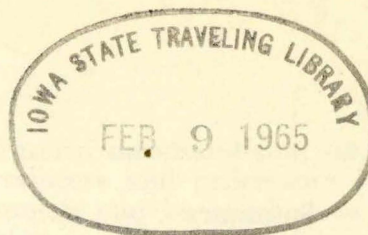
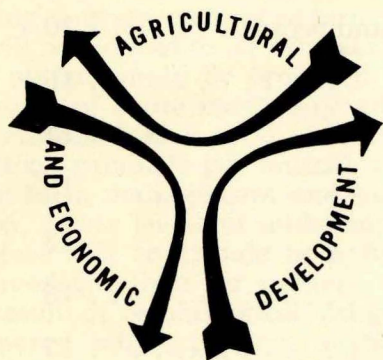


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Projections of Iowa's Economy and People in 1974



by Wilbur R. Maki

Department of Economics and Sociology

Center for Agricultural and Economic Development

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Iowa State University of Science and Technology
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SUMMARY

This report is about the economic prospects facing Iowa over the next decade. A variety of forecasts have been prepared and evaluated in the context of an interindustry transactions table of the Iowa economy for 1954—the base year in this study; 1964, therefore, is the midpoint in the 20-year period covered by the economic forecasts.

The prospects of Iowa's economy and people over the next decade are shaped by two important economic forces: technological progress and expanding market outlets. Technology has contributed to an extremely productive agriculture in Iowa. Physical output per worker in agriculture is increasing at an annual rate of 5 percent or more. The rising farm productivity will result in further contraction of the farm labor force. The 100 workers engaged in producing a given amount of farm products in 1954 will be reduced to 57 workers in 1974. The same output would be produced with less labor because of more machinery and equipment per worker, higher crop yields per acre, more livestock products per animal and better methods of farm management and marketing. In addition, lower levels of underemployment in agriculture will contribute to a further increase in average output per worker.

As a result of technological progress, the Iowa economy will experience a sharp shift in its employment structure. While 30 percent of the total employment in 1954 was in farming, by 1974 only 16 percent is expected to remain in farming. In absolute numbers, agricultural employment will decline from 266,000 to 150,000 persons over a 20-year period. Agricultural employment is now declining at a rate of 2.8 percent per year.

Meanwhile, agricultural production is increasing at an annual rate of slightly more than 2 percent simply because of the growth in national population and the rising aggregate demand for Iowa's agricultural output. By 1974, Iowa agricultural output is expected to be nearly one-fourth larger than it was in 1964. If Iowa's out-of-state markets were to grow more rapidly than the out-of-state markets of competing agricultural areas, the growth in agricultural output would be even larger. As a result, the decline in farm employment would not be quite as rapid, and the economic pressures to find off-farm work would be lessened. To compete effectively in out-of-state markets, however, requires certain favorable business considerations, such as a high level of labor and managerial efficiency, a good-quality product that is readily sold in out-of-state markets

and aggressive merchandising on the part of Iowa producers and processors so that new market outlets can be reached as quickly as they develop.

Technological progress in Iowa agriculture is manifested through farm consolidation. Iowa farms are becoming fewer, but larger. The 194,000 farms reported in 1954 will shrink to 144,000 by 1974. Total commercial farms will be even fewer. Farm consolidation thus is increasing the average Iowa farm size by 40 percent over a 20-year period.

Fewer farms mean fewer farmers and farm people. Farm population is expected to drop from the 1954 level of 735,000 to a 1974 level of 452,000—a decline of 2.4 percent per year. Thus, to maintain the total 1954 employment level of a million workers, 116,000 new jobs would be needed.

The impact of technological progress is not confined to Iowa agriculture. Iowa manufacturing also is becoming more efficient; output per worker is increasing more than 3 percent per year. In contrast to agriculture, however, the total number of jobs in manufacturing is expected to rise from 168,000 in 1954 to 200,000 or more by 1974. The output of Iowa factories is increasing more rapidly than productivity so that total employment also is increasing.

In marked contrast to farming and manufacturing, the service industries are characterized by small increases in productivity, except in transportation, communication and public utilities. In the service industries generally, output per worker is increasing by less than 2 percent per year. But demand for the outputs of these industries is increasing by 2.6 percent per year (largely as a result of the growth in per-capita incomes). Thus, total employment in the service industries is increasing. The 577,000 persons employed in 1954 are expected to increase to more than 600,000, and possibly 700,000, by 1974. The service industries, therefore, offer the major new job opportunities in Iowa over the next decade.

In short, the economic forecasts of Iowa's employment opportunities, when based on events of the post-World War II period, show barely enough growth in the expanding sectors to balance the losses in farm employment. Consequently, Iowa's population in 1974 is expected to increase by only 255,000—from its 1954 level of 2,665,000 to the projected 1974 level of 2,920,000. The expected increase in total employment also is small—only 57,000.

The projected levels of employment and

population are consistent, however, with rising per-capita incomes. Personal income per capita is expected to increase \$680, in constant 1954 dollars, from its 1954 level of \$1,690. Higher wages and salaries, along with increased earnings among proprietors and property owners, are contributing to the sharply increasing per-capita purchasing power. The higher incomes will mean expansion of consumer markets, particularly in personal and professional services.

As the Iowa economy changes from a pro-

ducer of agricultural products to an exporter of processed farm products, farm machinery, insurance and related goods and services, the pattern of employment will change. For example, many of the new jobs in manufacturing and the service industries are for women. The farm workers displaced by farm consolidation and mechanization, however, are mostly men. Thus, out-migration is expected to continue as a major means of adjustment between Iowa's population and its resource base.

Projections of Iowa's Economy and People in 1974¹

by Wilbur R. Maki

The target year for the projections of population, employment and income in this report is only a decade away. Yet, in this short period in its history, the Iowa economy and people will experience substantial changes—both in the composition of population and industry and in the sources of prosperity and economic growth.

To identify the industrial sources of Iowa's economic growth, demographic trends covering the historical period since 1900 are examined—particularly population and labor force—in relation to changes in Iowa's agriculture. Employment trends in Iowa industries are studied also, but with reference to the pattern of inter-industry purchases within the state during the 1954 calendar year. Finally, the major determinants and consequences of economic growth are projected to 1974. The plausibility of these projections is tested in the context of the 1954 interindustry transactions table, adjusted for expected changes in industrial structure.

Agricultural Adjustment and State Economic Change

Since the beginning of the century, Iowa's rural population has been declining, but its urban population has been increasing. This trend has involved two types of changes—a decline in the number of farm people and a shift of rural towns (those having less than 2,500 population) into the urban classification. Meanwhile, many rural communities have experienced gradual losses as social and trade centers for the surrounding countryside. Further, the larger urban centers have continued to expand in size and variety of services for their own residents and for the outlying towns and villages.

¹ Project No. 1496, Iowa Agricultural and Home Economics Experiment Station, Center for Agricultural and Economic Development cooperating. This report was prepared in conjunction with the Iowa College-Community Research Center study on "Business Responses to Agricultural Change." In the preparation of this report, the author gratefully acknowledges the assistance of Vaughn Manley and Jerald Barnard.

Farm consolidation and mechanization

Farm consolidation and mechanization are major sources of Iowa's economic and demographic changes. The number of farms declined from the 1934 peak level of 223,000 to the current level of approximately 175,000. Farm population increased to a 1922 peak of 1,005,000 and then declined to its present level of 603,000. Farm employment also declined from a 1934 peak level of 368,000 workers to the current level of 286,000 workers.

Iowa's total agricultural output kept increasing, despite the reduction in labor inputs, due to increasing agricultural productivity. But the latter was possible because of rapid farm mechanization, which has led, finally, to larger units that realize the economies of size under a more mechanized system of agriculture. At the local level, the agricultural change has forced corresponding adjustments in the off-farm businesses that handle farm inputs and outputs and that cater to the needs of farm households.

Community reorganization

Off-farm business adjustments have generated a series of local "shocks" or disturbances in the established patterns of trade and population in Iowa. Because the farm purchases greatly exceed in value the household purchases in Iowa agriculture, a proportionate change in farm purchases is substantially larger in an absolute sense than it is in household purchases. In 1960, for example, the average Iowa farm used \$17,000 worth of purchased goods and services for production purposes. However, the average farm household purchased \$4,200 worth of food, clothing, shelter and amenities. Of the \$21,000 of farm products sold per farm, many were processed in manufacturing plants within the state. When farm population declines, therefore, the farm household purchases decline also, but, at the same time, purchases of farm production items increase more than enough to make up for the population decline.

For many communities the decline in farm population has resulted in a decline in local

business. Farm people, moreover, travel greater distances now than they did a half-century ago to obtain even the daily necessities of life. Food stores in the larger towns, for example, compete with the grocery store in rural villages because of the wide choices of products, lower prices and the ease of transportation. Two different forces, therefore, are impinging upon the business activities of rural communities in areas of declining farm population—the contraction in its economic base and the competition from larger trade centers that cater more effectively and thoroughly to the needs of both rural and urban residents.

As the farm-oriented trade centers respond to the agricultural change, problems arise in the government sector of those communities. Whether or not the community is expanding, the local tax base typically is inadequate to support the needed complement of governmental services, including education. The demand for streets, schools and related governmental services increases more rapidly than the tax base in growing communities. In declining communities, the cost of government remains high, while the tax base deteriorates. In either case, local governmental receipts are inadequate to cover expenditures. Thus, political and economic pressures develop for governmental reorganization.

Finally, social institutions—the church, the voluntary civic groups and related organizations—undergo change as the rural communities attempt to reorganize their business and municipal activities. With fewer people in the open country and rural communities, the expanding "reach" of the family car and the increasing specialization of personnel within each of the social institutions of rural and urban society encourage the attainment of various economies of size. As a consequence, many businesses and institutions shift more and more to the larger trade centers.

Prospective Population, Employment and Income

The underlying changes in agriculture and community organization are evident in the changing patterns of Iowa's population, employment and income. Because of a long history of relative stability in the aggregate levels of these variables, they are not expected to change substantially during the next 10 years. The aggregate figures, however, mask important changes in the composition of Iowa's economy and population. To later identify these changes, the major determinants of Iowa's economic growth are reviewed briefly.

Determinants of state economic growth

First among the factors accounting for Iowa's prospective growth is the availability of its natural resources—primarily its agricultural land. Iowa's agricultural land is the most important natural resource; it accounts for an increasingly larger agricultural output, particularly of feed grains and livestock. Geographical specialization in agriculture is a manifestation of Iowa's agricultural advantages.

A second factor accounting for Iowa's economic growth (as distinct from the population growth rate, which is lower relative to the national growth rate) is the productivity of its primary inputs—labor, management and capital. In addition, the large reduction in farm employment, the high level of disguised unemployment or underemployment on farms and in many rural communities, and the large number of females who are readily attracted into Iowa's labor force, offer new businesses a potential supply of skilled clerical and professional workers.

Finally, the accessibility of Iowa businesses to consumer and producer markets ranks high in terms of both "local" and "export" outlets. The local markets, for example, are of two forms—(a) the agricultural and related industrial market and (b) the consumer market. Because of the high degree of agricultural mechanization and specialization, Iowa farms are substantial buyers of producer goods; they attract machinery and equipment manufacturers, as well as farm supply businesses into the state. Relatively high per-capita incomes also make the local consumer market profitable for many consumer-oriented business activities.

With reference to "export" outlets, several industries, other than agriculture, can be cited as maintaining a relatively favorable competitive position; these include meat packing, grain mills, fertilizer and other chemicals, rubber products (for farm machinery), farm machinery and equipment, electrical machinery and insurance. Each of the dominantly export businesses are advantageously located with reference to raw material supplies, farm markets and labor. For the Iowa insurance companies, an early start, plus proximity to a prosperous agricultural economy with opportunity for profitable investment of insurance receipts, must be included among the important location factors.

Structural relationships and socio-economic variables

As a result of favorable prospects for economic growth, Iowa's total personal income is expected to increase from 5.9 billion dollars in 1964 to 6.9 billion dollars in 1974 (in

constant 1964 dollars). During the same period, Iowa's population is expected to increase from 2.8 million persons to 2.9 million. Meanwhile, total employment is expected to remain quite stable at approximately 1 million workers.

From an economic standpoint, the number and quality of jobs are important measures of well being. In addition, the supply of workers and the number of people supported by each job affect living standards and expenditure patterns of the population. Thus, per-capita personal income in Iowa is expected to increase from \$2,120 to \$2,370 from 1964 to 1974. On the basis of the population and income projections, total consumer expenditures are expected to increase from 4.9 billion dollars to 5.7 billion dollars, which amounts to an 800 million dollar increase in the Iowa consumer market.

Role of Economic Information

Iowa's economic and social prospects are outlined in a general way to suggest the occurrence of substantial variability in the internal make-up of the Iowa economy—a characteristic that may be obscured by the over-all stability of total population and employment. Because of the variability in the internal characteristics of the Iowa economy, considerable uncertainty exists concerning the implications of present trends in Iowa's economic growth. This uncertainty can be attributed partly to a lack of adequately reliable estimates of the factors influencing business and community growth.

When uncertainty in decision-making is viewed as a function of economic information, an important role is assumed by those who generate the needed information and who can show its application in business and community decision-making. The conveyance of understanding of economic process becomes, therefore, a critical function of both the technician and the teacher. Accordingly, considerable emphasis is placed in this report on a discussion of the causal links in the chain of events that connect agricultural technology with the geographical redistribution of Iowa business and population.

A second facet of economic information pertains to its use in economic prediction and prognosis. Given an adequate understanding of economic process and structure, the accurate prediction of certain critical variables offers an important basis for making better long-range plans with reference to such projects as business relocation and expansion or the construction of new school buildings or other public facilities.

Accordingly, this report emphasizes the interrelations among different variables that describe the Iowa economy. Indeed, two different but related phenomena—historical change and structural interdependence—are involved in the procedures for obtaining estimates of various economic and demographic variables.

The detailed procedures used in the preparation of the economic forecasts can be summarized into the following steps:

1. Estimation of population, labor force and employment by using historical trends among variables and relationships as a basis for a first-round series of more detailed estimates of industrial composition.

2. Estimation of final demand by using assumptions regarding Iowa's share of total national output by industry (using, in part, the population estimates from step 1).

3. Estimation of total output, assuming,
 - (a) a particular input-output structure, and
 - (b) an interarea trading pattern.

4. Estimation of total employment, assuming specified levels of productivity per worker, and changes in productivity, by industry.

5. Comparison of the employment estimates in steps 1 and 4 as a basis for,

- (a) establishing a relevant range of estimates, and
- (b) evaluating the reliability of the available employment forecasts.

6. Estimation of total income by using the employment estimates from step 5 and wage and salary data (including earnings per worker, the proportion of total nonagricultural income accounted for by wage and salary payments and the contribution of proprietary income in agriculture to total personal income).

The six steps thus incorporate the use of an interindustry transactions table (in this case, for the base year 1954) in a historical context. Moreover, the use of two different analytical approaches provides two different series of estimates, rather than one, along with the bases for these estimates that can be evaluated by the analyst when examining the reliability of the individual estimates. Most important, however, is the additional information that is introduced by the one approach in the evaluation of results generated by the second approach. Finally, a twofold objective can be achieved for the study; namely, to provide both *understanding* of the processes accounting for state economic growth and *forecasts or projections* of future levels of the major indicators of well-being in Iowa.²

²In this study, the terms "forecasts" and "projections" are used interchangeably. It is recognized, however, that all the estimates of Iowa's future prospects are based on assumptions of some sort regarding the relationships among variables and the levels of these variables.

ANALYTICAL FRAMEWORK

The two analytical approaches used in this study are now summarized briefly. First, the major factors in Iowa's economic growth and development since 1900 were identified and estimated as a part of a larger system of relationships. Second, the interindustry transactions in the Iowa economy were estimated for the 1954 calendar year as a basis for evaluating the plausibility of the projections prepared as part of the historical approach. The two approaches are examined in detail before the discussion of the empirical findings.

Historical Trends and Relationships

Population, labor force and employment estimates for Iowa and the United States were obtained and analyzed in the context of a series of functional relationships. Total population was viewed as a basis for estimating employment. Thus, an essentially supply-oriented approach was used initially in estimating Iowa employment for the target year—1974.

The general framework for estimating the historical trends and relationships includes population as the principal factor affecting the level of economic activity in the state. Once the total population is estimated, it is disaggregated according to age and sex on the basis of historical relationships covering the 1900-1960 period. The labor force is estimated subsequently by using labor force participation rates by age and sex derived from data covering the given historical period.

Data prepared by the Iowa Employment Security Commission for 1947-60 were used in estimating the percentage of total employment in each of the specified industries. Data from the decennial censuses of population also were used to obtain a further disaggregation of employment by sex. Finally, reported wage and salary payments by industry of origin, when divided by the reported number of wage and salary workers, yielded the estimates of wages and salaries per worker that served as a basis for the personal income projections.

Population

The short procedure for estimating area population by age and sex reported by Hamilton and Perry³ was used in obtaining the preferred

estimates of the Iowa population for the 1960-74 period. This procedure involves the use of the United States Census of Population data for 1950 and 1960. (Hence, the population estimates are based on the population survival rates for the 1950-60 period. If birth and death rates or the rates of out-migration and in-migration were to change, the procedure would result in corresponding errors in the estimates of future population.)

For 1963, the latest year for which the U. S. Department of Commerce has estimates of state population, the short procedure yields identically the same estimated total Iowa population—2,780,000—as reported by the U. S. Department of Commerce. Thus, the extrapolation of recent historical population patterns results in what appear to be—on the basis of most recent data—reasonably accurate estimates of Iowa's future population.

Labor force

Labor force participation rates, which denote the percentage of the total population of a specified age and sex group in the labor force, are derived from the decennial census data starting in 1900. Each of the derived relationships is highly significant in a statistical sense. Hence, given the total population and its distribution by age and sex, the labor force should be estimated reasonably well.

To obtain the total employed labor force, the number of unemployed must be subtracted from the estimated total labor force. In Iowa, the unemployment rate is generally lower than in the United States as a whole. As the effects of urbanization are diffused through the economy, however, and as different forms of "disguised" unemployment or underemployment in agriculture diminish, the Iowa unemployment rate, which is now less than 4 percent, can be expected to approach the reported national employment rate.

Employment

A third series of coefficients, the percent of total employment in a specified industry, is used to obtain the pattern of future Iowa employment. Estimates of trends in national and state employment to 1973 prepared by the National Planning Association, along with estimates of Iowa employment reported by the Iowa Employment Security Commission, are the bases for the functional relationships used in the Iowa study. In addition, the 1940, 1950 and 1960 decennial censuses of population served as the source of information on male and female employment by industry.

³C. Horace Hamilton and Joseph Perry. A short method for projecting population by age from one decennial census to another. *Social Forces* 41: 163-170. Dec. 1962.

Personal income

Personal income estimates are tied to the level of wages and salaries per worker in manufacturing. Moreover, the manufacturing industries in Iowa are depicted as part of a national wage and salary structure. Wages and salaries in all other Iowa industries (and personal income payments in agriculture) are related to wages and salary levels in the Iowa manufacturing industries.

The wage and salary estimates are multiplied by the estimated number of wage and salary workers in each industry to obtain total personal income payments in the form of wages and salaries. Historically, the latter have made up about two-thirds of the total nonagricultural personal income payments. Thus, the estimates of total nonagricultural income payments to households are derived from the employment and income per worker data.

A different procedure is used to obtain estimated proprietary income in agriculture. Two assumptions are made regarding the farm parity index and the relationship between farm income per person and wage and salary payments per worker in manufacturing. These assumptions will be discussed later when the more detailed procedures are presented.

Interindustry Transactions

The second approach to the estimation of Iowa employment and population prospects is based on the use of an interindustry transactions table.⁴ Estimates of the total output of 25 different industrial sectors were prepared for the base year, 1954. The estimated total outputs, equivalent to the total outlays for goods and services in each of the specified industries, are broken down into major categories—interindustry "sales," or intermediate demand, and "sales" to final demand. The latter, when viewed from the standpoint of the buyer, is made up of (1) customers buying Iowa-produced goods and services in Iowa, (2) state, local and federal government purchases of Iowa-produced goods and services in Iowa, (3) private capital formation in Iowa in the form of purchases of Iowa-produced capital goods (and related services) and (4)

⁴ Because of the extreme bulk of the detailed interindustry transactions tables and the related estimates of the individual entries in these tables, only the final results are shown and, then, only in abbreviated form. For readers interested in the detailed data, a compilation of the basic tables can be obtained directly from the author. For an indication of the nature of detailed data for agriculture alone see: Wilbur R. Maki and Dean F. Schreiner, Regional intersectoral relations and demand projections with emphasis on the feed-livestock economy of the North-Central States. Iowa Agr. and Home Econ. Exp. Sta. Res. Bul. 530. 1964.

out-of-state shipments, or exports, of all forms of goods and services produced in Iowa.

The interindustry transactions table makes possible the estimation of the total output of each industry, once the export demand is given. The labor and capital requirements to produce the estimated output of goods and services can be converted into total employment, once the output per worker rates are obtained for each industry. Thus, the interindustry transactions table offers an export-market-oriented (rather than a labor-supply-oriented) approach to the preparation of the 1974 estimates for Iowa.

Synthesis of Analytical Approaches

The two analytical approaches are intended to provide a series of estimates of Iowa population, employment and income that are not necessarily either contradictory to or consistent with each other. For decision-making purposes, the two series of estimates can be viewed crudely as a modified probability distribution (with equal subjective probabilities assigned to each of the two estimates of a particular variable). In a more important sense, the two procedures provide a check on each other. When the results are substantially different, some doubts should arise about the reliability of one or both series of estimates. Fortunately, both approaches are based on a detailed set of relationships that depict the changing structure of the Iowa economy so that the source of variance in the two series of estimates can be isolated reasonably well by the analyst who has access to the basic data.

The results presented in this study are unique, therefore, because of the complementary use of two analytical approaches (that typically are used separately in the preparation of state-level projections). Moreover, the historical approach is based on the use of highly stable relationships rather than simply on the linear projection of the variables themselves. Despite year-to-year fluctuations in the variables, the use of the more stable relationships among the variables can result in reasonably reliable estimates of a large number of variables, provided, of course, that the population estimates are accurate. Because the latter cannot be accepted without reservation, however, an alternative estimation procedure is essential for checking the plausibility of the historical trends, especially since they account for the projected population levels by age and sex.

GENERAL CHARACTERISTICS OF IOWA'S ECONOMY AND PEOPLE

Iowa, historically, has been dependent upon agriculture for its prosperity and population support. Unlike the agriculture in much of the United States, however, Iowa agriculture has sustained relatively high income levels within its rural communities. The agricultural prosperity has been maintained partly because of the farming adjustments that have occurred over the past half century—consolidation of small farming units into larger ones and substitution of machine power for horsepower and manpower. The impacts of the agricultural changes have been felt throughout the state in terms of total population and its various characteristics. Some areas of the state have been affected more severely than other areas as revealed by the differential rates of change in the population of its incorporated places. However, only the aggregate demographic trends are examined in this report.⁵

Demographic Factors

Population

Population growth in Iowa has lagged behind national population growth since 1880 (see fig. 1). While the Iowa population increased

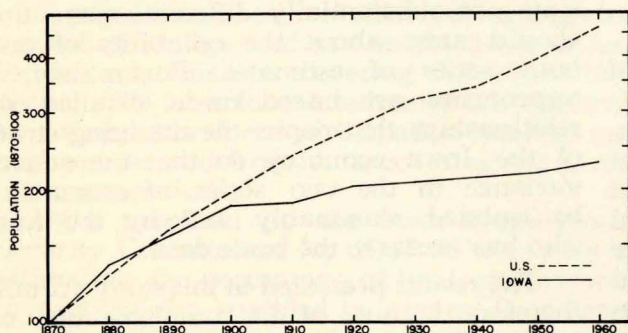


Fig. 1. Population trends, Iowa and the United States, 1870-1960.

at a rate of only 0.6 percent per annum (and largely because of the rapid growth rate before 1900), the national population increased 1.5 percent per annum. During the decade, 1950 to 1960, this discrepancy widened; the Iowa growth rate was 0.5 percent while the national growth rate increased more than 1.8 percent. Total Iowa population in 1960 was 2,757,500 which amounted to 1.8 percent of the national population of 178,464,200 (excluding Hawaii and Alaska).

⁵ Much of the historical data are obtained from: Everett S. Lee, et al. Population redistribution and economic growth. Vol. I, Methodological considerations and reference tables. American Philosophical Society, Philadelphia, 1957.

When the total population is separated into two categories—rural and urban (based upon a critical town size of 2,500 population)—the Iowa rural population is seen as having declined substantially in national importance. Historically, the Iowa urban population has increased enough to more than compensate for the net decline in rural population. Nonetheless, in relation to the urban population of the United States, the Iowa growth rate has gradually declined. With reference to the place of residence of the Iowa population in 1960, for example, 1,462,500 people resided in urban places—about 53 percent of the total population (which compares with 69 percent for the United States).

The lower-than-national rate of population growth in Iowa coupled with the higher-than-national birth rate has meant a large out-migration of Iowa-born residents. Iowa-born residents in the six contiguous states increased rapidly until the 1930's when out-migration of Iowa people was reduced sharply (from 167,200 to 73,400). During more recent years, out-migration has increased, particularly to the West Coast. In 1950, the Iowa-born population residing in Iowa totaled 2,029,800, while the number of Iowa-born residents in the six contiguous states and all other states, respectively, totaled 466,700 and 716,000—altogether nearly 1.2 million people who at one time lived in Iowa.

Finally, a population "pyramid" for Iowa and the United States summarizes the demographic impacts of the lack of economic opportunities for Iowa youth (see fig. 2). Many

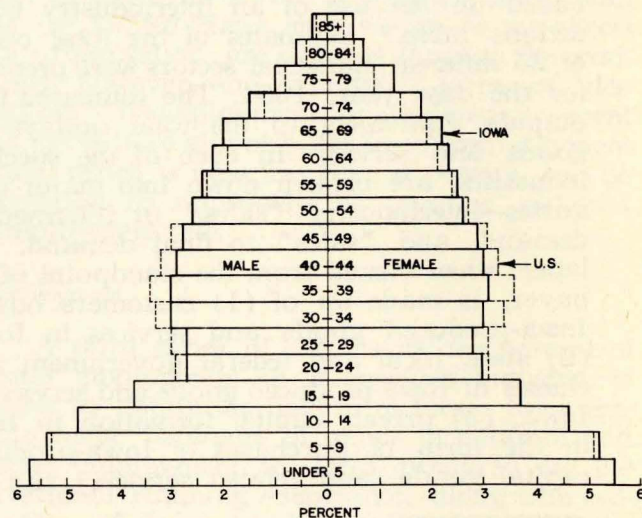


Fig. 2. Total population by age and sex, Iowa and the United States, 1960.

Iowa-born people must seek jobs outside the state, which results in lower-than-normal proportions of population in the 20- to 50-year-old age groups. Since the out-migration has

persisted for several decades, its effects are apparent over the entire range of the most productive years of life. Consequently, the older age groups account for a larger percentage of the total population—as illustrated in the larger-than-normal proportion of persons 55 years of age and older in the population.

On several grounds, therefore, Iowa's relative national position in population shows a persistent decline from the early days of this century. Of particular concern to the citizens of Iowa are the persistent underlying causal factors that have contributed to Iowa's relative decline in the number of new job opportunities for its young people and also its farmers who might be seeking off-farm employment.

Labor force and employment

In 1960, a somewhat smaller percentage of the Iowa population was in the labor force, as compared with the national population—54.3 percent compared with 55.3 percent. Historically, the percentage of both males and females that has entered the labor force in Iowa has been smaller than in the United States, but this relationship is changing (see fig. 3).

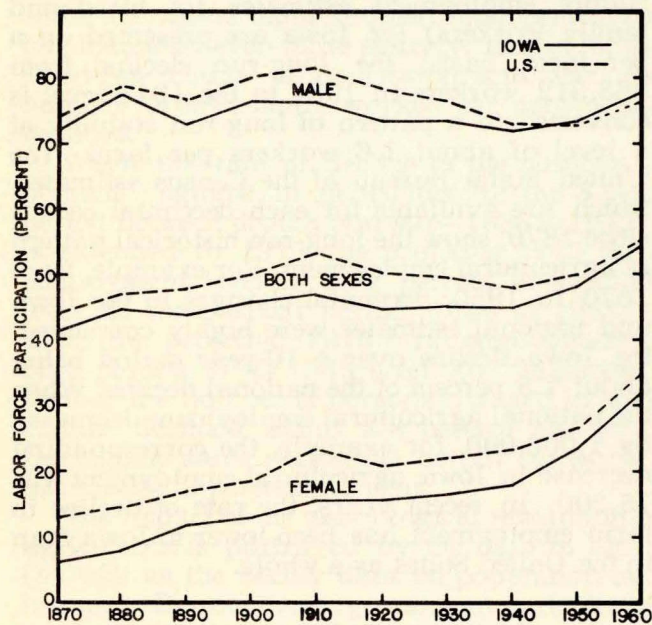


Fig. 3. Labor force participation rates, Iowa and the United States, 1870-1960.

The declining importance of the agricultural labor force is illustrated by the percentage of the total labor force made up of farm workers. For Iowa, the percentage figure declined at a rate of 1.1 percent per annum from 1890 to 1950. This rate of decline was substantially smaller than the 1.8 percent per annum decline for the United States.

The variety of industries from which Iowa workers obtain a livelihood is illustrated by the data in table 1. The data also illustrate the predominantly agricultural or "agribusiness" state economy. Of every 1,000 Iowa workers, for example, 207 workers are employed in agriculture, while an additional 55 workers are employed in the food industries. A substantial part of the employment in other manufacturing, trade, transportation and services is farm oriented. The general characteristics of the Iowa population and labor force, however, are quite similar to those for the nation as a whole.

Personal income

On a per-worker basis, Iowa agricultural income historically has exceeded the national average. For example, the 1949-51 average for Iowa was \$3,571 as compared with \$2,260 for the United States. Nonagricultural income per worker, however, has remained persistently below the national average—\$2,778 in 1949-51 as compared with \$3,097 for the entire nation. The differential between Iowa and the United States in nonagricultural income has widened, moreover, so that the percentage relation of Iowa personal income per person to average national income declined at the rate of 0.9 percent per annum during the period 1880 to 1950. The composition of national economic activity, meanwhile, shifted sharply from farming to manufacturing, trade and service industries.

The Iowa agricultural labor force has increased in relative importance with reference to the United States agricultural labor force. Every other major Iowa industry has declined in relative national importance, however, as one consequence of the below-average growth in state population and employment during the 1880-1960 period.

Agriculture

Farms and cropland

The demographic changes in Iowa have an agricultural origin in terms of farm mechanization and consolidation. First, the decline in the number of farms has occurred at an average rate of 1,350 farms per year since 1929. This decline, however, is quite small—about 1.6 percent of the decline in total number of farms for the nation as a whole. Iowa, however, accounts for 4.7 percent of all farms in the United States. For 1959, the U. S. Census of Agriculture reported 174,707 farms in Iowa, compared with 3,703,614 farms in the United States.

While the number of farms has declined,

Table 1. Percentage of total employment in specified industries, by sex, Iowa and the United States, 1960.^a

Industry	Iowa sector	Iowa			United States		
		Total	Male	Female	Total	Male	Female
Agriculture	1-6	20.66	19.02	1.64	6.73	6.08	0.65
Mining	7	0.23	0.22	0.01	1.01	0.77	0.24
Food and kindred products	8-10	5.46	4.38	1.08	2.82	2.16	0.66
Printing and publishing	11	1.72	1.29	0.43	1.76	1.31	0.45
Chemicals and allied goods	12	0.49	0.37	0.12	1.34	1.00	0.34
Other nondurables	13	1.33	0.76	0.57	5.97	3.29	2.68
Furniture, lumber and other wood products	14	0.72	0.59	0.13	1.65	1.39	0.26
Metal industries	15	2.00	1.64	0.36	3.90	3.28	0.62
Machinery except electrical	16-17	3.41	3.04	0.37	2.42	1.85	0.57
Electrical machinery	18	1.96	1.31	0.65	2.30	1.76	0.54
Other durables	19	1.30	1.07	0.23	2.12	1.78	0.34
Transportation	20	4.09	3.38	0.71	7.05	5.98	1.07
Communication and utilities	21	2.45	2.01	0.44	2.66	2.20	0.46
Wholesale trade	22	3.54	2.84	0.70	3.43	2.73	0.70
Retail trade	23	15.95	9.23	6.72	14.82	8.72	6.10
Finance, insurance, real estate	24	3.59	1.91	1.68	4.17	2.27	1.90
Services, including education	25	20.20	7.94	12.26	20.96	8.84	12.12
Public administration	26	3.22	2.28	0.94	4.95	3.54	1.41
Contract construction	27	5.20	4.99	0.21	5.90	5.86	0.04
Industries not reported		2.48	1.47	1.01	4.04	2.45	1.59
Totals		100.00	69.74	30.26	100.00	67.26	32.74

^a Based on data in: U. S. Census of Population, 1960; PC (1) IC, table 92, page 1, and PC (1) 17C, table 62, p. 17.

the total acres of harvested cropland has increased slightly from 1929-34 levels. In 1959, the 22,873,407-acre total was the largest since 1929. For the United States, total harvested cropland has declined from its 1944 peak of nearly 353,000,000 acres to its lowest level since 1929—311,000,000 acres. For Iowa, therefore, an expanding total cropland acreage and a declining number of farms yield a larger average size of farms.

Total cropland harvested in Iowa in relation to total farmland has remained quite stable over the 30-year period, 1929-59—about 60 percent of the total farmland acreage. Other cropland and other farmland each have accounted for about 20 percent of the total during the same period.

The temporal variability in cropland is geographically widespread and interrelated. For example, for each 1,000-acre change in total cropland harvested in the United States, the corresponding change in Iowa was 43 acres during the same period. Both phenomena—the changing number of farms and the changing cropland acreage—were subject to the effects of broad national forces that influence the entire agricultural economy, but at different rates.

Farm workers and population

To obtain estimates of agricultural employment, two agricultural employment series are available—one prepared by the United States Department of Agriculture, the other by the United States Bureau of the Census. The first gives a substantially larger estimate than the

second because of the method of enumeration.⁶ For 1950, these two Iowa estimates were, respectively, 346,000 and 283,000.

When the United States Department of Agriculture employment estimates (of hired and family workers) for Iowa are presented on a per-farm basis, the long-run decline from 368,312 workers in 1934 to the 1949 level is converted to a pattern of long-run stability at a level of about 1.6 workers per farm. The United States Bureau of the Census estimates, which are available for each decennial census since 1870, show the long-run historical pattern of agricultural employment. For example, from 1870 to 1950, decennial changes in the Iowa and national estimates were highly correlated, the Iowa decline over a 10-year period being about 1.5 percent of the national decline. When the national agricultural employment decreased by 1,000,000, for example, the corresponding decrease in Iowa agricultural employment was 15,200. In recent years, the rate of decline in farm employment has been lower in Iowa than in the United States as a whole.

Farm income and output

In this discussion, only some general observations based on national data can be presented, but these findings are applicable to the Iowa economy. First, as illustrated in fig. 4, the number of persons engaged in farming in the

⁶Henderson, John P. Changes in the industrial distribution of employment, 1919-1959. University of Illinois Bulletin No. 87. 1961.

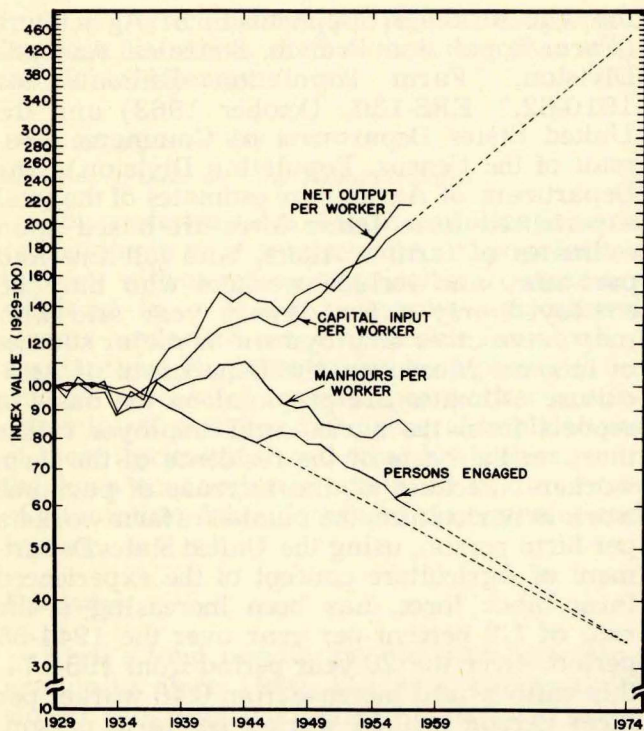


Fig. 4. Farm output per farm worker and related data, United States, 1929-59.

United States has dropped sharply since 1929, while the capital input and net output per worker has increased even more sharply. Except for the short-run effects of depression and war, the number of man-hours worked per person has declined.

When the rate of decline in the number of persons engaged in agriculture for the 8-year period between drought and war—1935 to 1942—is extended to 1975, the projected 1975 farm employment level is 33.2 percent of its 1929 level. If the postwar period, 1948 to 1957, is used, the projected 1975 farm employment is 33.5 percent of its 1929 level. For the postwar period, the number of persons engaged in agriculture declined about 2.8 percent per year. During the same period net output per worker increased 4.3 percent per year.

The impact of the technological revolution in agriculture is portrayed by the data in fig. 4 (as well as the earlier data on population and income). Despite the large gains in agricultural productivity since 1929, the available evidence suggests further technological advances in Iowa agriculture.

BUSINESS GROWTH PROSPECTS

The brief historical survey has illustrated the gradual transformation of Iowa from a predominantly rural state to one that depends more and more upon the basic economic activities

carried on in the larger trade centers. Farming is becoming more mechanized and less labor-intensive. Thus, the services required by farmers are changing from predominantly labor-related activities to capital-related activities. As a result, fewer households are supported directly by farming, and more households are supported indirectly by the farm-related businesses in the various trade centers of the state.

The geographical pattern of trade and population centers is changing, also, as a response, not only to the technological revolution in farming, but also to the transportation revolution and the changing needs of an affluent society. Both farm and nonfarm people are traveling greater distances, and they are buying a larger variety of services than they did even a decade ago.

The changing panorama of Iowa economic and social life is described now in more detail. Agricultural trends are examined with reference to the effect of farm technology on farm size, employment and income. Population trends also are examined by age and sex, and these trends are then projected to 1974 and 1975 along with trends for agriculture. Similarly, labor force, employment and income trends are examined with reference to their impacts upon existing Iowa businesses and their implications for future economic growth and development.⁷

Agriculture

Increased yield of crops per acre and of livestock products per animal unit have contributed to the growth in total agricultural output. These effects of farm technology have been reflected in employment and income; the latter have been maintained at higher levels than would otherwise have been possible. At the same time, the decline in employment and the migration of farm people into nonfarm work have made possible relatively high rural living standards for the remaining population.

Effect of farm technology on farm size, employment and income

The impact of farm technology on Iowa agriculture is illustrated in the summary data in table 2. If the post-World War II trend is projected to 1974, then the total number of farms is reduced from the 197,000 reported in 1954 to an estimated 144,000 in 1974.⁸ The average

⁷The economic models used in the preparation of the 1974 estimates are discussed further in: Wilbur R. Maki, Jerald R. Barnard and Richard Suttor, Recursive economic systems in rural-urban development. *Jour. Farm Econ.* 46: 466-474. May 1964.

⁸The number of farms differs slightly from the United States Census of Agriculture estimates because of the inclusion of additional abnormal farms and farm residences in the estimates used in this study. See: U. S. Department of Agriculture, Crop and Livestock Reporting Board. U. S. Dept. Agr. Stat. Bul. 316. 1962.

Table 2. Selected trends in Iowa agriculture, 1954-74.

Year	Number of farms	Farm population (thousands)	Number of farm workers	Agricultural employment
1954	197	735	341	266
1959	187	683	293	216
1964	175	603	286	199
1974	144	452	243	150

size of farms in terms of total farmland would increase from 173 acres to 236 acres, while total cropland would increase from 131 acres to 181 acres. It is assumed that total farmland will stabilize at around 34,000,000 acres and that total cropland will represent about 76 percent of total farmland, or 26,000,000 acres. Thus, the average annual rate of decline of about 2,800 farms would result in an increase of about 3 acres per year in average farm size. This projected decline in the number of farms is about twice the decline that actually occurred over the 1929-59 period. The first part of this period included, of course, the depression years of the 1930's which temporarily slowed down the processes of farm consolidation.

In relation to the United States, total number of farms has increased since 1900 when Iowa farms accounted for about 3 percent of all farms in the United States. During the 60-year period from 1900-1960, the relative position of Iowa increased at a rate of about 0.4 percent per decade.

Total farm population also has declined, partly because of the decline in the total number of farms and partly because of the decline in the average size of farm family. In 1954, for example, an average of 3.7 persons per farm was reported in Iowa. If the historical trends were to continue, the average number of persons per farm will decline to 3.1 by 1974.

The declining number of persons per farm is a reflection of the lower birthrate and also of the movement of farm youth from farm to off-farm residence and employment. The average size of farm family, of course, would be somewhat higher than the number of persons reported in the average farm household at any given time in the life history of the average farm family. In any case, the twofold impact on farm population would reduce the total farm population from the 735,000 of 1954 to an estimated 452,000 by 1974. The estimated decrease in total farm population of 283,000 would represent an average decline of 2.4 percent per year over the 20-year period.

The reduction in farm population is associated with a corresponding reduction in the farm labor force. Two concepts of farm employment are used by the two federal agencies concerned with agricultural employment estimates; namely,

the United States Department of Agriculture (Farm Population Branch, Statistical Analysis Division, "Farm Population Estimates for 1910-62," ERS-130, October 1963) and the United States Department of Commerce (Bureau of the Census, Population Division). The Department of Agriculture estimates of the total experienced farm labor force are based upon estimates of farm workers, both full-time and part-time, and include workers who may be employed only a few days a year and who may have other employment as major sources of income. Moreover, the Department of Agriculture estimates are prepared on the basis of reports from the agricultural employer rather than on the basis of the residence of the farm workers. Because of the increase of part-time work in agriculture, the number of farm workers per farm person, using the United States Department of Agriculture concept of the experienced farm labor force, has been increasing at the rate of 1.2 percent per year over the 1944-55 period. Over the 20-year period from 1954-74, this ratio would increase from 0.46 worker per farm person to 0.54 worker per farm person. Because of the decline in farm numbers, however, the total number of farm workers would decline from 341,000 to 243,000, or a total decline of 98,000 (as shown in table 2).

The United States Bureau of the Census concept of farm employment (used in the Census of Population) is based on the idea of assigning each worker to one job classification that represents the main source of livelihood. Also, the place of residence of the worker is used as the reporting unit. Thus, part-time farm labor (which would be included in the agricultural estimates of experienced farm labor force) would not be included in the census estimates of agricultural employment if a worker had some other employment as the main source of livelihood. The difference in the two concepts is widening numerically because of the increasing amount of part-time employment in agriculture. Since 1940, the ratio of total agricultural employment to the total experienced farm labor force has declined at an annual rate of 1.2 percent. If this relationship were continued to 1974, the ratio would decline from 0.78 in 1954, for example, to 0.62 in 1974. As a result, total agricultural employment would decline from 266,000 in 1954 to 150,000 in 1974.

While agricultural employment is declining, agricultural output is increasing. It is estimated that the agricultural output of Iowa will increase by about 60 percent over the 20-year period from 1954-74. Using the United States Bureau of the Census concept of employment, 116,000 fewer agricultural workers would produce 60 percent more output in 1974 than

in 1954. Agricultural output per manhour would increase in excess of 5 percent per year over the 1954-74 period.

Effects of migration and economic growth on rural living standards

The projected rates of farm consolidation and reductions in farm employment and population, together with increases in agricultural output, are resulting in a rising per-capita agricultural income under the more favorable farm policy assumption. The latter would keep pace with the rate of increase of incomes per worker in non-agricultural activities. The general implications of these agricultural and other basic changes in the Iowa economy are examined next in terms of population, labor force and employment and income.

Population

Iowa's total population has been increasing gradually since 1900, but at a substantially slower rate than the increase in national population. For example, in 1900 the Iowa population was about 2.9 percent of the national population. By 1960, it had declined to only 1.5 percent, and, by 1975, it is estimated that the Iowa population will make up 1.2 percent of the total national population (table 3). Be-

summarized in table 4. It is apparent from this table that the proportion of children in the Iowa population is increasing and that the proportion of both males and females in the 25- to 44-year-old age bracket is decreasing. Because of the substantial migration occurring in this age bracket, the proportion would be lower for Iowa than for the United States. Indeed, an absolute decline is projected for this particular age bracket in Iowa.

Effects of economic opportunity on migration

To illustrate the effects of changing economic opportunity and migration on population, historical and projected trends in population by age and sex are presented in table 4. The data support the contention that the people of Iowa face an increasingly severe problem in educating their young and caring for their old. These public responsibilities, moreover, are to be borne by a decreasing number of people in the economically most productive age groups.

Large losses of Iowa population through out-migration, particularly in the age groups from 15 to 44, are indicated in table 5 for three intercensus periods. During the two intercensus periods with the largest migration, the age group 15 to 44 accounted for 75 to 80 percent of the total migration. This percentage was even larger during the intercensus period of low migration.

The proportion of men and women migrants tends towards equality. More recently, however, the larger numbers of older females migrating from Iowa has increased the proportion for women.

The extensive migration of Iowa people from Iowa to other states is illustrated further in table 6. These data, when compared with life survival ratios, suggest an acceleration in the rate of migration for the age bracket 20 to 29 in the two intercensus periods from 1950 to 1970. In effect, the total migration for each of the two 10-year periods can be expected to exceed the 181,000 indicated in table 5 for the 1940-50 period.

As a result of labor-reducing technology in agriculture and manufacturing, substantial increases in output can be expected without corresponding increases in employment in these industries. As a result of these trends in the economic base, population growth is expected to occur at a rate slightly less than 1/2 percent per year for the 20-year period, 1950 to 1970. The Iowa population, moreover, is expected to stabilize at a level that is 1.2 percent of the total national population. With these changes in population, corresponding changes occur in the labor force.

Table 3. Estimated population, Iowa and United States, 1900-1975.

Year	Iowa (thousand)	United States (thousand)	Iowa as proportion of United States (percent)
1900	2,232	75,995	2.9
1910	2,225	91,972	2.4
1920	2,404	105,711	2.3
1930	2,471	122,775	2.0
1940	2,538	131,669	1.9
1950	2,621	150,697	1.7
1960	2,758	179,323	1.5
Projected:			
1965	2,801 ^a	195,747 ^b	1.4
1970	2,865 ^a	213,810 ^b	1.3
1975	2,938 ^a	235,246 ^b	1.2

^aBased on a survival rate procedure taken from: C. Horace Hamilton and Joseph Perry. A short method for projecting population by age from one decennial census to another. *Social Forces* 41: 163-170. Dec. 1962.

^bBased on Series II projections for the United States. U. S. Bureau of the Census. *Statistical Abstract of the United States: 1961* (82nd ed.). 1961. pp. 6-7.

cause of the rapid decline in farm population, however, the nonfarm population has been increasing more rapidly than the total population in Iowa. These effects of agricultural change are examined further in the context of urbanization and economic opportunity in Iowa.

Effects of urbanization and cultural change

The total number of children and adults in the various age groups in 1950 and 1970 are

Table 4. Estimated population in specified age and sex class and annual change in proportion of total population in each class, Iowa and United States, 1950-70.

Sex and age class	Iowa				United States			
	Total population		Proportion of total		Total population		Proportion of total	
	1950	Projected 1970	1950	Projected 1970	1950	Projected 1970 ^a	1950	Projected 1970
	(thousand)		(percent)		(thousand)		(percent)	
Male:								
Under 10	259.4	317.4	9.8	11.1	15,080	23,618	9.9	11.0
10 - 14	101.9	144.4	3.9	5.0	5,671	10,660	3.7	5.0
15 - 24	185.4	225.8	7.0	7.9	11,155	18,602	7.4	8.7
25 - 44	353.9	285.0	13.4	9.9	22,407	23,965	14.9	11.2
45 - 64	279.0	274.1	10.6	9.6	15,376	20,214	10.1	9.5
65 and over	137.4	151.1	5.2	5.3	5,837	8,399	3.8	3.9
Total	1,317.0	1,397.8	49.9	48.8	75,526	105,458	49.8	49.3
Female:								
Under 10	247.2	304.3	9.4	10.6	14,532	22,661	9.6	10.6
10 - 14	97.3	139.3	3.7	4.9	5,473	10,233	3.6	4.8
15 - 24	188.6	237.7	7.2	8.3	11,146	18,003	7.3	8.4
25 - 44	356.2	301.7	13.5	10.5	23,088	24,247	15.3	11.4
45 - 64	279.2	290.0	10.6	10.1	15,385	22,058	10.1	10.3
65 and over	151.2	193.9	5.7	6.8	6,527	11,150	4.3	5.2
Total	1,319.7	1,466.9	50.1	51.2	76,151	108,352	50.2	50.7

^a Department of Commerce, Bureau of the Census Current Population Reports, Series P-25, No. 241 and 246.

Table 5. Net intercensus out-migration (-) and in-migration (+) of native white males and females, Iowa, 1920-50.^a

Age group	Male			Female		
	1920-30	1930-40	1940-50	1920-30	1930-40	1940-50
	(thousand)					
10 - 14	-10.1	- 3.9	- 9.3	- 9.8	- 3.7	- 6.3
15 - 24	-18.5	-10.6	-18.3	-20.7	-11.7	-17.8
25 - 44	-48.8	-23.4	-47.1	-43.7	-23.0	-52.0
45 - 64	- 5.7	2.6	-11.4	- 8.6	0.0	-12.7
65 and over	1.6	2.8	- 1.9	0.4	0.6	- 4.2
Total	-81.5	-32.5	-88.0	-82.4	-37.8	-93.0

^a Everett S. Lee et al. Population redistribution and economic growth. Vol. I, Methodological considerations and reference tables. American Philosophical Society, Philadelphia 1957.

Table 6. Specified age and sex group as proportion of corresponding age and sex group 10 years earlier and related data, Iowa, 1950-70.

Age group	Male			Female			Life survival ratios United States 1949-51 ^a
	1950	1960	1970	1950	1960	1970	
	(Percent)						
10 - 19	94	90	90	96	93	92	98.2
20 - 29	83	76	76	87	83	84	98.6
30 - 39	86	88	87	88	88	88	98.1
40 - 49	89	91	90	90	91	91	96.0
50 - 59	84	89	88	89	90	91	90.2
60 and over	135	151	152	154	169	181	—

^a Everett S. Lee et al. Population redistribution and economic growth. Vol. I, Methodological considerations and reference tables. American Philosophical Society, Philadelphia 1957.

Labor Force

The labor force relative to total population in Iowa has remained quite stable since 1870, showing only slight increases in the participation rate during the intercensus periods. The female labor force, however, has increased substantially, particularly since 1940. On the other hand, the male labor force participation rate has declined slightly because of longer periods of compulsory education and earlier retirement. These trends are expected to continue to 1970 (table 7). The factors accounting for these changing trends in labor force by age and sex are examined in terms of education and changing values of the young and the social security and early retirement programs of the older workers.

Effects of education and legislation on employment of children

Under current definitions of the labor force, all persons 14 years of age and older who are seeking work are considered part of the labor force. If they are unemployed, but seeking work, they would be counted in the labor force.

In Iowa the number of persons 14 years of age who are seeking work is negligible, and, hence, only those persons 15 years of age and older are included in the employment projections. As late as 1950, however, the labor force concept included persons in the age group 10 to 14. In 1900, for example, 13 percent of the male population in the 10- to 14-year-old age group was classified as being in the labor force, while 2.5 percent of the female population was so classified; for the United States, the percentages were 23 and 8.7, respectively. In 1900, Iowa was a predominantly agricultural

state, which accounted for a large proportion of full-time family farm workers in the 10- to 14-year-old age group. Although the national population was more industrial, an even larger proportion of employment of children occurred. The enactment of child labor laws reduced the employment of 10- to 14-year-old children in off-farm activities. Since 1900, therefore, the employment of 10- to 14-year-old children has declined until today it is practically nonexistent.

Effect of higher education and changing values

The historical patterns of labor force participation in the age groups from 15 to 64, together with projections of these patterns in 1975, illustrate the rapidly increasing rate of participation of females of all age classes.

In Iowa, female participation in the labor force increased at an average annual rate of 0.3 percent for the age group 15 to 24 over the 1930-60 period. The corresponding increases for the age group 25 to 44 and the age group 45 to 64 were 0.5 percent and 0.9 percent. In 1930, 28 percent of the 15- to 24-year-old age group of females were in the labor force, while 19 percent of the age group 25 to 44 and 15 percent of the age group 45 to 64 were in the labor force. The education of women, the mechanization of the home and rising family aspirations have all contributed to a rapid increase in the employment of women. At the same time, the labor force participation rates for males in each of the three age groups cited has remained stable. Differential rates of migration among these age groups, however, will contribute to changing aggregate rates of labor force participation for the Iowa population.

Table 7. Estimated labor force in specified age and sex class and annual change in participation rate (proportion of population in labor force) 14 years and older, Iowa and United States, 1950-70.

Sex and age class	Iowa				United States			
	Total labor force		Proportion of total		Total labor force		Proportion of total	
	1950	Projected 1970	1950	Projected 1970	1950	Projected 1970 ^a	1950	Projected 1970
	(thousand)		(percent)		(thousand)		(percent)	
Male:								
14 - 24	125.6	151.5	12.4	14.0	8,668	13,121	13.4	15.1
25 - 44	336.1	271.0	33.1	25.0	20,996	23,172	32.4	26.6
45 - 64	248.7	244.7	24.5	22.7	13,952	18,446	21.5	21.2
65 and over	56.3	47.0	5.6	4.4	2,453	2,704	3.8	3.1
Total	766.7	714.2	75.6	66.1	46,069	57,443	71.1	66.0
Female:								
14 - 24	64.6	93.9	6.4	8.7	4,663	7,046	7.2	8.1
25 - 44	98.1	114.5	9.6	10.6	8,267	10,375	12.8	11.9
45 - 64	73.2	132.1	7.2	12.3	5,167	10,868	8.0	12.4
65 and over	11.7	25.1	1.2	2.3	584	1,360	0.9	1.6
Total	247.6	365.6	24.4	33.9	18,681	29,649	28.9	34.0

^a Department of Labor, Bureau of Labor Statistics. Population and labor force projections for the United States, 1960-1975. Bul. No. 1242.

Effects of social security and early retirement programs

The labor force participation rate for males 65 and over has declined some, but, for females, it has increased. In 1930, for example, 48 percent of the male population 65 years of age and over was in the labor force, while only 5.8 percent of the female population in this age group was in the labor force. By 1960, however, the male labor force participation rate had dropped to 34 percent, while the female labor force participation rate had increased to 12 percent. While the former was declining slightly, the latter was increasing at an average annual rate of 0.2 percent. As the total number of females in the 65-year-and-over age bracket increases and as urbanization continues, more and more of the older women can be expected to enter the labor force. At the same time, older couples who have adequate retirement programs and who have the desire for retirement will account for the lower participation rate among males 65 years of age and over.

Employment

Population and labor force trends show an increasingly larger proportion of female population in the Iowa labor force. The distribution of the labor force in terms of employment was illustrated in table 1. If the historical trends in the industrial composition of employment were extrapolated to 1975, they would show the consequences of recent demographic changes in terms of an increasing level of female employment. Finally, the extrapolation of historical trends in agriculture and transportation would show a much-diminished level of employment in these two sectors.

Effects of farm consolidation and mechanization

Employment trends in agriculture were mentioned earlier with reference to the declining number of farms and full-time farm workers per farm. As a consequence of the decline in agricultural employment, the total number of workers in nonagricultural industries must increase by nearly 6,000 each year merely to maintain the current level of employment in Iowa. As shown by the earlier projections, the net expansion in nonagricultural employment is approximately equal to the decline in agricultural employment.

Farm mechanization and consolidation will continue to contribute to increasing agricultural productivity so that farm income levels can be maintained. Thus, total farm marketings are expected to increase (about 3 percent per annum over the 1954-74 period). Accordingly,

we can expect an increase in the purchases of farm production items. As a consequence, segments of the manufacturing and service sectors are expected to employ more workers in 1974 than in 1954. Indeed, nonagricultural employment trends in Iowa, when compared with those for the United States, are characterized by a similarity in pattern. Iowa, of course, is becoming more urban as a result of the decline in (1) farm population and (2) farm-dependent trade centers of less than 2,500 population.

Effects of urbanization and migration

Agricultural mechanization and the urbanization of the Iowa economy have contributed to a relative (with respect to the United States) increase in the proportion of manufacturing, construction and service workers. To a substantial extent, these activities are farm oriented. Thus, a relatively prosperous and highly mechanized agriculture would sustain relatively high levels of employment in these activities.

Growth in total employment in the several service industries in Iowa probably will be accompanied by an even more rapid expansion in female employment. Some readjustment in the 1940-60 employment trends is expected to occur, however; but, once the readjustment is accomplished, female employment is expected to exceed 35 percent of total Iowa employment.

Except for agriculture, communications and utilities, female employment is increasing in relation to total employment (table 8). The trade and service industries, however, will continue as the major areas of female employment. Finance, insurance and real estate, along with the electrical machinery industry, are growing industries—thus providing additional job opportunities for women. Meanwhile, job opportunities for men in a number of industries are expected to decline. According to the employment estimates in table 8, which are based on historical trends in Iowa employment, the annual rate of increase in female employment exceeds the corresponding figure for male employment in 10 of the 19 specified industries.

Income

Personal income in Iowa originates from two major sources—wages and salaries and proprietary income. In 1954, 62 percent of the nonagricultural income and 6 percent of the agricultural income was in the form of wage and salary payments. The latter reached its lowest percentage level in 1954, however, while the former remained at a level of about two-

Table 8. Total employment, by sex and industry, Iowa.^a

Industry	Female			Male		
	1960 (No.)	1975 (No.)	Annual rate of change 1960-75 (%)	1960 (No.)	1975 (No.)	Annual rate of change 1960-75 (%)
Agriculture	17,323	10,726	-3.2	197,991	134,829	-2.6
Manufacturing (incl. mining):						
Mining	102	107	0.3	2,242	2,038	-0.6
Food and kindred products	11,413	11,263	-0.1	45,549	35,504	-1.7
Printing and publishing	4,484	4,827	0.5	13,451	10,834	-1.4
Chemical and allied goods	1,223	1,502	1.4	3,872	7,187	4.1
Other nondurables	6,012	5,685	-0.4	7,948	8,045	0.1
Furniture, lumber and other wood products	1,325	2,038	2.9	6,114	5,578	-0.6
Metal industries	3,770	7,079	4.2	17,119	11,477	-2.7
Machinery, except electrical	3,872	3,754	-0.2	31,691	41,189	1.7
Electrical machinery	6,827	9,117	2.0	13,655	12,550	-0.6
Other durables	2,446	1,823	-2.0	11,107	12,979	1.0
Transportation	7,439	9,439	1.6	35,156	23,705	-2.6
Communication and utilities	4,687	2,896	-3.2	20,890	31,535	2.7
Wholesale trade	7,337	6,221	-1.1	29,551	37,113	1.5
Retail trade	70,821	72,617	2.0	96,092	125,068	1.7
Finance, insurance, real estate	17,731	24,670	2.2	19,871	18,985	-0.3
Services, including education	129,412	185,135	2.4	82,641	78,087	-0.4
Public administration	9,884	10,726	5.8	23,743	35,718	2.7
Contract construction	2,242	2,574	0.9	51,969	62,749	1.3
Total employment	308,350	372,199	1.3	710,652	695,170	-0.1

^a Industries not reported in 1960 are distributed proportionately among all industries.

thirds of total nonagricultural personal income payments during the post-World War II period.

Proprietary income makes up the remainder of the agricultural income payments. Outside of agriculture, 14 percent of the total was in the form of proprietary income. Of the remaining 24 percent of nonagricultural income in 1954, 17 percent was in the form of property income, and 7 percent was in the form of government transfer payments.

In relation to the national economy, Iowa agricultural income (i.e., total net farm income) has increased more rapidly than national agricultural income. During the 1929-60 period, for example, a 10-percent increase in net farm income in the United States was associated with a 13-percent increase in net farm income in Iowa. On the other hand, a 10-percent increase in nonagricultural personal income payments

in the United States was associated with a corresponding 10-percent increase in Iowa income. In short, when agriculture prospers, Iowa's income position improves relative to the nation as a whole. Conversely, prolonged agricultural depression worsens Iowa's income position.

Agricultural income

Because of the crucial importance of agriculture in the Iowa economy, it is examined again with particular reference to its income-generating prospects. Two analytical approaches have been used to estimate future income prospects in Iowa agriculture, as shown in table 9. Under Assumption I, a national farm parity ratio of 80 is used, along with a projected increase in the index of farm prices paid, interest, taxes and wage rates for the United

Table 9. Selected data for estimating farm income, Iowa, 1954 and 1974.

Item	Units	1954	Projected 1974	
			Assumption I ^a	Assumption II ^b
Farm parity ratio, U. S.	(1910-14=100)	89	80	c
Index of prices paid, interest, taxes and wage rates, U. S.	(1910-14=100)	277	351	351
Index of prices received by farmers, U. S.	(1910-14=100)	246	281	c
Index of prices received by farmers, Iowa	(1910-14=100)	268	305	c
Government payments to farmers, Iowa	Million dollars	10	20	20
Farm population	Thousands	733	453	453
Earnings per worker in manufacturing	Dollars	3,958	6,829	6,829
Realized net farm income per farm person	Dollars	1,297	933	2,049
Total realized net farm income	Million dollars	951	422	928

^a Based on U. S. farm parity ratio of 80.

^b Based on ratio of 0.3 for farm income per person divided by wages and salaries per manufacturing worker in Iowa.

^c Not computed.

States. The latter is based on an extrapolation of the post-World War II trend in this ratio. Under Assumption II, net realized farm income per farm person is tied to wage and salary payments by making the former 30 percent of the wage and salary payments per manufacturing worker. To sustain this ratio, the index of farm prices paid must stabilize at its present level, or the farm parity ratio must increase gradually. Otherwise, the increasing costs of farming will impose additional pressure for further adjustments in agriculture. Indeed, total farm income is likely to decline in Iowa, with a continuation of historical trends in farm price and cost relationships. If Assumption II were to prevail, however, realized farm income per person engaged in agriculture (using the more conservative U. S. Department of Commerce definition of agricultural employment) would increase from its 1954 level of \$3,600 to a projected 1974 level of \$6,200 (in constant 1954 dollars).

The projected increase in real farm income per worker in agriculture would amount to a 2.8-percent growth rate. Productivity per worker, however, may increase as much as 6.2 percent per annum. In this study, a more conservative estimate of 5.2 percent is used (based on a

projected increase in agricultural output of 2.4 percent per annum and a projected decrease in agricultural employment of 2.8 percent per annum). These increases in agricultural productivity and income per worker would require substantial adjustments in agriculture, particularly in farm consolidation.

Nonagricultural income

Projected change in nonagricultural income per worker is based on post-World War II income relationships for Iowa and the United States, as indicated in the discussion of the analytical procedures used in the study. Given the projected increases in national earnings, Iowa earnings per worker are expected to increase as shown in table 10. Projected increases in output per unit of labor, based on National Planning Association estimates, are shown also for selected industries. In practically all cases, the projected increase in real earnings per worker is less than the specified increases in productivity. In the service industries, however, the general increases in earnings probably sustain wage and salary increases so that productivity in this sector lags behind earnings per worker.

Table 10. Estimated wages and salaries per worker in constant 1954 dollars, Iowa, 1954 and 1974.

Sector	Code	Estimated 1954	Projected 1974	Annual rate of change 1954-74	
				Wages and salaries	Output per worker ^a
		(\$)	(\$)	(%)	(%)
Agriculture	1-6	3,575	6,213	2.8	5.2
Mining	7	3,578	5,815	2.4	4.0
Manufacturing		3,958	6,829	2.7	3.3
Meat products	8	4,217	7,293	2.7	3.1
Dairy and grain products	9	3,544	6,129	2.7	3.1
Other food products	10	3,715	6,425	2.7	3.1
Printing and publishing	11	3,915	6,771	2.7	3.1
Chemical and allied products	12	4,135	7,151	2.7	3.1
Other nondurables	13	3,231	5,588	2.7	3.3
Building materials	14	3,581	6,193	2.7	3.3
Primary and fabricated metal	15	4,185	7,238	2.7	3.3
Farm machinery	16	4,386	7,585	2.7	3.3
Other machinery	17	4,185	7,238	2.7	3.3
Electrical machinery	18	3,515	6,079	2.7	3.3
Other durables	19	4,174	7,219	2.7	3.3
Transportation	20	3,381	5,129	2.1	2.9
Communication and public utilities	21	3,228	5,118	2.3	6.5
Wholesale trade	22	3,686	5,119	1.6	1.6
Retail trade	23	2,776	3,855	1.6	1.6
Finance, real estate, insurance	24	3,308	5,266	2.3	1.3
Services	25	2,340	3,510	2.0	1.0
Construction	27	3,381	5,783	2.7	1.2
Public administration	28	3,548	5,429	2.1	1.0

^aBased primarily on: Regional Economic Projections Series, State Employment Trends to 1976. Report No. 1. 1962 Ed. National Planning Association, 1606 New Hampshire Avenue, N. W., Washington 9, D. C.

**STRUCTURAL CHARACTERISTICS
OF THE IOWA ECONOMY**

Selected segments of the Iowa economy will be presented in the context of an aggregated series of interindustry transactions. The sales of each economic sector in Iowa are distributed among specified purchasing sectors, including industries and households in Iowa and out-of-state exports. In addition, the purchases of goods and services from other industries in the state and income payments to households and government, along with retained business earnings and savings, can be identified among the interindustry transactions.

The total business activity supported by Iowa agriculture is estimated from available data. First, however, selected economic characteristics of the Iowa economy in 1954—the base year for the interindustry analyses—are presented.

Selected Economic Characteristics

Because of the wide range of data on the Iowa economy that are available for 1954, it was selected as the base year for the construction of an input-output model of the Iowa economy. In spite of the variety of data, however, con-

siderable aggregation of industries was necessary to achieve a workable approach to the study of intersectoral flows in Iowa. Altogether, 25 interacting sectors and 14 exogenous sectors, including contract construction and government, were delineated and defined. Each of the sectors has been identified in terms of the Standard Industrial Classification of industries (see table 11).

Interindustry transactions

Next, the United States Censuses of Manufacturers and of Agriculture, the 1955 Survey of Farmers' Expenditures in the United States and other data sources, including a recent study of north-central agriculture,⁹ were consulted in the preparation of the table of interindustry transactions. This table shows the disposition of the total value of output in Iowa in 1954 and the industry sources of inputs of each of the 25 producing sectors.¹⁰ For example, Iowa sector 1—the meat-animals sector of agriculture—produced \$1,773,605,000 worth of out-

⁹Wilbur R. Maki and Dean F. Schreiner. Regional intersectoral relations and demand projections with emphasis on the feed-livestock economy of the North-Central States. Iowa Agr. and Home Econ. Exp. Sta. Res. Bul. 530. 1964.

¹⁰The detailed interindustry transactions tables discussed in this section of the report can be obtained directly from the author.

Table 11. Economic sectors in Iowa interindustry relations study, 1954.

Iowa sector	Standard Industrial Classification code (1957)	Description
1	01-09, exc. 0722	Meat animals Poultry and eggs Farm dairy products Feed crops Oil-bearing crops Other agricultural products
2		
3		
4		
5		
6		
7	12, 14	Mining
8	201	Meat products
9	202	Dairy products
	204	Grain mill products
10	20(except 201, 202, 204)	Other food and kindred products
11	27	Printing, publishing and allied industries
12	28 ^a	Chemicals and allied products
13	22, 23, 26, 31, 29, 30	Other nondurables (textiles, apparel, paper, leather products, petroleum, rubber)
14	24, 25, 32	Building materials (lumber, furniture, stone, clay and glass products)
15	33, 34	Primary and fabricated metal products
16	352	Farm machinery and equipment
17	35 (except 352)	Other machinery (except electrical)
18	36	Electrical machinery
19	37, 38, 39	Other durables (transportation equipment, instruments and misc. manufactured products)
20	40, 42, 44-47	Transportation
21	481, 482, 49	Communications and public utilities
22	50	Wholesale trade
23	52-59	Retail trade
24	60-67	Finance, insurance and real estate
25	70-89, 483, 0722	Services, radio and T. V. broadcasting Veterinarians
26	- - -	Households
27	15-17	Maintenance construction
28		New construction
29	92	State and local government
30	91	Federal government

^aSoybean oil mills were classified in S. I. C. 28 (chemicals and allied products) in 1954 and are included in Iowa sector 12. In the 1957 S. I. C. manual, soybean oil mills are designated as S. I. C. 2092.

put of which \$175,367,000 was utilized within the same sector and \$940,574,000 was purchased by livestock slaughtering packing plants in Iowa. Only \$46,000 and \$175,000 worth of outputs, respectively, were purchased by the chemical industries and other nondurable goods industries (e.g., hides). Finally, households buying or acquiring farm products directly from farms acquired \$27,806,000 worth of meat animals (valued at the farm gate; i.e., in terms of producers' prices).

The total 1954 output of the meat-animals sector was disposed of by utilizing \$1,103,511,000 of goods and services from 20 of the 25 producing sectors in Iowa, \$251,186,000 of goods and services imported from other states and \$418,908,000 of primary inputs (including payments to government). The primary input payments correspond to the "value added" or "gross national product" concepts used in national income accounting.

Similarly, the total value of agricultural output in Iowa can be traced with reference to input sources and market outlets (fig. 5). Of the total

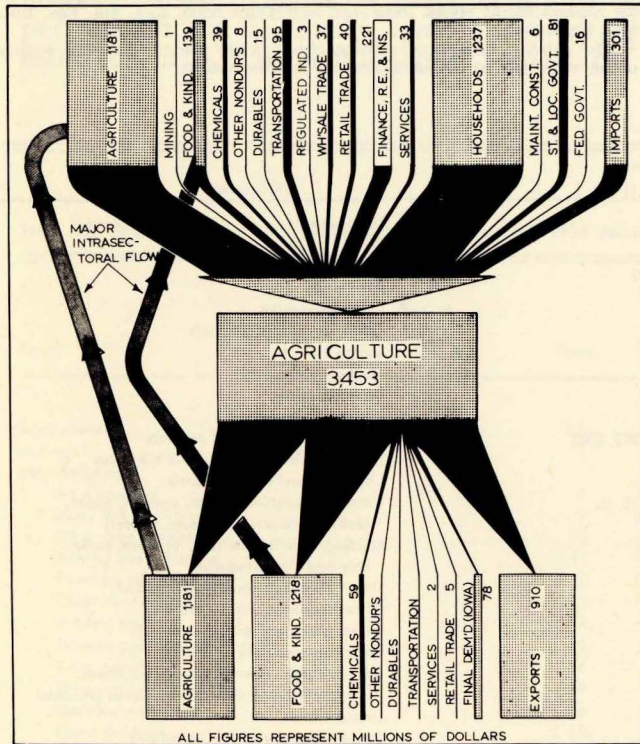


Fig. 5. Flows of goods and services into and out of the agricultural sectors in Iowa, 1954.

value of agricultural output, \$1,181,000,000 originated in the agricultural sectors. Households—specifically, farm proprietors, workers and managers—however, were the most important recipients of agricultural income. In terms of market outlets, food manufacturing

plants accounted for \$1,218,000,000 of the total agricultural sales.

Food and kindred products manufacturers are another component of the Iowa economy (fig. 6). Among the food-manufacturing sectors,

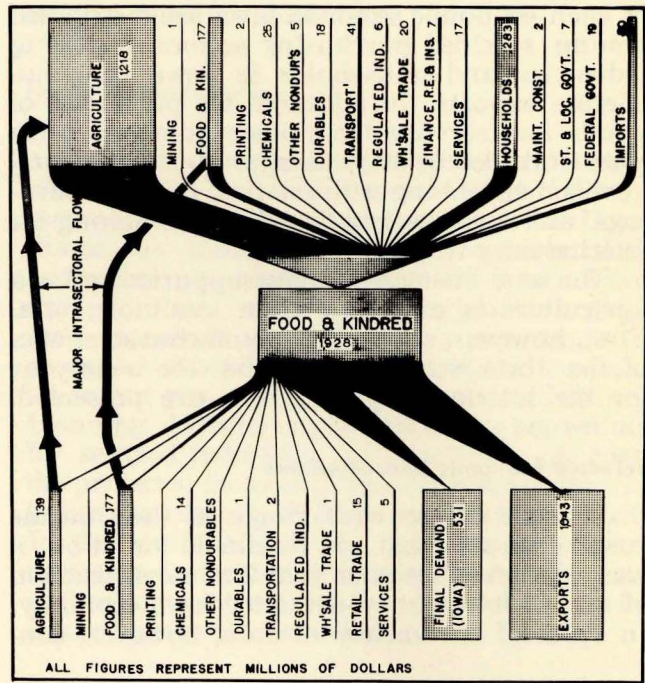


Fig. 6. Flows of goods and services into and out of the food manufacturing sectors in Iowa, 1954.

however, the value added by the primary inputs, such as labor and management, is substantially less than in agriculture. A major expense category is the cost of the agricultural raw materials. Also, the pattern of exports and final demand (or consumption) in Iowa, differs substantially between the food manufacturing and agricultural sectors.

A third major category of "export" industries in Iowa is the machinery manufacturing aggregate (fig. 7). A major part of the total output of Iowa machinery manufacturers is shipped to out-of-state markets. Unlike the agricultural and food-manufacturing sectors, moreover, the cost of raw materials is relatively low in machinery manufacturing, while payments to households account for the largest share of the total value of output.

Among the 25 sectors, only the agricultural and manufacturing sectors are represented in terms of the total value of output. The trade and service sectors are shown as "margin" industries; the value of raw materials handled is not included in the final value of output. Thus, for agriculture and manufacturing, the use of total output value would result in a substantial amount of double counting if the aggregate output of the Iowa economy were

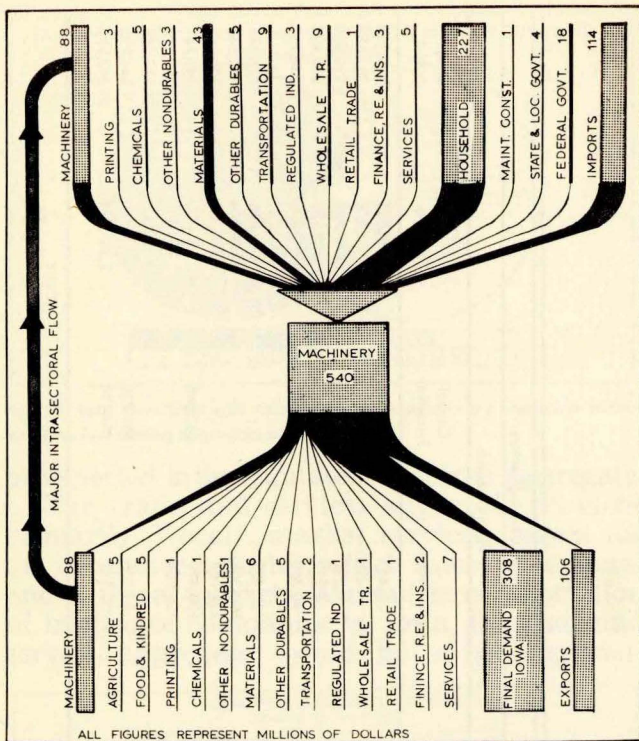


Fig. 7. Flows of goods and services into and out of the machinery manufacturing sectors in Iowa, 1954.

obtained from the interindustry transactions table.

The detailed interindustry transactions table has been summarized into a much smaller and, hence, more aggregative form in table 12. The 25 interacting sectors, for example, have been reduced to seven interacting sectors, while the eight exogenous input sectors and the eight exogenous final-demand sectors have been reduced to six.

The 7-sector breakdown of the Iowa economy in table 12 can be regrouped into five major categories—the agricultural aggregate (sectors 1 to 6), the food processing aggregate (sectors 8 to 10), the other manufacturing and mining aggregate (sectors 7, 11 to 19), the regulated industries aggregate (sectors 20, 21) and the trade and services aggregate (sectors 22 to 26). Each of the five aggregates can be analyzed with reference to the distribution of output and disbursement of income received from sale of the output.

The agricultural aggregate is now shown in terms of its disposition of output and of income (fig. 8). First, it can be observed that the intrasectoral transfers account for 34.2 percent of the total value of sales and also of purchases. Exports are substantially larger than imports, while final demand is only 2.3 percent of total sales. The value of sales to the Iowa nonfarm sectors is about the same as the monetary return to the primary inputs.

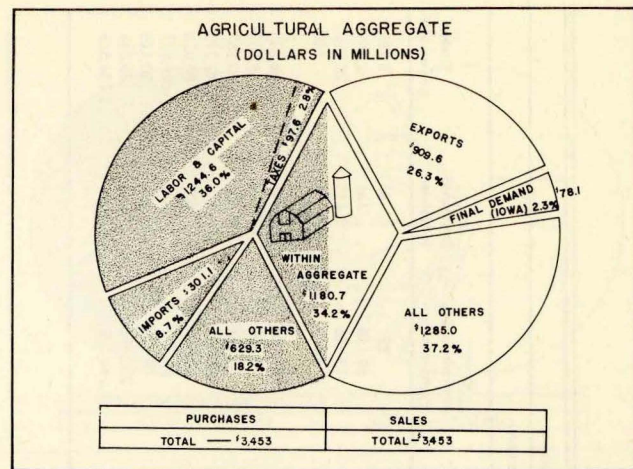


Fig. 8. Total purchases and sales in the agricultural aggregate of Iowa, 1954.

The food processing aggregate differs from the agricultural aggregate in both sales and purchases (fig. 9). Intrasectoral transfers are small, while final demand in Iowa is substantial. Exports, however, account for more than half of the total value of sales. Thus, the agricultural and food manufacturing aggregates represent an integrated economic complex that transforms the primary inputs of labor and capital into consumer goods of which a substantial portion are utilized in the state.

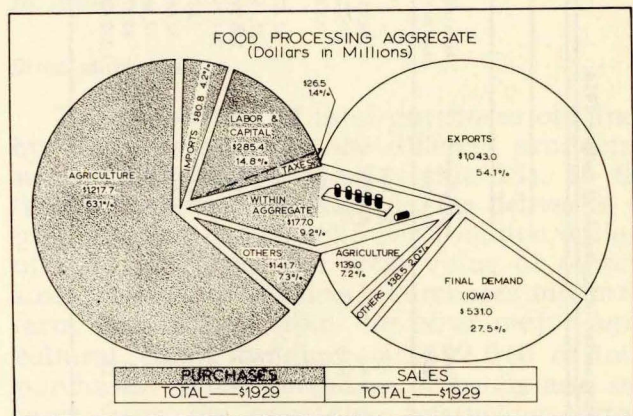


Fig. 9. Total purchases and sales in the food processing aggregate in Iowa, 1954.

In the residual or other manufacturing and mining aggregate, imports are quite large. Exports, however, when compared with the agricultural and food processing aggregates, are small; they are less than aggregate imports (fig. 10).

A favorable balance of trade is revealed again in the case of the regulated industries aggregate (fig. 11). However, the export level for the aggregate is exaggerated because of the inclusion of some governmental purchases in the export category. Also, because of the substantial volume of agricultural and food product exports, a net favorable balance of trade can

Table 12. Iowa interindustry transactions by major producing sector, in thousands of dollars, 1954.

Major producing sector	Iowa sector	Purchasing sectors						
		Intermediate demands						
		Agriculture-livestock	Agriculture-crops and other	Food manufacturing	Farm machinery manufacturing	Other manufacturing and mining	Regulated industries	Trade and services
Agriculture-livestock	1-3	211,804	- - -	1,094,638	- - -	221	80	5,150
Agriculture-crops and other	4-6	824,842	144,114	123,054	- - -	59,155	446	2,265
Food manufacturing	8-10	129,658	9,337	176,978	- - -	15,156	2,415	20,910
Farm machinery manufacturing	16	1,409	3,830	26	16,041	4,450	124	580
Other manufacturing and mining	7, 11-15, 17-19	10,482	47,475	50,061	48,329	293,203	29,686	134,346
Regulated industries	20-21	69,950	27,153	46,902	5,949	42,789	48,934	145,302
Trade and services	22-25	94,645	235,398	44,712	7,480	48,404	48,458	390,267
Households	26	434,601	701,719	225,035	76,492	425,031	276,014	1,742,219
Construction	27-28	3,348	2,877	2,017	604	1,534	25,832	80,020
Government	29-30	40,959	56,648	26,643	9,632	54,231	99,624	406,811
Capital consumption	31	23,510	78,567	58,366	7,879	94,423	184,586	220,145
Imports	32	255,550	45,571	80,804	63,093	205,596	61,476	136,533
Gross outlay	33	2,100,758	1,352,689	1,929,056	235,499	1,244,193	778,675	3,284,548

Table 12. (continued)

Major producing sector	Iowa sector	Purchasing sectors					Gross output
		Final demands					
		Households	Construction	Government	Capital formation	Exports	
Agriculture-livestock	1-3	50,363	- - -	2,467	- - -	736,035	2,100,758
Agriculture-crops and other	4-6	25,021	2,114	200	- - -	171,478	1,352,689
Food manufacturing	8-10	524,746	24	6,532	- - -	1,043,300	1,929,056
Farm machinery manufacturing	16	- - -	403	2,272	103,232	103,132	235,499
Other manufacturing and mining	7, 11-15, 17-19	290,419	162,547	40,366	133,351	3,928	1,244,193
Regulated industries	20-21	254,794	33,593	21,423	- - -	81,886	778,675
Trade and services	22-25	1,921,720	95,239	197,306	- - -	199,919	3,284,548
Households	26	- - -	184,670	428,197	- - -	- - -	4,493,978
Construction	27-28	- - -	115	193,499	332,895	- - -	642,741
Government	29-30	398,881	9,624	156,554	- - -	- - -	1,259,427
Capital consumption	31	380,844	28,748	- - -	- - -	- - -	1,077,068
Imports	32	647,190	125,664	53,756	169,720	- - -	1,844,953
Gross outlay	33	4,493,978	642,741	1,102,572	739,198	2,339,678	20,243,585

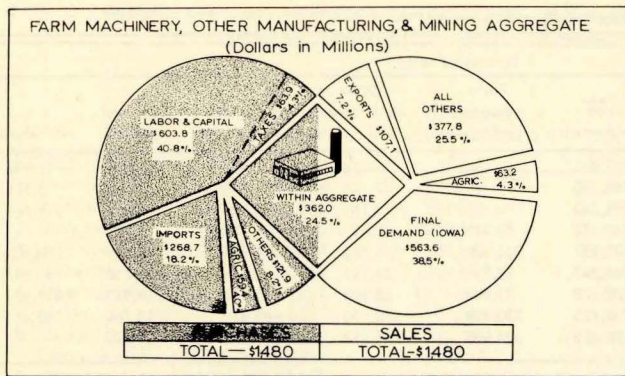


Fig. 10. Total purchases and sales in the farm machinery and other manufacturing and mining aggregate of Iowa, 1954.

be expected in the regulated industries aggregate.

The trade and services aggregate provides primarily "local" market services, except for the insurance industry, which caters to regional and national markets. Without the concentration of insurance companies in Iowa, the trade and service aggregate would be a net importer.

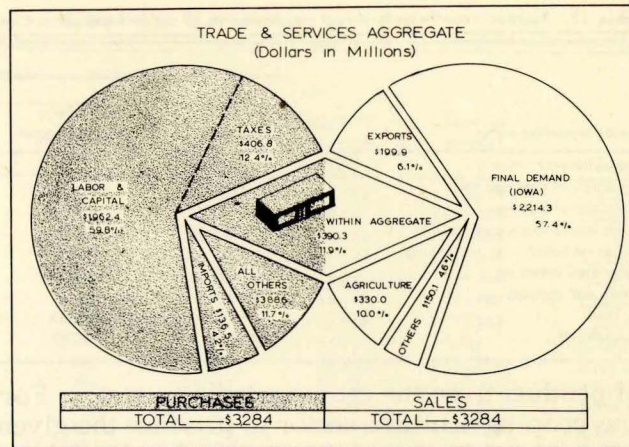


Fig. 12. Total purchases and sales in the trade and services aggregate of Iowa, 1954.

The food-manufacturing sector (Iowa sectors 8,9 and 10 in table 11) was the principal exporter of Iowa manufactured products with a net export balance in excess of 1 billion dollars. In comparison, farm machinery manufacturing (Iowa sector 16) had a net export balance of \$103,132,000, with other manufacturing and mining contributing only \$3,928,000 of net exports. Altogether, the net export balance for the primary and secondary industries of Iowa (sectors 1 to 19) was over 1.9 billion dollars in 1954.

Direct purchases

The proportion of total purchases obtained by each sector from the different producing sectors has been derived (table 13). In the livestock sector, for example, the deliveries to itself amount to \$100,823 per 1 million dollars of total purchases (or total value of output, since the two are identical). Purchases and intra-farm acquisitions from the other major agricultural sector amount to \$392,640 of total purchases. Other purchases of goods and services from the remaining interacting sectors (major sectors 3 to 7) total \$84,012 per 1 million dollars of sales. In addition, the household sector acquired \$206,878 in the form of wages and proprietary income per 1 million dollars of sales.

Because of intrasector transactions of goods and services, each of the economic sectors must produce a gross output in excess of the required amount for delivery to final-demand sectors. For example, the livestock-agriculture sector would have to produce at least \$1,100,823 of gross output (\$1,000,000 plus \$100,823 given in table 13) to deliver a million dollars worth of output to final demand. To produce \$1,100,823 of gross output, however, the livestock-agriculture sector would acquire \$392,640

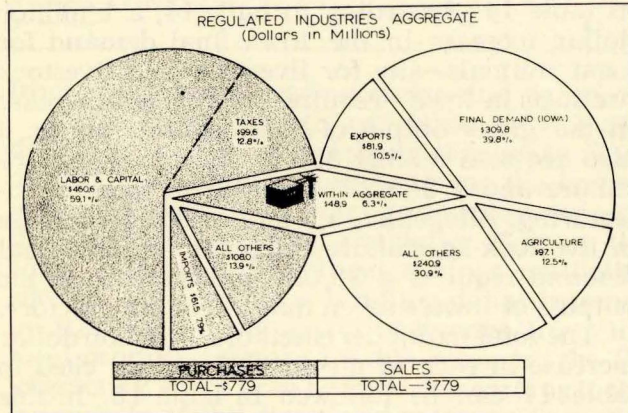


Fig. 11. Total purchases and sales in the regulated industries aggregate of Iowa, 1954.

Because only the value of the service is considered in the estimates of total sales and purchases, income payments to households are relatively large for the trade and service sectors (fig. 12). The latter will tend to grow in direct proportion to the growth of Iowa population and incomes.

Finally, the consolidated interindustry transactions table can be used to show more clearly the gross "multiplier" effects of agriculture on the Iowa economy (table 12). For example, of the 2.1 billion dollars of livestock output in 1954, nearly \$212,000,000 was delivered to itself—the livestock producing enterprises of Iowa—nearly 1.1 billion dollars was purchased by the food processing industries, and 58 million dollars was purchased by other industries, households and government within the state. Only 736 million dollars of livestock production was exported without processing.

Table 13. Technical coefficients: direct requirements of major Iowa sectors, per million dollars of output, 1954.

Major producing sector	Purchasing sectors							Households
	Agriculture-livestock	Agriculture-crops and other	Food manufacturing	Farm machinery manufacturing	Other manufacturing and mining	Regulated industries	Trade and services	
Agriculture-livestock	100,823	---	567,447	---	178	103	1,568	11,207
Agriculture-crops and other	392,640	106,539	63,790	---	47,545	573	690	5,568
Food manufacturing	61,720	6,903	91,743	---	12,181	3,101	6,366	116,766
Farm machinery manufacturing	671	2,831	13	68,115	3,577	159	177	---
Other manufacturing and mining	4,990	35,097	25,951	205,220	235,657	38,124	40,902	64,624
Regulated industries	33,298	20,073	24,313	25,261	34,391	62,843	44,238	56,697
Trade and services	45,053	174,022	23,178	31,762	38,904	63,516	118,819	427,621
Total	639,195	345,465	796,435	330,358	372,433	168,419	212,760	682,483
Households	206,878	518,759	116,656	324,808	341,612	354,466	491,675	---

of product from the crop-agriculture sector. For the crop-agriculture sector to produce the given amount of output, it would require about \$42,000 in intrasector deliveries (\$392,640 times 0.106539); hence, it would produce a gross output of at least \$434,640 (\$392,640 plus \$42,000). Other stages of production are handled similarly until the combined direct and indirect effects of the specified increase in final demand are worked out.

The technical coefficients are presented for both the seven interacting sectors and the one exogenous sector, households in table 13. The assumption of fixed proportions of consumer expenditures (see column 8), however, may be less valid than the assumption of fixed proportions of producer expenditures. There is no Engel's Law of producer expenditures, for example, that specifies a decreasing proportion of expenditures for some commodities (such as nondurables) and an increasing proportion of expenditures for other commodities (such as durables and services) as total expenditures increase. Nonetheless, the consumer expenditure coefficients in column 8 of table 13 are included for use later in evaluating the economic effects of changes in export demands for Iowa products.

The direct requirements data for the eight major sectors are presented also to show particularly the distribution of gross income payments among primary inputs and imports. The household sector, which includes wages

and salaries, proprietors' income, dividends, interest income, net rents, and other personal income payments, is the largest income recipient among the primary inputs and among all major producing sectors.

Total purchases

The combined direct and indirect effects of a million-dollar change in final demand are shown in table 14. According to table 14, a 1 million dollar increase in the Iowa final demand for meat animals—say for livestock and livestock products in Iowa—requires \$1,166,260 increase in the gross output of livestock-agriculture; it also requires a \$521,319 increase in crop-agriculture and a \$85,277 increase in food manufacturing. Altogether, a 1 million dollar increase in livestock-agriculture deliveries to Iowa final demand requires a \$2,059,509 increase in the outputs of Iowa's seven major economic sectors.

The total multiplier effects of a 1 million dollar increase in each of the first 25 sectors cited in table 11 can be followed in table 15. In this table, the entries in each column have been added according to the seven major categories in tables 12, 13 and 14. With respect to the agriculture-livestock sector, a 1 million dollar increase in out-of-state exports of meat animals, for example, results in a \$1,138,034 increase in total livestock production, a \$531,789 increase in gross deliveries from the agriculture-crops sector and a \$51,292 increase in gross deliveries

Table 14. Interdependence coefficients: direct and indirect of Iowa sector per million dollars output, 1954.

Major producing sector	Purchasing sectors						
	Agricultural-livestock	Agricultural-crops and other	Food manufacturing	Farm machinery manufacturing	Other manufacturing and mining	Regulated industries	Trade and services
Agriculture-livestock	1,166,260	7,826	729,864	3,235	12,983	3,628	8,140
Agriculture-crops and other	521,319	1,127,308	407,468	17,525	77,523	5,838	8,649
Food manufacturing	85,277	11,740	1,156,072	4,864	19,930	5,311	9,706
Farm machinery manufacturing	2,651	3,739	2,112	1,074,299	5,340	444	509
Other manufacturing and mining	47,575	67,383	75,430	294,720	1,321,037	58,492	64,997
Regulated industries	64,739	38,121	74,889	43,156	54,989	1,073,452	57,138
Trade and services	171,688	229,195	156,999	58,600	78,977	81,451	1,144,227
Total	2,059,509	1,485,312	2,602,834	1,496,399	1,570,779	1,228,616	1,293,366

Table 15. Multiplier effects on specified Iowa sectors per million dollars change in final demand, 1954.

Producing sectors	Agricultural-livestock 1-3	Agricultural-crops and other 4-6	Manufacturing and mining			Regulated industries 20-21	Trade and services 22-25	Total
			Food 8-10	Farm machinery 16	Other 7, 11-15, 17-19			
1 Meat animals	1,138,034	531,789	51,292	2,592	48,040	64,472	164,739	2,000,958
2 Poultry and eggs	1,202,260	571,820	434,395	2,028	71,180	96,903	277,609	2,656,195
3 Dairy products	1,035,661	453,106	137,937	2,553	58,014	66,762	181,882	1,935,915
4 Feed crops	3,817	1,139,835	13,814	3,643	72,229	43,585	236,809	1,513,732
5 Oil-bearing crops	2,954	1,130,694	10,448	2,856	49,338	26,598	231,249	1,454,137
6 Other agricultural products	3,215	1,076,593	11,595	2,804	59,450	24,229	116,598	1,294,484
7 Mining	1,037	12,044	3,664	1,541	1,094,847	39,532	78,893	1,231,558
8 Meat products	909,204	430,703	1,113,775	2,174	70,893	74,394	159,605	2,760,748
9 Dairy and grain mill products	312,799	439,197	1,177,816	1,836	88,498	84,908	164,634	2,269,688
10 Other food products	57,768	211,440	1,371,504	751	124,133	58,176	107,473	1,931,245
11 Printing and allied products	845	9,320	2,862	233	1,225,096	33,449	52,773	1,324,578
12 Chemicals and allied products	26,941	418,363	110,551	1,264	1,527,934	72,483	167,696	2,325,232
13 Other nondurables	6,323	56,465	16,208	337	1,297,131	45,504	70,434	1,492,402
14 Building materials	640	7,396	2,814	507	1,252,253	125,783	67,810	1,457,203
15 Primary and fabricated metals	600	5,522	2,182	2,136	1,202,653	41,031	51,704	1,305,828
16 Farm machinery and equipment	534	4,612	1,746	1,075,306	287,795	39,338	54,015	1,463,346
17 Other machinery (except electric)	612	5,415	1,975	20,949	1,350,911	33,374	57,216	1,470,452
18 Electrical machinery	2,741	15,706	6,417	514	1,303,505	33,490	58,320	1,420,693
19 Other durable goods	4,381	15,622	10,086	2,518	1,319,540	33,771	67,059	1,452,977
20 Transportation	1,227	4,899	7,096	417	63,854	1,057,131	99,950	1,234,574
21 Communications and utilities	929	1,828	2,109	60	40,888	1,107,767	36,900	1,190,481
22 Wholesale trade	1,790	3,662	6,109	495	44,317	25,739	1,139,191	1,221,303
23 Retail trade	14,680	14,502	27,855	183	43,261	50,007	1,201,620	1,352,108
24 Finance, real estate and insurance	463	1,357	1,059	58	39,133	80,047	1,121,408	1,243,525
25 Services	5,594	9,691	9,126	603	118,036	45,474	1,121,017	1,309,541

from the food-processing sector and so on.

From an examination of table 15, it is evident that a 1-million-dollar increase in final demand for poultry and eggs has the largest multiplier effect on primary production and also the second largest total multiplier effect on the Iowa economy. The largest gross multiplier effect is obtained by a 1-million-dollar increase in the final demand for deliveries from the meat-products sector. In this manner, the 25 interacting sectors can be ranked according to the magnitude of the direct and indirect effects of a 1-million-dollar increase in each of their final demands.

Personal income multipliers

To show the effect that an increase in exports, construction or government activity would have upon the household sector (i. e., increase in personal income payments to households) inter-

dependence coefficients of the major producing sectors and household sector were computed. Table 16 shows the value of direct and indirect requirements in output from producing sectors and household sector resulting from a 1-million-dollar increase in demand. For example, a 1-million-dollar increase in export demand from the food-manufacturing sector would generate through direct and indirect requirements an increase in output from the food-manufacturing sector of \$1,306,238; it also would generate an increased output of \$838,834 from the livestock sector, \$480,287 from the crops sector and \$209,119 from the other manufacturing sector, and so on. Finally, the 1-million-dollar increase in export demand of food would generate \$1,059,372 in personal income payments (wages, salaries, proprietors' income, dividends, etc.) in the household sector. Thus, the household sector (row 8) incorporates an income multiplier effect associated with an increase in

Table 16. Interdependence coefficients: direct and indirect requirements per million dollars of final demand, by major economic sector, Iowa, 1954.

Major producing sector	Purchasing sectors							Households
	Agriculture-livestock	Agriculture-crops and other	Food manufacturing	Farm machinery manufacturing	Other manufacturing and mining	Regulated industries	Trade and services	
Agriculture-livestock	1,278,480	136,039	838,834	90,778	109,646	80,928	114,519	173,678
Agriculture-crops and other	596,308	1,212,985	480,287	76,025	142,117	57,492	79,737	116,059
Food manufacturing	239,922	188,425	1,306,238	125,504	153,137	111,834	156,303	239,338
Farm machinery manufacturing	3,616	4,842	3,049	1,075,052	6,172	1,109	1,424	1,494
Other manufacturing and mining	182,252	224,682	209,119	402,123	1,439,628	153,327	195,509	213,077
Regulated industries	172,232	160,935	179,269	127,013	147,581	1,147,496	159,038	166,364
Trade and service	739,589	878,036	708,455	501,626	568,154	472,635	1,682,576	878,919
Households	1,090,965	1,246,452	1,059,372	851,074	939,731	751,483	1,034,194	1,688,444

demand for the products of a producing sector.

Interpreting the figures in the household column is somewhat more difficult because they require qualification. First, the effect of a 1-million-dollar increase in demand for households involves the different components of an increase in demand for household services, such as labor, management and capital. Thus, a 1-million-dollar increase in demand for household services (1-million-dollar increase in personal income) would mean more expenditures for goods and services, which would create direct and indirect requirements from producing sectors. For example, assuming fixed proportions of consumers expenditures, a 1-million-dollar increase in personal income would call forth, through direct and indirect requirements, an increase in output of \$173,678 from the livestock sector, \$116,059 from the crops sector and \$239,338 from the food-manufacturing sector, with the largest requirements, \$878,919 being generated in the trade and services sector. We would expect a smaller effect in the livestock, crop and food-manufacturing sectors and a larger effect in the durable goods, trade and services sector than that generated from the fixed proportion coefficients.

Total Business Activities Supported by Iowa Agriculture

The total economic support provided by agriculture in Iowa is substantially greater than the income earned by farm operators and hired workers. This economic support includes the business generated by farm purchases and sales and the expenditures of households that receive income payments from this interdependent business complex. To illustrate the total sales and employment generated by agriculture and agriculturally related activity, the interindustry transactions have been regrouped and summarized.

Total sales and purchases in Iowa

When the total sales of the five major economic sectors in Iowa industries and households are regrouped with reference to agriculture, the

data show that 66 percent of the industrial sales and 47 percent of the household sales in 1954 were made to farm or farm-related purchasers. Agriculture purchased \$1,810,000,000 of goods and services from the five major sectors, including internal transactions within agriculture and sold 1.3 billion dollars, or a third of its total output to the remaining four major economic sectors (table 17).

The 1954 distribution of total Iowa output by major purchasing sectors, including a three-fold breakdown of Iowa households, is shown in table 18. These percentages were applied to their appropriate totals to obtain the estimates shown in the preceding table.

Total employment and income

The input-output approach can be used also to study the effects of changes in final demand and output on employment in Iowa. First, however, the various concepts of employment are reviewed briefly (because the make-up of the primary inputs to the input-output tables will vary depending upon the particular concept that is used.)

Total employment in Iowa has been interpreted in accordance with the United States Bureau of the Census definitions. With reference to broad occupational categories, total employment includes wage and salary workers, private or public, the self-employed and unpaid family workers (table 19).

For the purposes of the input-output analyses, labor requirements per dollar of output are in terms of total employment. Projections of changes in total output, however, are derived from projections of wage and salary workers. Because the self-employed earn a residual income rather than a specified income per year, their earnings are likely to fluctuate more from year to year than wages and salaries per worker. Increased accuracy in employment and income estimates is obtained by using the more stable relationships pertaining to wage and salary workers. Hence, only the wage and salary workers and their total earnings are used in the estimating procedures.

Table 17. Estimated purchases of specified outputs by agriculture, farm households and related businesses and households, Iowa, 1954.

Major producing sector	Intermediate demands				Household purchases			
	Agricultural inputs	Agricultural outputs	Other	Total	Farm			Total
					Farm	related	Other	
	(million dollars)							
Agriculture	1,181	---	---	1,181	75	---	---	75
Food manufacturing	139	1,218	215	1,572	159	64	302	525
Other manufacturing and mining	62	59	577	698	88	35	167	290
Regulated industries	98	1	290	389	77	31	147	255
Trade and services	330	7	540	877	582	235	1,105	1,922
Total	1,810	1,285	1,622	4,717	981	365	1,721	3,067

Table 18. Percentage of specified output purchased by each major sector, Iowa, 1954.

Major producing sector	Purchasing sectors									Total
	Primary production	Manufacturing		Regulated industries	Trade and services	Households			Other final demands	
		Food	Other			Farm	Farm related	Other		
Primary production	34.2	35.3	1.7	0.0	0.2	2.2	0.0	0.0	26.4	100.0
Food manufacturing	7.2	9.2	0.8	0.1	1.1	8.2	3.3	15.7	54.4	100.0
Other manufacturing	4.3	3.4	24.5	2.0	9.1	5.9	2.4	11.3	37.1	100.0
Regulated industries	12.5	6.0	6.3	6.3	18.6	9.9	4.0	18.9	17.5	100.0
Trade and services	10.0	1.4	1.7	1.5	11.9	17.7	7.2	33.6	15.0	100.0

PROJECTED EMPLOYMENT, OUTPUT AND INCOME

The data on employment, income and population trends can be used in several ways to estimate prospective levels of economic activity in the state. First, the population and employment trends can be extended to 1974. In addition, trends in output per worker can be used to obtain current levels of productivity so that estimates of total production, based on the 1974 employment projections, can be obtained.

An alternative procedure for obtaining estimates of future levels of economic activity in the state would involve data on Iowa's share of the national market in each "exporting" industry. Once the market share estimates are obtained, future levels of production in Iowa can be derived, provided that corresponding estimates of national output levels are available. Again, the output per worker data can be used, but, in this case, the final series of estimates are of employment rather than of production. These two procedures are discussed further with reference to the 25-sector breakdown of the Iowa economy.

Employment and Output Projections

Population-based projections

Estimates of total Iowa employment and the number of workers earning wages and salaries are presented in table 20. These estimates were prepared from data provided by the Iowa Employment Security Commission, the Bureau of Labor Statistics, the National Planning Association and related sources of employment statistics. These data include the expected distribution of employment between agriculture and specified

nonagricultural activities, based upon historical population, labor force and employment relationships for Iowa and the rest of the national economy and upon estimates of prospective employment levels in the national economy. Finally, the population-based employment estimates correspond to the definitions and categories used in tables 4 and 5.

By using the estimated production per worker listed in table 21 with the estimates of the number of workers, the projected level of production is obtained for each of the nonagricultural industries. The projected increase in the total value of production, also in constant 1954 dollars, could be obtained by multiplying the estimated percentage change in total wages and salaries by the corresponding 1954 output level. This procedure assumes, however, that output per worker is increasing at the same rate as earnings in constant dollars.¹¹

By using output per worker estimates, the 1974 employment projections can be translated into a series of total output estimates. The annual rate of growth in total output is, therefore, a function of both changes in productivity and changes in employment levels. Underlying this procedure is the presumption that the 1949-60 employment distributions by industry are stable enough for estimating industrial employment, once an estimate of the total labor force is obtained.

Market-based projections

Market-based projections of economic activity in Iowa utilize the 1954 estimates of

¹¹When the expected increases in output per worker exceed the projected increases in earnings per worker, the projected production would understate the actual increases.

Table 19. Total employment in agriculture and nonagricultural industries, by class of worker, 1940-60.^a

Class of worker	Agriculture			Nonagriculture			Total employment		
	1940	1950	1960	1940	1950	1960	1940	1950	1960
	(Thousands)								
Private wage and salary workers	67.6	46.7	30.3	378.9	526.3	595.3	446.5	573.0	625.6
Government workers	0.3	0.4	0.4	69.6	86.8	112.1	69.9	87.2	112.5
Self-employed workers	207.2	200.2	160.0	97.6	99.5	91.7	304.8	299.7	251.7
Unpaid family workers	34.6	37.7	19.5	5.9	5.2	9.7	40.5	42.9	29.2
Total	309.7	285.0	210.2	552.0	717.8	808.8	861.7	1,002.8	1,019.0

^aU. S. Bureau of the Census, U. S. Census of Population, 1960, General Social and Economic Characteristics, PC(1) 17C Iowa, Table 56, Page 17-181.

Table 20. Total number of persons employed and annual percentage change in specified industries, Iowa, 1954 and 1974.^a

Sector	Iowa code	Estimated 1954			Projected 1974			Annual rate of change 1954-74
		Wage and salary workers	Other	Total employment	Wage and salary workers	Other	Total employment	
Agriculture	1-6	34.6	231.4	266.0	19.6	130.9	150.5	-2.0
Mining	7	3.1	0.1	3.2	2.1	0.1	2.2	-2.0
Meat products	8	28.0	0.1	28.1	23.9	0.0	23.9	-0.8
Dairy and grain products	9	11.7	0.5	12.2	10.5	0.3	10.8	-0.6
Other food products	10	11.6	0.2	11.8	12.1	0.2	12.3	0.2
Printing and publishing	11	11.4	0.5	11.9	15.0	0.4	15.4	1.3
Chemicals and allied products	12	6.1	0.1	6.2	8.4	0.1	8.5	1.6
Other nondurables	13	10.8	0.1	10.9	13.5	0.1	13.6	1.1
Building materials	14	13.4	0.3	13.7	12.8	0.2	13.0	-0.3
Metals	15	11.6	0.2	11.8	18.3	0.2	18.5	2.3
Farm machinery	16	16.0	0.1	16.1	25.5	0.1	25.6	2.3
Other machinery	17	17.2	0.2	17.4	19.0	0.1	19.1	0.5
Electrical machinery	18	9.2	0.0	9.2	21.2	0.0	21.2	4.2
Other durables	19	15.7	0.2	15.9	14.5	0.1	14.6	-0.4
Transportation	20	41.0	3.2	44.2	31.2	1.7	32.9	-1.4
Communications and public utilities	21	24.8	0.1	24.9	34.2	0.1	34.3	1.6
Wholesale trade	22	37.6	3.8	41.4	40.0	2.9	42.9	0.1
Retail trade	23	117.7	36.3	154.0	161.8	33.4	195.2	1.2
Finance, insurance, real estate	24	27.2	4.1	31.3	38.9	4.0	42.9	1.6
Services, including education	25	132.8	36.6	169.4	218.6	40.7	259.3	2.1
Contract construction	26	35.5	15.3	50.8	50.1	14.0	64.1	1.2
Public administration	27	58.6	0.0	58.6	45.8	0.0	45.8	-1.3
Total		675.6	333.4	1,009.0	837.0	229.6	1,066.6	0.3

^aBased on projected population, labor force and employment distributions by industry.

market shares and changes in these shares over the 1954-74 period. The 1954 levels of national output for each of the Iowa "exporting" sectors were obtained first. The 1954 export market shares were derived by using the data in table 12 along with estimates of national production. The new data, including the estimates of national production, are summarized in table 22.

Two levels of prospective relative market demand are assumed: one with a fixed market share in each of the Iowa exporting sectors and the other with a 10-percent increase in each of the specified export market shares. The derived increases in final demand were multiplied by the interdependence coefficients in table 14 to obtain the projected total Iowa outputs listed in table 23.

Table 21. Production per worker and total production in constant 1954 dollars and annual rates of change by industry, Iowa, 1954-74.

Producing sector	Code	Production per worker			Total production ^a		
		Estimated 1954	Projected 1974	Annual rate of change 1954-74	Estimated 1954	Projected 1974 ^a	Annual rate of change 1954-74
		(\$)	(\$)	(%)	(thou. \$)	(thou. \$)	(%)
Meat animals	1	23,658	37,500	2.3	1,773,605		
Poultry and eggs	2	6,239	26,900	7.3	162,071		
Dairy products	3	3,642	9,140	4.6	165,082	5,538,400	2.4
Feed crops	4	11,366	70,400	9.1	1,098,625		
Oil-bearing crops	5	25,650	86,700	6.1	136,845		
Other agricultural products	6	6,610	8,240	1.1	117,219		
Mining	7	9,570	21,300	4.0	30,673	46,860	2.1
Meat products	8	45,972	85,500	3.1	1,289,793	2,043,450	2.3
Dairy and grain mill products	9	35,146	65,200	3.1	430,254	704,160	2.5
Other food products	10	17,743	32,900	3.1	209,009	404,670	3.3
Printing and allied products	11	10,165	19,000	3.1	120,609	292,600	4.4
Chemicals and allied products	12	40,057	74,600	3.1	246,994	634,100	4.7
Other nondurables	13	8,796	16,300	3.1	96,226	221,680	4.2
Building materials	14	11,422	22,100	3.3	156,800	287,300	3.0
Primary and fabricated metals	15	10,094	19,500	3.3	118,742	360,750	5.6
Farm machinery and equipment	16	14,585	28,200	3.3	235,499	721,920	5.6
Other machinery (except electrical)	17	13,584	26,300	3.3	236,355	502,330	3.8
Electrical machinery	18	7,461	14,400	3.3	68,575	305,280	7.5
Other durable goods	19	10,647	20,500	3.3	169,219	299,300	2.9
Transportation	20	11,922	21,300	2.9	527,302	700,770	1.4
Communications and utilities	21	10,098	37,100	6.5	251,373	1,272,530	8.1
Wholesale trade	22	7,632	10,500	1.6	316,293	450,450	1.8
Retail trade	23	4,793	6,600	1.6	738,050	1,288,320	2.8
Finance, real estate and insurance	24	41,201	53,400	1.3	1,290,496	2,290,860	2.9
Services	25	5,549	6,780	1.0	939,709	1,758,054	3.1

^aBased on projected 1974 employment and output per worker.

Table 22. Estimated national production and Iowa's market share among selected industries, 1954 and 1974.

Producing sector	Code	Total national production ^a		
		Estimated 1954	Projected 1974	Iowa's market share in 1954 ^b
		(bil. \$)	(bil. \$)	(%)
Meat animals	1	10.8	14.7	5.81
Poultry and eggs	2	3.3	5.4	2.97
Dairy products	3	4.8	6.8	0.21
Feed crops	4	8.3	12.5	1.28
Oil-bearing crops	5	1.1	1.6	5.91
Meat products	8	12.6	22.1	8.00
Dairy and grain mill products	9	13.2	23.2	0.25
Printing and allied products	11	9.8	18.9	0.01
Farm machinery and equipment	16	2.3	5.8	4.54
Other machinery (except electrical)	17	16.8	42.7	0.02
Transportation	20	27.5	56.1	0.30
Finance, real estate and insurance	24	80.0	186.7	0.25

^a U. S. Dept. of Commerce, Bureau of the Census. United States Census of Manufacturers, 1954. Washington, D. C. 1956.

W. R. Maki, and D. F. Schreiner. Regional intersectoral relations and demand projections with emphasis on the feed-livestock economy of the North Central States. Iowa Agr. and Home Econ. Exp. Sta. Res. Bul. 530. 1964.

H. H. Landsberg, L. L. Fischman and J. L. Fisher. Resources in America's future. Johns Hopkins Press, Baltimore. 1963.

^b Iowa out-of-state shipments as a percentage of national production.

Once the projected market demands were obtained, the productivity-per-workers figures in table 21 were used to convert the estimates of output requirements into corresponding estimates of labor requirements, which also are summarized in table 23. Finally, the differential rates of change in employment (and production)

that would occur under the two market assumptions are shown in table 24.

Employment distributions derived by the two estimation procedures are compared in table 25. Excluded from these estimates are sectors 26 and 27—government and contract construction.

The population-based estimates generally show a higher proportion of employment in the primary and secondary industries (namely, agriculture and manufacturing) than do the market-based projections. Yet, when compared with the 1954 employment pattern, the population-based projections show the largest decline in the relative importance of agriculture and manufacturing.

On an absolute basis, the 1974 employment projections based on assumed fixed market shares show a decline in agricultural and total employment (table 26). Projected employment in food and kindred products manufacturing and in the regulated industries—transportation, communication and public utilities—also shows a decline in the market-based projections. A 10-percent increase in export market shares would result in only a 12,000-worker increase in agricultural employment in spite of the relative national importance of Iowa agriculture. The same increase in export market shares would result in a somewhat smaller employment increase in other sectors—a total increase of only 11,800 workers.

Table 23. Estimated total production and employment by industry, Iowa, 1974.

Producing sector	Code	Production			Employment		
		Fixed market share	10-percent larger market share	Difference	Fixed market share	10-percent larger market share	Difference
		(million dollars)			(thousands)		
Meat animals	1	2,714	2,960	246	72.4	78.9	6.5
Poultry and eggs	2	254	277	23	9.4	10.3	0.9
Dairy products	3	221	233	12	24.1	25.5	1.3
Feed crops	4	1,653	1,795	142	23.5	25.5	2.0
Oil-bearing crops	5	241	254	13	2.8	2.9	0.1
Other agricultural products	6	165	174	9	20.0	21.1	1.1
Subtotals		5,248	5,693	445	152.2	164.2	12.0
Mining	7	72	73	1	3.4	3.4	0.0
Meat products	8	2,174	2,361	187	25.4	27.6	2.2
Dairy and grain mill products	9	599	625	26	9.2	9.6	0.4
Other food products	10	401	404	3	12.2	12.3	0.1
Printing and allied products	11	229	231	2	12.0	12.2	0.2
Chemicals and allied products	12	525	537	12	7.0	7.2	0.2
Other nondurables	13	412	414	2	25.3	25.4	0.1
Building materials	14	417	419	2	18.9	19.0	0.1
Primary and fabricated metals	15	327	331	4	16.8	17.0	0.2
Farm machinery and equipment	16	554	583	29	19.6	20.7	1.1
Other machinery (except electrical)	17	527	532	5	20.0	20.2	0.2
Electrical machinery	18	268	269	1	18.6	18.7	0.1
Other durable goods	19	775	777	2	37.8	37.9	0.1
Subtotals		7,280	7,556	276	226.2	231.2	5.0
Transportation	20	855	892	37	40.1	41.9	1.8
Communications and utilities	21	557	564	7	15.0	15.2	0.2
Wholesale trade	22	530	539	9	50.5	51.3	0.8
Retail trade	23	1,014	1,021	7	153.6	154.7	1.1
Finance, real estate and insurance	24	2,497	2,581	84	46.8	48.3	1.5
Services	25	1,406	1,416	10	207.4	208.8	1.4
Subtotals		6,859	7,013	154	513.4	520.2	6.8
Total		19,387	20,262	875	891.8	915.6	23.8

Table 24. Annual rate of change in production and employment under two market-share assumptions, Iowa, 1954-74.

Producing sector	Code	Production		Employment	
		Fixed market share	10-percent larger market share	Fixed market share	10-percent larger market share
Meat animals	1	2.1	2.6	-0.2	0.2
Poultry and eggs	2	2.3	2.7	-5.1	-4.6
Dairy products	3	1.5	1.7	-3.2	-2.9
Feed crops	4	2.0	2.5	-7.1	-6.7
Oil-bearing crops	5	2.8	3.1	-3.2	-3.0
Other agricultural products	6	1.7	2.0	0.6	0.9
Average		2.1	2.5	-2.7	-2.4
Mining	7	4.3	4.3	0.3	0.3
Meat products	8	2.6	3.0	-0.5	-0.1
Dairy and grain mill products	9	1.6	1.9	-1.4	-1.2
Other food products	10	3.3	3.3	0.1	0.2
Printing and allied products	11	3.2	3.3	0.1	0.1
Chemicals and allied products	12	3.8	3.9	0.6	0.7
Other nondurables	13	7.3	7.3	4.2	4.2
Building materials	14	4.9	4.9	1.6	1.6
Primary and fabricated metals	15	5.1	5.1	1.8	1.8
Farm machinery and equipment	16	4.3	4.5	1.0	1.3
Other machinery (except electrical)	17	4.0	4.1	0.7	0.7
Electrical machinery	18	6.8	6.8	3.5	3.5
Other durable goods	19	7.6	7.6	4.3	4.3
Average		3.8	2.2	1.5	1.6
Transportation	20	2.4	2.6	-0.5	-0.3
Communication and utilities	21	4.0	4.1	-2.5	-2.5
Wholesale trade	22	2.6	2.7	1.0	1.1
Retail trade	23	1.6	1.6	0.0	0.0
Finance, real estate and insurance	24	3.3	3.5	2.0	2.2
Services	25	2.0	2.1	1.0	1.0
Average		2.6	2.7	0.5	3.9
Over-all average		2.9	3.1	-0.4	0.6

Table 25. Estimated employment distribution, by industry, Iowa, 1954 and 1974.

Producing sector	Code	Estimated 1954	Projected 1974		Population-based procedure
			Market-based procedure		
			Fixed market share	10-percent larger market share	
Meat animals	1	8.3	8.1	8.6	15.7
Poultry and eggs	2	2.9	1.1	1.1	
Dairy products	3	5.0	2.7	2.8	
Feed crops	4	10.8	2.6	2.8	
Oil-bearing crops	5	0.6	0.3	0.3	
Other agricultural products	6	2.0	2.2	2.3	
Subtotals		29.6	17.0	17.9	
Mining	7	0.4	0.4	0.4	0.2
Meat products	8	3.1	2.8	3.0	2.4
Dairy and grain mill products	9	1.4	1.0	1.1	1.1
Other food products	10	1.3	1.4	1.3	1.3
Printing and allied products	11	1.3	1.3	1.3	1.6
Chemicals and allied products	12	0.7	0.8	0.8	0.9
Other nondurables	13	1.2	2.8	2.8	1.4
Building materials	14	1.5	2.1	2.1	1.4
Primary and fabricated materials	15	1.3	1.9	1.9	1.9
Farm machinery and equipment	16	1.8	2.2	2.3	2.7
Other machinery (except electrical)	17	1.9	2.2	2.2	2.0
Electrical machinery	18	1.0	2.1	2.0	2.2
Other durable goods	19	1.8	4.2	4.1	1.5
Subtotals		18.7	25.2	25.3	20.6
Transportation	20	4.9	4.5	4.5	3.4
Communication and utilities	21	2.8	1.7	1.7	3.6
Wholesale trade	22	4.6	5.7	5.6	4.5
Retail trade	23	17.1	17.3	16.9	20.5
Finance, real estate and insurance	24	3.5	5.2	5.3	4.5
Services	25	18.8	23.4	22.8	27.2
Subtotals		51.7	57.8	56.8	63.7
Total		100.0	100.0	100.0	100.0

Table 26. Estimated employment, by major economic sector, Iowa, 1954 and 1974.

Major sector	Code	Estimated 1954	Projected 1974		Employment-based procedure
			Market-based procedure		
			Fixed market share	10-percent larger market share	
Agriculture:					
Livestock	1-3				
Other	4-6				
Subtotals		146.3	105.9	114.7	
Manufacturing:					
Food and kindred products	8-10	119.7	46.3	49.5	
Farm machinery	16	266.0	152.2	164.2	150.5
Other (including mining)	7, 11-15	52.1	46.8	49.5	47.0
Subtotals	17-19	16.1	19.6	20.7	25.6
Subtotals		100.1	159.8	161.0	126.1
Subtotals		168.3	226.2	231.2	198.7
Services:					
Regulated industries	20-21	69.1	55.1	57.1	67.2
Trade and services	22-25	396.1	458.3	463.1	540.3
Subtotals		465.2	513.4	520.2	607.5
Total		899.5	891.8	915.6	956.7

A series of four charts are used to summarize employment and production trends in the 25 Iowa sectors (figs. 13-16). The trends are based on the fixed market share assumption; they represent the results of using the interindustry transactions tables to convert the final demand estimates into corresponding output estimates.

For agriculture, the individual sector outputs are expected to increase at annual rates only slightly greater than national population growth (fig. 13). The labor force employed in each of

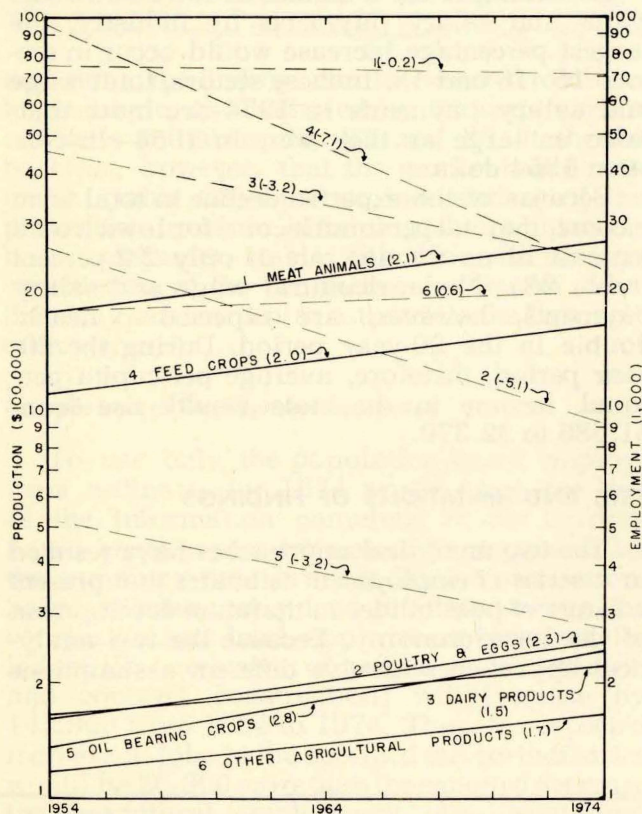


Fig. 13. Projected production and employment, for selected agricultural sectors, Iowa, 1954-74.

these activities, however, is decreasing because the increases in final demand generally are less than the increases in labor productivity. Thus, generally the trends in production and employment are inversely correlated.¹²

The manufacture of nondurable goods in Iowa also is increasing, but at somewhat higher annual rates than agricultural outputs (fig. 14). Moreover, increases in labor productivity are somewhat smaller—about 3.1 percent per year; hence, total employment in each of the seven specified sectors in fig. 14 is expected to increase slightly over the 1954-74 period.

The durable goods manufacturing sectors are characterized by even larger annual rates of increase in total production than in the case of

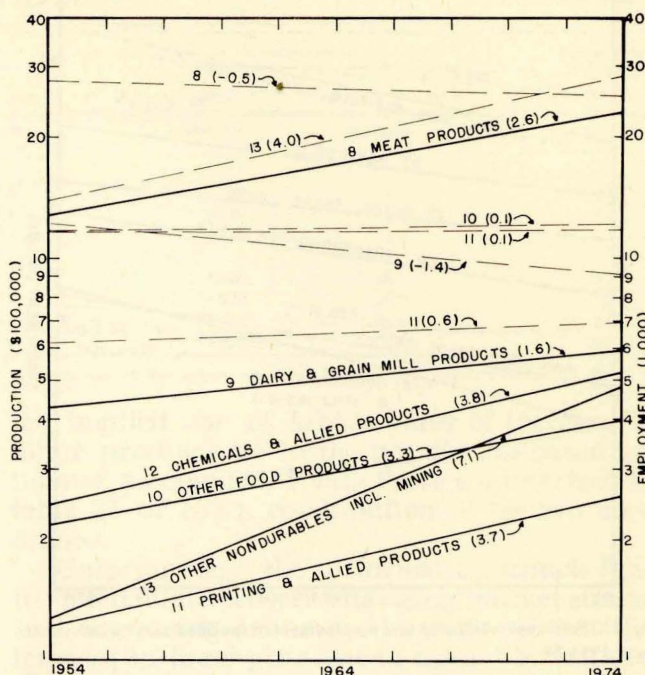


Fig. 14. Projected production and employment in mining and nondurable goods manufacturing, Iowa, 1954-74.

agricultural production and nondurable goods manufacturing (fig. 15). The value added per dollar of gross output by manufacturing workers also is somewhat larger; hence, the logarithmic scale for production has been reduced by a multiple of 10, while the scale remains the same for employment.

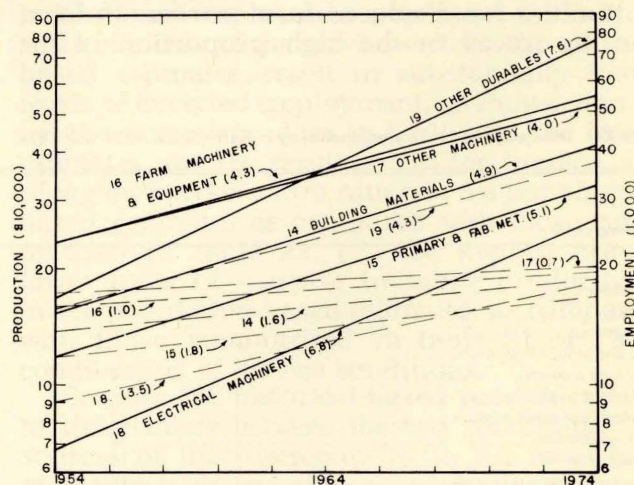


Fig. 15. Projected production and employment in durable goods manufacturing, Iowa, 1954-74.

Finally, the "margin" industries are expected to experience increases in output that correspond more closely with increases in Iowa, rather than national, population (fig. 16). However, the export and industrial-market-oriented activities (e. g., insurance and transportation) show somewhat larger relative increases than the local consumer-market-oriented activities (e. g., retail trade and services).

¹² The annual rates of change in production and employment are included in parenthesis in figs. 13-16.

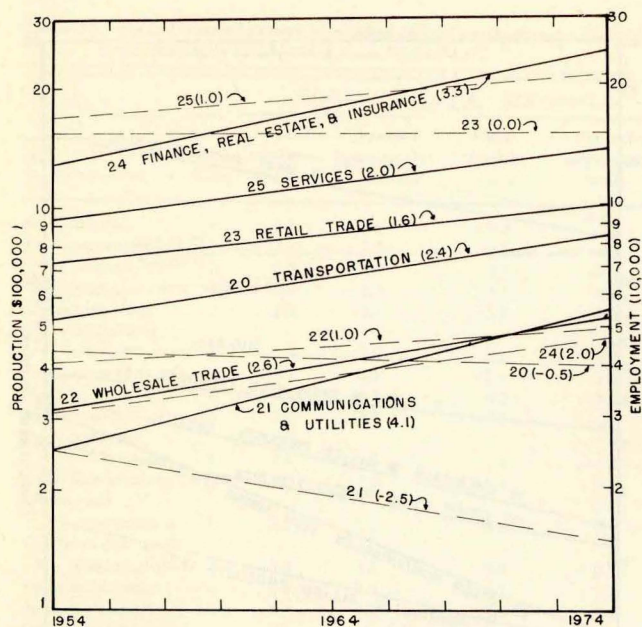


Fig. 16. Projected production and employment in specified service industries, Iowa, 1954-74.

Altogether, the series of four charts reveals (1) the differential rates of growth in output and (2) the varying importance of Iowa's major economic activities in accounting for expected changes in total employment. The latter is a function of the proportion of total employment in a particular activity in 1954 and the relative growth in employment in that activity since 1954. With reference to relative growth, much of the difficulty in finding new job opportunities for displaced farm workers in Iowa can be traced to the high proportion of the

declining and slowly growing activities in Iowa's economic structure.

Projected Income

Projected Iowa income, using the population-based estimates of production and employment, is obtained by estimating, first, the total level of wages and salaries. The latter is obtained by multiplying the projected wages and salaries per worker with the employment data in table 20. The results are summarized in table 27.

According to the estimates of 1954 and 1974 wage and salary payments by industry, the largest percentage increase would occur in sectors 15, 16 and 18. In these sectors, total wage and salary payments in 1974 are more than twice as large as they were in 1954—in constant 1954 dollars.

Because of the expected decline in total farm income, the total personal income for Iowa would increase at an annual rate of only 2.2 percent (table 28). Nonagricultural wage and salary payments, however, are expected to nearly double in the 20-year period. During the 20-year period, therefore, average per-capita personal income in the state would rise from \$1,686 to \$2,370.

USES AND LIMITATIONS OF FINDINGS

The two analytical approaches have resulted in a series of employment estimates that present a range of possibilities in the future development of the Iowa economy. Because the two analytical approaches involve different assumptions

Table 27. Total wage and salary payments, by industry, Iowa, 1954 and 1974.

Producing sector	Code	Estimated	Projected	Annual rate of
		1954	1974	change
		(million dollars)	(million dollars)	1954-74
				(percent)
Agriculture	1-6	69.0	68.0	-0.1
Mining	7	11.0	12.2	0.5
Meat products	8	118.0	174.3	2.0
Dairy and grain mill products	9	41.7	64.3	2.2
Other food products	10	42.8	78.1	3.0
Printing and allied products	11	44.6	100.9	4.1
Chemicals and allied products	12	25.0	60.2	4.4
Other nondurables	13	35.0	75.3	3.8
Building materials	14	48.0	79.2	2.5
Primary and fabricated metals	15	48.5	132.2	5.0
Farm machinery and equipment	16	70.4	193.1	5.0
Other machinery (except electrical)	17	72.2	137.1	3.2
Electrical machinery	18	32.2	128.8	6.9
Other durable goods	19	65.7	104.5	2.3
Transportation	20	149.0	162.2	0.4
Communication and utilities	21	80.0	174.9	3.9
Wholesale trade	22	138.6	204.8	2.0
Retail trade	23	326.6	623.8	3.2
Finance, real estate and insurance	24	90.0	204.8	4.1
Services	25	310.7	767.5	4.5
Households	26	120.0	289.5	4.4
Construction	27	208.0	248.4	0.9
Total		2,147.0	4,084.1	3.2

Table 28. Total personal income payments, in constant 1954 dollars, Iowa, 1954 and 1974.

Item	Estimated 1954 ^a		Projected 1974		Annual rate of change 1954-74 (percent)
	Total	Proportion of total	Total	Proportion of total	
	(mil. dol.)	(percent)	(mil. dol.)	(percent)	
Agricultural:					
Wages and salaries	70	1.6	68	1.0	-0.1
Proprietorial income	1,084	24.1	860	12.4	-1.2
Total	1,154	25.7	928	13.4	-1.1
Nonagricultural:					
Wages and salaries	2,078	46.2	4,016	58.0	3.3
Other income	1,262	28.1	1,978	28.6	2.3
Total	3,340	74.3	5,994	86.6	2.9
Total personal income	4,494	100.0	6,922	100.0	2.2

^aU. S. Department of Commerce, Office of Business Economics. Personal Income by States, a supplement to the Survey of Current Business. Washington, 1956.

and data, the findings can be expected to differ, for example, as illustrated by the employment estimates in tables 20, 23 and 26. It should be clear, however, that the market-based estimates (table 23) are not independent of the procedures used in obtaining the population-based estimates (table 20). Nor will the reconciliation of the two series of estimates mean that only one particular estimate is the "correct" estimate.

Comparison of Employment Estimates

To use only the population-based employment estimates for 1974 would mean the loss of the information contained in the market-based employment estimates. As suggested by the summary data in table 26, the population-based estimates may lead the data user to the conclusion that total employment in the service industries (exclusive of public administration and contract construction) will increase by 142,300 from 1954 to 1974. Thus, the expected increase in jobs in the specified service industries would be 26,800 more than the expected decrease in agricultural employment. An additional 30,400 jobs would be found in the manufacturing sectors. Thus, total employment is expected to increase by 57,200—an increase that would counterbalance (with reference to total population growth) the expected increase in the proportion of the total population in the employed labor force.

A somewhat different picture is presented by the market-based employment estimates, given the assumption of fixed market shares for the exporting industries: The expected agricultural employment estimate is, for practical purposes, the same in the two procedures, but the employment estimates for the manufacturing and service industries differ widely. In the case of manufacturing, the market-based approach results in greater estimated employment because of (1) the implicit use of *lower* market-share ratios in the population-based estimates as compared with those summarized in table 22, (2)

the implicit use of *higher* rates of increase in labor productivity in the population-based estimates as compared with those summarized in table 21 or (3) a combination of the two conditions.

Unfortunately, the historical approach fails to differentiate between changing market shares and increasing labor productivity so that differences in these phenomena cannot be isolated when comparing the results with those obtained by use of the interindustry transactions table. For example, a 10-percent increase in the export market for the manufacturing sectors would result in a 5,000-person increase in employment, as shown by the data in table 26. Similarly, the effects of changes in the levels of increase in labor productivity from those summarized in table 21 can be isolated in the market-based employment estimates but not in the population-based employment estimates.

In the case of the service sectors, the market-based estimates result in substantially lower levels of expected employment, as shown, again, by the summary data in table 26. The lower estimates are the result of (1) the implicit use of *higher* market share ratios in the population-based estimates as compared with those summarized in table 22, (2) the implicit use of *lower* rates of increase in labor productivity in the population-based estimates, as compared with those summarized in table 21 or (3) a combination of the two conditions.

Because the historical-based procedure fails to differentiate between the two conditions, the sources of the discrepancies in the two series of service-industry estimates cannot be isolated, given the data in tables 20, 23 and 26. To increase service exports by 10 percent clearly would not be an adequate adjustment in the market-based estimates for purposes of reconciliation of the two series of data. By the same token, a downward adjustment in the market-share ratios for the population-based estimates would not appreciably reduce the discrepancies. The differences in the estimates obtained by the two analytical approaches, therefore, must be

reconciled in terms of differences in labor productivity.

The fundamental limitation in the use of population-based estimates should be clear by now: The effect of increases in labor productivity have not been isolated and, hence, may generate large accumulative forecasting errors simply because historical rates are implicitly involved in the estimation procedures. The production estimates from the Iowa interindustry transactions table for 1954, therefore, provide a basis for including *labor productivity rates explicitly in the forecasting procedures*. By coordinating and comparing the results obtained by use of the historical (and econometric) approach and the input-output (and programming) approach in long-range forecasting, an important step has been made in "zeroing-in" on the sources of difficulty in the preparation of consistent and reliable long-range forecasts of a state's economic and population prospects.

Admittedly, the use of the interindustry transactions table imposes another category of limitations in the long-range forecasts because of the assumed stability of the input-output coefficients. The assumed fixity in area economic structure is not as great a limitation as it may seem on first glance, however, because of the tendency toward stability in the ratio between total primary input purchases and total purchases that is the result of (1) the substitution between labor inputs and capital inputs, (2) the rise in real income per unit of labor inputs that corresponds generally with the rise in labor productivity or (3) a combination of the two phenomena. A comparison of the empirical data on trends in wages and salaries per worker (table 10) with trends in labor productivity (table 21) supports at least one of the three hypotheses. In any case, the results obtained by use of the interindustry transactions table are no less plausible on logical grounds than the results obtained by use of the partial econometric models of particular segments of the over-all Iowa economy. Thus, the two series of estimates have been viewed as a relevant range in the estimation of Iowa's economic prospects, industry by industry.

Finally, remember that the two estimation procedures involve two different orientations to economic forecasting: the one based on the expected supply of labor; the other based on the expected demand for labor. For Iowa, the supply-oriented estimates may result in accumulative errors in the implicit market-share ratios and labor productivity rates simply because of the constraint imposed on the total employment estimate by the initial estimate of total population and labor force. If the latter esti-

mates were lower, the implicit productivity rates for the service sectors, for example, could be higher. (The productivity rates would be higher, also, for the manufacturing sectors, thus resulting in an even larger discrepancy in the two series of estimates.) A fundamental difficulty in the supply-oriented estimates occurs, therefore, in the use of the population estimates as the starting point for all subsequent estimates of Iowa's economic prospects. In short, when peering into the uncertainties of the future, as good a rule as any perhaps is this one: The wider the range of the employment estimates, the less is their reliability.

Data Uses in Business and Government

In spite of the shortcomings in the procedures for estimating Iowa's future economic and population prospects, the findings in this report can be useful in a variety of activities concerning Iowa's economic development, both private and public. First, in a general sense, Iowa's major problems of economic growth and improvement can be viewed with reference to changes in the production of goods and services per worker. The income derived from these productive activities becomes the essential means of (1) reimbursing workers, managers and owners for services rendered and (2) accumulating the financial resources for investment in improved equipment and facilities.¹³

To identify and formulate Iowa's major economic problems requires some judgments on reasonable goals for specific segments of the Iowa economy. The attainment of these goals involves both the private and public sectors of the Iowa economy.

In the private sector, information of the sort presented in this study is needed in both business and household decisions. Business decisions may range from buying a farm or the purchasing of a major farm machinery item to investing in new or expanded industrial plant and office facilities. Information on state economic prospects can be used in developing appropriate product and market strategies that could lead to a larger share of the state or national market for a particular commodity or company.

In the agricultural sector, information about local farming prospects (e.g., production practices, market outlets and taxes) and prospects of off-farm work, is most useful in individual

¹³In 1954, output per person in Iowa was \$2,100, of which nearly \$1,700 was used to reimburse households for different services rendered—labor, entrepreneurship and investment capital. Altogether, the various payments to households make up total personal income. Of fundamental importance to the future income growth is the allocation of total income between the present and the future—between current consumption and investment.

farm and family planning. In addition, farmers are concerned by the national prospects of agriculture—the relative levels of farm incomes and prices and the changing pattern of farm programs. Many of these needs, however, are poorly articulated because of the lack of understanding of the basic economic processes that account for agriculture's changing economic position in Iowa and elsewhere in the nation.

Business firms engaged in processing and marketing agricultural products will find estimates of prospective outputs of Iowa agricultural products and market demands for these products extremely useful in investment planning, particularly in the location and design of new marketing or processing facilities. Estimates are needed also of the competitive position or market shares of the Iowa businesses in relation to similar businesses elsewhere in the country and of the outlook for future supplies of agricultural raw materials. Again, the predictions would be useless without some understanding of their relation to the factors that affect long-run business profits.

Many of the agricultural estimates that are needed by marketing and processing firms are sought also by the agricultural supply businesses and manufacturers of farm machinery and other agricultural inputs. Manufacturers seek information about area farming prospects as a basis for sales forecasts, locating dealers and even expanding and relocating existing manufacturing facilities. In addition, local farm supply dealers can find forecasts of Iowa agricultural prospects useful in anticipating changes in their product lines, in physical equipment and in the managerial skills needed to operate a profitable business.

Among other businesses that are of substantial importance in the Iowa manufacturing sector are those engaged in the manufacture of electrical machinery. Since electrical machinery manufacturers employ a relatively large proportion of women, the increasing female labor supply in Iowa offers a location incentive for these firms. In addition, proximity to major industrial centers—without metropolitan congestion—offers additional advantages for these industries that may outweigh the lack of certain "external economies" (i.e., particular business services and a reservoir of professional managerial talent that attracts and retains many businesses in the major industrial centers). Public information regarding the nature of the labor supply and the transportation system would be relevant, therefore, in plant location decisions. The more detailed information on labor market prospects, however, requires a state-wide analysis of population and

employment trends as a means of checking the plausibility of the detailed estimates.

In the public sector, economic factors often-times influence decisions less than do political and social factors, particularly in establishing public priorities among tax-supported activities of local, state and federal governments. Nonetheless, the economic forecasts and prognoses sought by private business also can meet some of the data needs of the public sector. These data needs are viewed with reference to local and state governmental functions such as education, highways and general governmental services.

Data needs for area educational planning are not confined solely to school-age population projections; they also must include estimates of prospective tax receipts for supporting Iowa's schools and colleges. When the property tax is the major source of funds for financing public schools, the value of taxable properties becomes an important economic variable. However, when other sources of revenue, particularly those collected by the state, assume a larger share of the local school burden, then the distribution of personal incomes and the pattern of retail sales become important economic variables in educational planning.

In the long-run context, the technical and human requirements of existing and prospective jobs performed in Iowa industry and business also are important considerations in the economics of education. Projections of future job opportunities could serve as guidelines in the development of vocational training programs, particularly among boys who leave high school.

Finally, local and state government functions, such as welfare, police, health and a variety of other activities that generate services sought by the citizens of the state, are expanding. Moreover, as sources of governmental revenue expand, the heretofore unmet demands for these services can be satisfied. When ascertaining the future economic base for these services, estimates of the growth and distribution of income and wealth in the state can be used to advantage by legislators and public administrators.

For all the different potential uses of the findings presented in this report, the same limitations apply; namely, the limitations imposed by the uniqueness of human history. Each moment of history has its own peculiar set of circumstances, many of which defy our abilities, even to imagine, let alone to accurately forecast. To account for all the factors affecting Iowa's prospects in 1974 simply exceeds human capability. Yet, important decisions of long-range consequences are continually being made

on the basis of favorable or unfavorable forecasts of Iowa's economic prospects.

The alternative to the lack of omniscience is not a complete disregard of the element of futurity in decision making. Rather, it is proposed that the data user recognize (1) the uncertainty in forecasting and (2) the possi-

bilities in more precisely identifying the sources of the uncertainties by using different procedures (that essentially involve different assumptions) for estimating a given series of variables. The latter strategy of course will require some degree of collaboration between the economic analyst and the data user.

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