relatively constant during the past five years), total personal income in Colorado should be $6,100 million (1.28 × $4,756 million).

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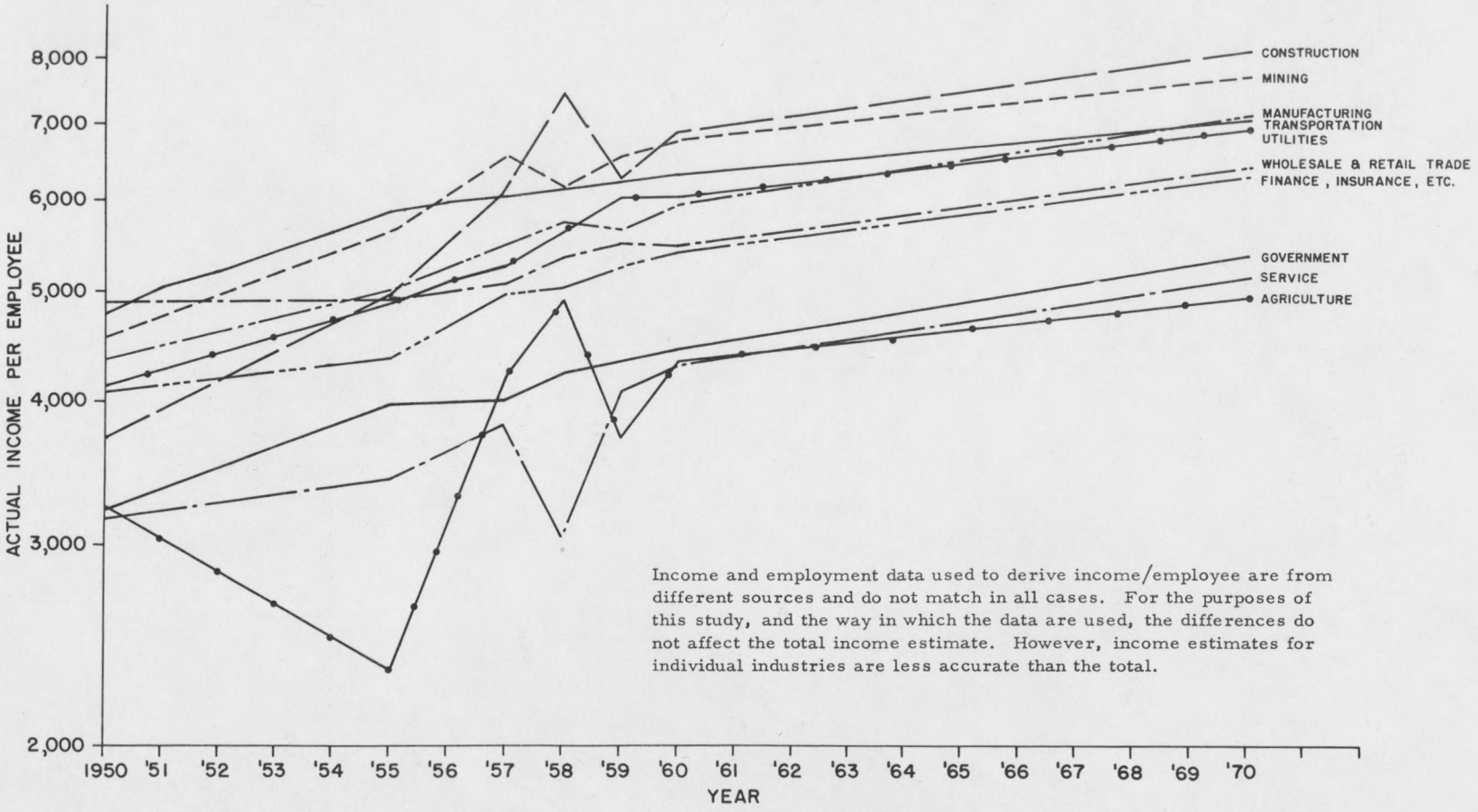
[31] Survey of Current Business, August, 1961.

FIGURE 33. TRENDS IN INCOME PER EMPLOYEE FOR VARIOUS INDUSTRIES, 1950 TO 1960, WITH PROJECTIONS TO 1970



Sources: 1950 to 1960 data are from Table 3, Appendix G. Projections are described in text of report.

TABLE 35. INDUSTRIAL SOURCES OF INCOME IN COLORADO, 1970

Industry Group	Most Probable Employment in 1970	Estimated Income per Employee, 1970	Industrial Income, 1970
Agriculture	44,000	$4,900	$216,000,000
Mining	15,000	7,700	115,000,000
Manufacturing	110,000	7,100	782,000,000
Construction	60,000	8,100	486,000,000
Transportation, Communication & Utilities	46,800	7,000	328,000,000
Finance, Insurance and Real Estate	40,000	6,300	252,000,000
Trade	170,000	6,400	1,090,000,000
Services	140,000	5,100	715,000,000
Government	143,000	5,400	772,000,000
Other	30,000	—	—
TOTAL	798,800		$4,756,000,000

Sources: Employment estimates are from Table 32.
Estimated income per employee in 1970 is from Figure 33.

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APPENDIX A. TECHNICAL NOTE ON EMPLOYMENT DATA

In accomplishing a study such as this, where primary reliance is placed on employment data, it is necessary to evaluate the many sources of employment information and then select the one or combination which is the most useful. The absence of consistent and comparable historical data series poses difficult problems for historical analyses going back more than twenty years.

The first part of this technical note deals with the construction of the historical employment series - from 1870 to 1940. The second part deals with the selection of employment statistics for the years 1950 through 1962.

Part 1. Historical Employment Series

The only agency which collected employment information in the 1880's and the first half of the twentieth century was the Bureau of the Census. The Census employment counts were taken every 10 years (in actuality, the time ranged from 9-3/4 to 10-1/4 years).[1]

There are several major problems which arise in interpreting and using the Census employment figures. One evolves around what was called the "gainful worker" concept. In the years prior to 1940, the Census counted a worker as anyone who stated he or she had an occupation; therefore, unemployed persons were counted as workers. Another problem which arose from this concept was that a person might actually be working in an occupation other than the one stated to the Census taker. For example, in the early years of Colorado, many individuals considered themselves miners even though they were working in restaurants or other service type occupations.

The difference in age coverage makes it difficult to interpret early employment statistics. Between 1870 and 1930, all workers 10 years and over were included in the labor force.[2] In the years since that time, only those workers 14 years and over have been counted.[3]

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[1] Harvey S. Perloff, et al., op. cit., p. 612.

[2] Everett S. Lee, et al., op. cit., p. 364

[3] Ibid.

Difficulty is also experienced when attempting to develop an historical employment series because the classification of workers by industry has changed. The present system of Standard Industrial Classifications did not come into use until the 1950's. To construct a consistent employment series, it was necessary to rearrange the historical employment statistics to agree with the present standard industrial classifications. Fortunately, there is a very comprehensive book available which suggests how to make these changes.[4]

Two terms need defining before proceeding. "Occupational" employment data refers to information collected in the home, from individuals concerning their occupation (bricklayer, machinist, carpenter, etc.). A second type of employment data, termed "establishment" data, are collected at the point of employment—a factory, office, or store, for examples.

For the past 100 years, the U. S. Bureau of the Census has collected both occupational and establishment data. The decennial census of population has always been taken at the home and therefore yields occupational data. On the other hand, the Census of Manufactures is taken at the point of work and contains establishment data.

Reconciliation of Historical Employment Data

Table 1 illustrates some of the differences which occur in employment data, depending upon the source of these data. The final employment figures used by the Denver Research Institute in this study are also included on this table for comparative purposes. It can be seen from the comparisons that the major differences are in the manufacturing grouping. Total employment figures are the same in all cases.

U. S. Census. The paragraphs following discuss each of the five sources of employment data and reasons why they were excluded or included in the Denver Research Institute series.

Historical U. S. Census reports provide the basic information used in all of the employment statistics presented in Table 1. Census definitions, however, have changed over time. Therefore, the major problem in using Census data for a study of this type is that employment breakdowns between industrial groups are not comparable from decade to decade.

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[4] Ibid.

APPENDIX A

Table 1. Comparisons of Employment Data from Various Sources for Selected Years, 1880, 1900 and 1920

Industry Group	1880 (I) U. S.[1] Census	1880 (II) Perloff[4]	1880 (III) Miller[5] & Brainerd	1880 (IV) Garnsey[6]	1880 (V) DRI[7]	1900 (I) U. S.[2] Census	1900 (II) Perloff	1900 (III) Miller[5] & Brainerd	1900 (IV) Garnsey[6]	1900 (V) DRI[7]	1920 (I) U. S.[3] Census	1920 (II) Perloff[4]	1920 (III) Miller[5] & Brainerd	1920 (IV) Garnsey[6]	1920 (V) DRI[7]
Agriculture	13,539	16,336	15,600	—	16,336	44,904	49,457	48,700	—	49,457	100,158	100,153	—	—	100,153
Mining	28,970	34,675	32,600	29,900	34,675	28,347	34,936	36,500	30,200	34,936	23,382	23,382	—	23,400	23,382
Manufacturing	18,438	19,526	7,300	15,300	4,393	42,423	47,318	20,200	36,500	20,007	73,924	74,168	—	58,300	35,673
All Other	40,304	30,714	45,800	—	45,847	102,589	86,552	110,900	—	113,863	168,998	168,754	—	—	207,249
Construction			9,900					13,800							
Transportation, Communications & Public Utilities	15,491		8,700			47,105		21,500			32,210				
Trade											45,730				
Finance, Insurance & Real Estate			14,500					35,300							
Services	24,813		12,600												
Government						55,484		40,800			64,965				
Miscellaneous											26,093				
Total Employment	101,251	101,251	101,300	—	101,251	218,263	218,263	218,300	—	218,263	366,457	366,457	—	—	366,457

Sources:
[1] 10th U. S. Census of Population, "Persons Engaged in each Selected Occupation, etc., Colorado," Table XXXIV, p. 812.
[2] 12th U. S. Census of Population, "Total Persons 10 Years of age and over Engaged in Each Specified Occupation (in detail), Classified by Sex, by States, and Territories," Table 93, pp. 510-519.
[3] 14th U. S. Census of Population, "Occupations," Vol. IV.
[4] Perloff, et al., Regions, Resources and Economic Growth, Washington, D. C.: Resources of the Future, Inc., 1960, pp. 622-635.
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[6] Garnsey, America's New Frontier, the Mountain West, 1950, p. 309 (DRI calculations based on Garnsey's data).
[7] Denver Research Institute as described in text of Technical Note.

Perloff. In his book entitled Regions, Resources and Economic Growth, Perloff found it necessary to adjust Census data to make it useful for his analysis.[5] Here, Perloff is primarily concerned with resource-oriented industries such as agriculture and mining. In these two industries he was particularly careful in his use of employment data. He did not correct manufacturing employment data since manufacturing was not considered a resource-oriented industry.

Perloff used two major sources in making his adjustments of agriculture and mining statistics. In the case of agriculture he relied on studies produced by Brainerd and Miller, and on a special study done for the Bureau of the Census by A. M. Edwards.[6,7] Edwards' corrections cover the years 1870 to 1940 and basically retabulate certain occupational data in terms of 1940 industrial classifications. These corrections cover national totals only, but Perloff converted these corrections into state-by-state corrections.[8]

Although Perloff was not concerned with adjustments to manufacturing data, he did use Census of Manufactures' data corrected with Edwards' adjustment, which produced a manufacturing figure slightly higher than that reported by the Census. Edwards' adjustment was applied to occupational data only.

Miller and Brainerd. The information presented in the third column of Table 1 represents Miller and Brainerd's adjusted data for Colorado of "occupational" Census information. (The same, book, in a later section written by Easterlin, suggests a technique which was used by the Denver Research Institute to adjust "establishment" manufacturing data to make it more comparable from decade to decade.)

The basic purpose of the Miller and Brainerd adjustment to Census data was to ensure or achieve maximum possible comparability

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[5] Perloff, op. cit., p. 612.

[6] C. P. Brainerd, Agricultural and Non-Agricultural Workers by States, 1870 - 1950 mimeo; and A. R. Miller, Statistics on the Labor Force by Sex and Age, 1870 - 1950 mimeo.

[7] 16th U. S. Census, 1940, Population, "Comparative Occupation Statistics for the United States, 1870 to 1940," by A. M. Edwards, Washington: Government Printing Office, 1943.

[8] Perloff, op. cit., p. 613 - 614.

over a long time span. Their major problem in making these adjustments was to estimate industrial affiliation from occupational affiliation. Detailed discussion of the procedure used in making these adjustments are on pages 390-409 of their book. It is noted in looking at Table 1, Column 3 that the major adjustment was in manufacturing. In 1880, for example, Miller and Brainerd's manufacturing employment totals were less than half of those reported in the Census or Perloff series, since many persons who would now be considered in the construction or mechanical trades industries were counted as being in manufacturing in the early days. Miller and Brainerd reclassified these people in the manufacturing sector and assigned some of them to the other sectors in line with our present industrial classification system.

Garnsey. Column 4 of Table 1 presents mining and manufacturing employment statistics used by Morris Garnsey in his book entitled, America's New Frontier, The Mountain West, published in 1950. Garnsey did not rely heavily on employment data in carrying out his study, and used data directly from the Census.

Denver Research Institute. Column 5 presents the employment statistics actually used in this study. In the case of agriculture, mining and total employment, we relied on Perloff's data. Perloff went to considerable effort, through the use of Edwards' correction, to construct reliable employment figures in the resource industries—agriculture and mining. Miller and Brainerd's estimates correspond quite closely to those of Perloff. However, Miller and Brainerd did not calculate employment by decades. Their information is available only for the years 1880, 1900 and 1940. Perloff, on the other hand, calculated employment every ten years.

In manufacturing, it was necessary to construct an employment series which would give a breakdown of activity within manufacturing as explained in the subheading below.

The final Denver Research Institute employment series (1870 to 1940) is attached as Table 2. The data for construction, transportation, and other industries for 1930 and 1940 are from Census reports and are not adjusted.

Construction of the Manufacturing Employment Series

The Denver Research Institute manufacturing employment series is based upon "establishment" data. Establishment data, it will be recalled, are obtained at the place of employment, not in the home. The

APPENDIX A

Table 2. Employment and Labor Force in Colorado, 1870-1940

Industry Group	1870	1880	1890	1900	1910	1920	1930	1940
Agriculture	7,353	16,336	43,552	49,457	85,704	100,153	104,413	73,911
Mining	2,478	34,675 (20,500)	24,195	34,936 (20,519)	28,376	23,382 (16,790)	20,702	15,897
Manufacturing	937	4,393	12,729	20,007	29,581	35,673	34,266	32,687
All Other	6,815	45,847	111,467	113,863	195,063	207,249	231,721	224,040
Construction							16,661	18,034
Transportation							30,297	20,730
Communications & Public Utilities							5,971	8,857
Wholesale & Retail Trade							55,525	67,201
Finance, Insurance & Real Estate							11,614	11,555
Services							75,530	54,982
Government							15,307	36,480
Other							20,816	6,201
Total Employed	17,583	101,251	191,943	218,263	338,724	366,457	391,102	346,535
Unemployed								71,758
Armed Forces								3,200
Total Labor Force	17,583	101,251	191,943	218,263	338,724	366,457	391,102	421,493

Note: The mining employment data shown in parentheses were used in certain income comparisons in Part I. No mining income data were available which corresponds to the higher employment figures.

Source: See explanation contained in text of Technical Note.

establishment data presented in the Decennial Census of Manufactures have certain inconsistencies which need to be adjusted to produce a continuous series tying into the present-day employment series. No single definition of manufacturing has prevailed in the Census throughout the period of this study, but fortunately Richard A. Easterlin developed a technique for adjusting Census establishment data for Census-to-Census consistency.[9]

The Easterlin corrections of manufacturing data are of three general types. The first corrects for the inclusion in manufacturing in the 1880's of such activities as carpentry, masonry, painting, paper hanging, plastering, stucco work, and other types of construction work. Easterlin suggested removing these activities from manufacturing in order to make the manufacturing series consistent with today's definition.

Easterlin's second correction deals with the fact that, in the 1880's and earlier, much manufacturing was done in the home in the form of handicrafts. An effort was made as early as 1849 to exclude small handicrafts by omitting from the Census any firm which produced $500 or less in value each year. In 1919 the minimum was raised to $5,000. This step eliminated many bakeries, blacksmith shops, boots and shoes (custom and repair shops) and clothing repair shops, as well as many handicraft operations. During this period, the Census made an effort to limit its counts to what it called "factories." By its definition, "The essential difference between factories and neighborhood establishments seems to be that the products of factories are distributed beyond the narrow limits of the communities in which they are located, while the products of neighborhood establishments are consumed by local patrons."[10] This is termed "production for the general market." This concept, combined with the minimum dollar limit, excluded many previously counted firms.

The third Easterlin correction relates to industries covered intermittently during the period 1870 to 1940. This included auto repairing, railroad car maintenance, illuminating and heating gas, motion pictures, and others.

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[9] Lee, et al., op. cit., pp. 635 - 701.

[10] Lee, et al., op. cit., p. 641.

For the purposes of this study, we were interested in more than total manufacturing employment figures back through the years. We needed to develop a series which would show the industry groups (food and kindred products, metal working, etc.) within the manufacturing sector. By going through the original Census reports, making the Easterlin correction, and then labeling each type of activity in accordance with the present Standard Industrial Classification system, it was possible to produce a series for manufacturing from 1870 to the present. This complete manufacturing series is presented in Table 3.

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Table 3. Colorado Employment in Manufacturing, 1870 to 1940

Industry Group	1870		1880		1890		1900		1910		1920		1930		1940	
	Employment	% of Total	Employment	% of Total	Employment	% of Total	Employment	% of Total	Employment	% of Total	Employment	% of Total	Employment	% of Total	Employment	% of Total
Food & Kindred Products	138	14.7	663	15.1	1,854	14.5	3,189	15.9	5,397	18.2	9,585	26.9	8,010	23.4	11,675	35.7
Textiles & Apparel	121	12.9	258	5.9	409	3.2	196	1.0	—	—	631	1.8	851	2.5	967	3.0
Lumber & Wood Products including Furniture	209	22.3	1,215	27.7	2,477	19.5	1,674	8.4	3,005	12.8	1,979	5.5	1,781	5.2	2,020	6.2
Paper, Printing & Publishing	57	6.1	235	5.4	1,522	12.0	2,448	12.2	3,775	12.8	3,732	10.5	3,864	11.3	3,261	10.0
Chemicals & Related Products	—	—	111	2.5	65	0.5	125	0.6	72	0.2	421	1.2	291	0.8	1,383	4.1
Leather & Leather Products including rubber	40	4.3	160	3.6	209	1.6	344	1.7	363	1.2	370	1.0	115	0.3	2,954	9.0
Stone, Clay & Glass Products	176	18.8	921	21.0	2,683	21.1	1,560	7.8	1,795	6.1	1,220	3.4	1,487	4.3	1,635	5.0
Metal Products	158	16.9	826	18.8	1,867	14.7	8,715	43.5	7,826	26.5	8,753	24.5	7,602	22.2	8,293	25.9
Miscellaneous Manufacturing & manufacturing N. E. C.	38	4.0	4	—	1,643	12.9	1,756	8.9	7,348	24.8	8,982	25.2	10,265	30.0	529	1.6
Total	937	100.0	4,393	100.0	12,729	100.0	20,007	100.0	29,581	100.0	35,673	100.0	34,266	100.0	32,687	100.0

Sources: 1870 to 1940 data are derived from Census of Manufacturers, various years, as explained in text of this Technical Note.

Part 2. Derivation of Current Employment Series

As we have seen, historical employment statistics are difficult to analyze because of changes in definition, coverage, etc.; however, current employment statistics also have limitations. The historical employment problem was simplified somewhat by the fact that there was only one source of employment information—the U. S. Bureau of the Census. At the present time there are at least five groups which report, in varying degrees of completeness, employment data for the State of Colorado. These five sources and the data reported by them in April of 1960, or the nearest date, are shown on Table 4.

A look at Table 4 reveals considerable variations in employment data for the same month of a given year. For examples: agricultural employment as reported by various sources varies from 48,000 to almost 85,000; manufacturing from 82,000 to almost 99,000; and construction from 27,000 up to 44,000. Services vary more than any other industry—from 52,000 to 117,000. Government employment also varies depending on the source.

As far as total employment is concerned, the Bureau of the Census is the only source which does not have major gaps or omissions in its data. While we have reservations, as far as this study is concerned, about the Bureau of the Census breakdown of employment among industrial categories, there is little doubt that Census of Population employment counts are the most complete and consistent. Therefore, the Denver Research Institute total employment figure is the same as that reported in the 1960 Census of Population.

In agriculture, the Census of Population total of 48,660 persons appeared to be best suited for the purposes of this analysis. This Census figure is considerably lower than that reported by the U. S. Census of Agriculture and the Colorado Department of Employment. The Census of Agriculture was taken in the fall of 1959 and includes all farm workers 10 years and older. (The Census of Population figure includes only those 14 years and over and who worked at least 15 hours during the week preceding the Census count.) In Colorado, agriculture employment in the fall is always considerably higher than it is in April. April, as a matter of fact, is the lowest month in agricultural employment. Therefore, the April Census of Population figure should approximate permanent agricultural employment in Colorado.

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Table 4. Current Employment Data for Colorado as Reported by Various Sources

Industry Group	County Business Patterns (March, 1959)[1]	U. S. Census of Agriculture (Fall, 1959)[2]	U. S. Bureau of Labor Statistics (April, 1960)[3]	U. S. Bureau of the Census (April, 1960)[4]	Colorado Department of Employment (April, 1960)[5]	Denver Research Institute (April, 1960)[6]
Agriculture	—	62,707	—	48,660	84,900	48,660
Mining	14,084	—	15,200	14,250	14,614	14,250
Manufacturing	81,155	—	84,600	98,887	81,960	84,600
Construction	29,515	—	31,600	44,179	27,644	44,179
Transportation	16,069	—	26,600	29,726	32,989	26,600
Communications & Public Utilities	15,358	—	17,100	20,222		17,100
Wholesale & Retail Trade	113,560	—	121,800	127,900	109,296	127,900
Finance, Insurance & Real Estate	24,823	—	24,900	29,562	20,544	29,562
Services	60,810	—	74,700	117,718	52,842	103,036
Government	—	—	109,700	74,483	—	109,700
Other	2,589	—	—	21,182	—	21,182
Total Employment				626,769		626,769

Sources: [1] U. S. Department of Commerce and U. S. Department of Health, Education and Welfare, County Business Patterns, First Quarter, 1959, (1961), pp. 24-30.

[2] U. S. Department of Commerce, Bureau of the Census, U. S. Census of Agriculture, 1959, "Colorado," Pt. 41, Vol. I, (June 1961), p. 8.

[3] U. S. Department of Labor, Bureau of Labor Statistics, "Estimated Nonagricultural Employment in Colorado for 1960," revised May 1961, mimeo.

[4] U. S. Department of Commerce, Bureau of the Census, U. S. Census of Population, 1960, "Colorado, General Social and Economic Characteristics," Final Report PC(1)-7C, pp. 7-114.

[5] State of Colorado Department of Employment, Statistical Abstract, November 1960.

[6] Explanation contained in text of Technical Note.

For certain projections made in Part II, it was necessary to have data on both full-time and part-time agricultural employment. The Colorado Department of Employment keeps very detailed records of seasonal employment and it estimated there were 8,800 full-time equivalents in 1960. This means that in Colorado in 1960, there were the equivalent of 57,460 persons whose primary occupation was agriculture (48,660 + 8,800).

The mining industry appears to have caused less trouble for those gathering employment statistics. In Table 4, mining employment statistics from the five sources are relatively close. We decided to use the U. S. Bureau of the Census for historical mining employment data. Thus, the historical series could be tied into the current employment statistics without any distortions or change in concept since they are based on occupational (as compared to establishment) data. By using the Census of Population, we are continuing to use occupational data.

In manufacturing it was decided to use the U. S. Bureau of Labor Statistics information. BLS data for manufacturing are quite complete, except that self-employed are not counted. However, this omission has a negligible effect upon the completeness of manufacturing employment data.

Another advantage is that BLS has a complete annual series going back to 1947 of manufacturing employment by two-digit SIC industry groups. Detailed manufacturing data were not available from any other source on a year-by-year basis over the past 15 years. A final factor in favor of using BLS employment data for manufacturing is that they fit the pattern of our historical employment series, i.e., they are establishment data.

Table 4 shows that Census of Population employment in manufacturing is almost 99,000, as compared to figures ranging around 82,000 to 84,000 from the other sources. Census data, however, include those persons who work directly for the Federal government but are engaged in manufacturing type activities. For example, certain persons working in the Pueblo Ordnance Depot are counted in Census manufacturing data.

Construction employment does not receive adequate coverage from the U. S. Bureau of Labor Statistics, from the County Business Patterns or the Colorado Department of Employment. The Census of Population appears to have the most complete count, and hence was used in this analysis.

Construction employment is characterized by many small subcontractors and individuals working on their own. These people are not counted by BLS or the other sources. It was feared early in the preparation of this report that persons on government payrolls but working in the construction field might cause some distortion in Census construction employment figures. However, it was determined that there was an insignificant number of people, working in construction, being carried directly on government payrolls. In the case of the missile site construction which was proceeding at the time of the 1960 Census, all of the employees were paid by a private firm—not directly by the Federal government. In the case of reclamation and highway projects, construction employees are also paid by private companies.

In the transportation field, BLS data appear to be the most complete and useful for the purposes of this study. BLS omissions of self-employed do not appear to be significant in this particular industry. County Business Patterns omits persons covered by the Railway Retirement Act, so its figures for transportation are incomplete. The U. S. Bureau of the Census includes persons on direct government payrolls working in transportation industries.

In the communications and public utilities industries, it was again decided to use BLS statistics, since BLS has excellent coverage of firms in these industries. Census figures are again higher than BLS figures because certain individuals working directly for the Federal government are included.

In the wholesale and retail trade industries, the Census of Population appears to have the most complete coverage, so its figures were used. BLS data are incomplete because proprietors and self-employed, which are an important factor in this industry, are not included. Colorado Department of Employment figures are even lower than those of BLS since it does not include firms with fewer than four employees. The Census figures are not affected to any appreciable extent by the inclusion of government workers since there are very few in this category.

In the finance, insurance, and real estate industries, Census statistics were used. Again, BLS and the Colorado Department of Employment do not take a complete count. These industries, particularly the real estate and insurance sectors, have many self-employed individuals which are omitted by both the BLS and the Department of Employment. Again, government employment does not appear to be a major factor.

Government employment, as reported by the Bureau of Labor Statistics, appears to be reliable. BLS' coverage of all types of government units is extensive. The Bureau of the Census government employment figure is low because many persons on direct government payrolls, as previously discussed, are counted in other industries, such as manufacturing, transportation, and communications.

Services is probably the most difficult industry in which to get an accurate count of employment. Services are characterized by large numbers of self-employed individuals, many of whom do not work full time or for one employer. BLS and the Colorado Department of Employment figures for the services industry considerably understate employment in this field. The Census count, on the other hand, contains individuals who are on the direct payroll of the Federal government and should not be counted in the services industry.

Since total employment as counted by the U. S. Bureau of the Census is considered to be quite reliable, it was possible to estimate employment in services by a residual technique. Since we were satisfied with the degree of accuracy of the employment figures for all industries except services, we were able to obtain a services employment figure by subtracting from total employment all employment in the other industries. The result of this technique, 103,036 persons, appears to be realistic.

The U. S. Bureau of the Census counted 21,182 in the "other" nonclassifiable employment category. Since nothing is known about these individuals and their occupations, they were included as "other" employment in the Denver Research Institute estimates.

The Employment Series - 1950 to 1960

Employment for 1950 was estimated using the same technique just described for deriving the Denver Research Institute 1960 employment estimates. Employment in the intervening years between 1950 and 1960 (see Table 5) was estimated using two techniques.

Agricultural employment for the years 1950 to 1962 was estimated for the Denver Research Institute by the Colorado Department of Employment. The Department of Employment utilized an Agricultural Marketing Service publication which presents data on the fluctuations of farm employment in Colorado. Since the AMS employment figures are

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Table 5. Total Civilian Employment in Colorado by Major Industry Groups in April 1950-1962

Industry Group	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Agriculture	72,419	63,574	59,854	58,271	58,471	61,132	55,391	48,264	45,298	49,514	48,660	47,000	42,900
Mining	10,275	10,300	12,100	12,000	11,300	14,500	15,100	15,500	14,400	14,300	14,250	13,300	13,100
Manufacturing	56,700	65,100	67,300	68,600	64,700	67,100	70,200	73,100	70,500	80,400	84,600	88,500	90,800
Food & Kindred Products	16,200	16,900	17,600	17,100	16,900	16,200	16,300	16,100	15,500	16,400	17,200	16,800	17,400
Textiles & Apparel	2,700	3,800	4,500	4,800	3,700	4,100	4,200	3,500	3,100	3,500	3,500	3,600	3,600
Lumber & Wood Products	2,900	3,500	3,400	3,500	2,900	3,200	2,900	2,600	2,400	3,100	3,000	2,800	2,800
Paper, Printing & Publishing	5,800	6,400	6,700	7,000	7,000	7,300	7,400	7,700	6,700	7,100	7,600	7,800	8,100
Chemicals & Related Products	1,700	2,100	2,400	2,500	2,600	2,400	2,400	2,300	2,000	2,200	2,200	2,300	2,200
Leather, Rubber & Related Products	4,600	5,700	5,100	5,400	5,100	5,200	5,100	4,900	4,900	5,500	5,400	5,200	5,200
Stone, Clay & Glass	2,800	3,600	3,000	2,900	3,300	3,700	3,800	3,900	4,200	4,600	4,900	4,600	5,400
Metal Products	17,300	20,100	21,800	22,100	20,100	21,700	24,700	28,600	27,800	33,700	36,500	41,200	41,700
Miscellaneous Manufacturing & Manufacturing N.E.C.	2,700	3,000	2,800	3,300	3,100	3,300	3,400	3,500	3,900	4,300	4,300	4,200	4,400
Construction	38,080	41,100	43,700	45,000	38,800	41,700	48,200	45,300	38,600	45,300	44,179	46,400	45,200
Transportation	27,100	29,000	29,300	29,200	26,300	27,300	28,300	28,700	26,100	26,800	26,600	25,700	26,300
Communications & Public Utilities	13,800	14,400	15,400	17,200	16,300	16,600	17,100	16,900	16,600	16,600	17,100	16,900	16,800
Wholesale & Retail Trade Wholesale —	19,348										24,781		
	(99,783)	106,500	110,300	113,800	113,500	117,000	121,300	120,800	115,500	123,200	(127,900)	121,200	127,600
Retail —	80,435										103,110		
Finance, Insurance, & Real Estate	16,942	18,400	19,600	21,000	21,500	23,200	25,200	26,200	27,400	28,800	29,562	30,200	31,200
Services	67,991	75,700	77,500	77,500	78,700	82,300	85,000	88,700	90,400	94,500	103,036	105,600	111,000
Government	66,300	74,800	80,300	82,200	81,600	85,300	89,100	95,900	98,200	102,100	109,700	115,800	121,100
Other	7,148	8,551	9,954	11,357	12,760	14,163	15,566	16,969	18,372	19,775	21,182	22,585	23,988
TOTAL CIVILIAN EMPLOYMENT	476,538	507,425	525,308	536,128	523,931	550,295	570,557	576,333	571,370	601,289	626,769	633,185	649,988

Source: Explained in the text of Technical Note on Employment Data.

based on a small sample, they are not reliable as a representation of total employment. However, Colorado Department of Employment personnel believe the AMS series is useful to show fluctuations in employment in agriculture from year to year. Using the AMS fluctuations and tying them to the bench-mark years of 1950 and 1960, it was possible for the Department of Employment to construct an agricultural employment series for use in this study.

In the case of manufacturing, transportation, communication, and public utilities and government, it was possible to use BLS employment statistics directly. However, in the mining, construction, wholesale and retail trade, finance, insurance, real estate, services, and other employment groups it was necessary to use the BLS statistics as indicators of fluctuations, similar to the use of the AMS agricultural employment statistics. In other words, the years 1950 and 1960 served as a bench-mark for the intervening years and BLS employment information served as the basis for calculations from 1951 - 1959 and 1961 - 1962. The ratios shown on Table 6 were used to adjust BLS data for use in the Denver Research Institute employment series.

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Table 6. Adjustments to BLS data

Year	Mining	Construction	Retail & Wholesale Trade	Finance Insurance & Real Estate	Services
1950	1.02	1.74	1.13	1.17	1.48
1951	1.01	1.74	1.12	1.17	1.47
1952	1.00	1.65	1.11	1.17	1.46
1953	.99	1.65	1.10	1.17	1.45
1954	.98	1.57	1.10	1.17	1.44
1955	.98	1.57	1.09	1.18	1.43
1956	.97	1.57	1.09	1.18	1.41
1957	.96	1.49	1.08	1.18	1.40
1958	.95	1.49	1.07	1.18	1.39
1959	.94	1.40	1.06	1.18	1.38
1960	.93	1.40	1.05	1.18	1.37
1961	.92	1.40	1.04	1.18	1.36
1962	.91	1.40	1.03	1.18	1.35

Sources: U. S. Department of Labor, Bureau of Labor Statistics, "Estimated Nonagricultural Employment in Colorado for 1950-1962", Revised May, 1961, mimeo; and U. S. Department of Commerce, Bureau of the Census, U. S. Census of Population, 1960, Colorado, "General Social and Economic Characteristics," p. 7 - 114.

APPENDIX B

Table 1. Cash Farm Income from Sales (in Millions of Current Dollars)

Year	Total	Livestock[1]	Grain[2]	Potatoes	Sugar Beets	Fruits and Vegetables	Dairy Products	All Others[3]	Miscellaneous
1945	$341,952	$138,028	$ 52,499	$18,136	$20,226	$42,581	$22,452	$35,200	$12,830
1946	386,759	174,286	58,666	17,513	19,566	36,733	26,218	39,202	14,575
1947	502,336	201,445	108,396	21,118	28,220	58,672	30,767	37,834	15,884
1948	568,254	255,444	135,794	30,525	13,262	46,010	31,112	41,961	14,146
1949	511,607	234,859	103,692	21,782	19,286	35,577	27,740	40,713	27,958
1950	501,800	272,303	77,059	18,840	23,367	27,068	27,605	37,278	18,280
1951	573,600	330,718	73,903	17,477	23,756	30,290	31,094	45,621	20,741
1952	607,600	319,866	98,984	27,143	23,211	39,588	33,205	42,897	22,706
1953	476,700	221,829	93,657	15,438	23,400	37,798	32,969	36,692	14,917
1954	443,400	231,607	58,893	12,299	18,591	35,472	31,907	36,860	17,771
1955	403,900	213,571	38,140	16,081	17,415	33,331	32,582	34,465	18,315
1956	426,700	230,676	39,494	16,527	22,206	31,632	32,173	35,830	18,162
1957	455,100	236,081	57,034	12,401	27,826	34,303	33,435	34,272	19,748
1958	602,600	324,724	96,874	15,807	34,574	36,023	32,780	37,420	24,398
1959	597,300	337,549	91,313	12,339	29,000	36,469	32,828	35,130	22,672
1960	638,700	340,060	113,516	20,766	34,043	37,333	33,597	38,531	20,854
1961	636,500	—	—	—	—	—	—	—	—

[1] Includes cattle and calves, hogs, sheep and lambs, and wool.
[2] Includes wheat, rye, oats and barley.
[3] Includes corn, hay, chickens, eggs and turkeys.

Source: Colorado Department of Agriculture, Colorado Agricultural Statistics, various years.

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Table 2. Statistics on Cattle and Calves, 1924-1961

Year	Cash Receipts from Farm Marketings			Quantity of Cattle Produced					Source of Colorado Production Produced			
				Live Weight		Head						
	Colo. ($000)	U.S. ($000)	Colo. ÷ U.S.	Colorado (000#)	U.S. (000#)	Colo. (000)	U.S. (000)	Colo. ÷ U.S.	in Feed-lots (Head)	Produced on Range (Head)	Total (Head)	Feedlot ÷ Total
1924	$ 31,560	$1,114,530	.0283									
1929	46,430	1,493,180	.0311									
1934	23,250	813,700	.0286		20,350,326							
1939	39,750	1,291,010	.0308	524,875	17,384,805	699	28,456	.024				
1944	79,930	2,608,070	.0306	697,450	23,117,075	928	37,950	.024				
1949	182,870	4,842,070	.0378	842,340	23,593,141	1,006	35,532	.028				
1954	191,380	5,092,010	.0376	1,090,800	31,428,450	1,363	46,136	.030				
1955	179,780	5,172,300	.0348	1,032,255	33,216,016	1,249	46,871	.027				
1956	194,710	5,348,700	.0364	1,147,185	35,450,215	1,363	49,732	.027	552,000	781,000	1,363,000	42.7
1957	197,930	5,964,800	.0332	1,005,195	34,146,611	1,183	47,899	.025	568,000	615,000	1,183,000	48.0
1958	267,730	7,382,510	.0363	1,104,225	32,841,285	1,236	43,801	.028	664,000	572,000	1,236,000	53.7
1959	293,130	7,827,770	.0374	1,214,475	34,025,125	1,308	44,107	.030	708,000	600,000	1,308,000	54.1
1960	294,580	7,381,040	.0399	1,333,620	35,865,305	1,515	47,742	.032	718,000	797,000	1,515,000	47.4
1961				1,460,520	36,898,370	1,584	47,059	.034	794,000	790,000	1,584,000	50.1

Sources: U.S.D.A. Statistical Bulletin #262, and Colorado Department of Agriculture, Colorado Agricultural Statistics, various years.

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Table 3. Farm Marketings of Sheep and Lambs, Wheat, Milk Products, and Sugar Beets, 1924-1960

Year	LAMBS AND SHEEP	WHEAT			MILK PRODUCTS			SUGAR BEETS		
		Cash Receipts in Colo. ($000)	Cash Receipts in U. S. ($000)	Colo. U. S.	Cash Receipts in Colo. ($000)	Cash Receipts in U. S. ($000)	Colo. U. S.	Cash Receipts in Colo. ($000)	Cash Receipts in U. S. ($000)	Colo. U. S.
1924	$21,210,000	$15,530	$ 799,890	.0194	$13,030	$1,411,050	.0092	$18,540	$ 61,350	.302
1929	23,520,000	13,470	723,970	.0186	17,290	1,843,860	.0094	17,890	56,560	.316
1934	12,090,000	2,880	317,850	.0091	9,390	1,144,260	.0082	7,810	38,140	.205
1939	16,000,000	6,550	425,090	.0153	10,500	1,346,110	.0078	6,630	47,230	.140
1944	24,880,000	25,810	1,232,160	.0209	22,390	2,916,110	.0077	9,640	52,140	.117
1949	29,560,000	92,690	2,059,270	.0450	27,560	3,756,780	.0073	19,540	111,310	.176
1954	23,920,000	53,160	2,036,500	.0261	31,900	4,133,510	.0077	18,610	144,770	.124
1955	23,030,000	33,130	1,684,690	.0197	32,720	4,226,510	.0077	17,370	147,780	.118
1956	23,490,000	34,590	1,894,970	.0183	32,030	4,492,910	.0071	22,200	152,820	.145
1957	24,570,000	48,690	1,640,320	.0297	33,220	4,652,540	.0071	27,760	178,940	.155
1958	29,550,000	101,910	2,238,140	.0455	33,770	4,543,080	.0074	30,150	167,030	.181
1959	28,060,000	84,770	1,973,670	.0430	32,840	4,616,380	.0071	28,660	200,710	.143
1960	30,030,000	104,160	2,210,910	.0471	33,230	4,727,950	.0070	33,870	204,080	.166

Sources: U. S. D. A. Statistical Bulletin #262, and Colorado Department of Agriculture, Colorado Agricultural Statistics, various years.

APPENDIX C

Table 1. Employment in Mining, 1947 to 1962 (April)

Year	Metal Mining	Bituminous Coal & Lignite Mining	Crude Petroleum & Natural Gas	Non-Metallic Mining	Total
1947	3,900	6,000	1,800	900	12,600
1948	3,800	5,600	2,400	800	12,600
1949	4,000	4,700	1,300	600	10,600
1950	3,700	4,500	1,300	600	10,100
1951	4,500	3,500	1,400	800	10,200
1952	5,300	3,500	2,400	900	12,100
1953	5,300	3,000	3,200	600	12,100
1954	4,700	1,300	4,900	600	11,500
1955	5,400	2,500	6,200	700	14,800
1956	6,000	2,500	6,300	800	15,600
1957	6,600	2,400	6,300	800	16,100
1958	6,100	2,000	6,300	800	15,200
1959	5,800	2,100	6,500	800	15,200
1960	6,200	2,200	6,300	500	15,200
1961	6,700	1,500	5,900	500	14,600
1962	6,300	2,000	5,500	600	14,400

Sources: U. S. Department of Labor, Bureau of Labor Statistics, "Estimated Nonagricultural Employment in Colorado," mimeo, revised May 1961 and subsequent mimeos.

APPENDIX D

Table 1. Colorado Employment in Food and Kindred Products Industry

Year	Total	Meat Packing	Dairy Products	Bakery Products	Sugar	Beverages	Canned & Frozen Food	All Other
1910	5,397[1]	834[1]	304[1]	1,325[1]		829[1]	630[1]	1,475[1]
1920	9,585[1]	2,360[1]	861[1]	2,051[1]		662[1]	796[1]	2,855[1]
1930	8,010[1]	1,904[1]	717[1]	1,867[1]		524[1]	925[1]	2,073[1]
1940	11,675[1]	2,356[1]	1,063[1]	2,294[1]	2,198[1]	1,114[1]	797[1]	1,853[1]
1950	16,200	3,900						
1951	16,900	4,300						
1952	17,600	4,400						
1953	17,100	4,300						
1954	16,900	4,500	2,075[2]	2,139[2]		1,466[2]	999[2]	
1955	16,200	4,500						
1956	16,300	4,700		3,004[3]	1,304[3]	1,427[3]	518[3]	
1957	16,100	4,100						
1958	15,500	3,700	2,500	3,200		1,619[2]	1,161[2]	
1959	16,400	4,100	2,800	3,300	1,371[3]	1,600[3]	627[2]	
1960	17,200	4,400	2,800	3,400				
1961	16,800	4,400	2,700	3,400				
1962	17,400	4,500	2,600	3,400				

Sources: [1] U. S. Department of Commerce, Bureau of the Census, Census of Population, 1910, 1920, 1930, and 1940, Washington: U. S. Government Printing Office.

[2] U. S. Department of Commerce, Bureau of the Census, 1954 and 1958 Census of Manufactures, Colorado, Washington: U. S. Government Printing Office, 1957 and 1961.

[3] U. S. Department of Commerce and U. S. Department of Health, Education, and Welfare, County Business Patterns, 1956 and 1959, "Mountain States."

All other data are from U. S. Department of Labor, Bureau of Labor Statistics, "Estimated Nonagricultural Employment in Colorado," 1950 to 1962, mimeo.

APPENDIX D

Table 2. Comparisons of Value Added, Selected Industries, Colorado versus United States, 1958

Industry	Total Value Added		Value Added Per Person	
	Colorado	United States	Colorado	United States
Food and Kindred Products	$175,882,000	$17,685,157,000	$104.07	$101.60
Furniture & Wood Products	22,966,000	5,536,831,000	13.60	31.80
Paper, Printing and Publishing	63,546,000	13,646,535,000	37.50	78.40
Chemicals and Allied Products	33,534,000	12,273,185,000	19.84	70.51
Stone, Clay and Glass	14,258,000	5,534,559,000	8.45	31.80

Sources: U. S. Department of Commerce, Bureau of the Census, 1959 Annual Survey of Manufactures, Sept. 1961, and 1958 Census of Manufactures, Colorado, 1961; and Statistical Abstract of the United States, 1961, 82nd Annual Edition.

APPENDIX D

Table 3. Colorado Employment in Fabricated Metal Products, Electrical and Non-Electrical Machinery, Transportation Equipment and Ordnance and Accessories

Year	Primary Metals Fab. Metal Prod. Elec. & Non-Elec. Mach. Trans. Equip. Ord. & Accessories	Primary Metals	Fab. Metal Prod. Elec. & Non-Elec. Mach. Trans. Equip. Ord. & Accessories	Fab. Metal Prod.	Machinery	Electrical Machinery	Trans. Equip.	Ordnance Accessories
1950	17,300	9,398[1]	7,900	2,234[1]	3,933[1]	1,050[1]	1,183[1]	—
1951	20,100	(9,000)[2]	11,100	—	—	—	—	—
1952	21,800	(9,000)[2]	12,800	—	—	—	—	—
1953	22,100	(9,000)[2]	13,100	—	—	—	—	—
1954	20,100	8,230[3]	11,900	2,715[3]	← 5,408[3] →		—	950[3]
1955	21,700	(9,000)[2]	12,700	—	—	—	—	—
1956	24,700	10,100[4]	14,600	2,854[4]	5,518[4]	1,698[4]	2,135[4]	2,024[4]
1957	28,600	(9,000)[2]	19,600	—	—	—	—	—
1958	27,800	8,800	19,000	3,991[4]	← 6,586[3] →		—	—
1959	33,700	10,200	23,500	2,900	5,400	2,500	2,900	9,800
1960	36,500	9,700	26,800	3,000	5,700	2,400	3,500	12,200
1961	41,200	8,700	32,500	2,900	5,500	2,800	3,800	17,500
1962	41,700	8,900	32,800	3,400	5,600	3,300	3,700	16,800

Sources: [1] U. S. Department of Commerce, Bureau of the Census, 1960 Census of Population, Colorado "General Social and Economic Characteristics," Final Report PC(1)-7C.

[2] Estimated by Denver Research Institute

[3] U. S. Department of Commerce, Bureau of the Census, 1958 Census of Manufactures, Colorado . (The 1958 Census contains data for 1954).

[4] U. S. Department of Commerce and U. S. Department of Health, Education, and Welfare, County Business Patterns, First Quarter 1956, Part 9, "Mountain States," 1958.

All those not otherwise marked are from U. S. Department of Labor, Bureau of Labor Statistics, "Estimated Nonagricultural Employment in Colorado for 1950-1962", mimeo.

APPENDIX D

Table 4. Employment in Manufacturing (Firms with 8 or more Employees)

Industry Group	1940	1941	1942	1943	1944	1945	1946	1947
Food & Kindred Products	10,280	9,755	10,789	11,596	13,444	13,176	13,580	12,905
Leather & Leather Products	507	694	1,017	958	710	896	1,037	957
Printing & Publishing	2,916	2,844	2,642	2,541	2,573	2,613	3,062	3,405
Rubber	2,440	2,691	2,763	3,165	4,159	4,347	5,235	5,828
Lumber & Wood Products	1,249	1,505	1,833	1,865	2,113	1,975	2,280	2,636
Stone, Clay & Glass	1,645	1,897	2,049	1,660	1,408	1,360	2,011	2,384
Primary Metals	7,166	8,797	8,691	8,397	8,365	8,125	9,019	9,285
Petroleum & Coal	214	322	287	300	233	266	308	341
Fabricated Metals	—	296	1,582	2,853	2,496	2,093	580	2,587
Machinery	934	1,106	890	864	880	818	997	3,891
Electrical Machinery	41	22	81	44	112	139	170	333
Transportation Equip.	969	2,211	2,691	3,120	3,075	2,995	3,105	1,193
Instruments	243	277	508	603	617	848	146	623
Ordnance	—	—	295	519	991	5,530	177	2
Chemicals & Related Products	700	912	14,562	21,161	4,829	5,490	1,018	1,390
Miscellaneous	809	1,310	1,533	1,393	1,525	1,861	2,210	1,995
TOTAL	31,208	36,146	53,902	63,057	50,011	55,117	47,313	51,941

Source: Colorado State Department of Employment records of covered employment (firms with 8 or more employees) as of April each year. This omission does not affect manufacturing significantly.

APPENDIX E. TRAVEL, TOURISM AND OUTDOOR RECREATION

The purpose of this appendix is to (1) present indicators of change in the tourist industry in Colorado, and (2) to discuss possible future developments of the industry.

Indicators of Change

There are certain indicators of the changes in tourism which are based on payments for admission, licenses, and other accounting records. These may suggest the trend of Colorado's tourist business, but it is uncertain just what they mean in terms of overall employment and income in the Colorado economy.

Table 1. Deer Licenses, and Small Game and Fishing Licenses Sold in Colorado to Residents and Non-Residents (000's omitted)

	Deer		Fishing and Small Game	
Year	Residents	Non-Residents	Residents	Non-Residents
1951	90.6	15.1	245.7	71.2
1956	92.6	20.0	271.5	123.0
1961	129.3	66.0	294.0	122.0

Note: More than one deer license may now be bought by a hunter; about one-fourth of Colorado hunters bought a second license as did nearly one-half of the non-resident hunters in 1961.

Source: Colorado Game and Fish Department, Annual Reports, various years.

The non-resident deer hunters are autumn visitors, while the fish and small game license holders are more apt to be summer tourists. The number of out-of-state deer hunters has more than doubled during the past decade, even allowing for multiple license sales to individuals. The out-of-state fish and small game people, on the other hand, have leveled off during the last five years, after an earlier increase.

The origins of the non-resident deer hunters may be of interest. In 1960 the leading states of origin for these hunters were:

Table 2. Origin of Non-Resident Deer Hunter

State	Thousand Hunters
Texas	12.6
California	6.7
Oklahoma	3.9
Kansas	2.7
Missouri	2.5

Source: Colorado Game and Fish Department, annual reports.

Another indicator of visitors from out-of-state is found in the Traffic Volume Studies of the Colorado Highway Department. These reports include estimates of out-of-state passenger cars entering and leaving Colorado, and are based on sample counts. No effort is made to distinguish between tourists, business travelers, or people living near the state lines and performing routine local travel.

Table 3. Out-of-State Passenger Vehicles Crossing Colorado State Lines (daily average)

State Line	1948	1956	1960
Colorado-New Mexico	1,352	2,959	2,803
Colorado-Oklahoma	255	488	542
Colorado-Kansas	1,778	2,696	2,691
Colorado-Nebraska	910	2,132	2,148
Colorado-Wyoming	1,426	2,449	3,072
Colorado-Utah	860	2,121	2,014
TOTAL	6,581	12,845	13,270

Source: Colorado Highway Department, Traffic Volume Studies, various years.

These figures would indicate that the growth in visitor auto traffic has partially leveled off since 1956. A possible assumption is that air travel has become a more common means of transportation, particularly for business and convention visitors and for winter tourists. These categories may be a source of growth in Colorado tourism, while the traditional summer auto tourist count may have fallen off.[1]

[1] Recent discussions with Colorado Highway Department origin and destination survey personnel indicates that 1962 out-of-state vehicle figures may be up, possibly because of travel to the Seattle World's Fair.

Another indicator of tourism, which includes visits originating from within the state as well as from outside, is the count of visitors to Colorado's National Parks. These visits during the past decade are as follows:

Table 4. National Park Area Visits in Colorado (000's omitted)

Year	Visits
1950	1,509
1951	1,422
1952	1,650
1953	1,763
1954	2,043
1955	2,019
1956	3,151
1957	3,083
1958	3,187
1959	3,271
1960	3,056
1961	3,042

Source: U. S. Department of the Interior, National Park Service, quoted in Bureau of Business Research, University of Colorado, Tourist Travel Trends. Boulder: University of Colorado, 1961.

Visits to Colorado's National Parks are predominantly summer activities, so here again is an indication that summer tourism has leveled off in recent years. However, current reports indicate this series experienced a substantial increase in 1962.

The one major type of tourism which has shown substantial growth in recent years is skiing. The growth in use of Colorado ski facilities is easily demonstrated, but little information is available on the contribution of out-of-state skiers to this growth. A 1957 study showed 31 percent of a sample of skiers at different Colorado resorts to be from out-of-state:

Table 5. Origins of Skiers at Various Colorado Resorts

State	Origin of Skiers
Colorado	69
Illinois	5
Texas	3
Minnesota	3
Kansas	2
California	2
Other	17

Source: Bureau of Business Research, University of Colorado, Skiing in Colorado and New Mexico, Boulder: University of Colorado, 1957.

The increase in total ski visits to Colorado facilities involving Forest Service land (which is almost all-inclusive) has been as follows:

Table 6. Skier Visits to Resorts Involving Forest Service Lands (Includes almost all ski resorts in Colorado) (000's omitted)

1950-51	202.1
1951-52	157.7
1952-53	140.2*
1953-54	151.8*
1954-55	165.5*
1955-56	259.8*
1956-57	278.7
1957-58	349.5
1958-59	393.9
1959-60	463.4
1960-61	462.0
1961-62	583.3

* Incomplete figures.
Source: U. S. Forest Service.

The Future of Tourism in Colorado

The Outdoor Recreation Resources Review Commission has estimated that the nation-wide demand for outdoor recreation facilities will roughly quadruple by 1976. In estimating the effect of this demand on its Colorado facilities, and on other facilities located on its Colorado land, the U. S. Forest Service has made these estimates on future visits:

Table 7. Recreation Visits on Forest Land in Colorado (000's omitted)

Facilities	1961	1976	2000
Campgrounds	3,206	12,399	32,886
Picnic sites	643	6,243	18,185
Organization sites	119	368	669
Commercial public service sites	558	571	991
Summer home sites	233	407	519
Swimming	5	14	26
Boating	14	43	85
Winter sports	541	1,544	4,233
Wilderness	98	313	691
Hunting	428	2,500	6,530
Fishing	1,839	7,667	20,817
Riding and hiking	169	520	1,333

Note: These figures are reported as number of man-days (in thousands) rather than visits.

Source: U. S. Forest Service estimates prepared for ORRRC.

Whether Colorado will experience this sort of increase in tourism and recreation will probably depend on the success of three efforts:

(1) Determining the present status of the tourist-recreation industry in Colorado.

It is commonly understood that the tourist industry is one of the big sources of income in Colorado, but there are no reliable figures on how many tourists come to Colorado, what they spend, or how much income and employment are generated by their presence.[2,3]

[2] The problems and inconsistencies of existing tourist data have been well described by L. J. Crampon in Tourist Travel Trends. (Bureau of Business Research, University of Colorado, Boulder, 1961). He shows (page 38) that while the estimated $300 million of tourist expenditures in Colorado in 1958 included an estimated $63 million spent by tourists for hotel and motel accommodations, the total receipts of Colorado hotels and motels were only $59 million. Since these total receipts included payments from business travelers and guests within the state, as well as tourists, the tourist expenditure figure would appear to be overstated.

[3] As a part of this project, Denver Research Institute queried hotels and motels in Colorado on the geographic sources of their business. Twenty replies, including those from some of the most famous hotels in the state, do not give statistically definitive data, but they indicate that about one-half of their registrations are by Colorado residents. The other half, out-of-state visitors, are both tourists and business travelers. High percentages of out-of-state guests were commonly reported from Aspen; very mixed results came from Colorado Springs, Boulder, Denver and Durango.

(2) Attracting the capital investment in needed facilities to meet future demand.

The lack of factual data may be an obstacle to developing the facilities needed to capitalize on this possibly rich potential. Small investments may be made acceptably on the base of intuition, but the big money commitments needed for major developments (and major contributions to Colorado's reputation as a tourist center) usually wait for precise data which define the degree of risk and the prospects for payout on investment.

(3) Appropriately promoting present and future facilities in order to attract visitors.

In other words, a complete analysis of the marketing of the Colorado services to tourists seems to be indicated.

Lacking such an analysis, one guess is offered here about the course of future development of this industry. If the increase in visitors, particularly summer visitors, has leveled off in the last five years, it may well be because of the relative saturation of the Colorado Springs-to-Estes Park area — the traditional Colorado summer resort. Two changes in such a problem situation are in sight. One is the completion of the Navajo Trail, a direct and high-speed route from Southern California to the Four Corners area. Since Southern California outdoor recreation areas are so crowded that the Forest Service already finds it necessary to close some of its campgrounds many afternoons during seasonal peaks, this appears to be an important market. The second change is the prospective construction of Interstate Highway 70 to the Western Slope. This seventy-mile-an-hour highway will give ready access to west central Colorado, relieving the pressure on the East Slope resorts, and may give a major boost to Colorado's tourist industry.

APPENDIX F. ANALYSIS OF COLORADO TRADE AREAS

In the early stages of this study, it was decided that insufficient information was available on the trade areas or administrative areas served from Colorado. Since it is hoped that this report, and the summary report which is a by-product of it, will be of value to manufacturers, distributors, and others in evaluating Colorado as a location for their facilities, it was apparent that more information was needed on Colorado's position as a trade center. In addition, in order to construct a more realistic forecast, information was needed on the proportion of business done outside the state by Colorado distributors.

Questionnaires similar to those contained in this appendix were sent to approximately 400 Colorado firms. The sample was broken down to include 160 firms in the field of distribution and wholesaling, 150 firms in manufacturing, and 100 organizations which could be generally classified as administrative or service activities. About half of those receiving questionnaires responded.

The sample was deliberately biased toward the larger, and in many cases nationally known, firms operating branch facilities from Colorado. Firms which obviously served small markets within the state (such as beer and soft drink distributors) were omitted from the survey.

A composite trade area map was made for most of the industries surveyed.[1] By examining the pages attached, it is possible to see how large a trade area is being served by specific industries.

We were also interested in knowing the proportion of out-of-state business done by Colorado based firms in various industries. This information has also been tabulated for each industry.

The answers to other questions on the questionnaire were not formally tabulated in connection with this study. In certain selected cases, the information was utilized in evaluating a specific industry.

The completed questionnaires are in the possession of the Denver Research Institute. Although promises were made not to disclose any

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[1] The sample was too small in certain industries to yield meaningful results.

information from specific firms, persons desiring a different breakdown of the information than is shown in the attached sheets should contact the Denver Research Institute, and we would be glad to cooperate as long as the confidence of the respondents is not violated by the request.

The trade areas shown on Figures 1 through 18 formed the basis for Part IV of the summary report published separately. (Each line represents the trade area of one firm; heavy lines are the result of overlapping trade areas.) The summary report contains population, employment, and income data for eight trade areas commonly served from Colorado.

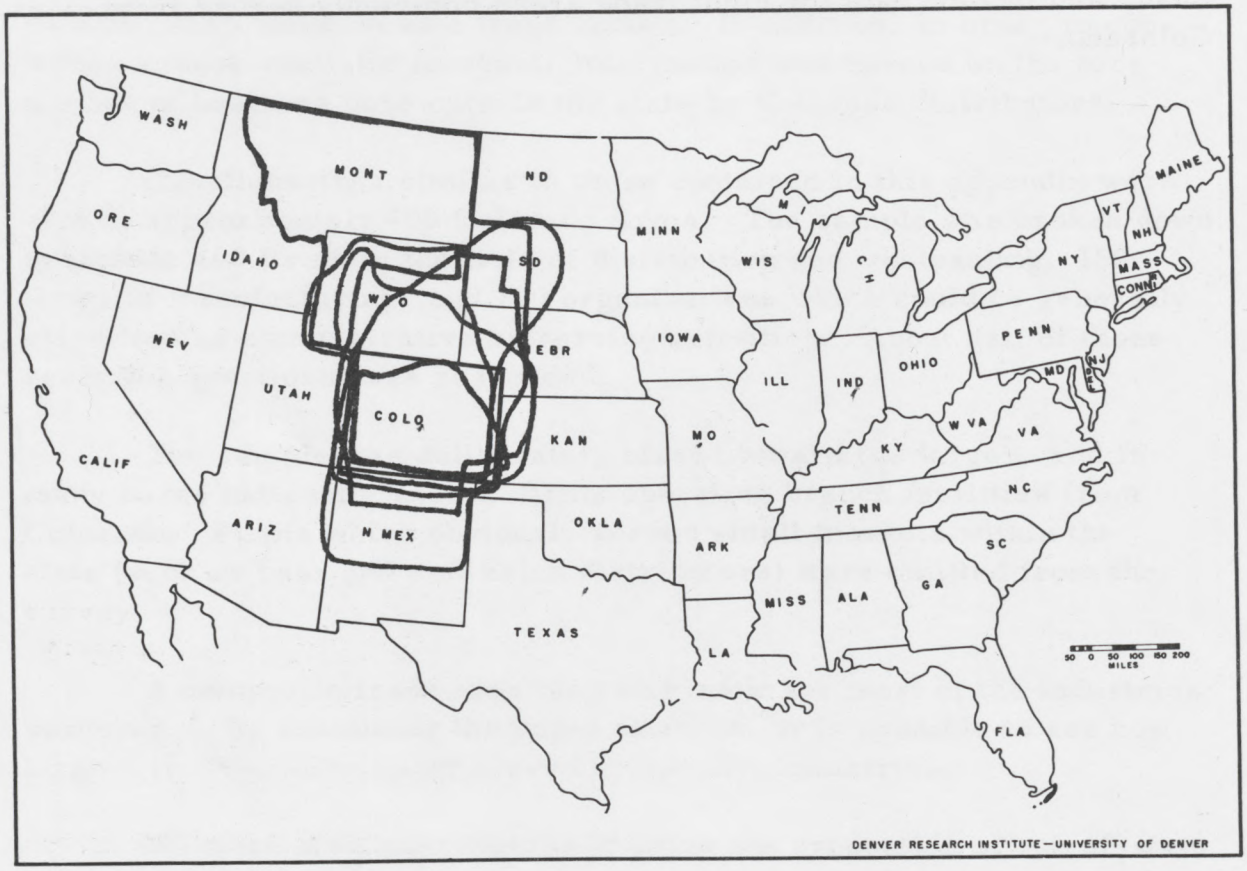
APPENDIX F

Figure 1. Distribution — Groceries and Food Products

PLEASE RETURN TO:

Industrial Economic Division
Denver Research Institute
University of Denver
Denver 10, Colorado

FROM: _____



1. Major products handled: _____

2. Percent of total sales in Colorado: _____%

3. Where are your major competitors located (please show on map with "C")?

4. What major factors limit your trade area (please check the three that are most important)?

Transportation costs _____	Span of management control _____
Transportation time _____	Parent company policy _____
Ability to service _____	Personal preference _____
Competitors' location _____	Others (please list) _____

APPENDIX F

Figure 2. Distribution — Drugs and Chemicals

PLEASE RETURN TO:

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Denver Research Institute
University of Denver
Denver 10, Colorado

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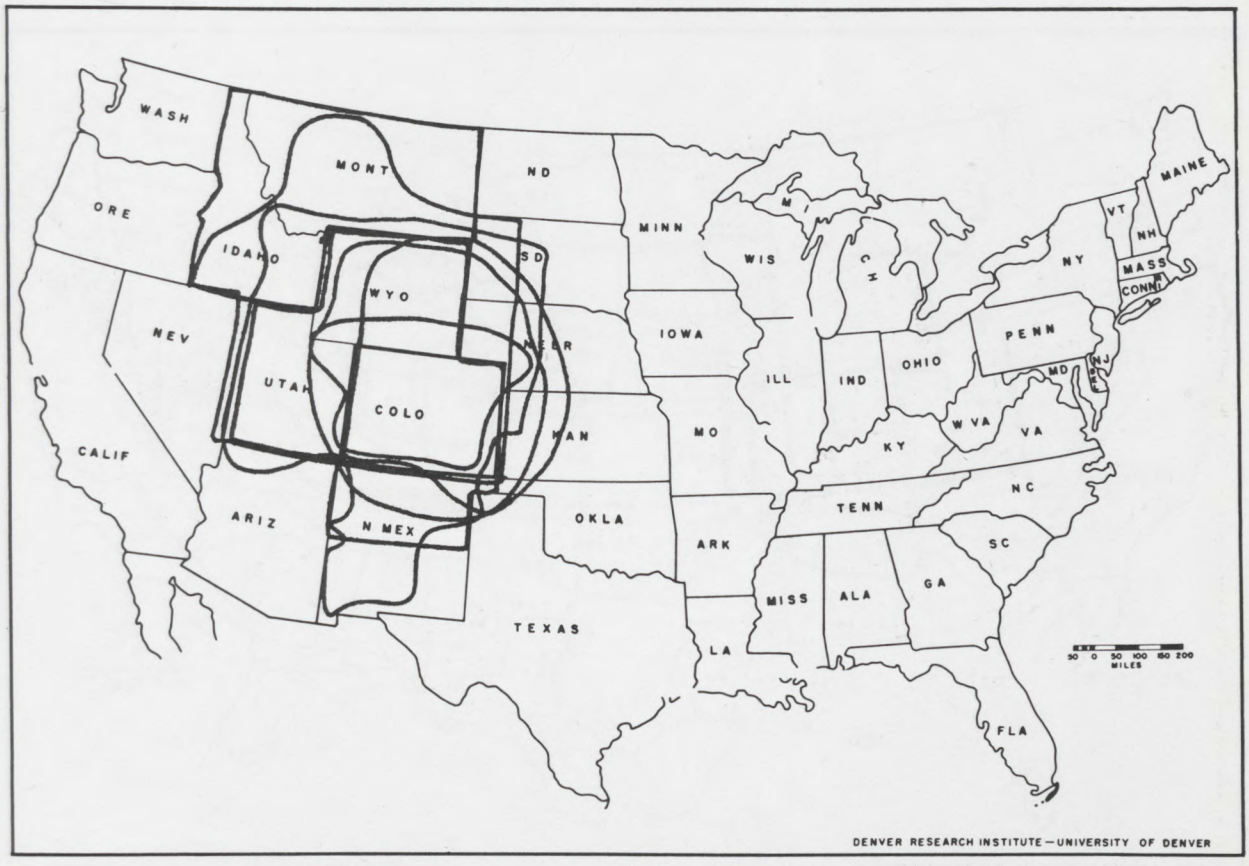

1. Major products handled: _____
   _____
   _____

2. Percent of total sales in Colorado: _____%

3. Where are your major competitors located (please show on map with "C")?

4. What major factors limit your trade area (please check the three that are most important)?

Transportation costs _____	Span of management control _____
Transportation time _____	Parent company policy _____
Ability to service _____	Personal preference _____
Competitors' location _____	Others (please list) _____

APPENDIX F

Figure 3. Distribution — Paper and Paper Products

PLEASE RETURN TO:

Industrial Economic Division
Denver Research Institute
University of Denver
Denver 10, Colorado

FROM:

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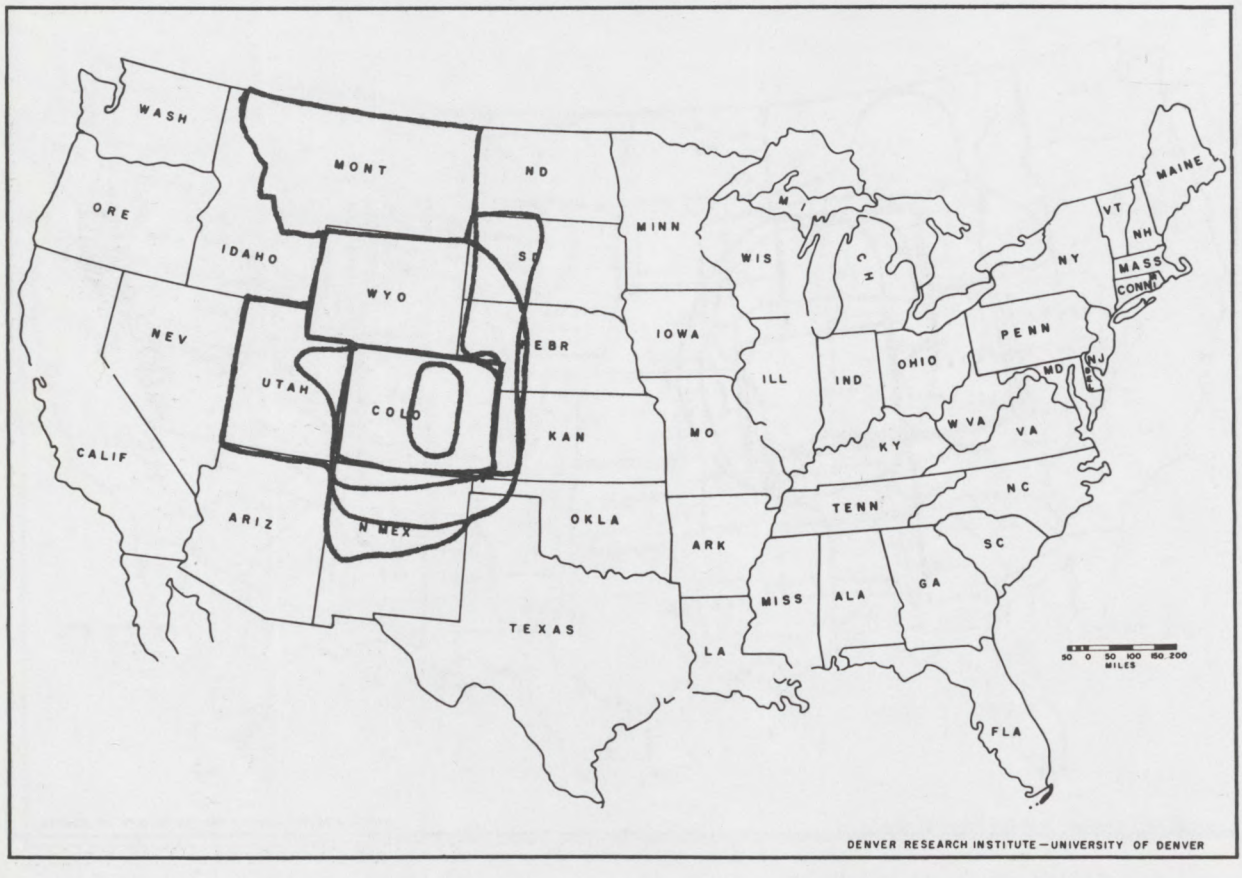

1. Major products handled: _____
_____
_____

2. Percent of total sales in Colorado: _____%

3. Where are your major competitors located (please show on map with "C")?

4. What major factors limit your trade area (please check the three that are most important)?

Transportation costs _____	Span of management control _____
Transportation time _____	Parent company policy _____
Ability to service _____	Personal preference _____
Competitors' location _____	Others (please list) _____

APPENDIX F

Figure 4. Distribution — Office Equipment

PLEASE RETURN TO:

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Denver Research Institute
University of Denver
Denver 10, Colorado

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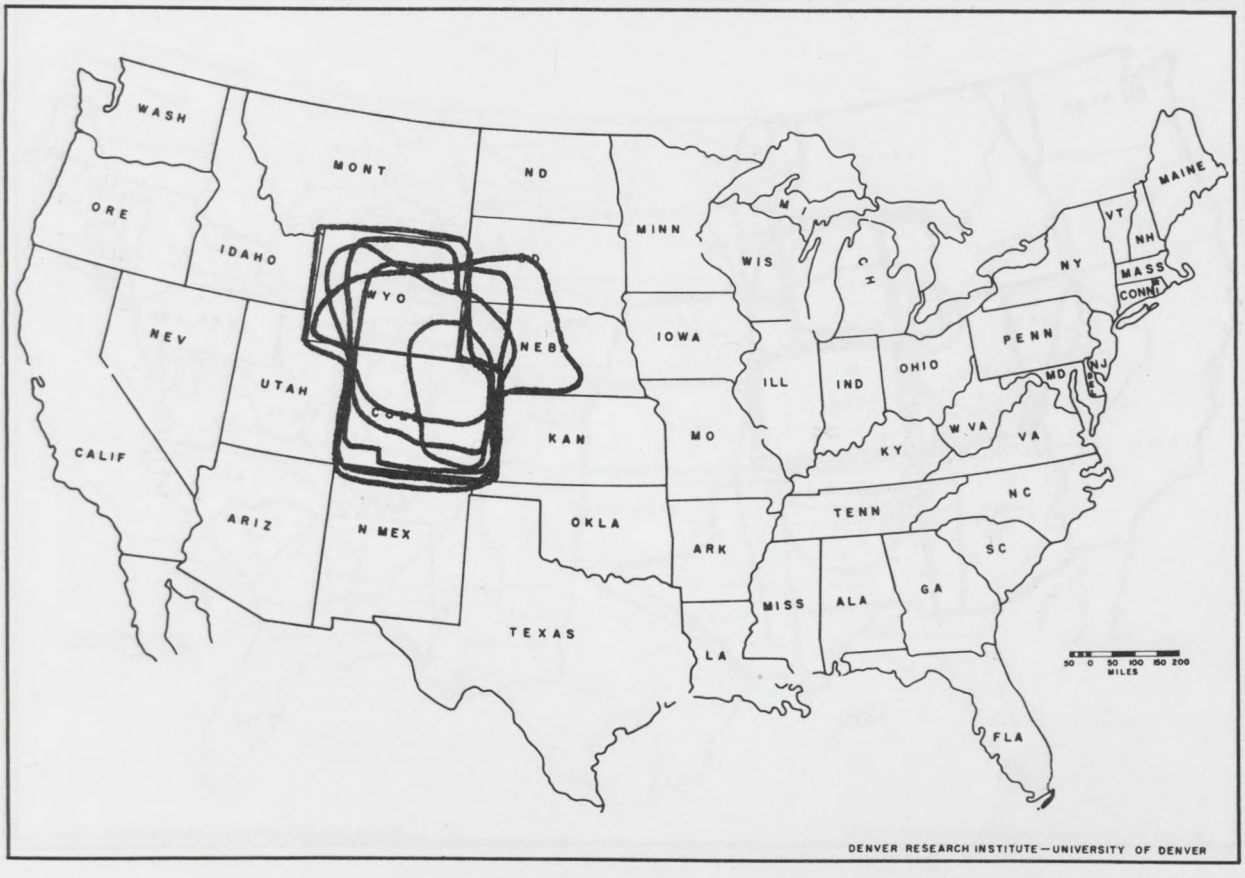

1. Major products handled: _____
_____
_____

2. Percent of total sales in Colorado: _____%

3. Where are your major competitors located (please show on map with "C")?

4. What major factors limit your trade area (please check the three that are most important)?

Transportation costs _____	Span of management control _____
Transportation time _____	Parent company policy _____
Ability to service _____	Personal preference _____
Competitors' location _____	Others (please list) _____

APPENDIX F

Figure 5. Distribution — Machinery and Equipment

PLEASE RETURN TO:

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Denver Research Institute
University of Denver
Denver 10, Colorado

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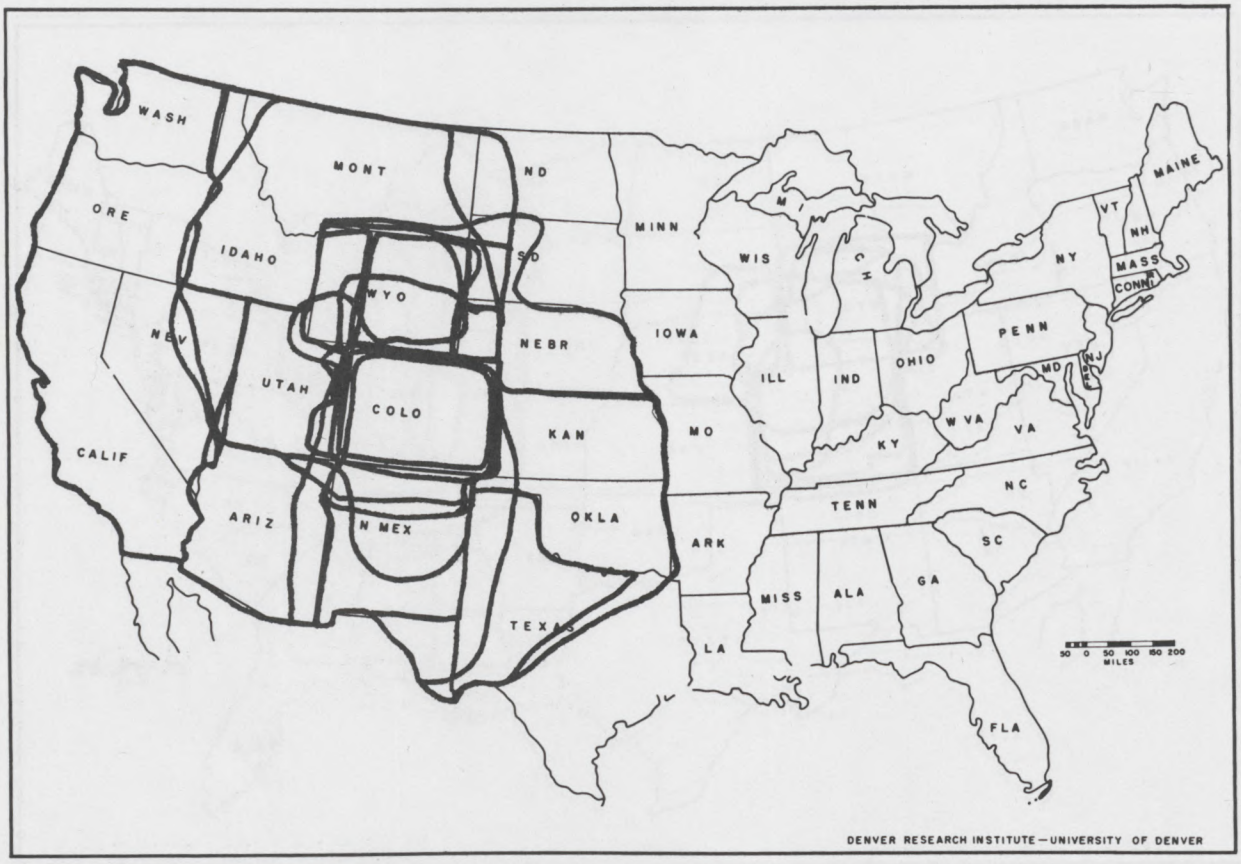

1. Major products handled: _____
_____
_____

2. Percent of total sales in Colorado: _____%

3. Where are your major competitors located (please show on map with "C")?

4. What major factors limit your trade area (please check the three that are most important)?

Transportation costs _____	Span of management control _____
Transportation time _____	Parent company policy _____
Ability to service _____	Personal preference _____
Competitors' location _____	Others (please list) _____

APPENDIX F

Figure 6. Distribution — Farm Equipment and Products

PLEASE RETURN TO:

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Denver 10, Colorado

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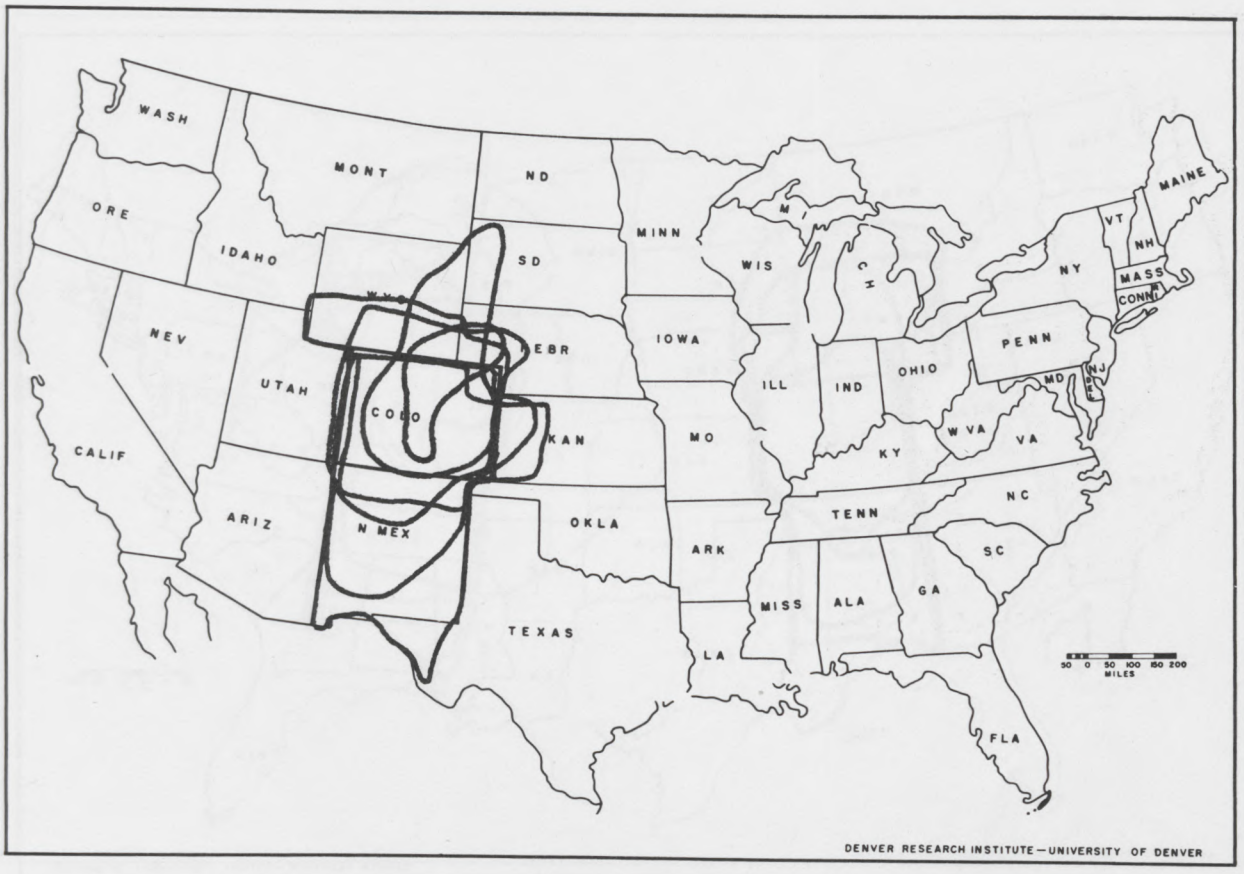

1. Major products handled: _____
_____
_____

2. Percent of total sales in Colorado: _____%

3. Where are your major competitors located (please show on map with "C")?

4. What major factors limit your trade area (please check the three that are most important)?

Transportation costs _____	Span of management control _____
Transportation time _____	Parent company policy _____
Ability to service _____	Personal preference _____
Competitors' location _____	Others (please list) _____

APPENDIX F

Figure 7. Distribution — Motor Vehicles and Automotive

PLEASE RETURN TO:

Industrial Economic Division
Denver Research Institute
University of Denver
Denver 10, Colorado

FROM:

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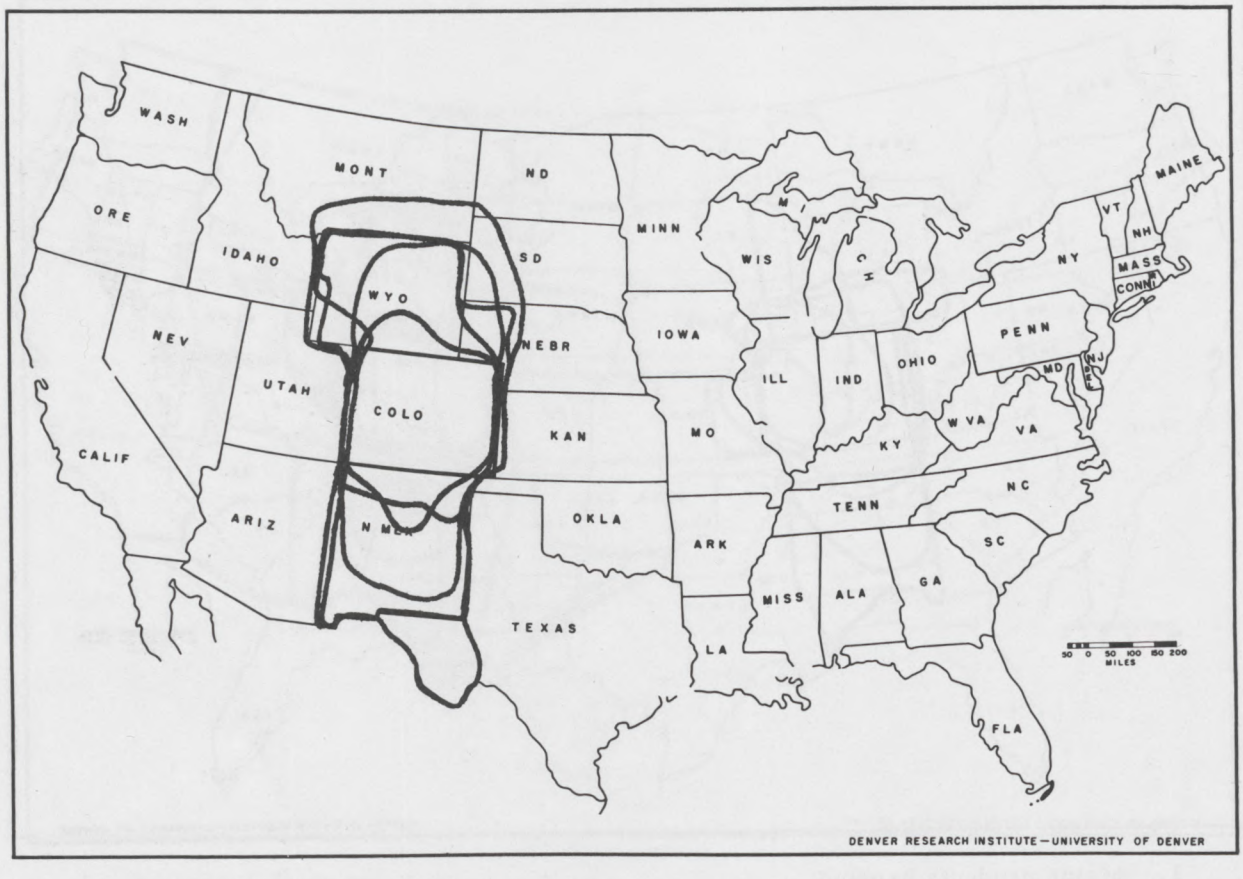

1. Major products handled: _____
_____
_____

2. Percent of total sales in Colorado: _____%

3. Where are your major competitors located (please show on map with 'C")?

4. What major factors limit your trade area (please check the three that are most important)?

Transportation costs _____	Span of management control _____
Transportation time _____	Parent company policy _____
Ability to service _____	Personal preference _____
Competitors' location _____	Others (please list) _____

APPENDIX F

Figure 8. Distribution — Electrical Goods

PLEASE RETURN TO:

Industrial Economic Division
Denver Research Institute
University of Denver
Denver 10, Colorado

FROM:

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_____
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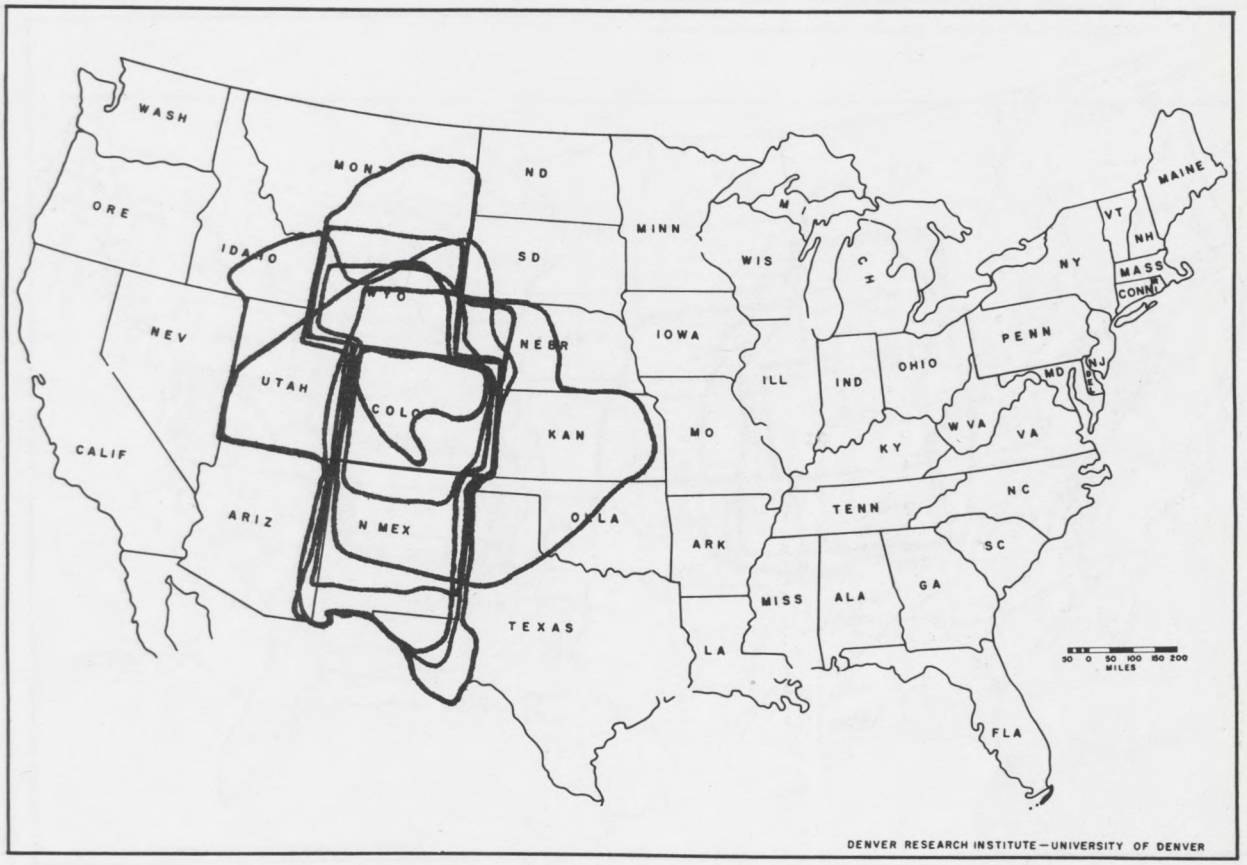

1. Major products handled: _____
   _____
   _____

2. Percent of total sales in Colorado: _____%

3. Where are your major competitors located (please show on map with "C")?

4. What major factors limit your trade area (please check the three that are most important)?

Transportation costs _____	Span of management control _____
Transportation time _____	Parent company policy _____
Ability to service _____	Personal preference _____
Competitors' location _____	Others (please list) _____

APPENDIX F

Figure 9. Administrative — Commercial Banks

PLEASE RETURN TO:

Industrial Economic Division
Denver Research Institute
University of Denver
Denver 10, Colorado

FROM:

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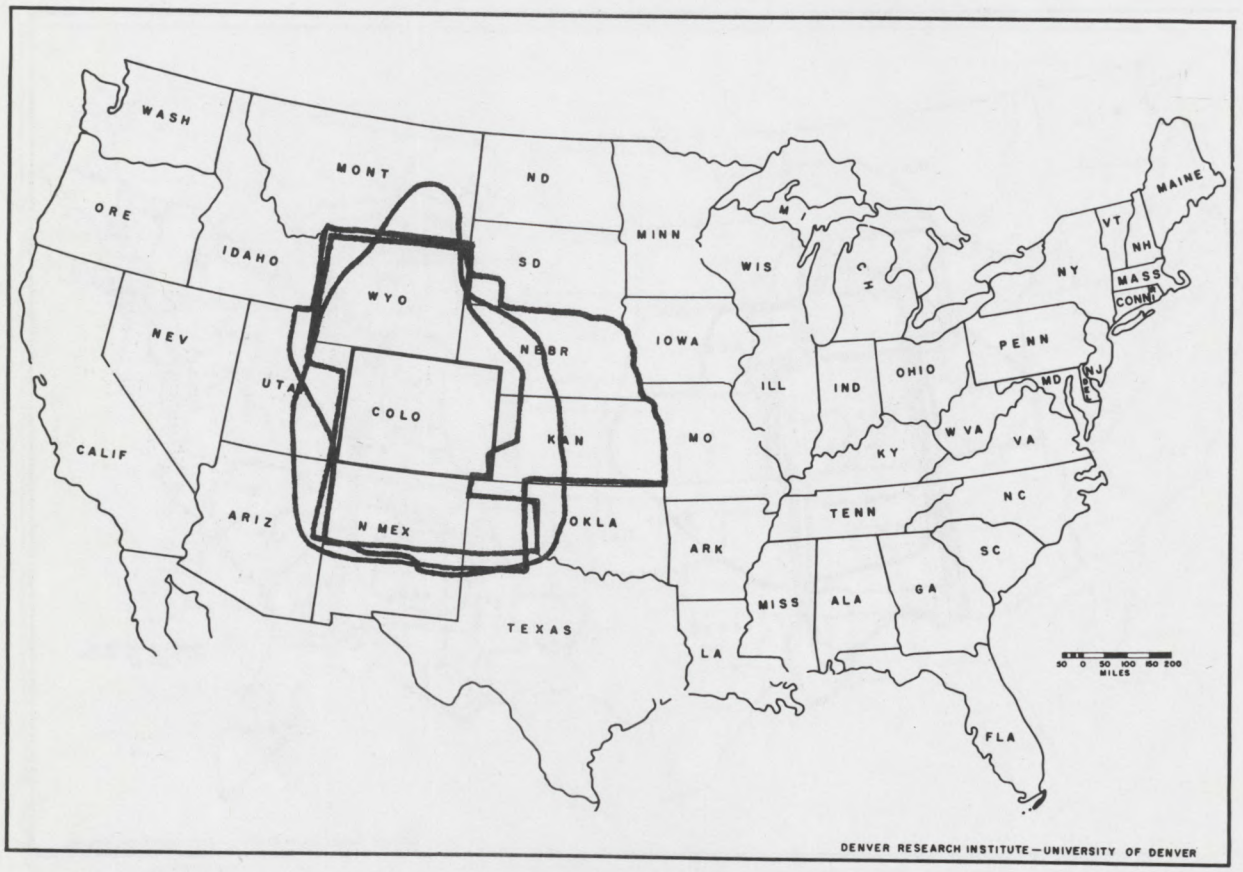

1. Percent of your business in Colorado? _____%

2. What are the major factors which limit the extent of your trade area?
   Location of competitors_____
   Ability to service outlying areas_____
   Others (please list) _____
   _____

APPENDIX F

Figure 10. Administrative — Investment and Mortgage Banking

PLEASE RETURN TO:

Industrial Economic Division
Denver Research Institute
University of Denver
Denver 10, Colorado

FROM:

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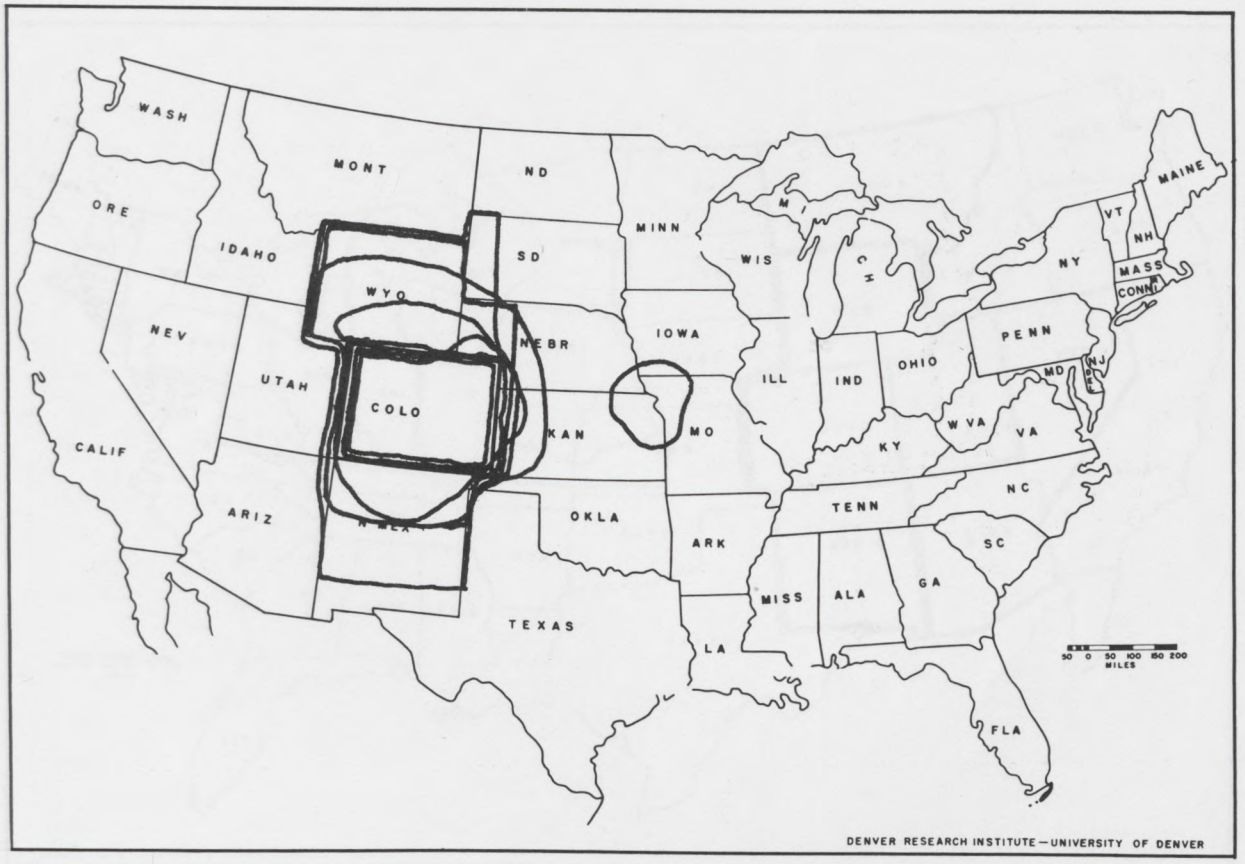

1. Percent of your business in Colorado? _____%

2. What are the major factors which limit the extent of your trade area?
   Location of competitors_____
   Ability to service outlying areas_____
   Others (please list) _____
   _____

APPENDIX F

Figure 11. Administrative — Insurance

PLEASE RETURN TO:

Industrial Economic Division
Denver Research Institute
University of Denver
Denver 10, Colorado

FROM:

_____
_____
_____
_____

1. Percent of your business in Colorado? _____%

2. What are the major factors which limit the extent of your trade area?
   Location of competitors_____
   Ability to service outlying areas_____
   Others (please list) _____
   _____

APPENDIX F

Figure 12. Administrative — Federal Government

PLEASE RETURN TO:

Industrial Economic Division
Denver Research Institute
University of Denver
Denver 10, Colorado

FROM:

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_____
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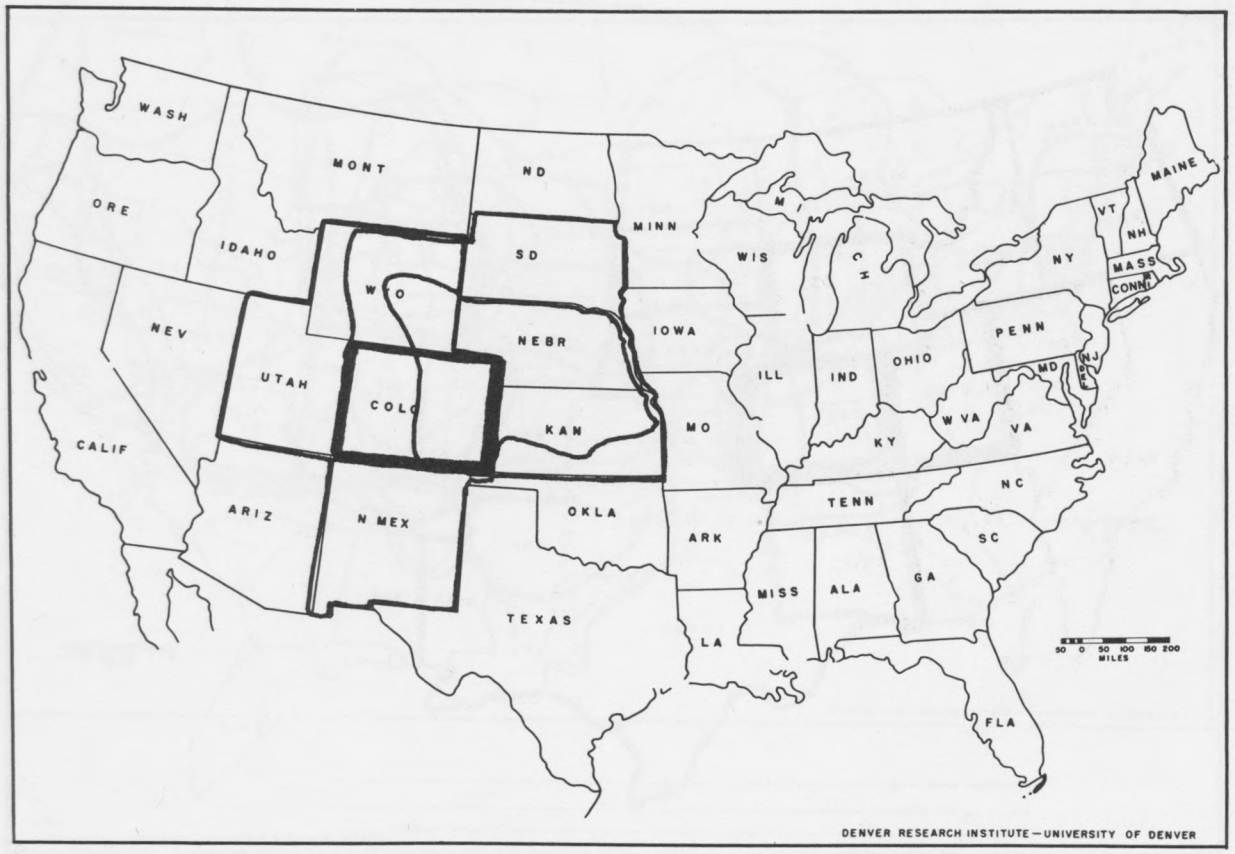

1. Percent of your business in Colorado? _____%

2. What are the major factors which limit the extent of your trade area?
   Location of competitors_____
   Ability to service outlying areas_____
   Others (please list) _____
   _____

APPENDIX F

Figure 13. Administrative — Oil Companies

PLEASE RETURN TO:

Industrial Economic Division
Denver Research Institute
University of Denver
Denver 10, Colorado

FROM:

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_____
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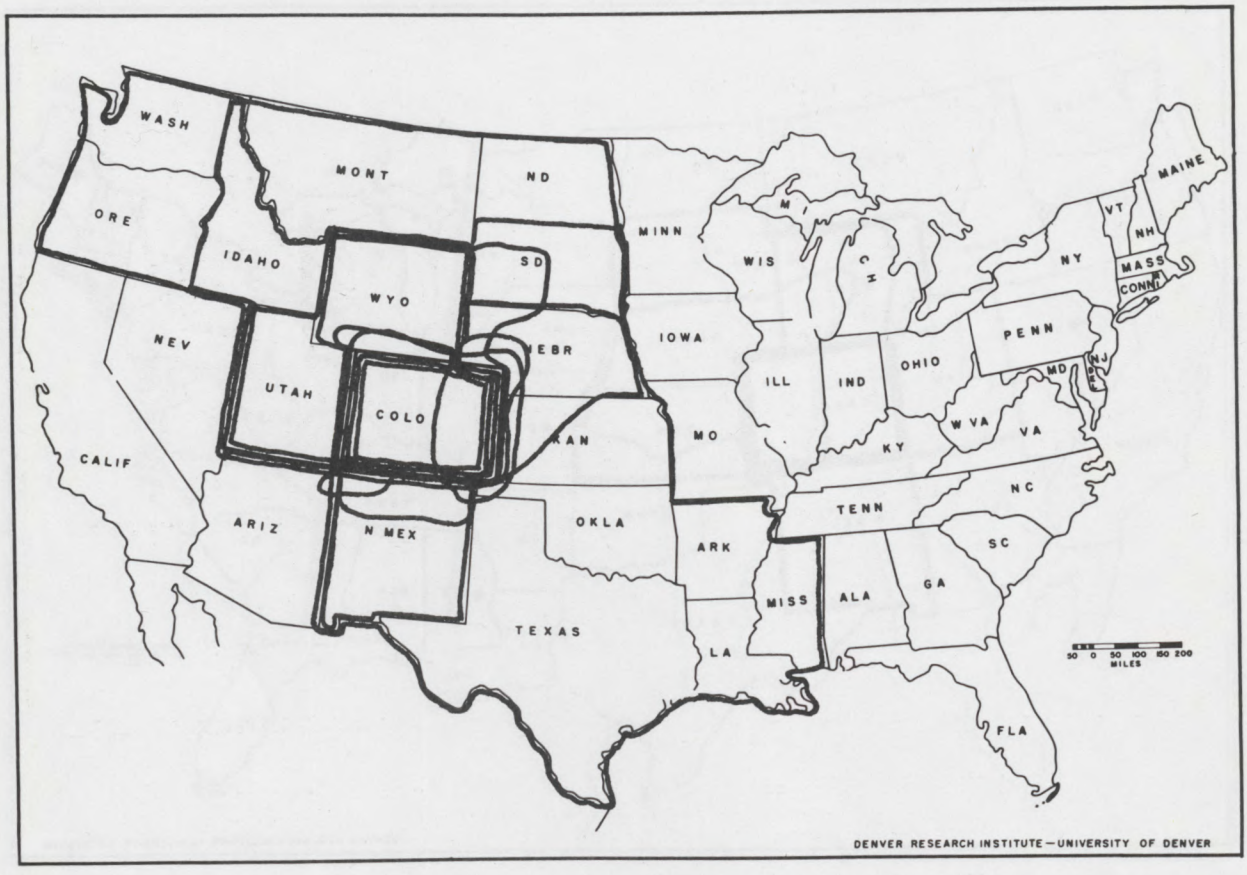

1. Percent of your business in Colorado? _____%

2. What are the major factors which limit the extent of your trade area?
   Location of competitors_____
   Ability to service outlying areas_____
   Others (please list) _____
   _____

APPENDIX F

Figure 14. Manufacturing — Food and Kindred Products

PLEASE RETURN TO:

Industrial Economic Division
Denver Research Institute
University of Denver
Denver 10, Colorado

FROM:

_____
_____
_____
_____

1. Products: _____
_____
_____

2. Percent of Total Sales in Colorado: _____%

3. How do you distribute your products? (check more than 1 if appropriate)
   - Direct sales _____ Manufacturers' Rep _____
   - Distributors _____ Other (please list) _____

4. Where are your competitors located (please show on map with "C")?

5. What major factors limit your trade area (please check the three that are most important)?
   - Transportation costs _____ Span of management control _____
   - Transportation time _____ Parent company policy _____
   - Ability to service _____ Personal preference _____
   - Competitors' location _____ Others (please list) _____

APPENDIX F

Figure 15. Manufacturing — Chemicals and Related Products

PLEASE RETURN TO:

Industrial Economic Division
Denver Research Institute
University of Denver
Denver 10, Colorado

FROM:

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_____
_____
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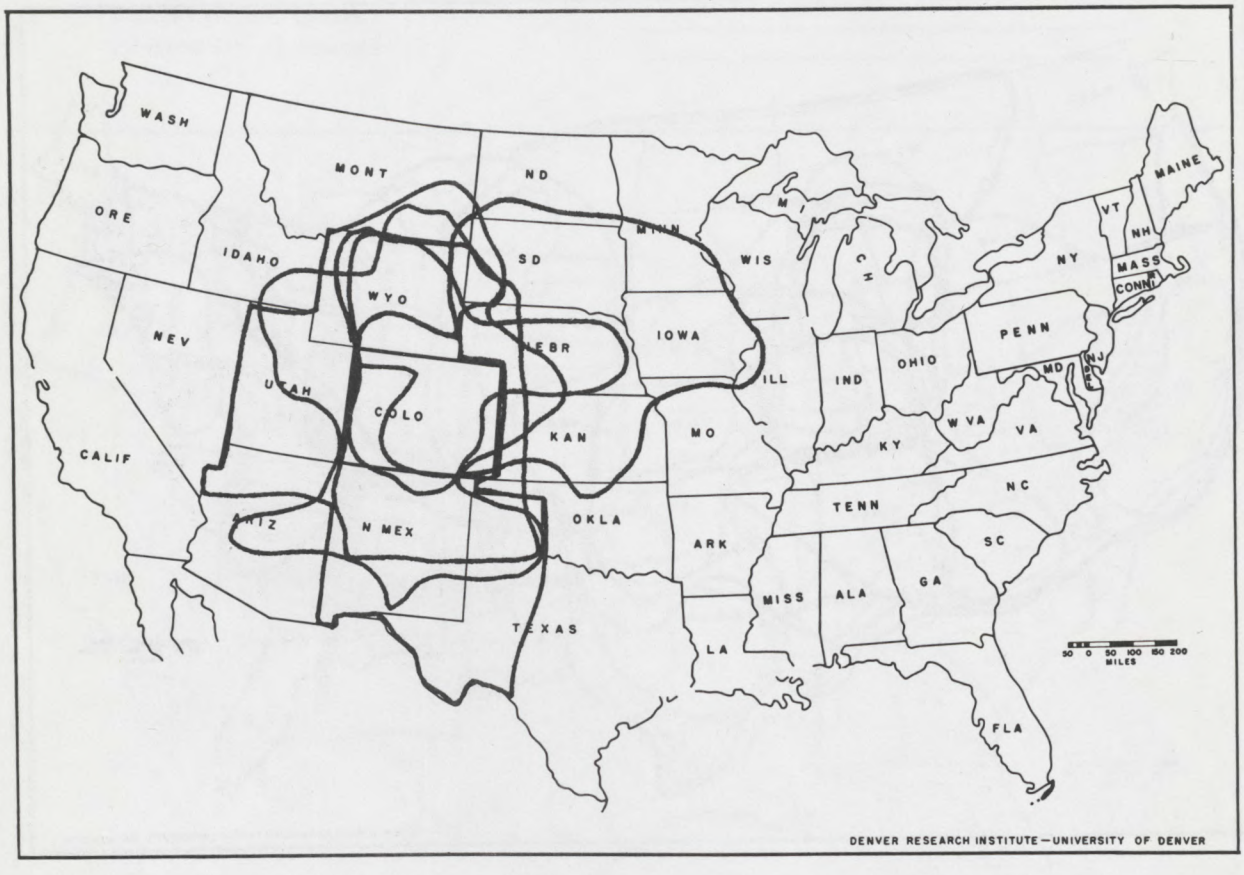

1. Products: _____
_____
_____

2. Percent of Total Sales in Colorado: _____%

3. How do you distribute your products? (check more than 1 if appropriate)
   - Direct sales _____
   - Distributors _____
   - Manufacturers' Rep _____
   - Other (please list) _____

4. Where are your competitors located (please show on map with "C")?

5. What major factors limit your trade area (please check the three that are most important)?
   - Transportation costs _____
   - Transportation time _____
   - Ability to service _____
   - Competitors' location _____
   - Span of management control _____
   - Parent company policy _____
   - Personal preference _____
   - Others (please list) _____

APPENDIX F

Figure 16. Manufacturing — Furniture and Wood Products

PLEASE RETURN TO:

Industrial Economic Division
Denver Research Institute
University of Denver
Denver 10, Colorado

FROM:

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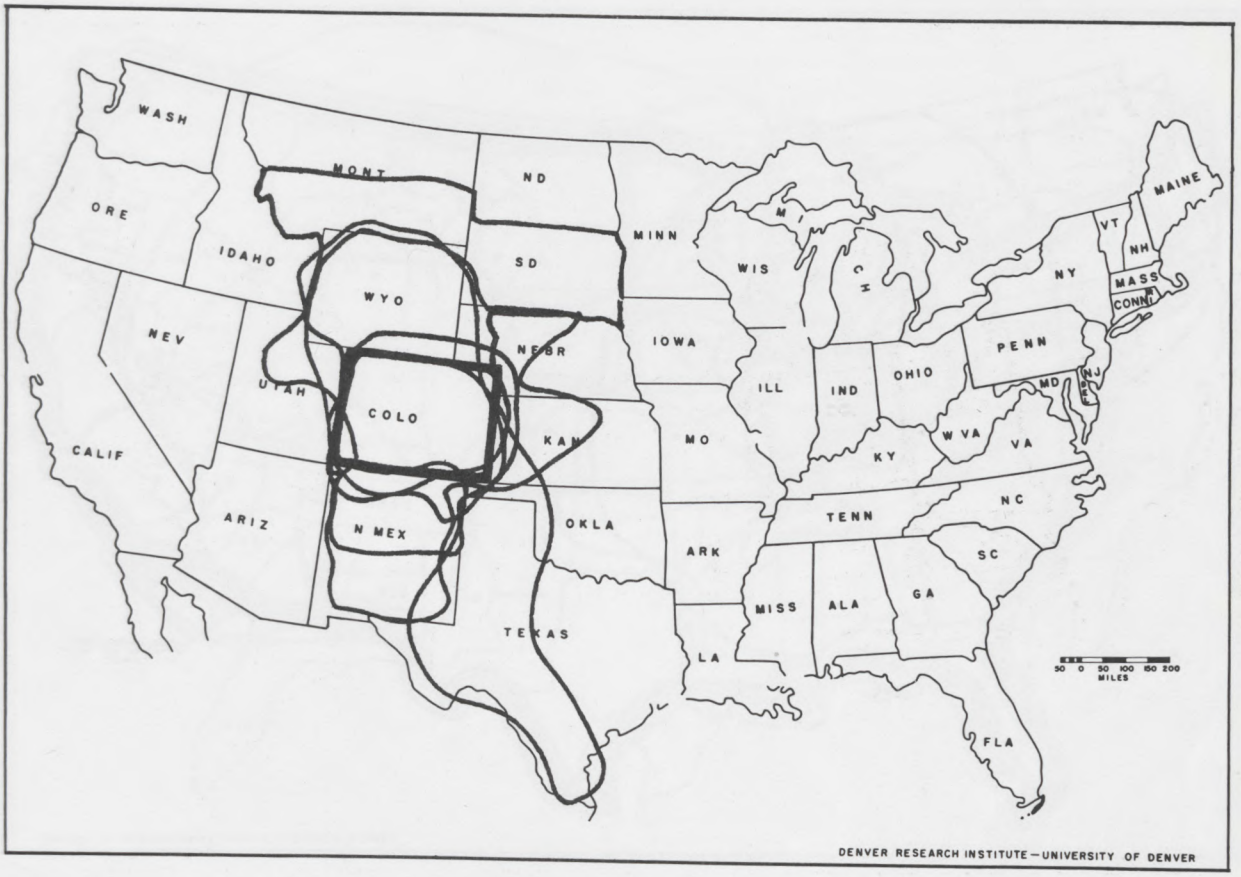
_____
_____
_____



1. Products: _____
_____
_____

2. Percent of Total Sales in Colorado: _____%

3. How do you distribute your products? (check more than 1 if appropriate)
   - Direct sales _____
   - Distributors _____
   - Manufacturers' Rep _____
   - Other (please list) _____

4. Where are your competitors located (please show on map with "C")?

5. What major factors limit your trade area (please check the three that are most important)?
   - Transportation costs _____
   - Transportation time _____
   - Ability to service _____
   - Competitors' location _____
   - Span of management control _____
   - Parent company policy _____
   - Personal preference _____
   - Others (please list) _____

APPENDIX F

Figure 17. Manufacturing — Primary Metals

PLEASE RETURN TO:

Industrial Economic Division
Denver Research Institute
University of Denver
Denver 10, Colorado

FROM:

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_____
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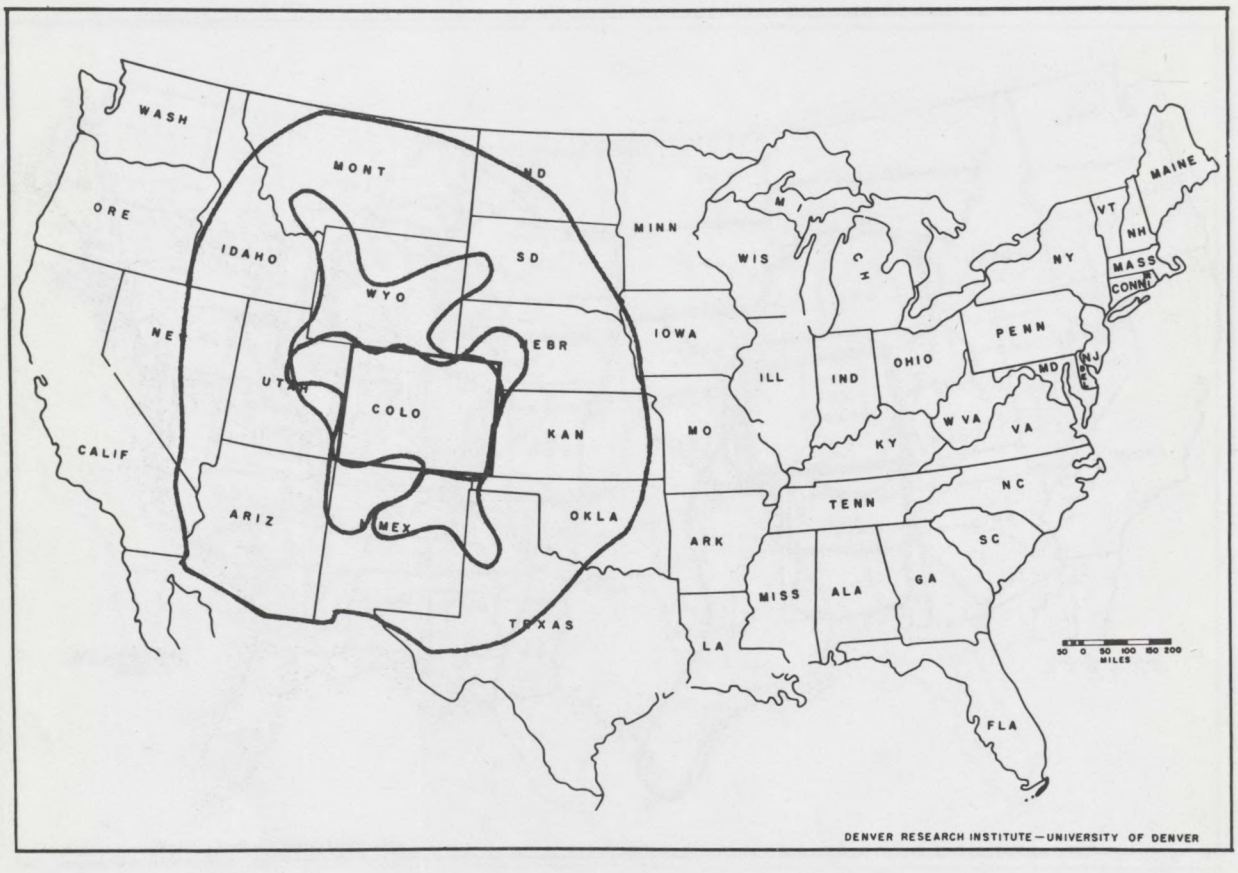

1. Products: _____
_____
_____

2. Percent of Total Sales in Colorado: _____%

3. How do you distribute your products? (check more than 1 if appropriate)
   - Direct sales _____
   - Distributors _____
   - Manufacturers' Rep _____
   - Other (please list) _____

4. Where are your competitors located (please show on map with "C")?

5. What major factors limit your trade area (please check the three that are most important)?
   - Transportation costs _____
   - Transportation time _____
   - Ability to service _____
   - Competitors' location _____
   - Span of management control _____
   - Parent company policy _____
   - Personal preference _____
   - Others (please list) _____

APPENDIX F

Figure 18. Manufacturing — High Value per Pound Products
(SIC's 34, 35, 36 and 37)

PLEASE RETURN TO:

Industrial Economic Division
Denver Research Institute
University of Denver
Denver 10, Colorado

FROM:

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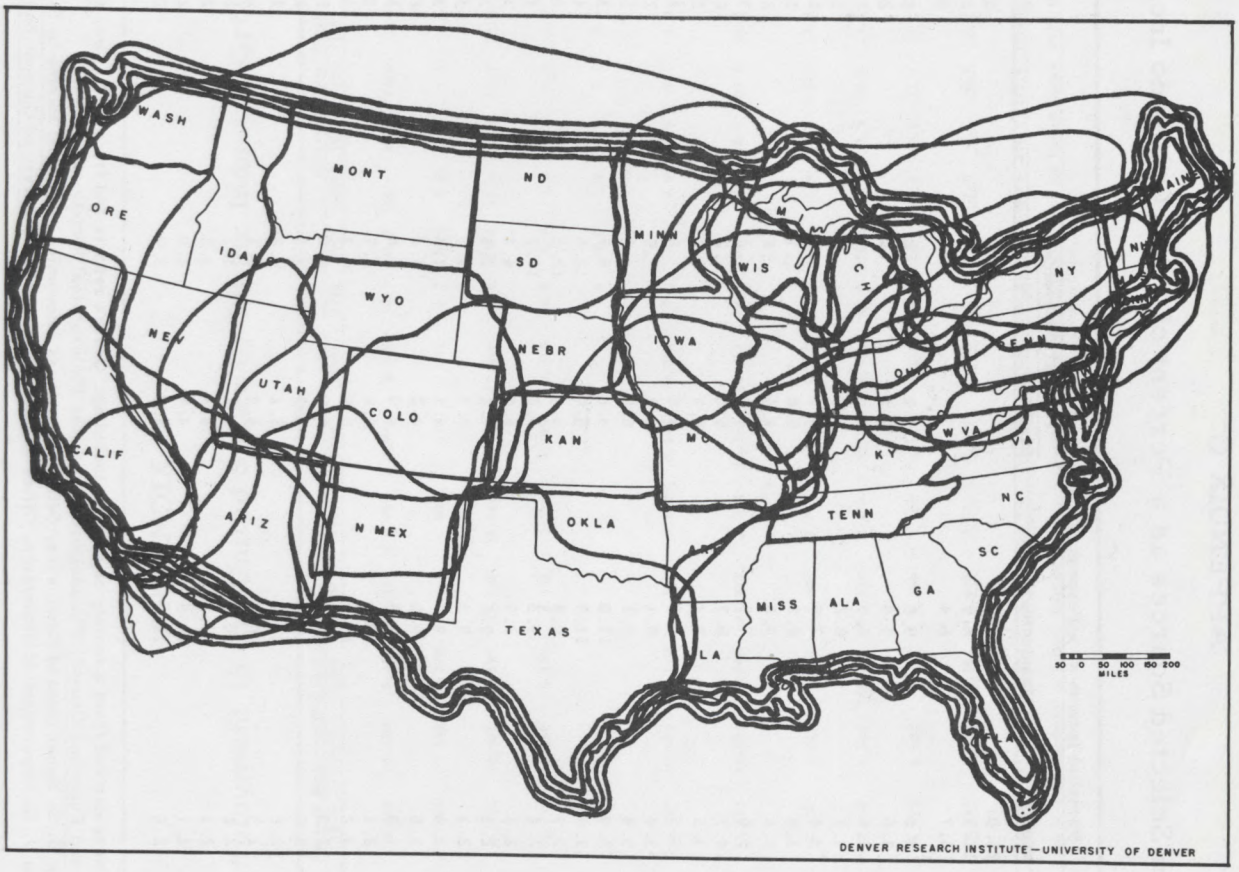


1. Products: _____
_____
_____

2. Percent of Total Sales in Colorado: _____%

3. How do you distribute your products? (check more than 1 if appropriate)
   Direct sales _____ Manufacturers' Rep _____
   Distributors _____ Other (please list) _____

4. Where are your competitors located (please show on map with "C")?

5. What major factors limit your trade area (please check the three that are most important)?
   Transportation costs _____ Span of management control _____
   Transportation time _____ Parent company policy _____
   Ability to service _____ Personal preference _____
   Competitors' location _____ Others (please list) _____

APPENDIX G

Table 1. Personal Income from Selected Sources as a Percent of Total Colorado Income, 1880 to 1961

Year	Personal Income as a Percent of Total Income					
				Federal Government		
	Agriculture	Mining	Manufacturing	Civilian	Military	Total
1880	5.6	25.0	2.0			32.6
1900	10.5	12.5	6.9			29.9
1920	20.8	3.7	6.4			30.9
1929	13.7	4.0	9.0	1.9	.2	28.8
1930	14.6	3.6	9.0	2.2	.2	29.6
1931	8.6	3.6	8.8	3.2	.3	23.8
1932	3.9	3.7	8.2	3.2	.3	19.3
1933	11.3	3.4	7.9	3.7	.3	26.6
1934	3.8	3.8	8.8	5.0	.3	21.7
1935	12.4	3.8	7.8	4.6	.2	28.8
1936	12.8	3.6	7.5	7.5	.2	31.6
1937	10.6	4.3	8.7	5.8	.2	29.6
1938	11.5	3.5	7.4	6.9	.2	29.5
1939	9.3	3.3	8.3	6.6	.3	27.8
1940	10.9	3.4	8.1	6.2	.5	29.1
1941	13.2	3.4	9.1	5.2	.8	31.7
1942	14.7	2.9	11.0	4.6	5.5	38.7
1943	15.8	2.7	11.5	5.9	12.5	48.4
1944	15.1	2.7	9.5	5.9	12.2	45.4
1945	15.3	2.4	9.3	5.5	11.5	44.0
1946	14.8	2.2	8.7	5.0	4.4	35.1
1947	18.7	2.3	9.2	4.1	2.5	36.8
1948	15.7	2.3	9.3	3.8	1.9	33.0
1949	13.6	2.0	9.0	4.1	2.4	31.1
1950	9.9	1.8	9.6	4.2	3.4	28.9
1951	11.5	1.8	9.8	4.9	4.6	32.6
1952	10.1	2.1	10.0	5.8	4.7	32.7
1953	8.0	2.2	10.8	5.8	4.3	31.1
1954	5.6	2.3	10.3	5.6	5.6	29.4
1955	4.7	2.5	10.4	5.5	4.8	27.9
1956	3.8	2.6	10.4	5.2	4.8	26.8
1957	5.7	2.5	10.6	4.9	4.1	27.8
1958	6.2	2.2	10.6	5.1	3.7	27.8
1959	4.8	2.1	11.0	4.8	3.2	25.9
1960	5.2	2.1	11.5	4.8	3.0	26.6
1961	4.8	2.0	11.9	4.8	2.9	26.4

Sources: 1880, 1900 and 1920 data were derived from a variety of sources including: Census reports and from E. S. Lee, et. al., Population Redistribution and Economic Growth, Philadelphia: American Philosophical Society, 1957.
1929 to 1955 data are from U. S. Department of Commerce, Office of Business Economics, Personal Income by States since 1929.
1956 to 1961 data are from U. S. Department of Commerce, Office of Business Economics, Survey of Current Business, August issues, various years.

APPENDIX G

Table 2. Total Civilian Employment in the United States by Major Industry Group, 1950-1960

Industry Group	Persons Employed (000 Omitted)											Percent of Total Employed										
	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
Agriculture	7,005	6,733	6,445	6,226	6,040	5,820	5,403	5,199	5,097	4,990	4,350	12.5	11.3	10.7	10.0	10.0	9.5	8.5	8.2	8.3	7.8	6.7
Mining	929	904	902	837	761	738	775	767	685	678	654	1.7	1.5	1.5	1.4	1.3	1.2	1.2	1.2	1.1	1.1	1.0
Manufacturing	14,478	16,353	16,369	17,614	16,263	16,581	17,131	17,168	15,561	16,528	16,814	25.7	27.4	27.1	28.4	26.9	27.0	27.1	26.9	25.3	25.9	26.0
Construction	3,440	4,032	3,973	3,934	3,870	4,039	4,178	4,132	3,720	4,019	3,815	6.1	6.7	6.6	6.4	6.4	6.6	6.6	6.5	6.1	6.3	5.9
Transportation												7.0	7.1	7.0	6.9	6.7	6.5	6.7	6.6	6.4	6.3	6.2
Communications & Public Utilities	3,940	4,216	4,186	4,263	4,069	4,019	4,219	4,244	3,942	3,981	4,022	7.0	7.1	7.0	6.9	6.7	6.5	6.7	6.6	6.4	6.3	6.2
Wholesale & Retail Trade	10,548	10,839	11,000	11,230	11,239	11,263	11,542	11,527	11,110	11,362	11,793	18.7	18.1	18.4	18.1	18.6	18.3	18.3	18.0	18.1	17.8	18.2
Finance, Insurance & Real Estate	1,916	1,987	2,071	2,146	2,232	2,327	2,437	2,480	2,533	2,603	2,695	3.4	3.3	3.4	3.5	3.7	3.8	3.9	3.9	4.1	4.1	4.2
Services	7,069	7,285	7,480	7,630	7,750	8,040	8,440	8,650	8,660	9,025	9,270	12.6	12.2	12.4	12.3	12.8	13.1	13.3	13.5	14.1	14.1	14.3
Government	6,074	6,407	6,594	6,691	6,725	6,881	7,201	7,629	7,850	8,174	8,618	10.8	10.7	10.9	10.8	11.1	11.2	11.4	11.9	12.8	12.8	13.3
Other	840	1,017	1,194	1,370	1,547	1,724	1,901	2,078	2,254	2,431	2,608	1.5	1.7	2.0	2.2	2.5	2.8	3.0	3.3	3.7	3.8	4.0
Total Civilian Employment	56,239	59,773	60,314	61,941	60,496	61,432	63,227	63,874	61,412	63,791	64,639	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sources: U. S. Employment series is from Census reports and from U. S. Department of Labor, Bureau of Labor Statistics, Employment and Earnings for the United States, 1909-60, issued in 1961. The procedure used for constructing this series was much the same as used in the Colorado series (see Appendix A, Technical Note on Employment Data).

APPENDIX G

Table 3. Annual Income Per Employee in Current and 1960 Prices

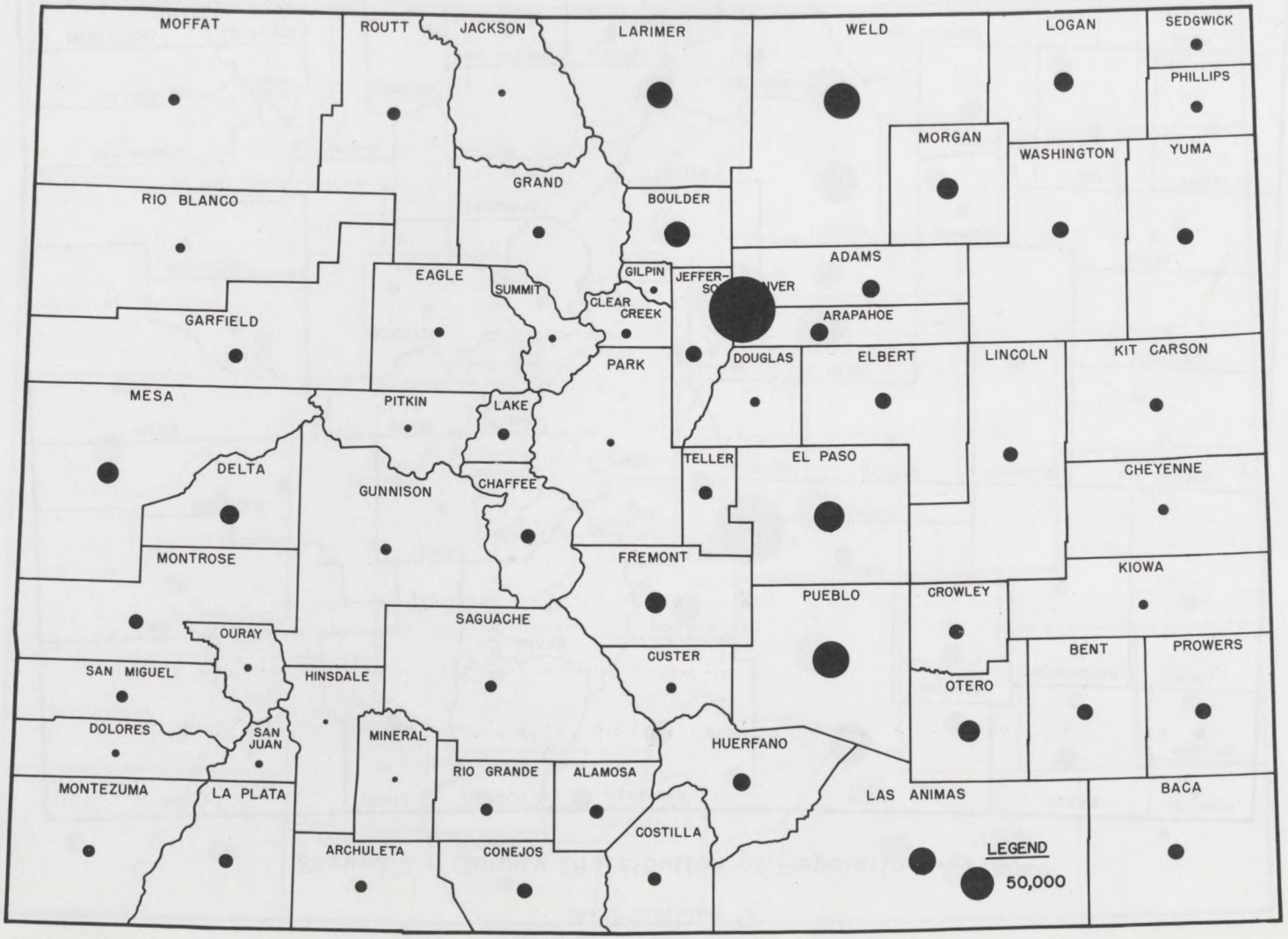
	1950		1955		1957		1958		1959		1960	
	Current	1960 Prices	Current	1960 Prices	Current	1960 Prices	Current	1960 Prices	Current	1960 Prices	Current	1960 Prices
Agriculture	$2,637	$3,246	$2,110	$2,332	$3,999	$4,207	$4,813	$4,929	$3,656	$3,711	$4,336	$4,336
Mining	3,698	4,552	5,103	5,639	6,258	6,583	6,042	6,187	6,434	6,531	6,737	6,737
Contract Construction	3,020	3,718	4,508	4,981	5,828	6,131	7,254	7,428	6,159	6,251	6,881	6,881
Manufacturing	3,527	4,342	4,531	5,007	5,226	5,498	5,617	5,752	5,572	5,656	5,922	5,922
Wholesale & Retail Trade	3,966	4,882	4,444	4,911	4,834	5,085	5,238	5,364	5,422	5,503	5,496	5,496
Finance, Insurance & Real Estate	3,305	4,068	3,966	4,382	4,733	4,979	4,927	5,045	5,174	5,252	5,412	5,412
Transportation	3,875	4,770	5,311	5,869	5,749	6,048	6,015	6,159	6,194	6,287	6,353	6,189
Communications & Public Utilities	3,333	4,103	4,398	4,860	5,030	5,292	5,482	5,614	5,964	6,053	6,023	6,180 6,189
Services	2,574	3,169	3,086	3,410	3,630	3,819	2,954	3,025	4,021	4,081	4,329	4,329
Government	2,624	3,230	3,599	3,977	3,806	4,004	4,145	4,244	4,280	4,344	4,412	4,412
Other Employment	139	171	141	156	118	124	109	112	101	103	94	94

Note: Income and employment data are from different sources and do not match in all cases. This is particularly evident when looking at "Other Employment" and the corresponding income.

Sources: Annual income per employee is calculated by dividing industrial income by employment in each industry. Industrial sources of income are from U. S. Department of Commerce, Office of Business Economics, "Personal Income by States, Since 1929, and Survey of Current Business, August, various years. Employment data are from Appendix A, this report. Price adjustments based on Consumer Price Index, Statistical Abstract of the United States, 1962 edition.

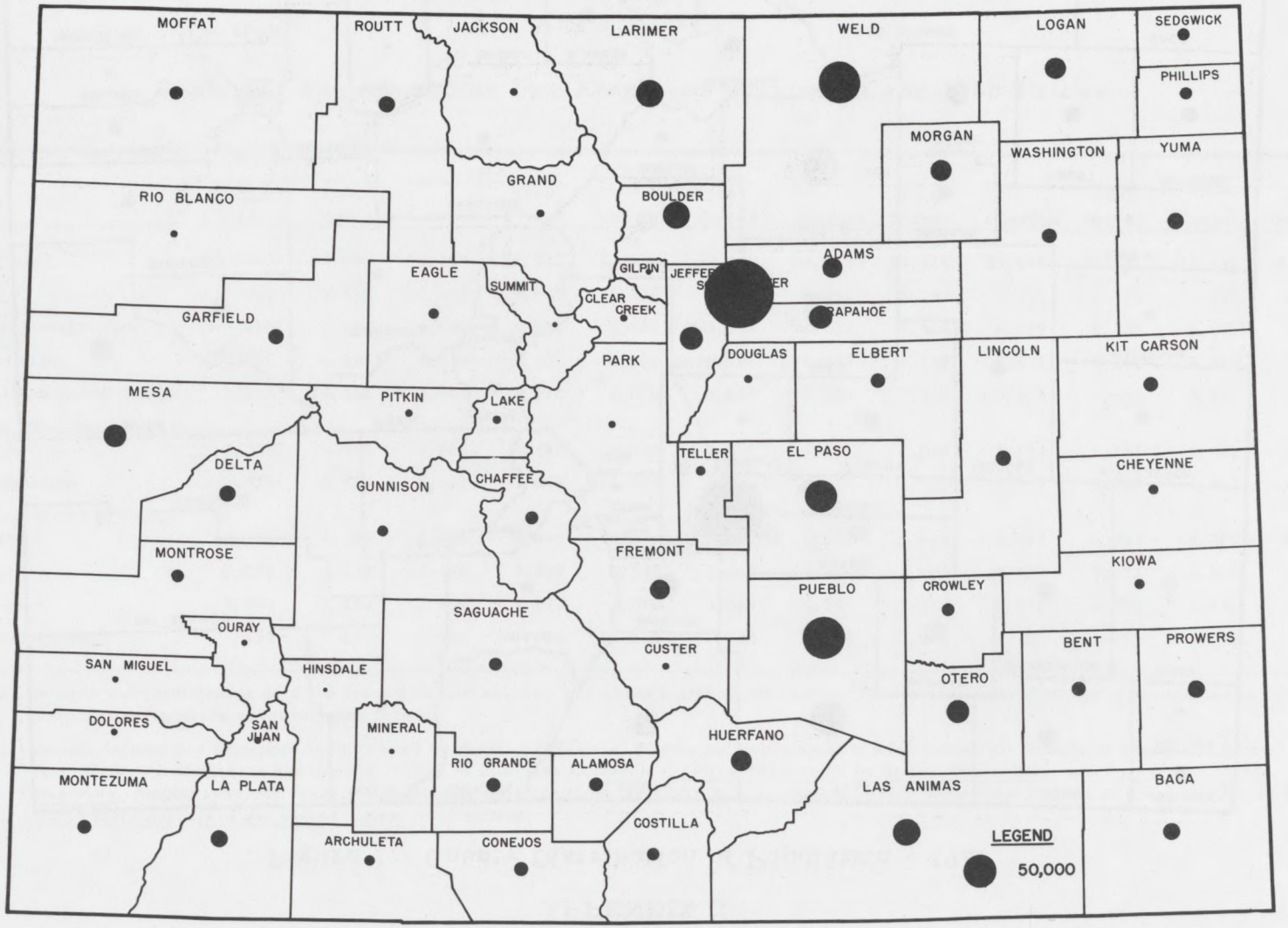
APPENDIX G

Figure 1. County Distribution of Population - 1920



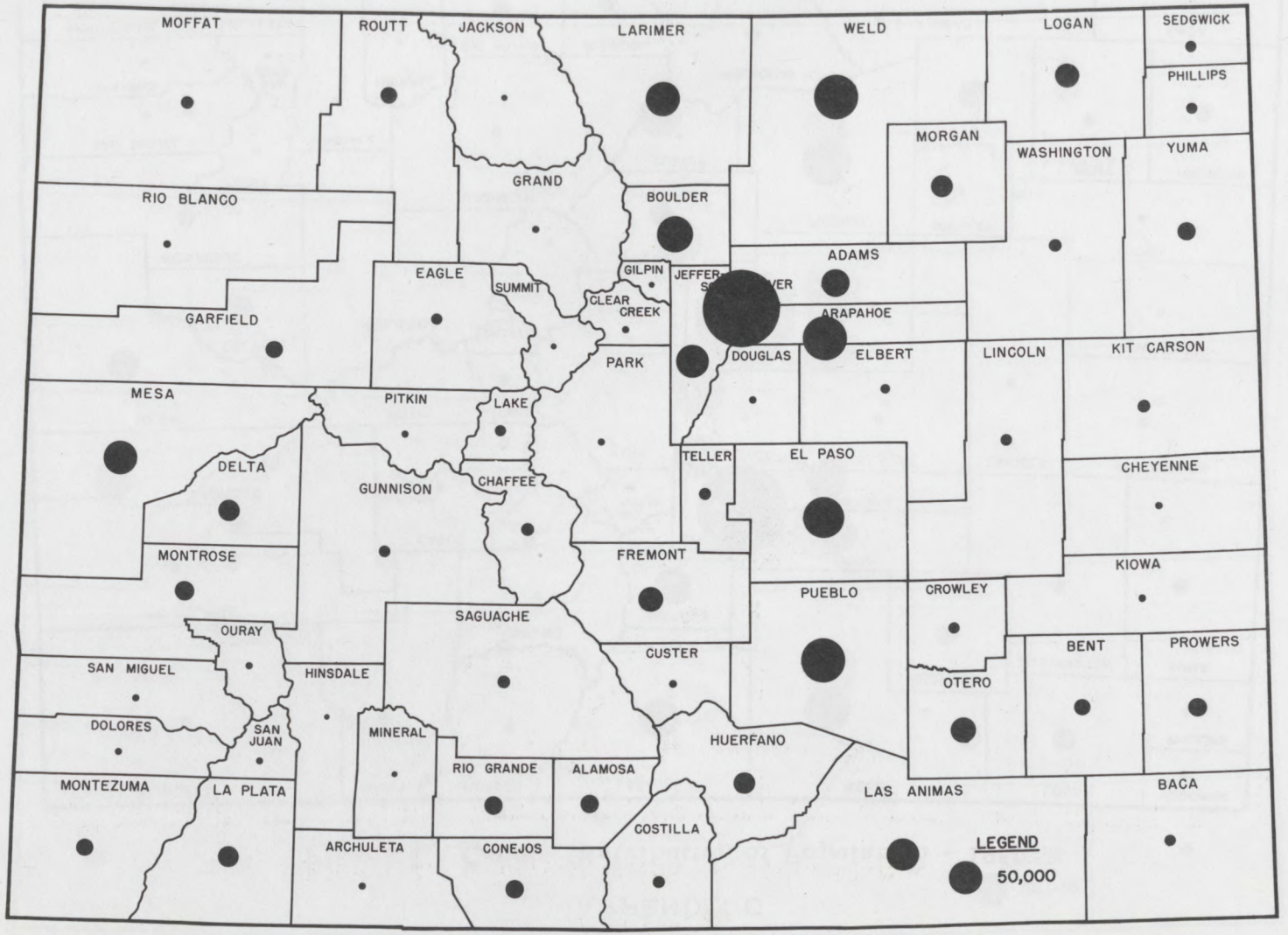
APPENDIX G

Figure 2. County Distribution of Population - 1930



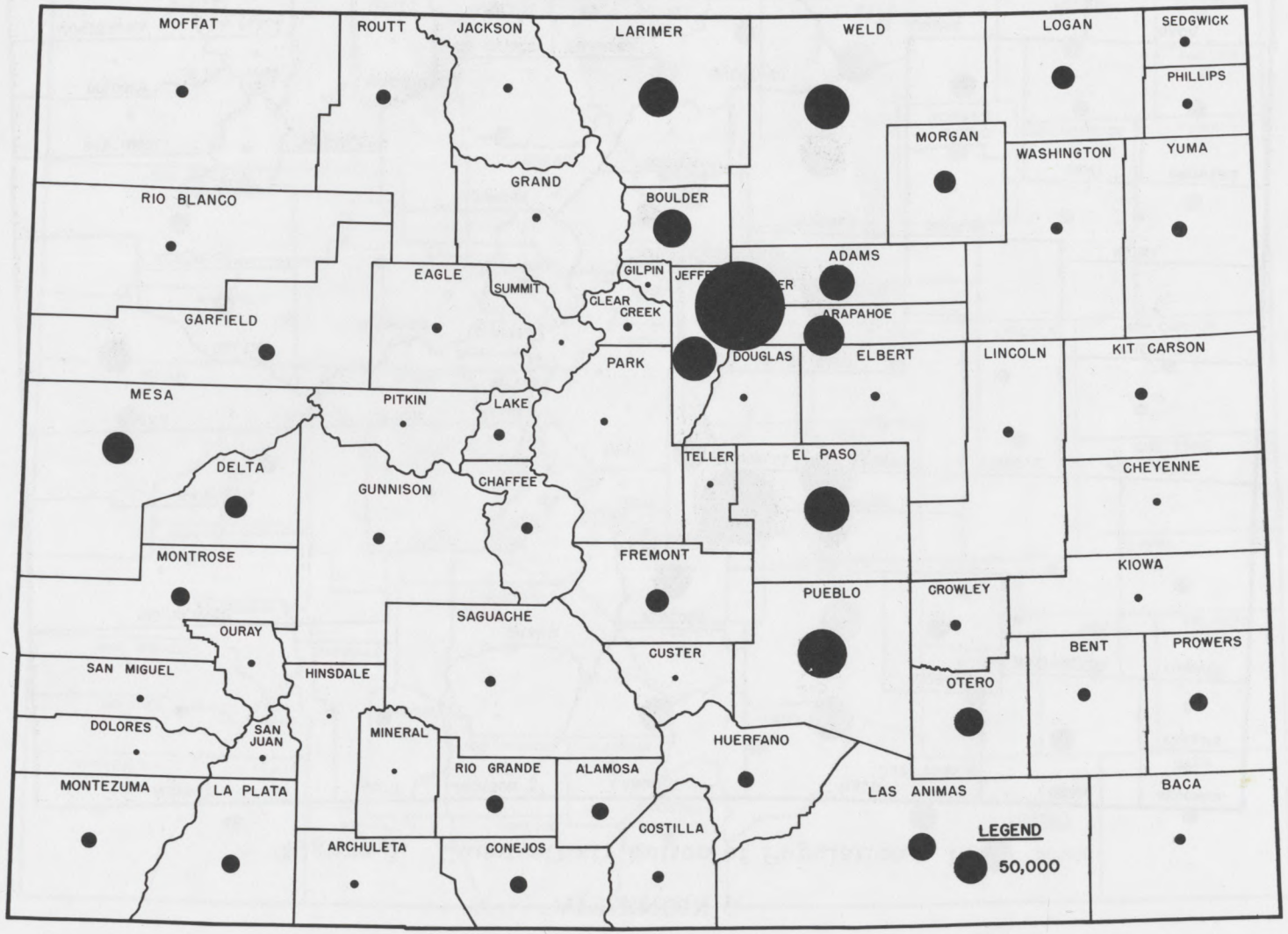
APPENDIX G

Figure 3. County Distribution of Population - 1940



APPENDIX G

Figure 4. County Distribution of Population - 1950



APPENDIX G

Figure 5. County Distribution of Population - 1960