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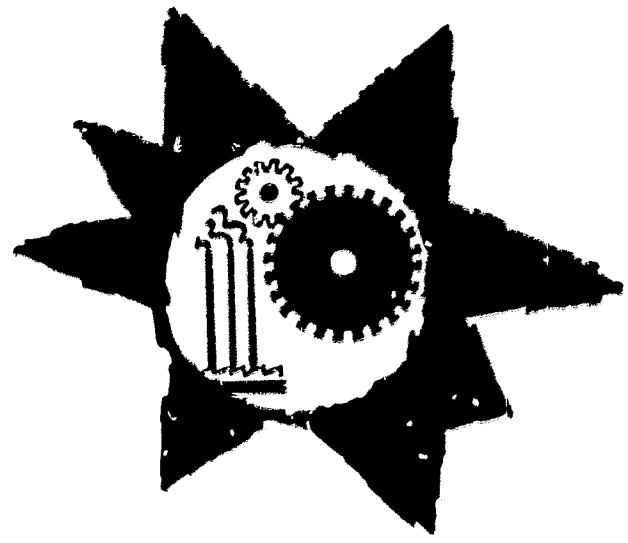
This study of the Northern Plains States (Iowa, Minnesota, Nebraska, North Dakota, South Dakota, Wisconsin) post secondary educational facilities for training craftsmen and operatives for manufacturing and related industries was conducted by means of a questionnaire survey. For each occupation in which training was offered, schools were requested to give data such as enrollment, completions, wage rates, and migration for the years 1959-1964. U.S. Department of Labor and 1960 census data were used to estimate the 1961 growth and replacement demand for each craftsman and operative occupation and this was compared with average annual training output for 1960-1963 as determined by the questionnaire. Analysis showed that in the early 1960's less than half the demand for the occupations was met by regional vocational education resources. The training is concentrated in a narrow range of traditional skills and is only partly responsive to actual needs. The rate at which new courses have been added since 1960 is negligible. The per capita expenditure on all vocational education in the Northern Plains States is slightly above the United States average while expenditures per student enrolled in trade and industry training programs is 25 percent below the national average. (HC)

VOCATIONAL TRAINING FOR INDUSTRY IN THE NORTHERN PLAINS



AREA DEVELOPMENT DEPARTMENT
NORTHERN NATURAL GAS COMPANY
OMAHA, NEBRASKA

/ VOCATIONAL TRAINING

FOR

INDUSTRY IN THE NORTHERN PLAINS

Published By

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Area Development Department
Omaha, Nebraska

The productivity of any labor force depends on its quality as well as its size. The American worker is probably the most productive in the world ... America's investment in education may have been its biggest contribution to its own productivity.

-- George Leland Bach

Vocational education is an important type of formal training to prepare youth for skilled jobs. Yet experience with training programs in recent years has revealed the limited scope and obsolescence of some of our public vocational education.

-- The Annual Report of
The Council of Economic Advisers, 1965.

C O N T E N T S

P R E F A C E

Northern Natural Gas Company and the local gas utilities serving the Northern Plains States recognize that their prosperity is tied to the growth of employment and income in their service areas. Vocational education policies are among the most important areas of public policy affecting the economic development of the region. Thus the character of these educational resources and plans for their further development are of concern to the natural gas industry in the Northern Plains.

The purpose of this study, Vocational Training for Industry in the Northern Plains, is to provide new information about education for skilled jobs in the region's manufacturing and related industries. The study comes at a time of expansion and innovation in Federal and State vocational education programs. It is hoped that the study will provide useful data and background for government decision-makers, educators, and area developers who are concerned with vocational education for industries vital to the economic development of the Northern Plains region.

This study was conducted and the report prepared by Donald W. Beard, Research Associate in the Area Development Department of Northern Natural Gas Company. Preliminary work, the conducting of a pilot study, and consultative assistance were provided by Dr. L. A. Danton, Professor of Economics at the University of Omaha. Grateful acknowledgement is made to the many educators and government administrators whose contributions and suggestions were essential to its preparation.

June, 1965

CHAPTER I

INTRODUCTION

In the promotion of industrial development in the Northern Plains States, Northern Natural Gas Company's Area Development Department has frequently found that the availability of skilled craftsmen and operatives or facilities to train them have been an important consideration in a prospect's plant-location decision. Because of its first-hand observation of the importance of vocational education resources to economic development and because of the paucity of information on these resources in the Northern Plains, Northern's Area Development Department began a study of them in 1964.

Scope and Objectives of the Study

The research and analysis in this study have been restricted to craftsmen and operative occupations in manufacturing, construction, and miscellaneous industries in the following Northern Plains states:

Iowa
Minnesota
Nebraska
North Dakota
South Dakota
Wisconsin

These states roughly comprise the Northern Natural Gas Company's service area. Manufacturing, construction, and miscellaneous industries were selected because they are, to some degree, exporting industries that require a variety of specially skilled labor. Craftsmen and operatives were selected because they have been found to be the types of labor most crucial in attracting new industry to the region.[1]

The objectives of the study were as follows:

-- to compile an inventory of the Northern Plains states' vocational training programs in craftsman and operative occupations in manufacturing, construction, and miscellaneous industries;

-- to measure the region's capacity to train people with the above types of skills, and trends in this capacity;

-- to measure the region's current situation and trends in employment of and demand for people with the above skills;

-- to obtain data on the wages of recent graduates and experienced workers trained in the above kinds of skills;

-- to detect types of trained labor which might interest industrial prospects considering the Northern Plains as a location for new or expanded operations;

-- to determine the extent to which training facilities for craftsmen and operatives respond to the needs of industry in the Northern Plains states;

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[1]Approximately 60 percent of all workers in both manufacturing and construction are craftsmen and operatives.

-- to indicate opportunities for further development of the Northern Plains vocational education programs in the future.

Methodology

The study of the Northern Plains states' facilities for training craftsmen and operatives in manufacturing and related industries was conducted by means of a questionnaire survey. The survey was limited to schools offering post-high school training in the above occupations. This definition included adult or post-high school vocational education programs and Bureau of Apprenticeship and Training (BAT) programs. Since the number of vocational schools is small, the survey attempted to include 100 percent of the schools that appeared at all likely to offer training in the above occupations. A 90 percent response to the questionnaire survey was obtained. Adjustment of the data obtained for schools not responding was not attempted. A more detailed discussion of the research techniques is presented in Appendix A.

The questionnaire survey focused on occupations rather than schools. For each occupation in which training was offered, data such as enrollment, completions, wage rates, and migration for the years 1959 through 1964 were requested. These data were tabulated by occupation and by school.

Analysis of the employment and incremental demand in craftsmen and operative occupations in manufacturing and related industries was based upon 1960 Census data and U. S. Department of Labor working-life tables for males and females. Requirements for both expansion and replacement were estimated separately for each craftsmen and operative occupation in manufacturing, etc. for which data were available in the Detailed Characteristics Volumes of the 1960 Census.

The analysis of the supply and demand for craftsmen and operative occupations compared the annual increments of trained workers graduated from the programs surveyed to the above estimates of the annual increments of demand for such workers stemming from expanding (or declining) employment and the need to replace separations from the labor force due to death, retirement, or other causes. Specifically, annual demand in each occupation was estimated for 1961 based on the detailed employment-by-occupation statistics in the 1960 Census. This was compared with annual average output in each occupation from 1960 through 1963. Trends in the rate of growth of both employment and training output were also analyzed in relation to the supply-demand situation.

Summary of Major Findings and Conclusions

This section summarizes the findings and conclusions of the study which are important for appraising the recent performance of the vocational education facilities in the six Northern Plains States and for determining policy in the future.

-- The numbers of skilled craftsmen and operatives trained for occupations in manufacturing and related industries in the Northern Plains grew at a greater percentage rate than total regional employment in these occupations during the early 1960's. This trend of improving performance

in vocational education for skilled industrial occupations is also evident in the nation as a whole. There remain, however, many opportunities for improvement in the Northern Plains States' vocational education programs.

-- During the early 1960's, less than half the demand for craftsmen and operatives by manufacturing and related industries in the Northern Plains States was met by regional vocational education resources. Specifically, only about 40 percent of the demand was met by formally trained craftsmen and operatives in 1961. Demand for craftsmen and operatives is met in widely varying degrees in each of the six states studied. South Dakota and Nebraska annually train over 60 percent of their annual requirements while Iowa trains only about 27 percent of its requirements annually.

-- Training is concentrated in a narrow range of traditional skills in the public and private vocational schools and in the Bureau of Apprenticeship and Training (BAT) program, and the courses offered by these resources are only partly responsive to the needs of regional employers. For example, surpluses or high percentages of requirements are trained in occupations with declining employment, such as auto mechanics while occupations with growing demand such as welders and skilled food processing and textile workers are largely neglected.

-- The courses offered are not as responsive to the economic development needs of the Northern Plains States as they might be. For example, training for skilled occupations in the food processing industry (the region's largest exporting industry) is almost non-existent while training in occupations such as printers and various kinds of repairmen (which have little impact on the area's economic development) meets a high percentage of demand. The states' public support of vocational education, in effect, subsidizes some industries and not others but without much apparent co-ordination of investment in vocational education with economic development needs and objectives.

-- The rate at which new courses have been added by the public and private vocational schools and the BAT program since 1960 is negligible. The training of craftsmen and operatives in the Northern Plains is still concentrated in the traditional apprenticeship trades in printing, metal working, construction, and miscellaneous services.

-- Expenditure per capita on all vocational education in the Northern Plains is slightly above the United States average. However, expenditure per student enrolled in trade and industry training programs is 25 percent below the national average.

-- Industry's annual requirements in many types of skilled craftsman and operative occupations in which training is not presently offered are large enough to support full time courses in each state.

-- Declining agricultural employment and increasing manufacturing employment in the Northern Plains indicate a continuing growth in many types of craftsmen and operative occupations which comprise the majority of manufacturing employment.

-- Continuing shifts in employment opportunities from the least skilled to the most skilled occupations will re-inforce the demand for trained workers and deny jobs to the untrained.

-- Employment opportunities are shifting from rural to urban locations. The larger Northern Plains cities (over 50,000, will continue to have the bulk of employment including manufacturing employment, but more rapid growth in total and manufacturing employment is occurring in medium-sized (10,000 to 50,000) and smaller (under 10,000) cities respectively -- suggesting the need for a changing geographic allocation of investment in vocational education in the future.

-- Previous research indicates above average returns to public investment in education through the increased productivity of those educated.

CHAPTER II

VOCATIONAL EDUCATION RESOURCES

Increasing attention has been given to vocational education by the Congress and state legislatures in recent years. From 1917 until the end of World War II, the Smith-Hughes Act provided Federal aid to vocational education in the amount of about $7 million annually. In 1946, the George-Barden Act added Federal assistance amounting to about $30 million annually. During the 1950's, several other acts of Congress expanded the scope of federally aided vocational training. In the early 1960's the Area Redevelopment Act and the Manpower Development and Training Act provided for a relatively massive effort to meet the training needs of the unemployed. The Vocational Education Act of 1963 significantly liberalized the coverage of Federal aid to vocational education. The appropriations under this act increase from approximately $150 million in 1964-65 to $260 million in 1966-67 and cover construction, equipment, teacher training, and research for vocational education in almost any occupation not requiring college education.

The effect of broader vocational education, particularly in public schools, can be seen in the proportion of those in the labor force 22 to 64 years of age who completed less than three years of college but who received formal vocational training in schools, the apprenticeship program, or the armed services. Chart 1 shows that as age decreases, a higher percentage of workers have received formal vocational training. It appears, however, that about 40 percent of the young people in the labor force who do not complete college lack formal training in any vocational skill. The percentage that receive training varies from occupation to occupation. For example, the average percentage of workers of all ages receiving formal training was 30 percent while in craftsman and operative occupations, the average was 40 and 13 percent respectively.

Graduates and Courses in Craftsman and Operative Occupations in the Northern Plains States

This section summarizes information from the questionnaire survey on the graduates and courses of the public, private, and apprenticeship resources for training in selected occupations in the Northern Plains. Chart 2 and Table 2 present related statistical data. The variables considered include the relative importance of the public, private, and apprenticeship program training; trends in the growth of each type's output; the range of occupations in which each type offers training; and change in the variety of courses offered by each resource.

The proportion of craftsman and operative graduates provided by public, private, and apprenticeship vocational programs in the Northern Plains is presently about equal, but these proportions vary greatly from state to state. The percentage provided by public schools between 1960 and 1963 ranges from a high of over 80 percent in South Dakota to a low of 15 percent in Iowa. Private school output in this period varied in importance from 64 percent in Nebraska to nothing in South Dakota. Apprenticeship completions comprised as much as 60 percent of craftsman and operative output in Wisconsin and as little as 13 percent in Nebraska.

Per Cent of Civilian Labor Force with under 3 yrs. College and with Formal Vocational Training; USA, 1963 By Age

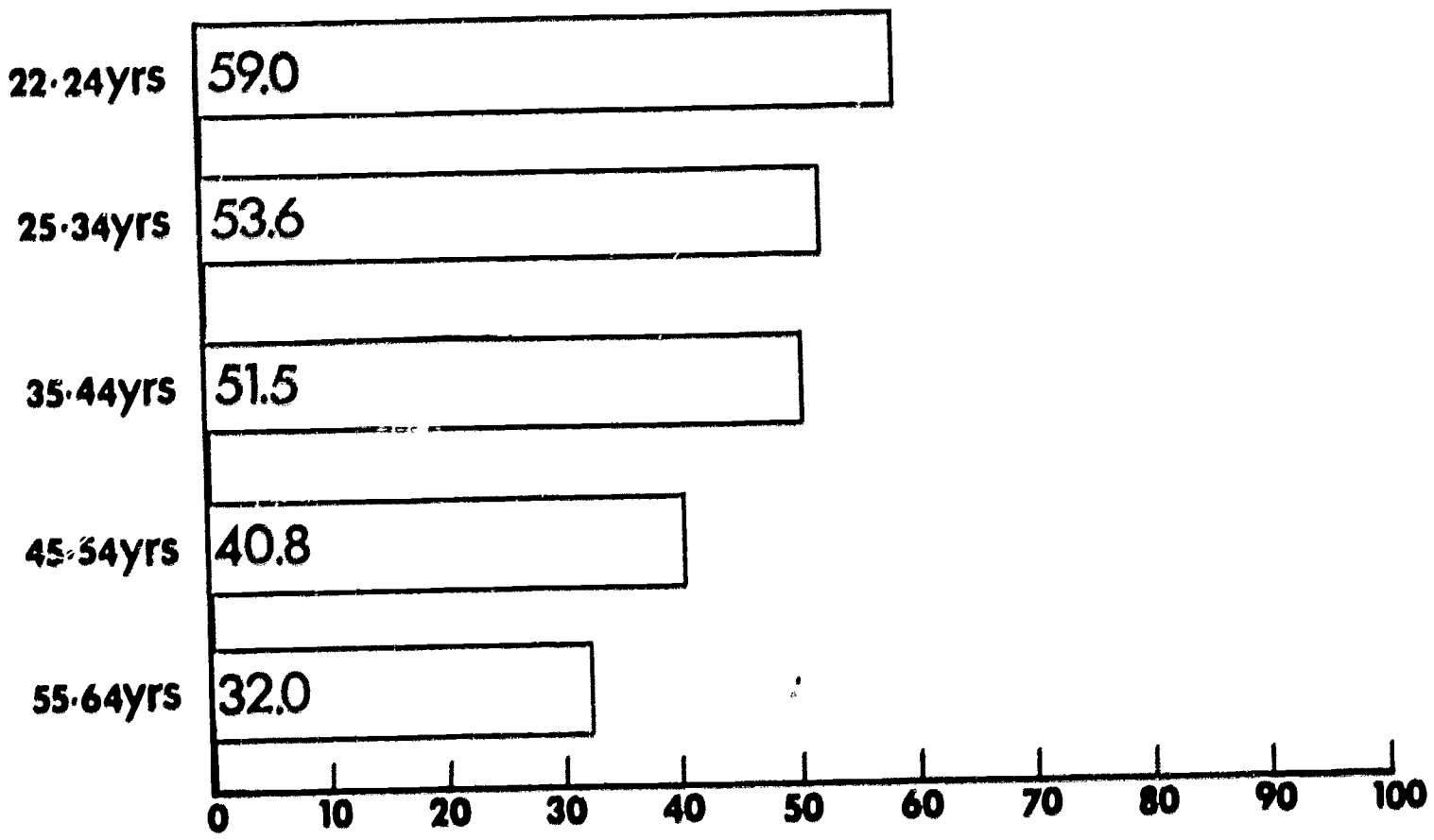

chart 1

Training Output by State for All Vocational Education Facilities for Craftsman & Operatives 1960-63

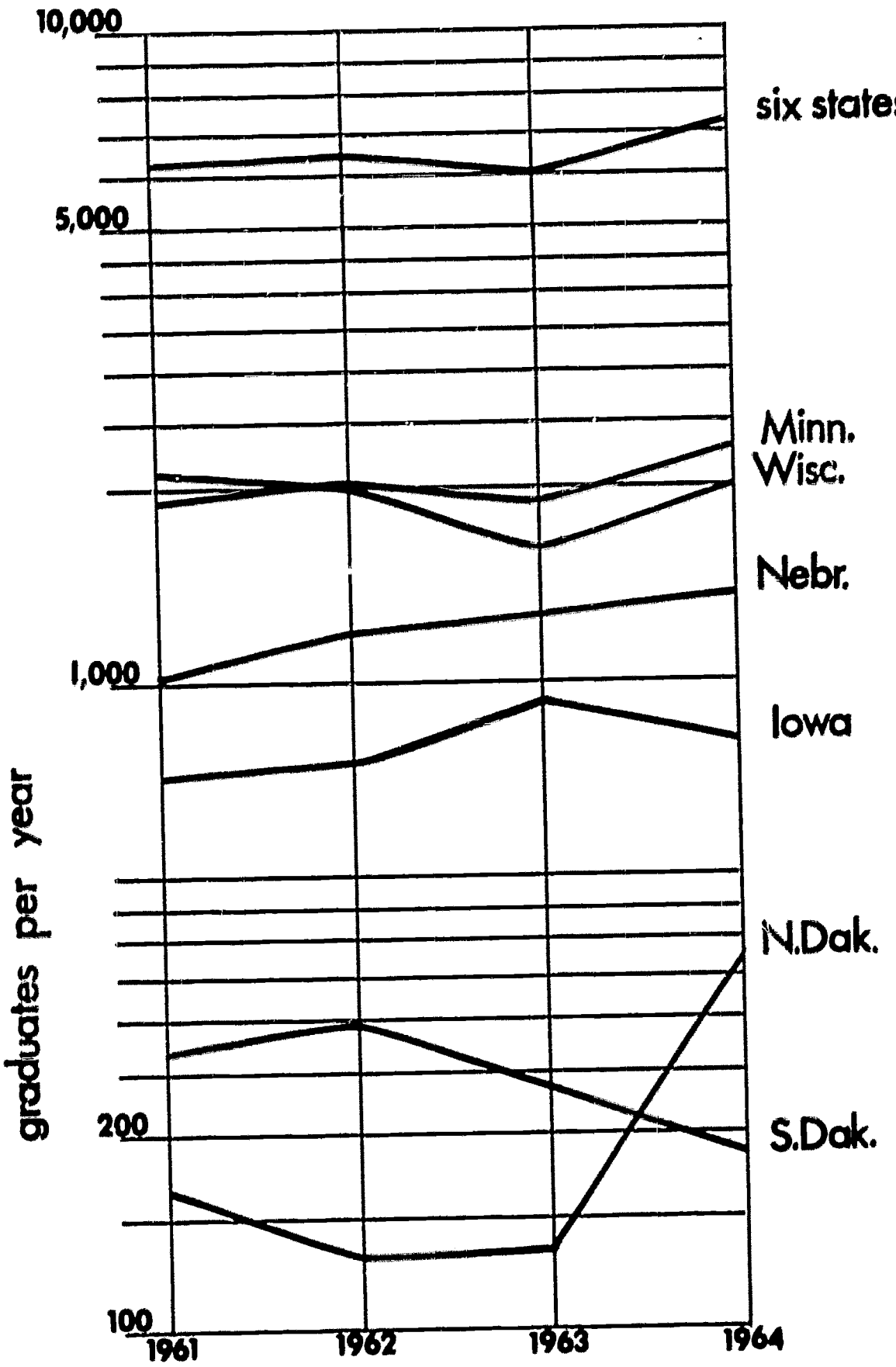

chart 2

Table 2

TRAINING OUTPUT OF PUBLIC, PRIVATE, AND APPRENTICESHIP VOCATIONAL EDUCATION PROGRAMS FOR CRAFTSMAN & OPERATIVE OCCUPATIONS IN MANUFACTURING & RELATED INDUSTRIES, 1959-1963

	1959	1960	1961	1962	1963	Numerical Change 1960--1963	Percent Change 1960--1963	Enrollment 1964
IOWA								
Graduates-Enrollment								
Public	39	72	68	160	185	113	156.94	1070
Private	429	437	408	433	423	-14	-3.20	201
Apprenticeship		208	274	349	211	3	1.44	1405
Total	468	717	750	942	819	102	14.23	2676
Occupations in which training available in 1964								
Public	3	4	5	7	8			11
Private	3	3	3	3	3			3
Apprenticeship		19	20	21	14			25
MINNESOTA								
Graduates-Enrollment								
Public	549	579	688	771	932	353	60.97	1647
Private	491	474	517	563	596	122	25.74	1500
Apprenticeship		879	841	566	745	-134	-15.24	4390
Total	1040	1932	2046	1900	2273	341	17.65	7537
Occupations in which training available in 1964								
Public	14	14	16	16	17			19
Private	10	10	10	10	11			12
Apprenticeship		24	24	21	24			28

Table 2

(Continued)

	1959	1960	1961	1962	1963	Numerical Change 1960--1963	Percent Change 1960--1963	Enrollment 1964
NEBRASKA								
Graduates-Enrollment								
Public	244	232	266	308	309	77	33.19	923
Private	645	627	781	829	885	258	41.15	678
Apprenticeship		183	142	129	189	6	3.28	823
Total	889	1042	1189	1266	1383	341	32.73	2424
Occupations in which training available in 1964								
Public	12	12	12	13	13			18
Private	7	7	7	7	7			7
Apprenticeship		18	17	15	18			25
NORTH DAKOTA								
Graduates-Enrollment								
Public	60	65	70	65	257	257		38
Private		101	59	68	70	5	7.69	374
Apprenticeship					46	-55	-54.46	
Total	60	166	129	133	373	207	124.50	412
Occupations in which training available in 1964								
Public	12	12	12	12	12			12
Private	4	4	4	4	4			4
Apprenticeship		13	12	8	13			17

Table 2

(Continued)

	1959	1960	1961	1962	1963	Numerical Change 1960--1963	Percent Change 1960--1963	Enrollment 1964
SOUTH DAKOTA								
Graduates-Enrollment								
Public		237	261	215	131	-106	-44.73	59
Private						--		--
Apprenticeship		39	40	29	55	16	41.03	353
Total		276	301	244	186	-90	-32.61	412
Occupations in which training available in 1964								
Public	1	8	6	10	10			11
Private						--		--
Apprenticeship		5	6	6	8			14
WISCONSIN								
Graduates-Enrollment								
Public	467	484	555	539	729	245	50.62	1937
Private	284	220	216	195	236	16	9.27	635
Apprenticeship		1397	1238	882	1018	-379	-27.13	4157
Total	751	2101	2009	1616	1983	-118	- 5.62	6729
Occupations in which training available in 1964								
Public	8	8	8	8	9			14
Private	2	2	2	2	2			2
Apprenticeship		16	16	17	17			19

Table 2

(Continued)

	1959	1960	1961	1962	1963	Numerical Change 1960--1963	Percent Change 1960--1963	Enrollment 1964
SIX STATE REGION								
Graduates-Enrollment								
Public	1299	1604	1838	1993	2543	939	58.54	5636
Private	1909	1823	1992	2085	2210	387	21.23	3052
Apprenticeship		2807	2594	2023	2264	-543	-19.34	11502
Total	3208	6234	6424	6101	7017	783	12.56	20190

The rate of growth of training output from each of the resources displays trends consistent among most states. Public program graduates grew twice as fast in the region between 1960 and 1963 as private school graduates did, and apprenticeship completions actually declined. Public vocational education increased over 150 percent in Iowa between 1960 and 1963.[2] South Dakota is an exception among the six states in that its public school graduates declined from 1960 to 1963. Private school output in the region has generally grown but at a slower rate. Growth of private school graduates between 1960 and 1963 ranges from 41 percent in Nebraska to virtually none in Iowa. Apprenticeship program completions declined 27 percent in this period. However, in South Dakota, which has a small apprenticeship base, completions increased 41 percent.

The range of occupations with training varies among the states, usually in proportion to the size of enrollment. The apprenticeship program offers the largest number of occupations in which training is available in the six state region. The breadth in 1963 ranged from 24 occupations in Minnesota down to eight in South Dakota. Public schools run a close second to the apprenticeship programs in each state in terms of the variety of training available. Minnesota again tops the list with 17 occupations while Iowa is lowest with eight occupations. Private programs do not cover the range of occupations that the other two types of resources do in the Northern Plains. The courses available in private schools range from 11 in Minnesota to none in South Dakota.

The growth of occupations with training has been very slight between 1960 and 1963. Public schools added at least one or two new occupations between 1960 and 1963 in all states. The variety of courses in private schools has been constant during these years in all states except Minnesota which added one in 1963. The occupations with completions under the apprenticeship program tended to fluctuate slightly during the period, but on the average it ended with about the same number in 1963 as in 1960.

Graduates Compared to Demand in Craftsman and Operative Occupations in the Northern Plains States

This section summarizes the analysis which combines the questionnaire survey of training facilities for craftsman and operative occupations, trends in employment in these occupations, and working life expectancy for males and females of various age groups. Three indices were used to compare the output of training facilities with demand in craftsman and operative occupations in the six Northern Plains states:

1. average annual output 1960 through 1963 compared to total employment in craftsman and operative occupations in 1960;

2. average annual output 1960 through 1963 compared to employment in selected craftsman and operative occupations in manufacturing and related industries.[3]

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[2]Public School graduates in North Dakota are recorded for 1963 only.

[3]The occupations selected include almost all craftsman and operative occupations in manufacturing and construction and many such occupations in the miscellaneous category listed in the Detailed Characteristics Volumes of the 1960 Census of Population.

3. average annual output 1960 through 1963 as a percent of employment in selected craftsman and operative occupations compared to estimated annual percentage requirements in these occupations in 1961.[4]

Chart 3 and Table 3 show the results of applying these indices to the Northern Plains states.

The first measure was chosen to give perspective on each state's training in craftsman and operative occupations in manufacturing and related industries relative to employment in such occupations in all industries. By this measure the states rank from high to low as follows: Nebraska, Minnesota, South Dakota, North Dakota, Wisconsin, and Iowa. The highest score is 3.3 times the lowest score.

The second measure compares training output in craftsman and operative occupations in manufacturing and related industries to such employment in these industries only. The 1960 employment figure includes craftsman and operative occupations in manufacturing in which no training is offered as well as those in which it is. The ranking this measure produces changes from that of the first measure only for South Dakota and Minnesota. South Dakota changes from third to second, and the reverse is true for Minnesota. The highest score is 3.1 times the lowest score.

The third measure is undoubtedly the best measure of output relative to requirements. The employment base for this measure is the same as that for the second measure. The ranking in terms of the third measure for the six states is as follows: South Dakota, Nebraska, North Dakota, Minnesota, Wisconsin, and Iowa. The highest score in terms of the third measure is 2.6 times the lowest.

The data in Table 3 also reveal two major characteristics of employment and demand in craftsman and operative occupations in manufacturing and related industries:

1. employment in these occupations declined in four out of six states and grew only modestly in the other two states between 1950 and 1960; and

2. only about 40 percent of the demand in these occupations was met in 1961 from formal vocational training resources.

There are, however, great variations in the growth of employment and in the degree to which annual requirements are met from occupation to occupation within each state. Chapter III contains detailed analyses for each occupation in each of the six Northern Plain states.

Expenditure on Federally Aided Vocational Education in the Northern Plains and the Nation

Data on expenditures and enrollment in Federally aided vocational education programs (virtually all public programs) permits a comparison of this effort in the Northern Plains relative to the United States. Chart 4 and Table 4 show expenditures on Federally aided programs per capita and

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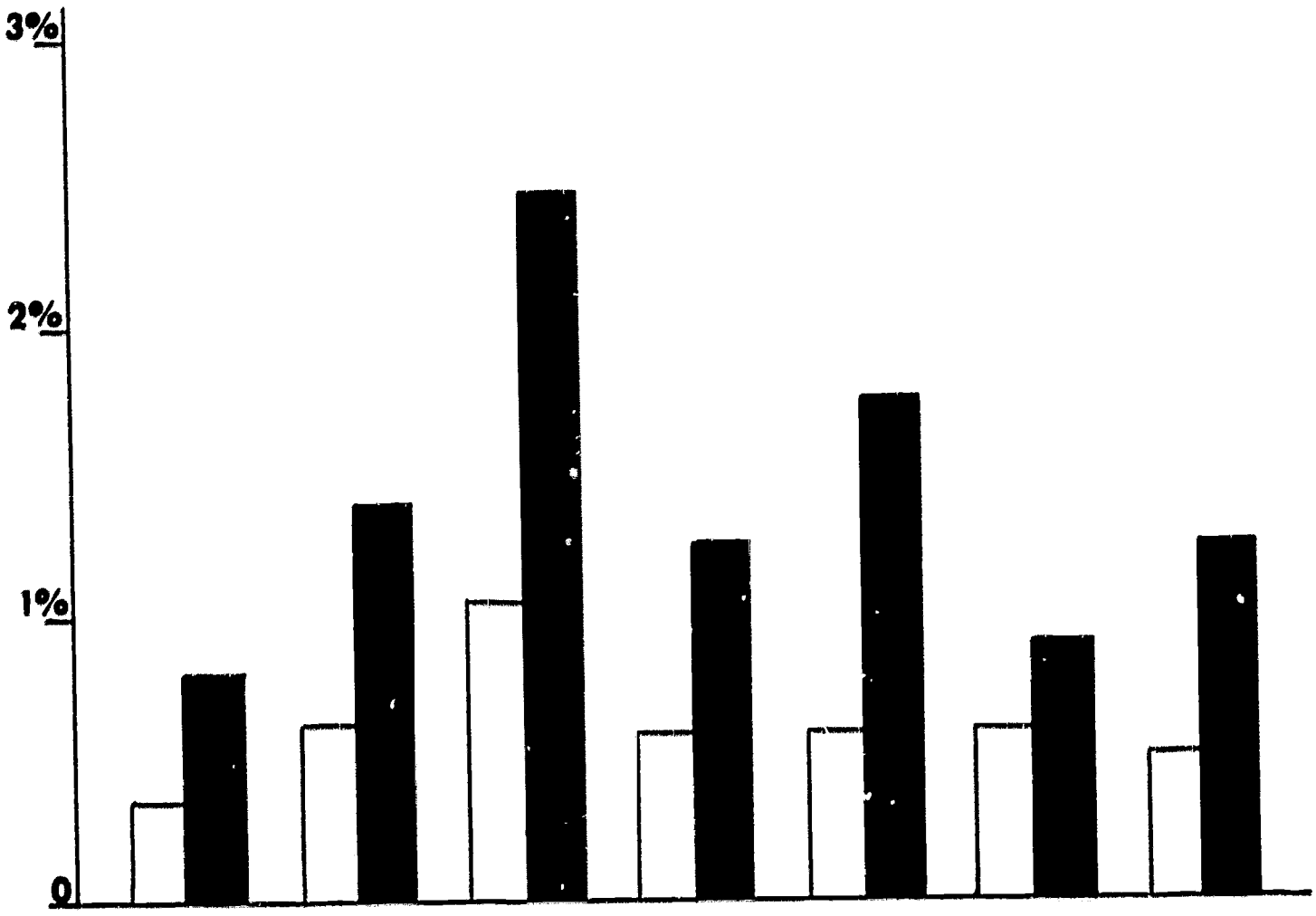
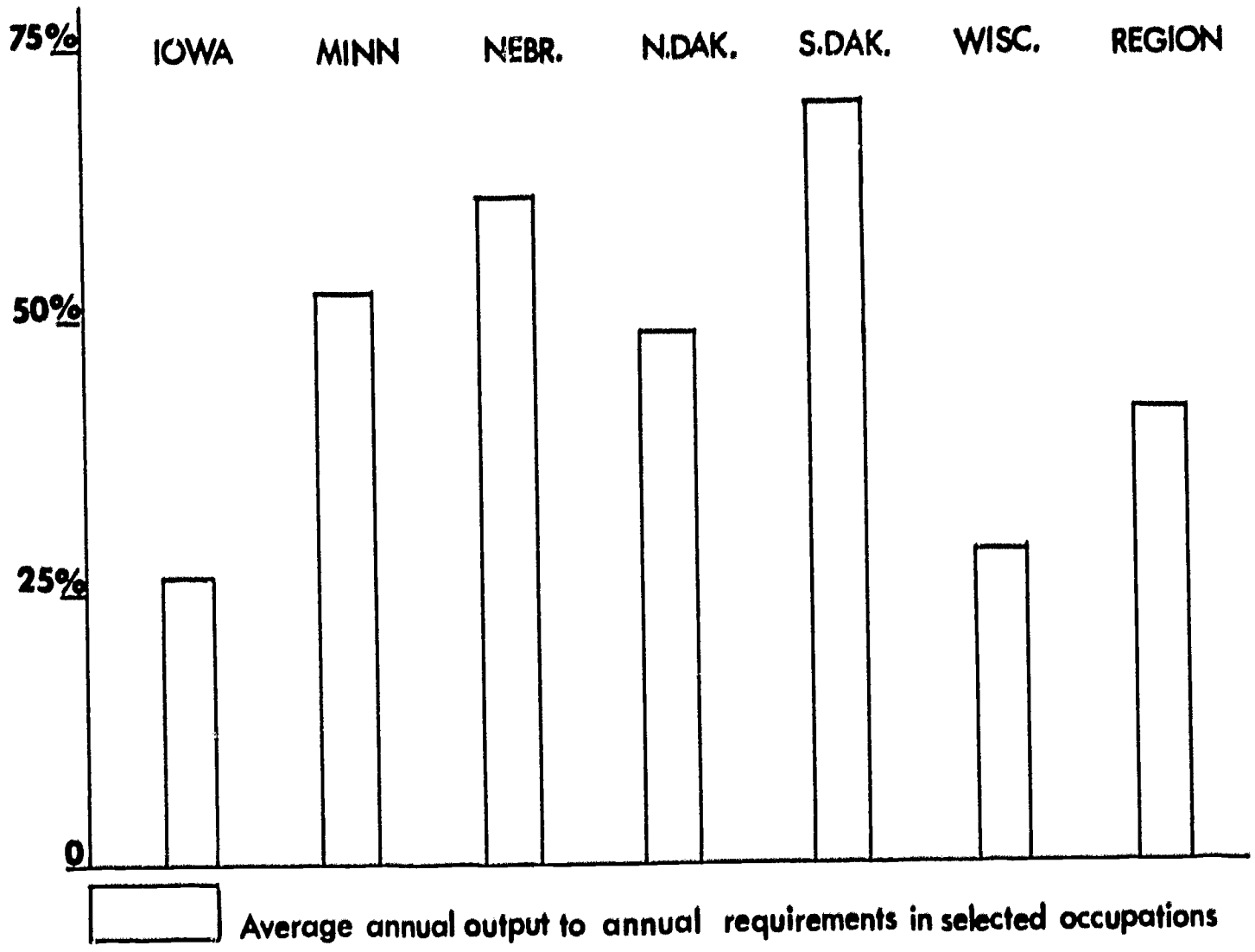
[4]See Appendix A, "Methodology" for an explanation of how annual requirements in 1961 were estimated.

Three Indexes of Trainee Output compared to Occupational Demand



Average annual output to total employment

Average annual output to total employment in selected occupations



Average annual output to annual requirements in selected occupations

chart 3

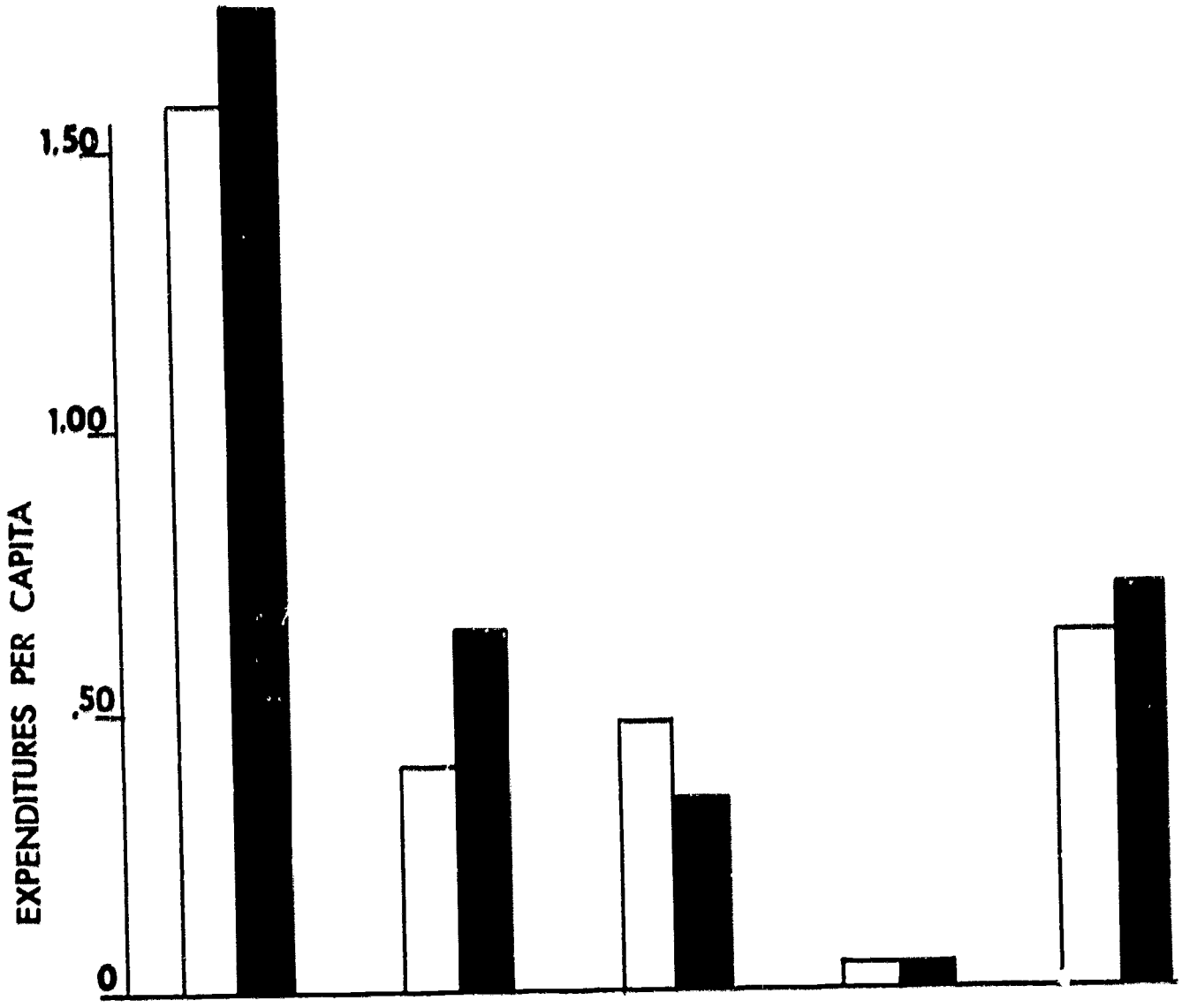
Table 3.

Performance of Northern Plains Vocational Education Facilities

		1	2	3	4		5	6		7	8	9	10	
		Average annual output 1960-63	% distribution	* Skilled employment 1960	Av. an. output 1960-63 to skilled employment (col.1/col.3) (%)	Rank	** Skilled employment in manufacturing 1960	Av. an. output 1960-63 to manf. employment (col.1/col.5) (%)	Rank	** Growth requirement 1961 (%)	** Replacement requirement 1961 (%)	** Net requirement 1961 (col.7 + col.8)	Av. an. output to net requirement (col.6/col.9)	Rank
Iowa	Public	122	15.12											
	Private	425	52.66											
	Apprenticeship	260	32.22											
		807	100.00	259465	.31	6	98686	.82	6	(.1)	3.19	3.09	26.54%	6
Minnesota	Public	742	36.43											
	Private	537	26.36											
	Apprenticeship	758	37.21											
		2037	100.00	324261	.63	2	126984	1.60	3	(.1)	3.16	3.06	52.29%	4
Nebraska	Public	279	22.87											
	Private	780	63.93											
	Apprenticeship	161	13.20											
		1220	100.00	118743	1.03	1	48416	2.52	1	.8	3.33	4.13	61.02%	2
North Dakota	Public	65	32.50											
	Private	67	33.50											
	Apprenticeship	68	34.00											
		200	100.00	35159	.57	4	15889	1.26	4	(.7)	3.01	2.31	54.55%	3
South Dakota	Public	211	83.73											
	Private	-0-												
	Apprenticeship	41	16.27											
		252	100.00	43461	.58	3	13567	1.86	2	(.5)	3.18	2.68	69.40%	1
Wisconsin	Public	577	29.94											
	Private	217	11.26											
	Apprenticeship	1133	58.80											
		1927	100.00	500270	.39	5	209360	.92	5	.5	3.03	2.53	36.36%	5
Six-State Region	Public	1996	30.98											
	Private	2026	31.44											
	Apprenticeship	2421	37.58											
		6443	100.00	1281359	.50		512902	1.26		—	—	3.00***	42.00%	

* Skilled employment includes craftsman and operative occupations.
** See Appendix A, "Methodology".
*** Estimated on basis of above requirements for each state.

Expenditures in the U.S. and Northern Plains, for Vocational Training



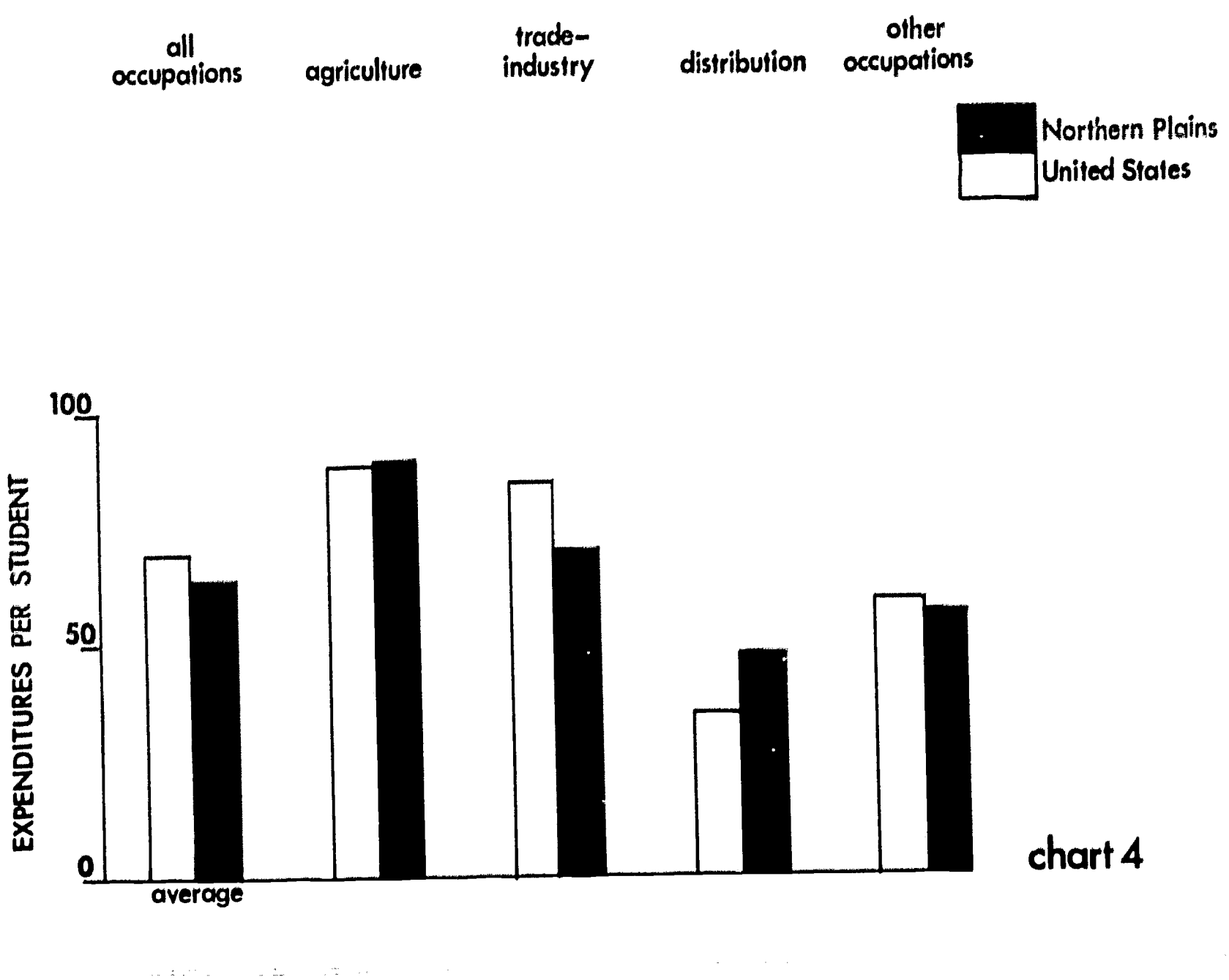


chart 4

Table 4
Expenditure on Federally Aided Vocational Education

State		Dollar Expenditure Per Capita					Dollar Expenditure Per Student Enrolled				
		All Programs	Agricultural	Trade & Industry	Distributive	Other	All Programs	Agricultural	Trade & Industry	Distributive	Other
Iowa	State	$1.13	$.45	$.16	$.05	$ .47					
	Federal	.37	.15	.05	.01	.16					
	Total	1.50	.60	.21	.06	.63	$63	$ 65	$50	$61	$ 68
Minnesota	State	1.70	.61	.41	.08	.61					
	Federal		.11	.05	.01	.16					
	Total	2.04	.72	.46	.09	.77	72	88	78	72	59
Nebraska	State	1.07	.40	.11	.05	.52					
	Federal	.40	.14	.05	.01	.19					
	Total	1.47	.54	.16	.06	.71	67	111	40	54	59
North Dakota	State	2.07	.48	.28	.03	1.28					
	Federal	.58	.21	.08	.02	.27					
	Total	2.65	.69	.36	.05	1.55	98	107	76	56	103
South Dakota	State	1.09	.40	.13	.02	.54					
	Federal	.43	.19	.08	.02	.14					
	Total	1.52	.59	.21	.04	.68	79	103	56	48	77
Wisconsin	State	1.42	.52	.44	.02	.44					
	Federal	.34	.10	.06	.01	.17					
	Total	1.76	.62	.50	.03	.61	57	109	55	22	41
6 State Total	State	1.41	.51	.30	.05	.55					
	Federal	.37	.13	.06	.01	.17					
	Total	1.78	.64	.36	.06	.72	66	90	60	47	57
U. S. Total	State	1.30	.33	.41	.05	.50					
	Federal	.29	.08	.07	.01	.14					
	Total	1.59	.41	.48	.06	.64	70	89	85	36	59

Source: Statistical Abstract of the United States, 1964; and

Digest of Annual Reports of State Boards for Vocational Education, 1963.

per student enrolled in 1962. The former measure is a good measure of the relative quantity of public vocational education provided while the latter gives some indication of the quality.[5] The region is 12 percent above the national average in expenditure per capita on all types of vocational training but lags the national average six percent when measured by expenditure per enrollee.

There are wide differences among the six Northern Plains states in their per capita total spending for vocational education. On a per capita of population basis, the six states rank in the following order: North Dakota, Minnesota, Wisconsin, South Dakota, Iowa, and Nebraska. The first three states are above the national average and the latter three are below. On a per student enrolled basis, the states rank as follows: North Dakota, South Dakota, Minnesota, Nebraska, Iowa, and Wisconsin. Again, three are above and three are below the national average.

Vocational training in agricultural occupations is more important per capita in the Northern Plains states than in the nation as might be expected from the region's above average employment in agriculture. Expenditure per capita exceeds the national average in all the states while expenditure per student enrolled is greater in four out of the six states.

Financial support of training in the trades and industrial occupations in the Northern Plains notably lags the national average, and these are the skills upon which industrial development depends. On a per capita basis, regional expenditure is 33 percent below the nation; and on a per student enrolled basis, it is 25 percent below the U. S. average. Wisconsin and Minnesota are near the national average on a per capita basis (which might be expected from their higher employment in manufacturing) but all of the others are well below. More significantly, expenditure per pupil enrolled in trade and industry training (a measure of quality) is below the national average in all Northern Plains states. The state nearest to the U. S. average, Minnesota, is about ten percent below.

Expenditure on training in distributive occupations is relatively slight in both the nation and the region and is about the same per capita. The Northern Plains spends considerably more per pupil enrolled, but the figure varies widely from state to state within the region.

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[5]Assessment of the quality of education is difficult, but important qualitative differences appear to exist. Two additional measures of quality are the average salary paid to teachers and the percentage of teachers who have bachelor and master degrees. The assumptions are that pay and education affect the quality of the teachers a system has and that teachers largely determine t.e quality of education students receive.

Information specifically for vocational school teachers is not readily available, but data on elementary and secondary school teachers show that the Northern Plains states are generally below the United States average. This suggests that the same might be true for the region's vocational education. As of 1964, only Minnesota's teacher salaries exceeded the national average at both the elementary and secondary levels. Wisconsin is above average in secondary school teacher salaries only. The percentage of elementary and secondary school teachers who hold degrees is also below the average in several of the Northern Plains States.

"Other" occupations in which training is offered consist mainly of home economics, medical service (e.g. practical nursing), and other technical education programs. Here, the per capita expenditure in the Northern Plains exceeds the national average. All but Wisconsin are above average in the region, and these per capita figures show little difference among the states. Expenditure per pupil enrolled in "other" occupations is about the same for the nation and the region, but there is considerable variation among the six states.

CHAPTER III

INCREMENTAL SUPPLY AND DEMAND IN CRAFTSMAN AND OPERATIVE OCCUPATIONS IN MANUFACTURING AND RELATED INDUSTRIES IN THE NORTHERN PLAINS

This chapter discusses the detailed statistical analysis included in this project. For each craftsman and operative occupation in manufacturing, construction, and miscellaneous industries in each state, growth and replacement demand were estimated for 1961; and this was compared with average annual training output for 1960 through 1963 as determined from the questionnaire survey. Details of the method may be obtained from Appendix A.

The analysis has been divided into two parts. The first concerns only those occupations in which public and private vocational schools offer training. This section may be used by policy makers and school administrators in assessing the demand-supply situation in occupations included in existing programs. Industrial developers may be particularly interested in skills which appear to be in excess supply in the region.

The second part focuses on the entire range of craftsman and operative occupations in manufacturing and related industries that are in the Detailed Characteristics section of the 1960 Census. This second part includes the above occupations, but puts them in the perspective of the range of skilled and semi-skilled occupations in manufacturing and related industries. This second analysis should indicate occupations for which new courses would be profitable.

Incremental Supply and Demand in Occupations with Public and Private School Training

Comparing the incremental supply and demand in various occupations indicates where training is meeting the demand, exceeding it, or falling short of it (Appendix C, Table C-1, Columns 10 & 11). For the purposes of industrial promotion, skills which are produced in excess of local demand may potentially attract industries using these skills to the region. The export of a skill (output in excess of demand) is indicated with relative certainty since output (the high figure) in this study does not include any informal, on-the-job training programs. The indicated import of a skill (demand in excess of output) is much less certain since the supply gap is most probably made up by informal training rather than by in-migration. Where the difference between output and demand was less than one percent of 1960 employment, demand and supply were considered to be in balance.

Chart 5 and Table 5 show the percentage of the listed occupations that export or import in each state. If output exceeded demand and was growing faster than the rate of additions to employment required, the occupation was considered to be exporting at an increasing rate. But if output exceeded demand and was growing slower than the rate of additions required, the occupation was considered to be exporting at a decreasing rate. (see Table 5.) A similar comparison of the growth rate of output and the required rate of additions to employment determined whether an occupation was importing at an increasing or decreasing rate. (See Appendix C, Table C-1, Column 13.)

Balance of Output vs. Demand, in Occupations for which Training is Offered

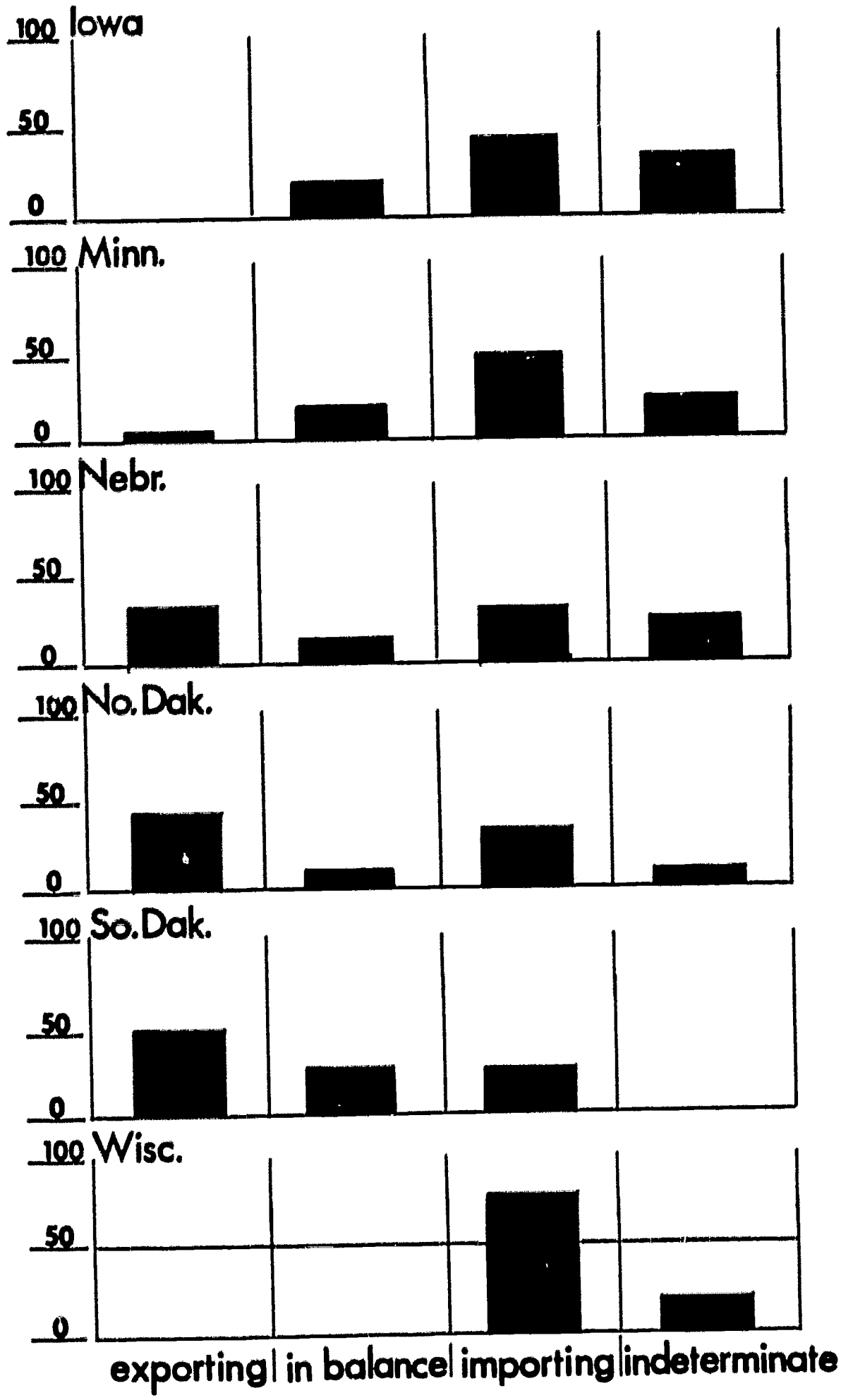

chart 5

Table 5.

Summary of Supply-Demand Relationships in Occupations with Training Output in 1963

	1	2	3	4	5	6
		Percent of Skilled Occupational Classes with Training in 1963*				
		With Exports		In Balance	With Imports	
	Number of Occupations	At Increasing Rate	At Decreasing Rate		At Increasing Rate	At Decreasing Rate
Iowa	11	0	0	18	9	36
Minnesota	19	0	5	21	16	32
Nebraska	14	14	21	14	14	14
North Dakota	9	44	0	11	0	33
South Dakota	8	0	50	25	13	12
Wisconsin	13	0	0	0	39	39

* May not add across to 100% because incomplete information is available for some occupational classes.

Iowa

Iowa had the lowest ratio of average annual training output in the selected occupations (1960 through 1963) to employment in 1960 or to requirements for the following year. (See Table 3.) It also had no exports in the occupations studied (See Table 5). Iowa did produce more than twice as many data processing trainees as any other state, but employment figures for this occupation are not available to indicate whether or not this skill is exported. Administrators' estimates of the proportion of data processing graduates leaving the region are slightly above average. Administrators also estimated that a high percentage of graduates in cabinet making and chemical technology leave the region although employment figures for the former suggest that demand and supply almost balance for the state.

Minnesota

Minnesota trains slightly more in the selected occupations in relation to its total skilled employment than the average for the six states. Export is indicated only for electronics technicians, and this is at a decreasing rate since employment is growing faster than training. Administrators of the two schools with the largest number of electronics graduates substantiate the export of this skill. The local market for trained graduates in other occupations listed looks promising, especially for heavy equipment operators, machinists, and welders.

Nebraska

Nebraska had the highest ratio of average annual output in the selected occupations to skilled employment. Nebraska is also an exporter of several skills. Air conditioning and refrigeration servicemen, carpenters or cabinet makers, auto mechanics (including diesel), electricians, electronics technicians, and especially radio and TV servicemen are all trained more or less in excess of the state's requirements. On the other hand, Nebraska needs more trained draftsmen, machinists, printers, and welders than it trains locally.

North Dakota

North Dakota is also a relatively heavy exporter of trained workers. Auto mechanics, electrical and electronics technicians, and printers are the principal skilled workers trained in excess of local requirements. Plumbers and welders, however are in moderately short supply. It appears that North Dakota's two vocational schools and its apprenticeship program meet the requirements of its rather low employment base in the more traditional occupations.

South Dakota

South Dakota exports a few workers in half of the occupations in which it offers training, but the exporting in each category is proceeding at a decreasing rate. A large proportion of the carpenters, electricians, and electronics technicians trained are in excess of the demand. Modest imports of auto repairmen, draftsmen, and sheetmetal workers or welders are indicated.

Wisconsin

Wisconsin's average annual training output in any of the occupations with training is less than incremental demand where this could be estimated (i.e. in 80 percent of the occupations studied). In the majority of occupations, demand is more than twice the output.

Incremental Demand in the Range of Craftsman and Operative Occupations

This section extends the demand analysis techniques of the previous section to the range of craftsman and operative occupations in manufacturing, construction, and miscellaneous industries. (See Appendix D, Table D-1.) The average annual growth and replacement rates for the decennial period and the numerical requirements for 1961 were calculated for craftsman and operative occupations with over 50 employed per Northern Plains states in 1950 or 1960. This analysis was limited, somewhat arbitrarily, to states with over 100 thousand employment in craftsman and operative occupations. This eliminated North and South Dakota; but when the skilled employment in these states is distributed among some 60 to 70 occupations, the resulting numerical requirements in many occupations for 1961 were too small to warrant continuous training programs. In general, it was assumed that an annual requirement of 15 or more would make it economical for a vocational school to set up training in a particular occupation on a regular basis.[6]

Occupations in which training is offered by vocational schools, the apprenticeship (BAT) program, or Manpower Development and Training Act (MDTA) projects are marked in Appendix D, Table D-1 in columns 7, 8, and 9. The number trained by the vocational schools and the apprenticeship program and the demand-supply relationships can be obtained from Appendix C, Table C-1. Available MDTA data are not amenable to determining average annual output for 1960 through 1963 in the same manner as for the schools and apprenticeship program.

Iowa

Food products occupations in Iowa show growth between 1950 and 1960 except in beverages. Bakers and workers in dairy products, grain and milled products, and meat products all have sufficient annual requirements to support a continuing training activity. Grain milling and meat products require enough to support several courses. Yet none of the sources of trained labor considered offer training in these food processing occupations.

Textile fabricators show growth with sufficient demand to support a training program only in sewing and stitching occupations in dress manufacturing. Printing and publishing occupations except electrotypers and stereotypers show growth between 1950 and 1960. The annual requirements for compositors and typesetters; pressmen and plate printers; and workers in newspaper publishing are of sufficient volume and growing. Photoengravers and lithographers or bookbinders might also be of interest to vocational educators. Vocational schools and the apprenticeship program together train about enough people to meet the needs for pressmen and plate printers, but the existing apprenticeship output in the other occupations is not enough to meet estimated requirements.

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[6]The assumption is admittedly arbitrary. It is quite possible that demand outside the region would make it attractive to train people in skills which have little local demand.

Metal working and manufacturing occupations in many instances show good growth; however, others such as machinists, molders, blacksmiths, boilermakers, forgemen, pattern makers, furnacemen, and rollers show rapid decline. The most promising occupations with sufficient requirements to support training are tool and die makers; welders; job setters; and filers, grinders, and polishers. Training is available in tool and die making and welding, but output does not equal fifty percent of the requirement in either occupation.

In the electrical field, one-half of the need for electricians is met by the apprenticeship program. Only about one-half of the electronics technician requirement is met by courses in about ten vocational schools; no training is offered in the remaining types of electrical workers which show very rapid growth and high volume requirements.

Construction employment shows a decline in most occupations, but the annual demand estimate for carpenters and plumbers exceeds the output of the apprenticeship programs in these occupations. The miscellaneous occupations by and large show rapid growth. Air conditioning, aircraft, and radio and TV servicemen; stationary engineers; cranemen; auto mechanics and repairmen (in spite of a slight decline in employment); and draftsmen all have sufficient demand for regular training. The only miscellaneous occupations with training are draftsmen and auto mechanics, and the output in these two does not nearly equal demand.

Minnesota

Food products occupations in Minnesota show modest growth between 1950 and 1960 except in dairy products and grain and mill products. Bakers, beverage workers, dairy product workers, and meat cutters all show sufficient volume to support regular training. New apprenticeship programs in baking and meat cutting provide less than ten percent of the annual requirements.

Knit goods manufacturing employment in the textile mill field shows very rapid growth, and requirements by 1961 are sufficient to support training. Employment in fabricated textile products displays rapid declines in all occupations and largely negative requirements.

Printing and publishing occupations have had mixed growth. Compositors and typesetters, pressmen and plate printers, and operatives in newspaper and other publishing are growing and have sufficient requirements for training. Over 60 percent of the requirements for pressmen and plate printers are met by vocational schools and the apprenticeship program. Employment in chemical production shows consistent growth. Operatives in plastics and synthetics show the best growth and probably require enough additions annually at present to justify training.

Metal working and manufacturing occupations display a mixed growth pattern with both rapid increases and decreases between 1950 and 1960. Those with positive growth and enough volume to support training are machinists; tool and die makers; welders and flame cutters; filers, grinders, etc.; and job setters. About one-half of the machinists required are trained in the state; but for any of the other preceeding occupations, training is relatively small or non-existent.

In transportation equipment, aircraft and ships have shown very rapid employment growth; and each should now have enough of an annual requirement to interest vocational educators. Electricians and electrical manufacturing workers have shown modest growth and have a relatively large annual requirement. Formal training of electricians currently almost meets demand while the output of electronics technicians exceeds demand within the state.

Construction employment grew in brick and stone mason, cement mason, and plumber occupations but declined in carpenter and roofer occupations. The existing vocational school and apprenticeship program output meets less than half of the estimated annual requirement in the growing construction occupations.

Miscellaneous occupations show both growth and decline. The occupations with growth and sufficient requirements to support training are stationary engineers; cranemen, etc.; airplane mechanics; air conditioning and refrigeration servicemen; radio and TV servicemen; and draftsmen. In spite of declining employment, auto mechanics require large replacements annually. There is some training for all of these occupations except cranemen, but only in the case of auto mechanics and draftsmen do vocational schools and the apprenticeship programs meet even half of the estimated requirements.

Nebraska

Food products occupations in Nebraska show mixed growth between 1950 and 1960. Baking, confections (especially), dairy products, and meat products occupations all display growth and by 1961 have sufficient annual requirements to support regular training. No training by vocational schools or the apprenticeship program is currently offered in food products occupations, yet this is one of the largest sources of manufacturing employment in the state.

In fabricated textile products, operatives in apparel and accessories and sewers and stitchers in manufacturing both show exceptional growth and by 1965 each should have enough of an annual requirement to support training on a regular basis. However, the Nebraska training facilities studied offer no courses in the occupations.

Occupations in printing and publishing show spotty growth. Pressmen and plate printers and operatives in publishing and printing excluding newspapers are the only expanding groups which generate sufficient annual requirements to support training, although compositors and typesetters still have significant replacement requirements despite a moderate decline in employment. Existing training output takes care of about one-third of the incremental demand.

The majority of the skilled occupations in metalworking and manufacturing have growing employment, but a number as yet have insufficient annual requirements for regular training. Growing occupations with significant volume include machinists, tool and die makers, tinsmiths and sheet metal workers, welders and flame cutters, and metal filers, etc. Sheet metal workers are trained in the amount required, but training in the other growing metal working occupations equals only one-fourth to one-third of the requirement.

Operatives in railroad equipment manufacturing have grown very rapidly; and if growth continues at the rate achieved in the last decade annual demand will be enough to support continuing training. Other very rapidly growing occupations are operatives in electrical equipment manufacturing and electronic technicians. Employment and annual demand reached a volume by 1960 that could support courses in both occupations; electronics technicians, however, are trained far in excess of the local demand while training for other electrical industry workers is largely neglected.

The construction occupations which grew and those which declined were in about equal number in Nebraska during the preceding decade. Brick and stone masons, cement masons, and roofers grew, but the latter two barely have enough of an annual requirement to support regular training. Plumbers show only a slight decline, and their annual requirement is sufficient for training. Apprenticeship training is offered in all of the above construction trades, but annual apprenticeship completions equal only one-third to one-fourth of the annual requirements in each case.

Miscellaneous craftsman and operative occupations, except for railroad equipment and motor vehicle servicemen, had increases in employment from 1950 to 1960. Stationary engineers, cranemen, air conditioning and refrigeration servicemen, radio and TV servicemen, and draftsmen all expanded and have adequate annual requirements to support training. Motor vehicle service employment declined but has a relatively large annual replacement requirement. Training output in Nebraska in air conditioning, radio and TV, and motor vehicle service occupations exceeds requirements. New MDTA and existing vocational training for draftsmen also appear likely to exceed demand. Only stationary engineers offer significant opportunity for new courses in the miscellaneous occupations.

Wisconsin

The majority of food products occupations in Wisconsin grew between 1950 and 1960. Beverages and dairy products are exceptions, but the latter still have large annual replacement requirements. Bakers, grain millers, and meat cutters are growing and have adequate annual requirements to support training. Less than ten percent of the requirement for bakers and meat cutters is met by existing apprenticeship or MDTA training programs. Training of the types studied is not offered in any of the other food products occupations.

Skilled employment in textile mill products declined rapidly in the preceding decade except in knit goods. Operative employment in the latter industry has grown phenomenally in this period and has annual requirements adequate to support training, but no training in such occupations is offered. Sewers and stitchers in textile fabrication show a modest growth and large annual requirements, but no training facilities are available.

Printing and publishing occupations exhibit a mixed growth pattern. Compositors and typesetters, photoengravers and lithographers, pressmen and plate printers, operatives in newspaper publishing, and operatives in other kinds of publishing have all been increasing and have sufficient annual demand to justify regular training. Vocational school and apprenticeship training has recently been available only for compositors and pressmen, and the output in each meets only 10 to 15 percent of the estimated annual requirements.

Chemical operatives have grown since 1950 and those employed in plastics, synthetics, and processing chemicals manufacturing currently have annual requirements adequate to support training. A new course in chemical technology offered by one Wisconsin school may in the future contribute to the skilled labor force in this industry.

About an equal number of occupations in metalworking and metal manufacturing grew and declined in the 1950's. The occupations with growing employment and sufficient annual demand to support training include tool and die makers; structural steel workers; welders and flame cutters; heat treaters, annealers, and temperers; job setters; pattern makers; and filers, grinders, and polishers. Of these occupations, machinists are trained by vocational school and apprenticeship programs in sufficient number. Tool and die makers; structural steel workers; welders and flame cutters; and patternmakers are all trained in quantity; but output in these occupations equals less than half the estimated requirement. Sheet metalworkers and molders have declining employment but still require enough annual replacements to support training, but the output of molders is about one-third of the estimated requirement.

In transportation equipment manufacturing in Wisconsin, operative occupations in motor vehicles and equipment, aircraft and parts, and ships and boats show gains coupled with sufficient annual demand to warrant training. Although no training is offered in skilled occupations in transportation equipment manufacturing, those who are trained to service and repair transportation equipment could probably transfer easily to manufacturing.

Construction occupations show mixed growth. Employment in brick mason, cement mason, and plumber occupations increased while it declined slightly in the carpenter and roofer groups. All of these construction occupations have enough of a net annual requirement to support training. Training in brick masonry, carpentry, and plumbing meet from 30 to 60 percent of the needs in these occupations; the remaining two occupations currently have no vocational school or apprenticeship training.

Miscellaneous craftsmen and operative occupations, except for millwrights and railroad equipment repairmen, exhibit growing employment from 1950 to 1960 in Wisconsin. Stationary engineers, cranemen, glaziers, aircraft servicemen, motor vehicle servicemen, and draftsmen grew in this period and have adequate annual demand to sustain training activity. Training is available for auto-mechanic, air conditioning and refrigeration service and draftsmen occupations; but output does not nearly satisfy the demand. Sufficient replacement demand exists for millwrights, after accounting for declining employment, to justify training in this occupation.

CHAPTER IV

THE CHANGING STRUCTURE OF EMPLOYMENT IN THE UNITED STATES AND THE REGION

The study of the structure of employment is a valuable tool for guiding certain phases of industrial development efforts and vocational education activities. It will show the industries, occupations, and places in which labor is being displaced and to what extent; and it will show where opportunities for employment will probably be the greatest in the future. This knowledge can suggest what kinds of industries will be most attracted by existing labor surpluses and what kinds of training will be useful to industries with the brightest future.

Determinants of Labor Force and Employment

Population growth determines the limits of the labor force available for employment. The rate of population growth is primarily determined in the present day United States by the rate of birth less the rate of death (fertility and mortality). In-and-out migration have also been important to the nation in the past and are currently significant for the growth of the labor force in the various regions of the U. S.

Births for the nation averaged about 2.4 percent of the population annually between 1950 and 1960, but have declined slightly since 1960. Deaths averaged about .95 percent annually in this decade and since; the net of the two rates gives the natural increase -- about 1.45 percent per year between 1950 and 1960. Immigration amounted to only about .02 percent per year in the decade.

Natural increase and particularly migration vary from region to region within the nation. In the West North Central region, the natural increase averaged 1.40 percent annually between 1950 and 1960, but out-migration averaged .56 percent per year during the decade. This reduced the region's average annual population growth to about .84 percent.

Labor force participation rates measure the extent to which the population 14 years and older seeks employment. The average rate of participation in the labor force has been remarkably constant since World War II. Since that time the rate has varied between 59.3 and 57.3 percent -- usually increasing slightly when the demand for labor increased. However, participation rates are different and change rapidly among various age and sex groups. Young and old persons do not work in the same proportions that those of prime working age do. Rates for both young and old are declining. Participation rates declined from 53 to about 46 percent between 1950 and 1960 for those aged 14 to 19 as educational opportunities and skill requirements for employment increased. Participation for males over 65 declined from about 45 to 33 percent in this decade, but women whose children have grown increased their participation. For example, the participation of white females aged 45 to 54 jumped from 26 to 49 percent in this period.

Personal income and expenditures, business investment, and government fiscal and monetary operations are the most important determinants of the level of employment. When consumers, businesses, or governments increase their expenditures on goods and services, new employment is

required to meet the demand. In addition, the initial recipients of expanded consumption expenditure increase their spending or investment, thus multiplying the effect of the initial increase in expenditure. Similarly, decreases in income and expenditure reduce the demand for labor. Consumers, business, and government spent or invested $399, $88, and $176 billion respectively in 1964.

Changes in consumer tastes (primarily due to rising per capita income) affect the demand for labor in various industries and occupations. Changes in expenditure patterns have a much more pronounced impact on employment in particular regions -- with their more specialized resources -- than on employment in the economy as a whole. Between 1950 and 1964, consumers have spent a declining portion of their total expenditure on food and clothing and an increasing portion on housing, medical care, education, and personal services.

Technology in the production of goods and services is also an important determinant of the level of employment and especially, the distribution of employment among industries and occupations. The productivity of labor (output per manhour of labor) shows a long-term upward trend as technology improves the efficiency of both capital and labor. Gains in labor productivity occur at different rates in different industrial sectors, however. Gross National Product (in constant, 1954 dollars) per manhour rose from $71 in 1947 to $121 in 1964, but agricultural productivity rose from $50 to $134 in this period while productivity in non-agricultural industries rose only from $76 to $118.

The trends in these important variables help to explain changes in the level and kinds of employment in the six-state Northern Plains region which will be discussed below. All of these major factors are inter-related. Population growth affects consumer expenditures which (in turn) affect employment and income. Employment and income affect decisions (e.g. to marry and have children or to move) which determine population growth. The growth of demand for the output of a particular industry or increasing wages in an industry stimulate the development of new technology. The factors which can be most readily manipulated by policy makers in our society are expenditures and technology through monetary and fiscal policy and policies on education, respectively. This report has particular relevance from some aspects of education policy.

Employment by Industry

A higher proportion of employment in agriculture in the Northern Plains region than in the U. S. is the major difference in the distribution of employment by industry. (See Appendix E, Table E-1.) The share of total employment in agriculture in 1960 ranged from a high of 33 percent in North Dakota to a low of 12 percent in Wisconsin -- both well above the national average of seven percent. The rate of decline in agricultural employment has been slower in the region than in the nation, and this suggests an increasing relative importance of the region as an agricultural supplier.

The continuing loss of employment in agriculture is still a much higher percentage of total employment in the Northern Plains than in the nation. This poses one of the region's greatest problems in fostering over-all growth in employment and in providing education adequate to affect a change in skills for a large segment of the regional population. In the

Northern Plains, non-agricultural employment increased about 558,000 between 1950 and 1960, but 338,000 new jobs (or 60 percent of the increase in non-agricultural employment) were canceled by lost jobs in agriculture. For the nation, the loss in agricultural employment was only 25 percent of the gain in non-agricultural employment between 1950 and 1960. In the Dakotas, the decline in agricultural employment actually exceeded gains in non-agricultural employment for the decade -- resulting in a decline in total employment.

The above-average rate of increase in productivity in agriculture is the main reason for declining employment in this sector, but there are other important aspects of the problem. One mentioned above is that consumers are spending a smaller portion of their rising incomes on food, thus setting a below average growth rate for agricultural products. Another is the relatively pure price competition in markets for agricultural commodities which passes on the best part of gains from increasing productivity to consumers.

Manufacturing had the largest share of employment in the nation in 1950 and 1960 and in the Northern Plains region by 1960. All states in the region except Wisconsin had relatively less employment in manufacturing than the U. S. as a whole.

Excepting Wisconsin, manufacturing employment grew more rapidly in the region than it did nationally between 1950 and 1960, even though total regional employment grew less rapidly. In the 1960-1964 period, manufacturing employment actually decreased slightly in the nation while it grew in the region. The annual rate of increase in the region between 1960 and 1964 was well below the 1950-1960 rate, however.[7] This suggests that manufacturing industries may become a less important source of new jobs in the future. However, the ability of manufacturing employees to support service and trade employment will increase with their productivity and wages. Current trends indicate that those states with a lower employment base in manufacturing can probably look for better than average percentage growth.

Manufacturing covers a vast variety of products, and many will grow rapidly while others will decline. In the Northern Plains region, several manufacturing industries have shown trends toward increasing employment in most states, and National Planning Association projections to 1976 predict continuing increases in a group of industries.[8] These are Paper Products; Publishing and Printing; Stone, Clay, and Glass Products; Fabricated Metal Products; Electrical and Non-electrical Machinery; and Instruments.

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[7]Data on employment between 1960 and 1964 are available in Employment and Earnings Statistics for States and Areas 1939-1964, U. S. Department of Labor, Bureau of Labor Statistics, 1965.

[8]See Factors Influencing the Economic Growth Rate of the Midwestern States, North Star Research and Development Institute, 1964.

Agriculture, Manufacturing and Mining together are the major commodity producing sectors of any regional economy. Although very important to some local areas, mining is a relatively insignificant employer in the total Northern Plains economy. It shows some growth, however, as opposed to the national decline in mining employment. Commodity-producing sectors are important because the employment and income in these activities within a region are not tied to the demand (expenditure) of consumers in that region alone. In short, commodities are easily exported outside the region, and employment and income in exporting industries can grow faster than local demand alone will allow.

All services taken together are the second largest source of jobs in the Northern Plains and the U. S. -- comprising 19.9 and 21.0 percent of total employment in 1960, respectively. Services have had the most rapid growth in employment of all sectors from both 1950 to 1960, and 1960 to 1964. Professional services, the largest component, increased more than 50 percent in the nation and the region. Most longer-term employment forecasts expect services to provide the largest number of new jobs in the next decade; and, although training for occupations in service industries is beyond the scope of this study, it is very important for regional economic development.

Trade is the third largest employer nationally and regionally and accounts for about the same share of employment in both areas. Between 1950 and 1960 trade grew only about one-half as fast in the Northern Plains states as it did nationally, reflecting the difference in the over-all growth of employment. Trade will continue to grow in the region and should provide a large share of the new jobs in the next decade.

Government (Public Administration) also accounts for a greater share in 1960 than in 1950, both nationally and regionally, and shows above average growth in both areas. Government employment in the Northern Plains will continue to grow, but many of the government services that will grow at an above average rate are associated with the needs of large, rapidly growing urban centers of which the Plains states have few.

Employment by Occupation

Many trends evident in the analysis of employment by industrial sector will appear in the analysis of employment by occupational class because occupations are often not separable from industries. There is, however, a general trend in occupational employment in addition to industrial shifts in employment -- whether the latter are positive or negative. This is the more rapid growth in the most skilled occupations than in the unskilled and semi-skilled occupations.

Occupational employment shifts in the U. S. Manufacturing Sector between 1950 and 1960 will serve to illustrate. (See Appendix E, Table E-2.) The over-all increase in employment in Manufacturing in this decade of 3.1 million, or about 21 percent, includes a number of dramatic occupational shifts. Employment of Laborers (unskilled) actually declined 18 percent while employment of professional, technical, and kindred workers almost doubled in the decade. Since 1960, these trends have accelerated. Shifts in occupations within each industry for each state in the Northern Plains and for the nation were not analyzed in detail for the purposes of this report. Analysis of employment by occupation, however, will indicate trends

which hold true generally in all industries. These trends are discussed in the following paragraphs.

Professional, technical, and kindred workers accounted for ten percent of employment in the region and for slightly more nationally in 1960. (See Appendix E, Table E-3.) In both the U. S. and the Northern Plains, the professional group is the fastest growing; and the nation's is growing more rapidly than the region's as is true for total employment.

The lower proportion of professionals in the Northern Plains is related to the lag in the manufacturing industry which employs about twenty percent of all professionals.[9] Service industries (which are equally important in both areas) employ 32 percent of the professionals; and as these industries become more important relative to manufacturing, the importance of professional employment in the region should approach the nation's.

Managers and proprietors (except farm) remained at about eight percent of employment between 1950 and 1960 in both the U. S. and the Northern Plains states. The growth of this category was below average, and it declined slightly in importance. This group of occupations should continue to maintain its share of employment throughout the decade since the Trade sector employs about half of all managers and is expected to continue to grow at an average to better rate in both the region and the nation.

Clerical workers are the second most rapidly growing occupational group in the nation, and they accounted for a larger share of total employment in the nation than in the region in both 1950 and 1960. Although the region's clerical employment grew more slowly than the nation's, it is above average in the region. The regional lag in clerical employment is explained by below-average employment in manufacturing, finance, and government. Of these three sectors, manufacturing is growing faster in the region than in the U. S.

Employment in sales work is about the same proportion in the region and the nation, and the growth rates of sales employment in the region and the U. S. paralleled the growth of total employment in the respective regions. This pattern is accounted for by the Trade sector which employs about 70 percent of all sales workers and displays average growth in both areas.

Craftsmen, foremen, and kindred workers (who are of special interest in this study) accounted for 12 percent of the region's employment from 1950 to 1960 but dropped from 14 to 13.5 percent in the U. S. This average to below average growth can be attributed to the relatively slow growth of construction employment which accounts for over 20 percent of all craftsmen. The employment of craftsmen in manufacturing (35-40 percent of all craftsmen) grew about the same as total manufacturing employment over the decade. The large variations among the six states in the importance of craftsmen can be traced to the large differences in manufacturing activity among them.

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[9]The share of occupational employment in various industries was obtained from National Economic Projections Series National Planning Association, 1963.

Operatives and kindred workers (also of special interest in this study) dropped from 19.8 to 18.4 percent of total employment in the nation from 1950 to 1960 while in the region they rose from 14.4 to 15.3 percent. The growth of operative jobs was above average in each of the Northern Plains states and exceeded the national growth in spite of the slower increase in over-all employment in the region during the decade. This regional growth pattern and the large differences in the importance of operatives among the states are again largely a function of variations in manufacturing which employs over 60 percent of all operatives. Trade is the only other significant employer of operatives (13 percent), and this sector is growing at about the average rate in both the region and the nation.

Service workers[10] accounted for about 11 percent of total employment in the Northern Plains by 1960 as they did nationally. However, in the region service employment grew faster during the decade than in the U. S. despite the greater growth of total employment that the nation exhibited. The above average growth of service employment is caused by the increasing share of rising per capita income going for health, recreation, household, and personal services.

Industrial laborers declined from 4.9 to 3.9 percent of total employment in the region during the decade while they declined from 6.2 to 4.8 percent in the U. S. The decline was more rapid in the Northern Plains. Industrial laborers are accounting for a declining share of employment in all industries except in agriculture and in services where increases in importance are slight. This trend is related to the need for trained workers to employ increasingly complex technology.

Farm workers and managers are obviously more important to the Northern Plains economy than to the national economy as a whole, comprising 17 percent of total employment versus six percent. The rate of decline during the decade has also been less in the region than in the U. S. Although farm workers and managers almost equal total agricultural employment, it is interesting that they are gradually losing ground to such groups as professionals and operatives in agriculture. This is reflected in the more moderate decline in agricultural employment as compared to farm workers and managers.

Employment by Place of Residence of the Employed

The continuing rapid decline in agricultural employment possibilities is responsible for the nationwide movement of population and employment from rural to urban places. The rate at which employment is moving into urban places varies with the size of place and the industry, however.

In rural places, as defined in the 1960 Census of Population, total employment has declined while manufacturing employment has increased at above average rates for the nation and particularly for the region.

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[10]This occupation class excludes professional service workers.

(See Appendix E, Table E-4.) The designation of places as "rural" may be somewhat misleading since it includes many populous areas surrounding the corporate limits of cities. In these areas close to cities, an unspecified portion of the growth in rural manufacturing employment has taken place.

Small towns with populations of from 2,500 to 10,000 have registered below-average increases in total employment in the region but above average increases in manufacturing employment. This is not true for North and South Dakota which both suffered declines in employment in small towns. South Dakota, however, had gains in manufacturing employment in towns with populations of from 2,500 to 10,000 equal to the rate of gain for the region in places of this size.

The medium-sized towns with populations of from 10,000 to 50,000 have had the most rapid gains in both total and manufacturing employment in the region. This trend is generally true for all states, except that manufacturing employment in Iowa and Wisconsin grew most rapidly in small towns. Medium-sized towns can frequently offer lower wages in conjunction with fully developed municipal services; and as transportation costs slowly decline, these two factors become increasingly important to industry.

Large cities with populations over 50,000 show below-average growth in both total and manufacturing employment in the Northern Plains region. Such cities are the only places where manufacturing employment grew less rapidly than total employment. Some measure of the cities' low employment growth can be explained by the growth of rural manufacturing employment cited above. People either live outside the cities' corporate limits and commute into town to work or live in suburbs and work in the growing number of plants located beyond but close to the city borders.

CHAPTER V

IMPLICATIONS OF THE STUDY FOR VOCATIONAL EDUCATION POLICY

This study was designed primarily to aid those concerned with regional economic development in determining the extent and saleability of the vocational training resources in the Northern Plains area. However, the study also has implications for some aspects of vocational education policy in the Northern Plains states. The data obtained in the questionnaire survey of public and private schools are believed to be unique. In addition, the application of demand analysis to a large number of occupations provides detail and geographic coverage that have not previously been available in the region. It is principally in providing this new information that the study will be of help to educators and other policymakers.

The information gleaned from this study should be most helpful in deciding which occupations should have training and how many to train in each occupation. Information in the study which bears upon the difficult and controversial decisions of where to locate schools and how to organize vocational education programs is present to only a limited degree.

The development and analysis of alternative ways of planning, locating, and administering vocational education programs is beyond the scope of this report. However, the concensus of experienced educators on those matters (but not much new research) can be found in both Education and Economic Growth, The Next Steps, prepared by A Special Dean's Ad Hoc Committee of the College of Education, University of Minnesota and Education for a Changing World of Work, Report of the Panel of Consultants on Vocational Education, published by the Department of Health Education and Welfare.

Curriculums

Both public and private schools have tended to concentrate their courses in the occupations in which the apprenticeship program is traditionally strong, namely: printing, metalworking, construction, and miscellaneous skilled occupations. (See Appendices C and D). Yet even within these broad groups some newer and expanding occupations are largely neglected. For example, photoengravers and lithographers in the printing industry; job setter, tool and die makers, filers and grinders, and welders in metal working and manufacturing; and aircraft and air conditioning servicemen in the miscellaneous category are not trained in quantity. However, in several states, the foregoing exhibit growth and relatively large requirements.

In contrast to the areas of traditional concentration, occupations in some regionally important industrial sectors are almost totally absent from public and private school curriculums and to a lesser extent from the apprenticeship programs in the six states studied. The most notable is the food products industry -- a large employer of craftsmen and operatives in most of these states. Some training in baking is available; but skilled occupations in beverage, confections, dairy products, milling, and meat

products industries apparently are filled by informal and in-house training. Craftsman and operative occupations in the manufacture of transportation equipment (excepting automobiles and railroad equipment in some states), chemicals, electrical and electronic equipment, and some textile products also have largely unrealized potential for formal training programs.

The concentrations of vocational education resources in relatively few occupations seems undesirable in terms of both political equity and economic returns. First, only certain industries (i.e. printing, metalworking, and construction) have training costs subsidized by public and private education while other industries important to the region (i.e. food products and chemicals) obtain little benefit from vocational schools. Note that the industries subsidized are not the largest employers or exporters in the region nor do they appear to have the greatest growth potential. Second, the economics of diminishing returns and of supply and demand imply higher returns to more diverse curriculums. General experience with diminishing returns suggests that the addition of formally trained workers to industries which previously did not have any is likely to foster a greater increase in productivity than adding more trained workers to industries where they are prevalent.

Although strictly comparable statistics on the Manpower Development and Training Act (MDTA) programs and Area Redevelopment Act (ARA) programs are not available, it appears that they have responded to opportunities in a few occupations that the schools and the apprenticeship programs have neglected. The most obvious examples are MDTA projects for welders, meat cutters, gas or electric appliance servicemen, and farm equipment mechanics and repairmen. MDTA statistics for more than one year were available for Minnesota only, but these statistics plus informally gathered information suggest that the MDTA program has added new occupations more rapidly than the schools.

The performance of the MDTA programs and the large fund of information on employers' needs available from state bureaus of employment security, the U. S. Department of Labor, and other agencies suggest that curriculums could be broadened rather rapidly. The recruitment of competent faculty to teach new occupational disciplines will probably be the major constraint on the rate at which new courses can be added.

The extent to which state vocational education facilities can respond to the particular needs of an existing industry or a prospective new plant is an intriguing question. North Carolina, for example, has tailored courses in both college and vocational schools to the needs of the textile industry.[11]

Capacity

Decisions on the number of people to train in all of the various occupational skills can be guided by the needs of both employers and the young people seeking to prepare for a place in the labor force. The needs

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[11]See "Plastic Film, Sheet and Profiles," Economic Research Council, January, 1965.

of the young people of the Northern Plains may very likely exceed those of the region's employers. Historically, the largest net out-migration has taken place among those in the region between the ages of 15 and 24. The number of young people seeking to enter the labor force in recent years has been larger than the number of new jobs available in the region.

This study provides detailed estimates of requirements in craftsman and operative occupations in 1961 for four of the six states and in these occupations with training for all six states. Because manufacturing employment has grown slowly from 1961 to 1964 in the region, numerical estimates for 1961 are probably applicable in many occupations at present.

Increased training in any occupations in which requirements are not being met can be economically justified. The direct economic returns from investment in either high school or college training are about the same -- roughly ten percent per year over the life of the student.[12] This compares favorably to the average return on investment available in most industries. Returns to vocational education might even be higher since the direct economic returns to the student are a major consideration in designing his education. Additional benefits such as a state's greater competitiveness in attracting industry are not included in the above measures.

The question of training in excess of industrial requirements within a state in order to prepare youth who must migrate is difficult to illuminate. Young people in the age group 15 to 24 years of age are the prime age for vocational training and are also the most mobile age group. Large percentages of the population in this age group leave and enter each of the six Northern Plains states, but more leave than enter. Chart 6 and Table 6 show the migration rates for age groups 15 to 19 and 20 to 24 between 1955 and 1960.

If it is assumed that the same proportion of out-migrants as of the total population in these age groups should be given vocational education, then training should be increased in excess of local industry requirements by from .5 to 3.3 percent depending upon the state and age group. Some may argue, however, that young persons with marketable skills may be more likely to migrate than the average. Further research on vocational school graduates would be needed to resolve this question.

A policy which consciously anticipates exporting some of a state's investment in education is favored by the considerations that the parents of young out-migrants are probably state taxpayers and that surplus labor that is not marketable outside the region is likely to cause welfare costs in excess of the costs of education if it remains in the state.

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[12] Economic Report of the President, Together with the Annual Report of the Council of Economic Advisers, 1965, page 158, and "Estimating the Return of Education," Review of Economics and Statistics, August, 1960, by E. F. Renshaw.

Migration 1955 to 1960 of Youths

Aged 15 to 24 by State & Age Group

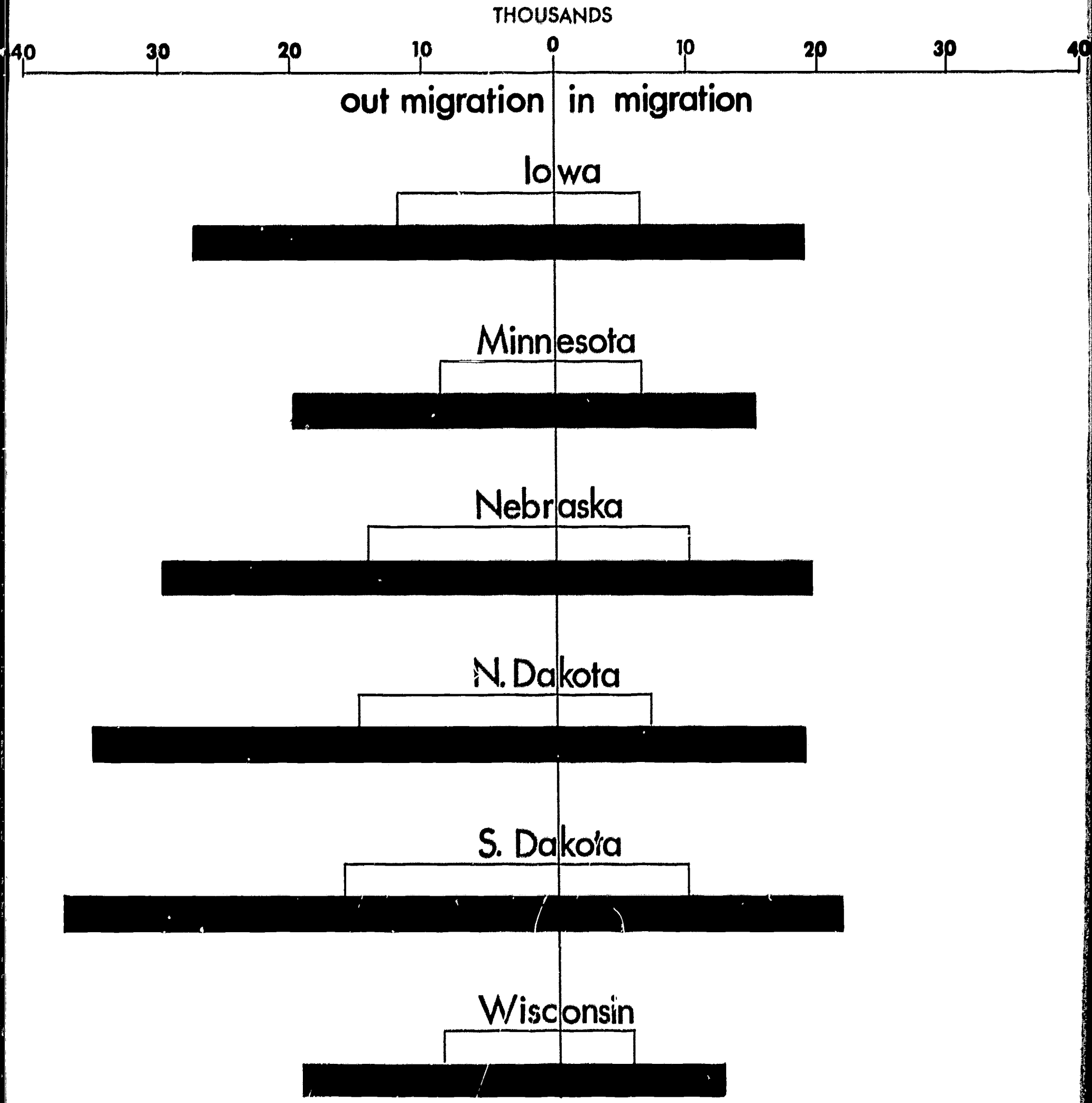

chart 6

Table 6

Net Out Migration: Persons 15 to 24 Years of Age 1955 to 1960

Age Group of Migrants	1955-1960 in-migrants as % 1960 population in age group	1955-1960 out-migrants as % 1960 population in age group	1955-1960 net out-migration as % 1960 population in age group	1955-1960 average annual net migration as % 1960 pop. in age group
Iowa				
15 to 19	6.5	12.0	5.5	1.1
20 to 24	14.1	27.3	13.2	2.6
Minnesota				
15 to 19	6.6	8.9	2.3	.5
20 to 24	14.7	20.3	5.6	1.1
Nebraska				
15 to 19	10.0	14.6	4.6	.9
20 to 24	22.0	30.1	8.1	1.6
North Dakota				
15 to 19	6.8	15.3	8.5	1.7
20 to 24	19.1	35.5	16.4	3.3
South Dakota				
15 to 19	9.7	16.5	6.8	1.4
20 to 24	21.6	37.8	16.2	3.2
Wisconsin				
15 to 19	5.8	8.2	2.4	.5
20 to 24	12.6	19.4	6.8	1.4

Location

The study of the geographic pattern of employment and shifts in the pattern suggests certain general guide lines for locating vocational schools. Cities of over 50,000 in the region have a declining share of manufacturing employment, the largest source of employment for craftsmen and operatives. However, as of 1960, cities still had almost 40 percent of manufacturing employment. In addition, an unknown portion of the rapidly growing rural manufacturing employment which comprised 24 percent of the total by 1960 is near to these cities.

Because larger cities have the greatest share of both population and manufacturing employment opportunities, they have advantages as locations for vocational schools. They reduce transportation and board and room costs for a large percentage of students and offer close contact with a variety of industries. However, these cities are likely to be already better served by existing public and private schools and the apprenticeship program than are small and medium sized towns located far from them.

Towns with populations between 10,000 and 50,000 show the greatest growth in both total and manufacturing employment. Thus, they offer a reasonable base of population and industry with the probability that they can attract an increasing share of new students and job opportunities in the future.

Administration

The only aspect of the administration of vocational schools that this study bears upon is the coordination of curriculums with employers' needs and the counseling of potential vocational school students. The existence of over-supplies of trained graduates in a few states and the continuing emphasis on some occupations that are not growing while newer, rapidly expanding occupations and industries are ignored suggests a need for better knowledge of industry requirements on the part of educators and better communication of this knowledge to students. Certainly, student aptitudes and interests are important in determining their choice of occupation. However, given students with ability in several fields, vocational counselors can help them to select the occupation with the greatest earning potential.

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APPENDIX A

METHODOLOGY

This Appendix deals with the questionnaire survey by Northern Natural Gas of vocational training facilities in the Northern Plains and the detailed forecasts of employment requirements in selected occupations. Although the research was tailored to the needs and objectives of the Company's area development activities, the needs of other development groups and educators were considered throughout, and it is hoped that this research will be useful to others participating in the development of regional labor resources.

Survey of Training Output in Selected Occupations (Incremental Supply)

The survey of vocational training facilities was restricted to programs training for craftsman and operative occupations in manufacturing, construction, and miscellaneous categories as defined in the Dictionary of Occupational Titles.[13] The miscellaneous category includes mainly maintenance and repair workers who service manufactured products and who could transfer to related production jobs.

Limiting the survey to occupations in industries that are able to produce for export outside the region is consistent with the large body of research which indicates that they are most important to a region's development. The growth of producers who can export their products outside the region is not tied to the regional market alone. These industries are basic in the sense that their employees' consumption expenditures support service industries which must cater to the local market.

The survey was further restricted to training programs open to high school graduates and drop-outs as opposed to programs open only to regular high school enrollees. This policy made it very likely that the trainees and graduates of the programs studied would be those who were seriously preparing to enter a given occupation rather than just rounding out their secondary school program. It also assured that the training facilities surveyed would have access to the broadest possible range of students -- including those whose maturity and previous experience might contribute to their qualification as skilled workers. In practice, these criteria restricted the survey to public and private adult or post-high school vocational education programs and Bureau of Apprenticeship and Training programs. Manpower Development and Training Act and Area Redevelopment Act projects were excluded from the questionnaire survey because trainees in these projects are limited to the unemployed or underemployed.

The list of schools and programs surveyed was compiled from standard reference sources and from information provided by state and local directors of vocational education and Federal and state officials with the Bureau of Apprenticeship and Training. Some schools were eliminated from the survey list when preliminary information indicated that their curriculums

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[13] Almost all occupations included in the survey are classified under Craftsmen or Operatives in the 1950 & 1960 Census although a few are classified under Professional and Technical.

did not include training in the above occupations. The questionnaire mailed to the schools requested information about each course of instruction that they offered including graduation figures for the last five years, current enrollment, types of jobs graduates take, salary ranges for new and experienced graduates, the proportion of graduates remaining in the region, and planned changes in curriculum. Information on returned questionnaires was tabulated for each state and classified by occupation.

One hundred thirteen schools that are currently in operation and open to the public received questionnaires, and 101 responded. About 70 percent of the responding schools provided data on training programs for occupations in the manufacturing, construction, and miscellaneous categories. A very few in the remaining 30 percent of the responding schools indicated courses in occupations included in the study, but did not provide completed questionnaires. Most of the schools in this 30 percent did not offer training in occupations within the scope of the survey. No adjustment for schools not reporting was attempted since the number was small and since the desired occupational detail was difficult to estimate.

Estimates of Growth and Replacement Requirements in Selected Occupations (Incremental Demand)

Census of Population data on employment in 1950 and 1960 and the most current working life tables estimate the annual increment of demand for labor in 1961 in occupations in manufacturing and related industries. Active apprentices were added to employment in the above occupations wherever they were applicable. Bureau of Census data were chosen as a basis for estimating demand because they provide detailed information on employment by occupation while Bureau of Labor Statistics data provide detail only on employment by industry.

Analysis of the employment by occupation for each state provided estimates of annual increments of demand for each occupation. This consists of two elements: the demand for more or less employment due to economic expansion or decline and the demand for replacement of workers who retire, die, or otherwise leave the labor force. The average annual compound growth rate of employment in any occupation between 1950 and 1960 measures expansion demand during the decade and approximates it for the years beyond 1960 through 1963. (See Appendix C, Table C-1, Column 3). Average annual replacement demand for skilled occupations in each state was estimated by applying Department of Labor working life tables for males and females to total employment figures distributed by age and sex for each state. (See Appendix B, Table B-1) Age and sex distribution of employees in all skilled occupations were assumed to approximate the age and sex distributions of total employment.[14] Although age and sex distribution varied slightly from state to state, the average annual replacement rate was about three percent for each state.

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[14] The average replacement rate calculated by this method is very close to those estimated in a few special studies of skilled occupations. For example, see "Electricians" in Appendix C, Table C-1.

The sum of the average annual growth rate and the average annual replacement rate for a particular occupation gives a net rate of annual demand for that occupation (see Appendix C, Table C-1, Column 5). These net rates of demand were applied to occupational employment figures for 1960 to give a numerical estimate for demand of each occupation in the next year (1961). (See Appendix C, Table C-1, Column 6.)

Comparison of Incremental Demand and Supply in Selected Occupations

The percentage rates of demand and numerical demand in 1961 for each occupations were compared to the average annual training output 1960 through 1963 for each occupation (Appendix C, Table C-1, Column 7). Average output 1960 through 1963 was compared both as a percentage of employment in 1960 and numerically (Appendix C, Table C-1, Columns 9-12).

There is a reasonable time congruence between estimates demand for 1961 and average annual training output for 1960 through 1963. It was judged better to base demand estimates on actual employment figures for 1960 and to average out annual training fluctuations in trying to relate supply and demand in each occupation. Employment could be projected to a later year and demand for the succeeding year estimated (by applying net replacement rates). This demand estimate could then be compared to training output in that year, but this would require additional assumptions. The method selected will give a rough idea of the relationship of supply and demand in a recent year for each occupation studied.

Appendix B, Table B-1

REPLACEMENT REQUIREMENTS BY STATE

	Male Employment 1960	% Total Employment 1960	Separation Rates (D&R) 1955	Weighted Average for Males 1960	Female Employment 1960	% Total Employment 1960	Separation Rates 1955	Weighted Average for Females	Weighted Average for Males and Females
IOWA									
14-19					33,779	3.32	.0583	.00194	
20-24	260,778	25.59	.00187	.00048	33,451	3.28	.1076	.00353	
25-29					21,281	2.09	.0623	.00130	
30-34					24,047	2.36	.0181	.00043	
35-39	155,554	15.26	.00517	.00079	62,768	6.16	.0174	.00109	
40-44									
45-49	141,292	13.86	.01516	.00210	66,109	6.49	.0438	.00284	
50-54									
55-59	58,966	5.79	.03104	.00180	28,000	2.75	.0633	.00174	
60-64	46,750	4.59	.07367	.00338	18,893	1.85	.0685	.00127	
65 & Over	47,344	4.65	.13852	.00644	19,990	1.96	.1409	.00276	
Weighted Average				.01499				01688	.03187
MINNESOTA									
14-19					48,423	3.93	.0583	.00229	
20-24	309,973	25.13	.00187	.00047	48,860	3.96	.1076	.00426	
25-29					28,527	2.31	.0623	.00144	
30-34					29,318	2.38	.0181	.00043	
35-39	190,840	15.47	.00517	.00080	75,984	6.16	.0174	.00107	
40-44									
45-49	167,451	13.58	.01516	.00206	84,027	6.81	.0438	.00298	
50-54									
55-59	68,573	5.56	.03104	.00173	34,575	2.80	.0633	.00177	
60-64	55,241	4.48	.07367	.00330	23,166	1.88	.0685	.00129	
65 & Over	48,143	3.90	.13852	.00540	20,307	1.65	.1409	.00232	
Weighted Average				.01376				.01785	.03161
NEBRASKA									
14-19					17,811	3.39	.0583	.00198	
20-24	130,672	24.85	.00187	.00046	17,785	3.38	.1076	.00364	
25-29					11,588	2.20	.0623	.00137	
30-34					12,646	2.40	.0181	.00043	
35-39	77,623	14.76	.00517	.00076	32,659	6.21	.0174	.00108	
40-44									
45-49	71,752	13.64	.01516	.00207	35,010	6.66	.0438	.00292	
50-54									
55-59	40,162	5.73	.03104	.00178	13,923	2.65	.0633	.00168	
60-64	25,055	4.76	.07367	.00351	10,424	1.98	.0685	.00136	
65 & Over	28,059	5.34	.13852	.00740	10,769	2.05	.1409	.00284	
Weighted Average				.01598				.01735	.03333
NORTH DAKOTA									
14-19					8,186	3.83	.0583	.00223	
20-24	56,777	26.57	.00187	.00050	7,263	3.40	.1076	.00366	
25-29					4,565	2.14	.0623	.00133	
30-34					4,846	2.27	.0161	.00041	
35-39	33,414	15.64	.00517	.00081	11,640	5.45	.0174	.00095	
40-44									
45-49	32,311	15.22	.01516	.00231	12,718	5.95	.0438	.00261	
50-54									
55-59	12,291	5.75	.03104	.00198	4,869	2.28	.0633	.00144	
60-64	9,361	4.38	.07367	.00323	3,156	1.48	.0685	.00101	
65 & Over	9,169	4.29	.13852	.00594	2,895	1.35	.1409	.00190	
Weighted Average				.01457				.01554	.03011
SOUTH DAKOTA									
14-19					8,520	3.58	.0583	.00209	
20-24	60,781	25.52	.00187	.00048	7,237	3.04	.1076	.00227	
25-29					5,152	2.16	.0623	.00135	
30-34					5,869	2.47	.0181	.00045	
35-39	37,365	15.69	.00517	.00081	13,421	5.64	.0174	.00098	
40-44									
45-49	33,643	14.12	.01516	.00214	14,707	6.17	.0438	.00270	
50-54									
55-59	13,876	5.83	.03104	.00181	5,932	2.49	.0633	.00158	
60-64	11,202	4.70	.07267	.00346	4,239	1.78	.0685	.00122	
65 & Over	12,053	5.06	.13852	.00701	4,176	1.75	.1409	.00249	
Weighted Average				.01571				.01611	.03182
WISCONSIN									
14-19					45,783	3.12	.0583	.00182	
20-24	371,562	25.30	.00187	.00047	51,442	3.50	.1076	.00377	
25-29					35,691	2.43	.0623	.00151	
30-34					38,584	2.63	.0181	.00048	
35-39	228,314	15.53	.00317	.00080	98,045	6.67	.0174	.00116	
40-44									
45-49	206,842	14.08	.01516	.00212	102,607	5.99	.0438	.00306	
50-54									
55-59	85,511	5.82	.03104	.00181	38,302	2.61	.0633	.00165	
60-64	65,745	4.48	.07567	.00330	24,940	1.70	.0685	.00116	
65 & Over	53,350	3.63	.13852	.00503	21,913	1.49	.1409	.00210	
Weighted Average				.01354				.01671	.03025

Appendix C

Incremental Supply and Demand in Occupations with Public and Private School Training

Table C-1

IOMA		1 Total Employment 1950	2 Total Employment 1960	3 Average Annual Compound Growth Rate 1950-60 (equals 1960 percentage growth requirement)	4 Average Annual Rate of Replacement Required	5 Net Rate of Additions to Employment Required (col. 3 + col. 4)	6 Net Numerical Requirement 1961 (col. 5 × col. 2)	7 Average Annual Training Output 1960 through 1963	8 Av. An. Compound Growth Rate of Training Output 1960 through 1963	9 Av. An. Training Output 1960-1963 as Percent of Employment 1960 (col. 7 to col. 2)	10 Percentage of Employment: Exc. (Deficiency) of Output 1960-63 Over Net Additions Required (col. 9-col. 5)	11 Numerical Excess (Def.) of Output 1960-63 Over Net Additions Required (col. 7-col. 6)	12 Excess (Deficiency) As % of Av. Output 1960-63 (col. 11 to col. 7)	13 Ratio: Av. An. %Δ Output to Av. An. %Δ Additions Required (col. 8 to col. 5)
Chemical Industries Technology		1230	1180	(0.5)	3.19	2.69	32							
Construction Technology		NA	NA					10						
Data Processing		NA	NA					320	4.1					
Drafting Technology		989	1870	6.6	3.19	9.79	183	22		0.48		(161)		
Electronic Technician		133	712	18.3	3.19	21.49	152	81	13.9	11.3	(10.9)	(71)	(87.8)	0.65
Printing		796	1160	3.8	3.19	6.99	81	61	17.0	5.25	(1.74)	(20)	(32.79)	2.43
Machine Tool Operator (machinists)	- school	6430	5082	(2.3)	3.19	0.89	46	20		0.39	(0.50)	(26)	(130.00)	
	apprenticeship	174	99											
	Total	6504	5191					10						
Mechanical Technology		NA	NA											
Tool & Die Makers	- school	1167	1441	2.7	3.19	5.89	90	20		1.31	(4.58)	(70)	(350.00)	
	app.	no	83											
	Total	1167	1524					13	(9.8)	1.6	(9.9)	(7)	(53.85)	(3.94)
Cabinet Making		852	795	(0.7)	3.19	2.49	20	28	2.5	0.2	(2.19)	(264)	(90.48)	(1.05)
Auto Mechanics (auto diesel)		13310	12302	(0.8)	3.19	2.39	294							
TOTAL		24848	24022				898	585				(621)		
MINNESOTA														
Air-conditioning - General		791	937	1.7	3.16	4.86	46	12		1.28	(3.58)	(34)	(283.3)	
Appliance Repair & Refrigeration		NA	NA					23	6.3					1.83
Aircraft & Power Plant Technology		1067	1939	6.1	3.16	9.26	180	22	17.0	1.13	(8.13)	(158)	(718.2)	
Auto Body		(Incl. in Auto Mech.)						43	4.3					
Auto Mechanic	- school	14732	13122	(1.2)	3.16	1.56	258	117	16.1	1.22	(0.74)	(141)	(120.3)	8.21
	app.	60	43											
	Total	14792	13165					117	16.1					
Carpentry, Millwork & Cabinetmaking	- school	20985	17789	(1.6)	3.16	1.56	279	61						3.84
	app.	136	120					130	8.8	1.07	(0.49)	(88)	(46.97)	
	Total	21121	17909					191						1.33
Drafting Technology		1905	3594	6.6	3.16	9.76	351	163	13.0	4.54	(5.22)	(188)	(119.36)	
Electricity	- school	5355	5426	0.2	3.13 **	3.33	189	82						2.52
	app.	216	270					89	8.4	3.0	(0.33)	(18)	(10.3)	
	Total	5571	5696					171						.24
Electronics		173	1448	23.6	3.16	26.76	387	480	6.5	33.15	6.39	93	19.38	
Engineering Technology		NA	NA					8	7.7					
Farm Equipment Mechanics		NA	NA					15	42.0					12.25
Heavy Equipment Operators & Maintenance		3387	5525	5.0	3.16	8.16	451	40	100.0	0.72	(7.44)	(411)	(1027.5)	
Machine Shop (machinist)	- school	9333	10036	0.7	3.16	3.86	394	122						3.78
	app.	191	167					18	14.3	1.72	(5.58)	(236)	(181.6)	
	Total	9524	10203					140						

Appendix C

Incremental Supply and Demand in Occupations with Public and Private School Training

Table C-1

		1	2	3	4	5	6	7	8	9	10	11	12	13
MINNESOTA (continued)		Total Employment 1950	Total Employment 1960	Average Annual Compound Growth Rate 1950-60 (equals 1960 percentage growth requirement)	Average Annual Rate of Replacement Required	Net Rate of Additions to Employment Required (col. 3 + col. 4)	Net Numerical Requirement 1961 (col. 5 x col. 2)	Average Annual Training Output 1950 through 1963	Av. An. Compound Growth Rate of Training Output 1960 through 1963	Av. An. Training Output 1960-1963 as Percent of Employment 1960 (col. 7 to col. 2)	Percentage of Employment: Exc. (Deficiency) of Output 1960-63 Over Net Additions Required (col. 9-col. 5)	Numerical Excess (Def.) of Output 1960-63 Over Net Additions Required (col. 7-col. 6)	Excess (Deficiency) As % of Av. Output 1960-63 (col. 11 to col. 7)	Ratio: Av. An. %Δ Output to Av. An. %Δ Additions Required (col. 8 to col. 5)
Mechanical Repair & Servicemen								NA						
Tool & Die Maker		1383	2031	4.0	2.97	6.97	142	36	3.1	1.77	(5.20)	(106)	(294.4)	.4448
Printing	- school	6415	6825					30						
	app.	349	258					132						
	Total	6764	7083	0.6	3.16	3.76	266	162	12.1	2.29	(.37)	(104)	(64.20)	3.2181
Plumbing	- school	4835	5312					20						
	app.	226	184					98						
	Total	5061	5496	0.8	3.16	3.96	218	118	2.9	2.2	(1.76)	(100)	(84.7)	.7323
Sheet Metal	- school	2678	2501					21						
	app.	150	111					51						
	Total	2828	2612	(0.8)	3.16	2.36	62	72	(5.3)	2.76	0.40	10	13.9	2.2458
Welding		4360	6061	3.4	3.16	6.56	398	27	20.0	0.45	(6.11)	(371)	(1374.1)	3.0488
TOTAL		78727	83701				3621	1849				(1870)		
NEBRASKA														
Air-conditioning & Refrigeration		265	457	5.6	3.33	8.93	41	84	21.0	18.4	9.47	43	51.19	2.3516
Auto Body & Fender Repair		* (included below)						87	39.0					
Carpentry & Cabinet Making	- school	9259	6923					22						
	app.	50	32					26						
	Total	9309	6955	(2.9)	3.33	0.43	30	48	7.9	0.7	0.27	18	37.50	18.3721
Commercial Artist		313	487	4.5	3.33	7.83	38	47	2.7	9.7	1.87	9	19.15	.3448
Data Processing		NA	NA					129	21.0					
Diesel Mechanic Automotive Mechanic	- school	*7147	6329					259						
	app.	25	15					31						
	Total	7172	6344	(1.2)	3.33	2.13	135	290	16.2	4.1	1.97	155	48.28	7.6056
Drafting Technician		500	802	4.8	3.33	8.13	65	21		2.6	(5.53)	(44)	(209.52)	
Electrician	- school	2351	1874					15						
	app.	72	62					20						
	Total	2423	1936	(2.2)	3.13 **	0.93	18	35	(2.2)	1.8	0.87	17	48.57	
Electronic Technician		83	251	11.7	3.33	15.03	38	246	2.4	98.0	82.97	208	84.55	.1597
Machinist, Machine Shop (training only, empl. NA)	- school	1840	1879					10						
	app.	60	109					12						
	Total	1920	1988	0.3	3.33	3.63	72	22	(4.1)	1.1	(2.53)	(50)	(227.27)	
Radio & Television Service		429	764	5.7	3.33	9.03	67	90		12.1	3.07	23	23.33	
Printing (all printing trades)	- school	1926	2077					20						
	app.	134	99					7						
	Total	2060	2176	0.5	3.33	3.83	83	27	(6.9)	1.2	(2.63)	(56)	(207.41)	
Sheet Metal	- school	757	766					17						11.3536
	app.	33	27					11						
	Total	790	793	0.1	3.33	3.43	27	28	15.1					
Welding		1387	2109	4.2	3.33	7.53	159	2	26.0	0.1	(7.53)	(157)	(7850.0%)	3.4529
TOTAL		25894	24294				748	1156				164		

** Figure given in special B.L.S. study.

Appendix C

Incremental Supply and Demand in Occupations with Public and Private School Training

Table C-1

		1	2	3	4	5	6	7	8	9	10	11	12	13
NORTH DAKOTA		Total Employment 1950	Total Employment 1960	Average Annual Compound Growth Rate 1950-60 (equals 1960 percentage growth requirement)	Average Annual Rate of Replacement Required	Net Rate of Additions to Employment Required (col. 3 + col. 4)	Net Numerical Requirement 1961 (col. 5 * col. 2)	Average Annual Training Output 1960 through 1963	Av. An. Compound Growth Rate of Training Output 1960 through 1963	Av. An. Training Output 1960-1963 as Percent of Employment 1960 (col. 7 to col. 2)	Percentage of Employment: Exc. (Deficiency) of Output 1960-63 Over Net Additions Required (col. 9-col. 5)	Numerical Excess (Def.) of Output 1960-63 Over Net Additions Required (col. 7-col. 6)	Excess (Deficiency) As % of Av. Output 1960-63 (col. 11 to col. 7)	Ratio: Av. An. %Δ Output to Av. An. %Δ Additions Required (col. 8 to col. 5)
Auto Diesel, Mechanics, Maintenance & Repair	- school	3599	2703											
	app.	11	5											
	Total	3610	2708	(2.9)	3.01	.11	3	77	see					
Machinist	- school	292	243											
	app.	9												
	Total	301	243	(2.1)	3.01	.91	2				(.91)	(2)		
Carpenter (construction tech.)	- school	3357	2804											
	app.	10	27											
	Total	3367	2831	(1.7)	3.01	1.31	37	34		1.20	(.11)	(3)	(8.8)	
Plumbers	- school	535	624											
	app.	22	16											
	Total	557	640	1.4	3.01	4.41	28	11		1.72	(2.69)	(17)	(154.5)	
Electrical & Electronic Technology	- school	976	694											
	app.	28	33											
	Total	1004	727	(3.1)	3.01	(.09)	(1)	66		9.08	9.17	67	101.52	
Sheet Metal, Air Conditioning & Refrigeration	- school	269	329											
	app.	8												
	Total	277	329	1.7	3.01	4.71	15	19		5.78	1.07	4	21.1	
Drafting	- school	86	253											
	app.													
	Total	86	253	11.4	3.01	14.41	36	25		9.88	(4.52)	(11)	(44.0)	
Welding	- school	621	641											
	app.	17												
	Total	638	641	.4	3.01	3.41	22	5		.78	(2.63)	(17)	(340.0)	
Printers	- school	519	435											
	app.	28	21											
	Total	547	456	(1.8)	3.01	1.21	6	22		4.82	3.61	16	72.7	
TOTAL		10387	8828				148	259						
SOUTH DAKOTA														
Auto Body Repairman	- school	3540	2943											
	app.	9	8											
	Total	3549	2951	(1.8)	3.18	1.38	41	30		1.02	(.36)	(11)	(36.7)	
Carpenters	- school	4691	3410					0						
	app.	19	18					15						
	Total	4710	3428	(3.1)	3.18	.08	3	15		.44	.36	12	80.0	
Drafting or Blueprint Reading	- school	101	215											
	app.													
	Total	101	215	7.8	3.18	10.98	24	15	12.3	6.68	(4.30)	(9)	(60.0)	1.1202
Electricians & Elec. App.(elec. technicians)	- school	1368	956											
	app.	17	8											
	Total	1385	964	(3.6)	3.18	(.42)	(4)	68	(42.0)	7.05	7.47	72	105.9	
Printers & Printers App.	- school	592	532					11						
	app.	38	40					12						
	Total	630	572	(1.1)	3.18	2.08	12	23	(11.2)	4.02	1.94	11	47.8	
Plumbers & Pipe Fitters (steam fitters)	- school	770	756					0						
	app.	13	13					40						
	Total	783	769	(.2)	3.18	2.98	23	40	(16.4)	5.20	2.22	17	42.5	(5.5034)
Sheet Metal & Welding	- school	589	815											
	app.	7	8											
	Total	596	823	3.3	3.18	6.48	53	39	(30.0)	4.74	(1.74)	(14)	(35.9)	(4.6296)
Electronics (electrical technicians)	- school	29	61											
	app.													
	Total	29	61	7.8	3.18	10.98	7	20		32.79	21.81	13	65.0	
TOTAL		11783	9783				159	250				91		

see North Dakota output available for one year only.

Appendix C
Incremental Supply and Demand in Occupations with Public and Private School Training
Table C-1

WISCONSIN		1 Total Employment 1950	2 Total Employment 1960	3 Average Annual Compound Growth Rate 1950-60 (equals 1960 percentage growth requirement)	4 Average Annual Rate of Replacement Required	5 Net Rate of Additions to Employment Required (col. 3 + col. 4)	6 Net Numerical Requirement 1961 (col. 5 × col. 2)	7 Average Annual Training Output 1960 through 1963	8 Av. An. Compound Growth Rate of Training Output 1960 through 1963	9 Av. An. Training Output 1960-1963 as Percent of Employment 1960 (col. 7 to col. 2)	10 Percentage of Employment: Exc. (Deficiency) of Output 1960-63 Over Net Additions Required (col. 9-col. 5)	11 Numerical Excess (Def.) of Output 1960-63 Over Net Additions Required (col. 7-col. 6)	12 Excess (Deficiency) As % of Av. Output 1960-63 (col. 11 to col. 7)	13 Ratio: Av. An. %△ Output to Av. An. %△ Additions Required (col. 8 to col. 5)
Air-conditioning & Refrigeration		1191	1236	0.4	3.03	3.43	42	14		1.13	(2.30)	(28)	(200.0)	
Automotive Technology (mechanics & body)	- school	15184	16344					54						
	app.	3814	1970											
	Total	18998	18314	(0.4)	3.03	2.63	481	54	13.4	.29	(2.34)	(427)	(790.7)	3.0990
Cabinetmaking & Carpentry	- school	20650	18933					11						
	app.	287	78					65						
	Total	20937	19011	(1.0)	3.03	2.03	395	76	1.3	.40	(1.63)	(319)	(419.7)	.3074
Data Processing		NA	NA					12						
Drafting :		3572	5316	4.1	3.03	7.13	379	75	1.2	1.41	(5.72)	(304)	(405.3)	.1683
Electrical Technicians (electricians)	- school	6407	6840					9						
	app.	257	221					109						
	Total	6664	7061	0.4	3.03	3.43	242	118	(6.2)	1.67	(1.76)	(124)	(105.1)	(1.8076)
Electronics (electrical & electronics)		232	1409	19.8	3.03	22.83	322	122	20.0	8.66	(14.17)	(200)	(163.9)	.8760
Engineering Technology		2262	3606	4.8	3.03	7.83	282	151	(4.1)	4.19	(3.64)	(131)	(86.8)	(.3234)
Machine Shop-Production Mach. Opr.	- school	17164	16023					206						
	app.	576	455											
	Total	17740	16480	(0.7)	3.03	2.33	384	206	4.7	1.25	(1.08)	(178)	(86.4)	2.0172
Mechanical Drafting & Design Technology								51	25.0					
Chemical Technology								2						
Printing (graphic arts)	- school							11						
	app.							43						
	Total	7146	8069	1.2	3.03	4.23	341	54	33.0	.67	(3.56)	(287)	(531.3)	7.8816
Welding	- school	10022	14233					112						
	app.	459	269					-						
	Total	10481	14502	3.3	3.03	6.33	920	112	5.6	.77	(5.56)	(808)	(721.4)	.8847
Industrial Technology Fluid Powers														
TOTAL		89223	95004					3788	1047			(2806)		

Appendix D
Incremental Demand in the Range of Craftsman and Operative Occupations
Table D-1

IOWA	1 1960 Employment	2 1950 Employment	3 Annual Growth Rate %	4 Ave. Annual Rate of Replacement Required	5 Net Rate of Additions to Employment Required	6 Net Numerical Requirement 1961	7 Public and Private Schools	8 Apprenticeship Program	9 MDTA Program
Food Products									
Bakers	1696	1580	0.7	3.19	3.89	66			
Beverages	267	311	(1.5)		1.69	5			
Confections	161	126	2.5		5.69	9			
Dairy Products	1619	1441	1.2		4.39	71			
Millers (grain-milled products)	2336	1335	5.8		8.99	210			
Meat Cutting & Meat Products	12875	11101	1.5		4.69	604			
Textile Mill Products									
Knit Goods	19	70	(12.2)	3.19	(9.01)	(2)			
Floorcovering (exec. hard surface)	4	27	-						
Yarn, Thread & Fabric Mills	101	94	0.7		3.89	4			
Fabricated Textile Products									
Furriers	42	126	(10.4)	3.19	(7.21)	(3)			
Hat & Capmakers (apparel & acc.)	791	991	(2.2)		.99	8			
Dressmaker (sewers & stitchers, mfg.)	2244	1654	3.1		6.29	141			
Lumber Products									
Cabinet Makers	795	852	(0.7)	3.19	2.49	20		x	
Upholsterers	625	627	(0.1)		3.09	19			x
Printing & Publishing									
Compositors & Typesetters	2817	2563	0.9	3.19	4.09	115		x	
Electrotypers & Stereotypers	108	169	(4.4)		(1.21)	(1)		x	
Photoengravers & Lithographers	231	159	3.8		6.99	16			
Pressmen & Plate Printers	1160	796	3.8		6.99	81	x	x	
Bookbinders	391	351	1.1		4.29	17		x	
Newspaper Publishing (op.)	243	93	10.1		13.29	32			
Printing & Publishing excl. Newspapers (op.)	598	607	(0.1)		3.09	18			
Chemicals									
Paint & Varnish (mixer-blender)	148	124	1.8	3.19	4.99	7			
Plastics, Related Synthetics & Processing Chemicals	114	374	(11.2)		(8.01)	(9)	x		
Leather & Leather Products									
Leather Mfg.	-	22	-						
Boot & Shoemaker	101	86	1.6		4.79	5			
Shoemaker & Repairman (excl. factory)	574	805	(3.3)		(.11)	(1)			
Stone, Clay & Glass Products									
Glassworker	32	86	(9.4)	3.19	(6.21)	(2)			
Pottery Maker	8	52							
Stonecutter & Stonecarver	48	77	(4.6)		(1.41)	(1)			
Metal Working									
Engravers	56	43	2.7	3.19	5.89	3			
Forgeman & Hammerman	60	103	(5.3)	3.19	(2.11)	(1)			
Machinist	5082	6430	(2.3)		.89	45	x	x	x
Heat Treaters, Annealers, & Temperers	213	202	0.5		3.69	8			
Tool & Die Maker	1441	1167	2.1		5.29	121	x	x	
Job Setters, Metal	300	132	8.6		11.79	35			
Tinsmith, Coppersmith, Sheet Metal	1292	1524	(1.6)		1.59	21		x	
Molders, Metal	681	951	(3.3)		(0.11)	(1)			
Pattern & Model Makers, except paper	317	429	(3.0)		0.19	1		x	
Structural Steel Workers	609	491	2.2		5.39	33		x	
Filers, Grinders & Polishers, metal	1317	1254	0.5		3.69	49			
Welders & Flame Cutter	6100	4471	3.2		6.39	390			x
Furnacemen, Smelters & Pourers	324	528	(4.8)		(1.61)	(5)			
Blacksmith	413	1111	(9.4)		(6.21)	(26)			
Rollers & Roll Hands, metal	25	62	(8.7)		(5.51)	(1)			
Boilermaker	137	359	(9.2)		(6.01)	(8)		x	
Transportation Equipment									
Motor Vehicle & equip.	297	273	0.5	3.19	3.69	11			
Aircraft & parts	24	91	(12.5)		(9.31)	(2)			
Ships & Boats	36	3	28.1		31.29	11			
Railroad & misc.	31	58	(6.1)		(2.91)	(1)			
Electrician & Electrical Equipment									
Electrician	3770	4414	(1.6)	3.19	1.59	60		x	
Other Electrical Workers	3555	1329	10.3		13.49	480	x		
Construction									
Brick & Stone Mason	2039	2357	(1.4)	3.19	1.79	36	x	x	
Carpenter	12937	16834	(2.6)		.59	76		x	
Cement Mason & Finisher	308	315	(0.2)		2.99	9			
Plumbing, Pipesetter, Steamfitter	4146	4037	0.2		3.39	141		x	
Roofers & Slaters	555	679	(2.0)		1.19	7		x	
Miscellaneous									
Stationary Engineer	2809	2500	1.2	3.19	4.39	123			
Craneman, Derrickman, Hoistmen	1027	827	2.2		5.39	55			
Glaziers	218	201	0.8		3.99	9		x	
Millwrights	499	600	(1.8)		1.39	7		x	
Air Conditioning, Heating, Refrigeration	844	667	2.4	3.19	5.59	47			
Mech. & Repairmen, Rail & Carshop	500	638	(2.4)		.79	4			
Mech. & Repairmen, Airplane	192	138	3.4		6.59	13			
Mech. & Repairmen, Motor Vehicle	12302	13310	(0.8)		2.39	294		x	x
Radio & T.V. Repairmen	1622	826	7.0		10.19	165			
Opticians, Lens Grinders & Polishers	213	216	(0.2)		2.99	6			
Data Processing (operative & maintenance)							x		x
Drafting	1870	989	6.4		9.59	179	x	x	x
Selected Occupations, State Total -	98299	97258	0.1		3.29	3823			

Appendix D

Incremental Demand in the Range of Craftsman and Operative Occupations

Table D-1

MINNESOTA	1 1960 Employment	2 1950 Employment	3 Annual Growth Rate %	4 Ave. Annual Rate of Replacement Required	5 Net Rate of Additions to Employment Required	6 Net Numerical Requirement 1961	7 Public and Private Schools	8 Apprenticeship Program	9 MDTA Program
Food Products									
Bakers	3151	2862	1.0	3.16	4.16	131	x	x	
Beverages	1349	1197	1.2		4.36	59			
Confections	356	300	1.7		4.86	17			
Dairy Products	2952	3165	(0.7)		2.46	73			
Millers (grain-milled products)	1358	1818	(2.9)		.26	4			
Meat Cutting & Meat Products	9383	9095	0.3		3.46	325		x	
Textile Mill Products									
Knit Goods	423	87	17.1	3.16	20.26	86			
Floorcovering (exec. hard surface)	13	123							
Yarn, Thread & Fabric Mills	128	435	(11.5)		(8.34)	(11)			
Fabricated Textile Products									
Furriers	61	268	(13.8)	3.16	(10.64)	(6)			
Hat & Capmakers (apparel & acc.)	2296	3037	(2.8)		.36	8			
Dressmaker (sewers & stitchers, mfg.)	2980	4312	(3.6)		(.44)	(13)			
Lumber Products									
Cabinet Makers	1337	1562	(1.5)	3.16	1.66	22	x	x	
Upholsterers	877	904	(0.3)		2.86	25			
Printing & Publishing									
Compositors & Typesetters	3842	3674	0.4	3.16	3.56	137		x	
Electrotypers & Stereotypers	188	241	(2.4)		.76	1		x	
Photoengravers & Lithographers	564	600	(0.6)		2.56	14		x	
Pressmen & Plate Printers	1639	1139	3.7		6.86	112	x	x	
Bookbinders	582	761	(2.6)		.56	3		x	
Newspaper Publishing (op.)	197	127	4.5		7.66	15			
Printing & Publishing excl. Newspapers (op.)	1957	1253	4.6		7.76	152			
Chemicals									
Paint & Varnish (mixer-blender)	195	162	0.7	3.16	3.86	8			
Plastics, Related Synthetics & Processing Chemicals	693	567	2.1		5.26	36			
Leather & Leather Products									
Leather Mfg.	183	235	(2.5)	3.16	.66	1			
Boot & Shoemaker	416	511	(2.0)		1.16	5			
Shoemaker & Repairmen (excl. factory)	588	1053	(5.6)		(2.44)	(14)			
Stone, Clay & Glass Products									
Glassworker	74	148	(6.7)	3.16	(3.54)	(3)		x	
Pottery Maker	87	256	(10.2)		(7.04)	(6)			
Stonecutter & Stonecarver	178	311	(5.4)		(2.24)	(4)			
Metal Working									
Engravers	156	161	(0.3)	3.16	2.86	4		x	
Forgemen & Hammermen	105	98	0.7	3.16	3.86	4			
Machinist	8005	7950	0.1		3.26	261	x	x	
Heat Treaters, Annealers, & Temperers	140	87	4.9		8.06	11			
Tool & Die Maker	2031	1383	3.9		7.06	143	x	x	
Job Setters, Metal	200	91	8.2		11.36	23			
Tinsmith, Coppersmith, Sheet Metal	2501	2678	(0.7)		2.46	62	x	x	x
Molders, Metal	618	757	(2.0)		1.16	7			
Pattern & Model Makers, except paper	408	439	(0.7)		2.46	10		x	
Structural Steel Workers	633	595	0.6		3.76	24	x	x	
Filers, Grinders & Polishers, metal	1650	1117	4.0		7.16	118			
Welders & Flame Cutter	6061	4360	3.3		6.46	392	x		x
Furnacemen, Smelters & Pourers	337	431	(2.4)		0.76	3			
Blacksmith	578	1404	(8.5)		(5.34)	(31)			
Rollers & Roll Hands, metal	92	81	1.3	3.16	4.46	4			
Boilermaker	241	655	(9.5)		(6.34)	(15)		x	
Transportation Equipment									
Motor Vehicle & equip.	411	636	(4.3)	3.16	(1.14)	(5)			
Aircraft & parts	134	45	11.5		14.66	20			
Ships & Boats	355	61	19.3		22.46	80			
Railroad & misc.	44	75	(5.2)		(2.04)	(1)			
Electrician & Electrical Equipment									
Electrician	5426	5355	0.1	3.16	3.26	177	x	x	
Other Electrical Workers	2341	2335	0.1		3.26	76	x		
Construction									
Brick & Stone Mason	3130	2696	1.5	3.16	4.66	146		x	
Carpenter	15487	18379	(1.7)		1.46	226	x	x	
Cement Mason & Finisher	675	515	2.8		5.96	40		x	
Plumbing, Pipesetter, Steamfitter	5312	4660	1.3		4.46	237	x	x	
Roofers & Slaters	639	844	(2.9)		.26	2		x	
Miscellaneous									
Stationary Engineer	5282	4838	0.9	3.16	4.06	214		x	
Craneman, Derrickmen, Hoistmen	1349	1118	1.9		5.06	68			
Glaziers	273	221	2.1		5.26	14		x	
Millwrights	965	1044	(0.8)		2.36	23		x	
Air Conditioning, Heating, Refrigeration	997	791	2.4		5.56	55	x		
Mech. & Repairmen, Rail & Carshop	875	1414	(4.7)		(1.54)	(13)			
Mech. & Repairmen, Airplane	1939	1067	6.2		9.36	181	x		
Mech. & Repairmen, Motor Vehicle	13122	14732	(1.2)		1.96	257	x	x	x
Radio & T.V. Repairmen	1725	1016	5.4		8.56	148	x		x
Opticians, Lens Grinders & Polishers	488	425	1.4		4.56	22			
Data Processing (operative & maintenance)									
Drafting	3594	1905	6.5		9.66	351	x	x	
Selected Occupations, State Total -	120366	126675	(0.1)		3.06	4515			

Appendix B
Incremental Demand in the Range of Craftsmen and Operative Occupations
Table D-1

NEBRASKA	1 1960 Employment	2 1950 Employment	3 Annual Growth Rate %	4 Ave. Annual Rate of Replacement Required	5 Net Rate of Additions to Employment Required	6 Net Numerical Requirement 1961	7 Public and Private Schools	8 Apprenticeship Program	9 MDTA Program
Food Products									
Bakers	1167	1156	0.1	3.33	3.43	40			
Beverages	259	289	(1.1)		2.23	6			
Confections	391	69	18.9		22.23	87			
Dairy Products	585	552	0.6		3.93	23			
Millers (grain-milled products)	647	698	(0.8)		2.53	16			
Meat Cutting & Meat Products	7291	4658	4.6		7.93	578			
Textile Mill Products									
Knit Goods	4	2	7.2	3.33	10.53	-			
Floorcovering (exec. hard surface)	4	15	(12.6)		(9.07)	(-)			
Yarn, Thread & Fabric Mills	12	30	(8.7)		(5.37)	(1)			
Fabricated Textile Products									
Furriers	12	53	(13.8)	3.33	(10.47)	(1)			
Hat & Capmakers (apparel & acc.)	406	159	9.8		13.13	53			
Dressmaker (sewers & stitchers, mfg.)	879	461	6.7		10.03	88			
Lumber Products									
Cabinet Makers	352	392	(1.1)	3.33	2.23	8	x	x	
Upholsterers	287	394	(3.1)		.23	1			
Printing & Publishing									
Compositors & Typesetters	1323	1324	(0.1)	3.33	3.23	43		x	
Electrotypers & Stereotypers	45	64	(3.5)		(.17)	(-)		x	
Photoengravers & Lithographers	83	120	(3.6)		(.27)	(-)		x	
Pressmen & Plate Printers	450	266	5.4		8.73	39	x	x	
Bookbinders	176	151	1.5		4.83	9		x	
Newspaper Publishing (op.)	78	37	7.8		11.13	9			
Printing & Publishing excl. Newspapers (op.)	361	242	4.1		7.43	27			
Chemicals									
Paint & Varnish (mixer-blender)	5	8	(4.6)	3.33	(1.27)	(-)			
Plastics, Related Synthetics & Processing Chemicals	118	67	5.8		9.13	11			
Leather & Leather Products									
Leather Mfg.	-	5	-						
Boot & Shoemaker	12	66							
Shoemaker & Repairmen (excl. factory)	297	523	(5.5)		(2.17)	(6)			
Stone, Clay & Glass Products									
Glassworker	-	43	-	3.33					
Pottery Maker	4	22							
Stonecutter & Stonecarver	20	74	(12.3)		(8.97)	(2)			
Metal Working									
Engravers	46	37	2.2	3.33	5.53	3			
Forgemen & Hammermen	-	17	-			-			
Machinist	1879	1860	0.1		3.43	64	x	x	
Heat Treaters, Annealers, & Temperers	28	8	13.3	3.33	16.63	5			
Tool & Die Maker	308	107	11.2		14.53	45		x	
Job Setters, Metal	44	14	12.1		15.43	7			
Tinsmith, Coppersmith, Sheet Metal	766	757	0.1		3.43	26	x		
Welders, Metal	96	112	(1.5)		1.83	2			
Pattern & Model Makers, except paper	27	126	(14.3)		(10.97)	(3)		x	
Structural Steel Workers	264	212	2.2		5.53	15			
Filers, Grinders & Polishers, metal	209	108	6.8		10.13	21			
Welders & Flame Cutter	2109	1587	4.3		7.63	161	x		
Furnacemen, Smelters & Pourers	85	76	1.1		4.43	4			
Blacksmith	267	698	(9.2)		(5.57)	(16)			
Rollers & Roll Hands, metal	12	12	-	3.33	-	-			
Boilermaker	110	225	(6.9)		(3.57)	(4)		x	
Transportation Equipment									
Motor Vehicle & equip.	80	86	(0.7)	3.33	2.63	2			
Aircraft & parts	-	11	-						
Ships & Boats	13	5	10.1		13.43	2			
Railroad & misc.	285	22	25.0		28.33	58			
Electrician & Electrical Equipment									
Electrician	1074	2351	(2.2)	3.33	1.13	21	x	x	
Other Electrical Workers	2043	314	20.6		23.93	489			
Construction									
Brick & Stone Mason	1393	1318	0.6	3.33	3.93	55		x	
Carpenter	6571	8867	(2.9)		.43	28		x	
Cement Mason & Finisher	316	252	2.3		5.63	18		x	
Plumbing, Pipesetter, Steamfitter	1998	2042	(0.2)		3.13	63		x	
Roofers & Slaters	384	386	1.7		5.03	19		x	
Miscellaneous									
Stationary Engineer	1935	1549	2.5	3.33	5.63	109		x	
Craftsmen, Derrickmen, Hoistmen	369	256	3.7		7.03	26			
Glaziers	107	73	3.9		7.23	8			
Millwrights	131	131	0.1		3.43	4			
Air Conditioning, Heating, Refrigeration	457	265	5.6	3.33	8.93	41	x		
Mech. & Repairmen, Rail & Carshop	431	503	(1.5)		1.83	8			
Mech. & Repairmen, Airplane	190	156	2.0		5.33	10			
Mech. & Repairmen, Motor Vehicle	6329	7147	(1.2)		2.13	135	x		x
Radio & T.V. Repairmen	746	429	5.7		9.03	67	x		x
Opticians, Lens Grinders & Polishers	177	136	2.7		6.03	11			
Data Processing (operative & maintenance)	802	380	4.8		8.13	65	x		x
Drafting									
Selected Occupations, State Total -	48069	44435	0.8		4.13	2597			

Appendix D

Incremental Demand in the Range of Craftsman and Operative Occupations

Table D-1

WISCONSIN	1 1960 Employment	2 1950 Employment	3 Annual Growth Rate %	4 Ave. Annual Rate of Replacement Required	5 Net Rate of Additions to Employment Required	6 Net Numerical Requirement 1961	7 Public and Private Schools	8 Apprenticeship Program	9 MDTA Program
Food Products									
Bakers	3728	3563	0.5	3.03	3.53	132		x	x
Beverages	2674	3404	(2.4)		.63	17			
Confections	422	391	0.8		3.83	16			
Dairy Products	6592	7218	(0.9)		2.13	140			
Millers (grain-milled products)	1762	1312	3.0		6.03	106			
Meat Cutting & Meat Products	8807	7181	2.1		5.13	452		x	
Textile Mill Products									
Knit Goods	1073	142	22.4	3.03	25.43	273			
Floorcovering (exec. hard surface)	115	336	(10.2)		(7.17)	(8)			
Yarn, Thread & Fabric Mills	482	903	(6.1)		(3.07)	(15)			
Fabricated Textile Products									
Furriers	50	190	(12.5)	3.03	(9.47)	(5)			
Hat & Capmakers (apparel & acc.)	1666	2882	(4.3)		(1.27)	(21)			
Dressmaker (sewers & stitchers, mfg.)	7590	7252	0.5		3.53	268			
Lumber Products									
Cabinet Makers	1791	1902	(0.6)	3.03	2.43	44			
Upholsterers	1238	1684	(3.0)		.03	-			
Printing & Publishing									
Compositors & Typesetters	4378	4043	0.8	3.03	3.83	168	x	x	
Electrotypers & Stereotypers	167	267	(4.6)		(1.57)	(3)		x	
Photoengravers & Lithographers	933	860	0.8		3.83	36			
Pressmen & Plate Printers	1822	1088	5.3		8.33	152		x	
Bookbinders	769	888	(1.4)		1.63	13		x	
Newspaper Publishing (op.)	364	154	9.0		12.03	44			
Printing & Publishing excl. Newspapers (op.)	2567	1968	2.7		5.73	147	x		
Chemicals									
Paint & Varnish (mixer-blender)	308	303	0.2	3.03	3.23	10	x		
Plastics, Related Synthetics & Processing Chemicals	1047	638	5.1		8.13	85			
Leather & Leather Products									
Leather Mfg.	1971	3021	(4.2)	3.03	(1.17)	(23)			
Boot & Shoemaker	4864	6279	(2.5)		.53	26			
Shoemaker & Repairmen (excl. factory)	711	1286	(5.8)		(2.77)	(20)			
Stone, Clay & Glass Products									
Glassworker	156	231	(3.9)	3.03	(.87)	(1)		x	
Pottery Maker	229	830	(12.1)		(9.07)	(21)			
Stonecutter & Stonecarver	299	470	(4.4)		(1.37)	(4)			
Metal Working									
Engravers	231	194	1.8	3.03	4.83	11			
Forgemen & Hammermen	482	584	(1.9)	3.03	1.13	5			
Machinist	16025	17164	(0.7)		2.33	373	x	x	
Heat Treaters, Annealers, & Temperers	876	755	1.5		4.53	40			
Tool & Die Maker	5802	5174	1.2		4.23	245		x	
Job Setters, Metal	1599	762	7.7		10.73	172			
Tinsmith, Coppersmith, Sheet Metal	3419	3812	(1.1)		1.93	66		x	x
Molders, Metal	2516	3002	(1.8)		1.23	31			
Pattern & Model Makers, except paper	1645	1594	0.3		3.33	55		x	
Structural Steel Workers	1234	980	2.4		5.43	67			
Filers, Grinders & Polishers, metal	5907	5215	1.3		4.33	256			
Welders & Flame Cutter	14233	10022	3.6		6.63	944	x		
Furnacemen, Smelters & Pourers	1236	1325	(0.7)		2.33	29			
Blacksmith	487	1271	(9.1)		(6.07)	(30)			
Rollers & Roll Hands, metal	279	265	0.5		3.53	10			
Boilermaker	279	546	(6.5)		(3.47)	(10)		x	
Transportation Equipment									
Motor Vehicle & equip.	7265	6941	0.5	3.03	3.53	256			
Aircraft & parts	246	55	16.2		19.23	47			
Ships & Boats	491	410	1.8		4.83	24			
Railroad & misc.	374	721	(6.4)		(3.37)	(13)			
Electrician & Electrical Equipment									
Electrician	6840	6407	0.7	3.03	3.73	255	x	x	
Other Electrical Workers	9734	6918	3.5		6.53	636	x		
Construction									
Brick & Stone Mason	4269	4150	0.3	3.03	3.33	142		x	
Carpenter	17142	18748	(0.9)		2.13	365	x	x	
Cement Mason & Finisher	669	533	2.3		5.23	35			
Plumbing, Pipesetter, Steamfitter	5893	5337	1.0		4.03	237		x	
Roofers & Slaters	934	956	(0.4)		2.63	25			
Miscellaneous									
Stationary Engineer	5750	4375	2.8	3.03	5.83	335			
Cranemen, Derrickmen, Hoistmen	3301	3022	0.9		3.93	130			
Glaziers	441	321	3.2		6.23	27			
Millwrights	2087	2146	(0.3)		2.73	57			
Air Conditioning, Heating, Refrigeration	1236	1191	0.4	3.03	3.43	42	x		
Mech. & Repairmen, Rail & Carshop	775	904	(1.5)		1.53	12			
Mech. & Repairmen, Airplane	316	206	4.4		7.43	23			
Mech. & Repairmen, Motor Vehicle	16344	15184	0.8		3.83	626	x		x
Radio & T.V. Repairmen	2219	1122	7.1		10.13	225			
Opticians, Lens Grinders & Polishers	361	321	1.2		4.23	15			
Data Processing (operative & maintenance)									
Drafting	5316	3572	4.0		7.03	374	x	x	
Selected Occupations, State Total -	206828	196891	0.5		3.53	8147			

APPENDIX E, Table E-1

THE CHANGING STRUCTURE OF EMPLOYMENT

Industry	IOWA 1950 No. (000)	IOWA 1950 Pct.	IOWA 1960 No. (000)	IOWA 1960 Pct.	IOWA % Change* 1950--60	MINNESOTA 1950 No. (000)	MINNESOTA 1950 Pct.	MINNESOTA 1960 No. (000)	MINNESOTA 1960 Pct.	MINNESOTA % Change* 1950--60
Agriculture	286	28.5	211	20.7	(26.30)	261	22.8	178	14.4	(31.58)
Mining	3	.3	2	.2	(26.04)	16	1.4	18	1.5	11.04
Construction	55	5.5	53	5.2	(3.59)	63	5.5	68	5.5	7.61
Manufacturing	152	15.2	190	18.6	24.78	187	16.3	240	19.5	22.20
Transportation, Communication, & Utilities	69	6.9	64	6.3	(7.24)	95	8.3	90	7.3	(5.68)
Trade	192	19.2	199	19.5	3.23	228	19.9	241	19.5	5.70
Finance, Insurance, & Real Estate	28	2.8	37	3.6	32.27	37	3.2	50	4.1	34.88
Business & Repair Service	26	2.6	21	2.1	(21.78)	32	2.8	28	2.3	(12.78)
Personal Services	44	4.4	49	4.8	10.13	51	4.5	61	4.9	17.92
Entertainment & Recreation	8	.8	7	.7	(20.72)	10	.9	9	.7	(10.78)
Professional & Related Services	88	8.8	130	12.7	48.05	107	9.4	165	13.5	54.68
Public Administration	30	3.0	33	3.2	8.50	40	3.5	47	3.8	18.38
Industry Not Reported	20	2.0	25	2.4	--	15	1.3	37	3.0	--
TOTAL	1,002	100.0	1,019	100.0	1.68	1,144	100.0	1,233	100.0	7.83

Industry	NEBRASKA 1950 No. (000)	NEBRASKA 1950 Pct.	NEBRASKA 1960 No. (000)	NEBRASKA 1960 Pct.	NEBRASKA % Change* 1950--60	NORTH DAKOTA 1950 No. (000)	NORTH DAKOTA 1950 Pct.	NORTH DAKOTA 1960 No. (000)	NORTH DAKOTA 1960 Pct.	NORTH DAKOTA % Change* 1950--60
Agriculture	152	29.7	111	21.1	(26.52)	99	44.2	70	32.7	(29.98)
Mining	1	.2	2	.4	75.39	1	.4	2	.9	166.79
Construction	33	6.4	32	6.1	(3.39)	11	4.9	11	5.2	1.51
Manufacturing	47	9.2	64	12.2	36.70	7	3.1	8	3.7	20.20
Transportation, Communication, & Utilities	47	9.2	44	8.4	(5.89)	16	7.1	14	6.6	(12.56)
Trade	97	19.0	103	19.6	5.31	40	17.8	43	20.1	8.58
Finance, Insurance, & Real Estate	17	3.3	22	4.2	27.20	4	1.8	7	3.3	61.28
Business & Repair Service	14	2.7	12	2.3	(13.68)	6	2.7	4	1.9	(37.19)
Personal Services	23	4.5	28	5.3	20.34	8	3.6	11	5.2	(42.37)
Entertainment & Recreation	5	1.0	4	.8	(15.44)	2	.9	1	.5	(17.78)
Professional & Related Services	44	8.6	66	12.5	52.50	19	8.5	28	13.1	(50.98)
Public Administration	20	3.9	24	4.6	17.54	8	3.6	10	4.7	(23.76)
Industry Not Reported	12	2.3	14	2.6	--	4	1.7	4	1.9	--
TOTAL	512	100.0	526	100.0	2.79	224	100.0	214	100.0	(4.42)

*Percentage changes in employment are based on un-rounded employment figures.

Industry	SOUTH DAKOTA 1950 No. (000)	SOUTH DAKOTA 1950 Pct.	SOUTH DAKOTA 1960 No. (000)	SOUTH DAKOTA 1960 Pct.	SOUTH DAKOTA % Change* 1950--60	WISCONSIN 1950 No. (000)	WISCONSIN 1950 Pct.	WISCONSIN 1960 No. (000)	WISCONSIN 1960 Pct.	WISCONSIN % Change* 1950--60
Agriculture	98	40.5	73	30.7	(25.87)	254	18.8	169	11.5	(33.47)
Mining	3	1.2	2	.9	(13.22)	3	.2	3	.2	1.09
Construction	15	6.2	15	6.3	1.09	67	5.0	72	4.9	7.46
Manufacturing	12	4.9	16	6.7	34.30	417	30.8	484	32.9	16.07
Transportation, Communication, & Utilities	13	5.4	12	5.1	(6.51)	86	6.4	82	5.6	(4.65)
Trade	43	17.8	45	18.9	4.60	232	17.1	258	17.6	11.21
Finance, Insurance, & Real Estate	5	2.0	7	2.9	34.54	33	2.4	43	3.1	34.34
Business & Repair Service	7	2.9	5	2.1	(28.77)	30	2.2	29	2.0	(3.33)
Personal Services	10	4.1	13	5.5	29.91	56	4.1	60	4.1	7.14
Entertainment & Recreation	2	.8	2	.8	(1.04)	10	.7	9	.6	(10.00)
Professional & Related Services	21	8.7	31	13.0	44.28	106	8.0	163	11.1	54.23
Public Administration	10	4.1	11	4.6	17.53	41	3.0	52	3.5	26.83
Industry Not Reported	4	1.6	6	2.5	--	18	1.3	43	2.9	28.89
TOTAL	242	100.0	238	100.0	(1.67)	1,333	100.0	1,460	100.0	8.41

Industry	SIX-STATE REGION 1950 No. (000)	SIX-STATE REGION 1950 Pct.	SIX-STATE REGION 1960 No. (000)	SIX-STATE REGION 1960 Pct.	SIX-STATE REGION % Change* 1950--60	UNITED STATES 1950 No. (000)	UNITED STATES 1950 Pct.	UNITED STATES 1960 No. (000)	UNITED STATES 1960 Pct.	UNITED STATES % Change* 1950--60
Agriculture	1,159	25.7	812	17.3	(29.39)	7,034	12.5	4,350	6.7	(38.16)
Mining	27	.6	29	.6	7.41	931	1.6	654	1.0	(29.75)
Construction	244	5.5	251	5.3	2.87	3,458	6.1	3,816	5.9	10.35
Manufacturing	822	18.4	1,002	21.3	21.90	14,685	26.0	17,513	27.1	19.25
Transportation, Communication, & Utilities	326	7.3	306	6.5	(6.14)	4,458	7.9	4,458	6.9	0.19
Trade	832	18.6	889	18.9	6.85	10,507	18.6	11,793	18.2	12.23
Finance, Insurance, & Real Estate	124	2.8	158	3.4	27.42	1,920	3.4	2,695	4.2	40.37
Business & Repair Service	113	2.6	99	2.1	(33.91)	1,388	2.3	1,611	2.5	23.18
Personal Services	192	4.3	222	4.7	15.43	3,445	6.1	3,859	6.0	11.36
Entertainment & Recreation	28	.6	32	.7	14.29	493	.9	583	.8	1.91
Professional & Related Services	387	8.7	584	12.6	50.98	4,827	8.6	7,578	11.7	57.00
Public Administration	149	3.3	177	3.8	18.79	2,515	4.5	3,203	5.0	27.38
Industry Not Reported	73	1.6	129	2.8	76.71	843	1.5	2,608	4.0	--
TOTAL	4,479	100.0	4,699	100.0	4.91	56,435	100.0	64,639	100.0	14.54

*Percentage changes in employment are based on un-rounded employment figures.

Appendix E, Table E-2

U. S. MANUFACTURING EMPLOYMENT BY OCCUPATION

1950--1960

	1950* (Thousands)	1960* (Thousands)	Change 1950-1960 (Thousands)	% Change 1950-1960
Professional, Technical, etc.	701	1,323	622	88.9
Managers, Officials, etc. (excl. farm)	691	892	201	29.0
Clerical, etc.	1,585	2,097	512	32.3
Sales, etc.	428	658	230	53.7
Craftsmen, etc.	2,822	3,434	612	21.6
Operatives	6,617	7,487	870	13.0
Service	273	287	14	5.1
Laborers (except farm & mine)	1,269	1,038	-231	-18.2
Farmers, etc.	--	--	--	--
Occupations Not Reported	68	313	244	--
TOTAL	14,453	17,530	3,077	21.3

* Figures may not add to total due to rounding.

Appendix E Table-3

Employment by Occupation 1950-1960

Occupation	IOWA 1950 No. (000)	IOWA 1950 Pct.	IOWA 1960 No. (000)	IOWA 1960 Pct.	IOWA % Change* 1950--60	MINNESOTA 1950 No. (000)	MINNESOTA 1950 Pct.	MINNESOTA 1960 No. (000)	MINNESOTA 1960 Pct.	MINNESOTA % Change* 1950--60	NEBRASKA 1950 No. (000)	NEBRASKA 1950 Pct.	NEBRASKA 1960 No. (000)	NEBRASKA 1960 Pct.	NEBRASKA % Change* 1950--60	NORTH DAKOTA 1950 No. (000)	NORTH DAKOTA 1950 Pct.	NORTH DAKOTA 1960 No. (000)	NORTH DAKOTA 1960 Pct.	NORTH DAKOTA % Change* 1950--60
Professional, Technical & Kindred Workers	77	7.7	99	9.7	28.6	99	8.7	141	11.4	42.4	41	8.0	52	9.9	26.8	16	7.2	21	9.8	31.3
Managers, Officials, & Proprietors (except farm)	84	8.4	79	7.7	(6.0)	100	8.8	108	8.4	3.0	44	8.6	48	9.1	9.1	18	8.1	20	9.3	11.1
Clerical & Kindred Workers	58	9.8	123	12.1	25.5	137	12.0	171	13.9	24.8	53	10.4	67	12.7	26.4	16	7.2	21	9.8	31.3
Sales Workers	70	7.0	74	7.2	5.7	80	7.0	91	7.4	13.8	35	6.8	36	6.9	2.9	13	5.8	13	6.1	--
Craftsmen, Foremen, & Kindred Workers	113	11.2	114	11.2	.9	142	12.4	149	12.1	4.9	56	10.9	57	10.8	1.8	19	8.5	19	8.9	--
Operatives & Kindred Workers	130	13.0	146	14.3	12.3	158	13.8	175	14.2	10.8	51	10.0	62	11.8	21.6	14	6.3	18	7.5	14.3
Service Workers	182	8.1	108	10.6	31.7	103	9.0	136	11.0	32.0	42	8.2	59	11.2	40.5	17	7.6	25	11.7	47.1
Laborers (except farm & mine)	50	5.0	41	4.0	(18.0)	55	4.8	47	3.8	(14.6)	29	5.7	21	4.0	(27.6)	9	4.0	6	2.8	(33.3)
Farmers, Farm Managers, Laborers, & Foremen	282	28.1	205	20.1	(27.3)	256	22.4	174	14.1	(3.2)	150	29.4	109	20.7	(27.3)	98	44.0	69	32.2	(29.6)
Occupation Not Reported	17	1.7	30	3.0	76.5	13	1.1	46	3.7	253.8	10	2.0	15	2.9	50.0	3	1.3	4	1.9	33.3
TOTAL	1003	100.0	1019	100.0	1.60	1143	100.0	1233	100.0	7.87	511	100.0	536	100.0	2.94	223	100.0	214	100.0	(4.04)

*Percentage changes in employment are based on un-rounded employment figures.

Occupation	SOUTH DAKOTA 1950 No. (000)	SOUTH DAKOTA 1950 Pct.	SOUTH DAKOTA 1960 No. (000)	SOUTH DAKOTA 1960 Pct.	SOUTH DAKOTA % Change* 1950--60	WISCONSIN 1950 No. (000)	WISCONSIN 1950 Pct.	WISCONSIN 1960 No. (000)	WISCONSIN 1960 Pct.	WISCONSIN % Change* 1950--60	SIX-STATE REGION 1950 No. (000)	SIX-STATE REGION 1950 Pct.	SIX-STATE REGION 1960 No. (000)	SIX-STATE REGION 1960 Pct.	SIX-STATE REGION % Change* 1950--60	UNITED STATES 1950 No. (000)	UNITED STATES 1950 Pct.	UNITED STATES 1960 No. (000)	UNITED STATES 1960 Pct.	UNITED STATES % Change 1950--60
Professional, Technical & Kindred Workers	19	7.9	23	9.7	21.3	108	8.0	147	10.9	36.1	368	8.0	483	10.3	34.2	4921	8.7	7232	11.2	47.1
Managers, Officials, & Proprietors (except farm)	21	8.7	21	8.8	--	187	7.9	185	7.1	(1.9)	374	8.4	376	8.0	.5	5037	8.9	5410	8.4	7.4
Clerical & Kindred Workers	18	7.4	22	9.3	22.2	146	10.8	189	12.9	29.5	468	10.5	593	12.6	26.7	6954	12.3	9367	14.4	33.8
Sales Workers	14	5.8	15	6.3	7.1	99	6.6	103	7.0	14.4	302	6.7	332	7.1	9.9	3907	6.9	4639	7.2	18.7
Craftsmen, Foremen, & Kindred Workers	22	9.1	22	9.2	--	186	13.7	208	13.7	8.1	538	12.0	562	12.0	4.5	7821	13.9	8741	13.5	11.8
Operatives & Kindred Workers	19	7.9	22	9.2	15.8	271	20.0	300	20.4	10.7	643	14.4	721	15.3	12.1	11180	19.8	11898	18.4	6.4
Service Workers	18	7.4	27	11.3	50.0	114	8.4	147	10.0	28.9	376	8.4	502	10.7	33.5	5708	10.1	7171	11.1	25.6
Laborers (except farm & mine)	10	4.1	8	3.4	(20.0)	68	5.0	61	4.2	(10.3)	221	4.9	184	3.9	(16.8)	3436	6.2	3107	4.8	(9.6)
Farmers, Farm Managers, Laborers, & Foremen	97	40.1	71	29.8	(26.8)	249	18.4	162	11.0	(34.9)	1132	25.3	799	16.8	(30.2)	6728	11.9	3930	6.1	(41.3)
Occupation Not Reported	6	1.6	7	3.0	75.0	16	1.2	54	3.7	37.5	63	1.4	156	3.3	147.6	743	1.3	2184	4.9	328.5
TOTAL	242	100.0	238	100.0	(1.65)	1355	100.0	1449	100.0	8.41	4477	100.0	4699	100.0	4.96	56435	100.0	64639	100.0	14.54

*Percentage changes in employment are based on un-rounded employment figures.

Appendix E Table E-4

Employment by Place of Residence of the Employed 1950 & 1960

Size of Place of Residence		IOWA 1950	IOWA 1960	IOWA % Change 1950-60	MINNESOTA 1950	MINNESOTA 1960	MINNESOTA % Change 1950-60	NEBRASKA 1950	NEBRASKA 1960	NEBRASKA % Change 1950-60	NORTH DAKOTA 1950	NORTH DAKOTA 1960	NORTH DAKOTA % Change 1950-60
Rural	Total	494073	452538	(8.4)	485686	427174	(12.1)	259589	225991	(12.9)	158943	132316	(16.8)
	Manufacturing	30739	49180	60.0	36263	50211	38.5	7169	13053	82.1	2006	2464	22.8
2,500 to 9,999	Total	126410	144636	14.4	128036	147792	15.4	52402	57239	9.2	17439	15650	(10.3)
	Manufacturing	16328	22993	40.8	23361	29260	25.3	5460	7039	28.9	923	833	(9.8)
10,000 to 49,999	Total	131254	151136	15.1	123399	253536	105.5	47495	59234	24.7	47160	65316	38.5
	Manufacturing	35226	41585	18.1	26255	62639	138.6	5421	8681	60.1	3590	4538	26.4
50,000 & Over	Total	242600	262814	8.2	400787	391087	(2.4)	147645	173593	17.6	-0-	-0-	-0-
	Manufacturing	67597	73323	8.5	99253	94489	(4.8)	27555	33162	20.3	-0-	-0-	-0-
All Places	Total	994537	1011124	1.7	1137908	1219589	7.2	507131	516057	1.8	223542	213282	(4.6)
	Manufacturing	149890	187082	24.8	185132	236599	27.8	45605	61935	35.8	6519	7835	20.2

Size of Place of Residence		SOUTH DAKOTA 1950	SOUTH DAKOTA 1960	SOUTH DAKOTA % Change 1950-60	WISCONSIN 1950	WISCONSIN 1960	WISCONSIN % Change 1950-60	SIX-STATE REGION 1950	(%)	SIX-STATE REGION 1960	(%)	SIX-STATE REGION % Change 1950-60	UNITED STATES Population (in thousands) 1950	(%)	1960	(%)	% Change 1950-60
Rural	Total	157501	138967	(11.8)	528446	497058	(5.9)	2084238	47.1	1874044	40.3	(10.1)	54230	36.0	54054	30.1	(.3)
	Manufacturing	2909	4942	69.9	91291	118666	30.0	170377	21.4	238536	24.2	40.0					
2,500 to 9,999	Total	29904	26765	(10.5)	128224	163883	27.8	482415	10.9	555965	12.0	15.2	14629	9.7	17360	9.7	18.7
	Manufacturing	1424	1894	33.0	40244	53945	34.0	87740	11.0	115964	11.8	32.2					
10,000 to 49,999	Total	32405	47026	45.1	260582	347812	33.5	642295	14.5	924060	19.9	43.9	20675	13.7	32507	18.1	57.7
	Manufacturing	3051	4241	39.0	103587	135568	30.9	177130	22.2	257253	26.1	45.2					
50,000 & Over	Total	22264	24849	11.6	402073	438727	9.1	1215569	27.5	1291070	27.8	6.2	61164	40.6	75402	42.1	23.3
	Manufacturing	4347	4591	5.6	163712	168537	2.9	362464	45.4	374102	37.9	3.2					
All Places	Total	242074	237607	(1.8)	1319325	1447480	9.7	4424517	100.0	4645139	100.0	5.0	150697	100.0	179323	100.0	19.0
	Manufacturing	11731	15669	33.6	398834	476736	19.5	797711	100.0	985855	100.0	23.6					