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**Analysis of**

**PRODUCTION**

**PROCESSING**

**CONSUMPTION**

**Markets for Durum Wheat**



By

DONALD W. BERGER and DONALD E. ANDERSON

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IN COOPERATION WITH  
NORTH DAKOTA STATE WHEAT COMMISSION  
BISMARCK, NORTH DAKOTA

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North Dakota State Wheat Commission

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## HIGHLIGHTS\*

This study was undertaken to gain insights into the market organization of the durum milling industry, the macaroni industry, and the flow patterns of durum wheat and durum products.

Over the past 24 years the number of durum mills has remained relatively stable, while the productive capacity (size) of mills has increased considerably. The number of companies in the durum milling industry has remained quite small (eight companies). The industry is considered to be highly concentrated, indicating a high degree of interdependence in firms' price and output decisions. The two largest companies control 54 percent of the durum milling capacity in the United States.

Other structural characteristics of the durum milling industry indicate that there is no product differentiation of semolina and durum flour, and entry into the industry is relatively easy. That is, any established wheat milling operation could convert to a durum milling operation rather easily.

The number of macaroni plants remained relatively stable from 1947 to 1967. During the same period the size of plants has increased. In 1963 there were 200 companies operating 221 plants. Since 1947 the eight largest companies have shared better than 33 percent of industry sales. Thus, the macaroni industry has a relatively large portion of its sales produced by a small number of the industry's firms.

The obstacles that new entrants into the macaroni industry must overcome are consumers' preferences and obtaining desirable shelf space for new products. The macaroni industry is characterized by a large number of small, inefficient plants with excess productive capacity, so costs do not appear to be an obstacle to new entrants if they operate efficiently and can obtain a share of the market.

The average price of macaroni and spaghetti increased 54 percent from 1947 to 1967. During the same period the price of noodles increased 37 percent as compared to a decrease of 27 percent in the price of durum wheat and an increase of 19 percent in the price of semolina and durum flour.

North Dakota has produced over four-fifths of the durum wheat in the United States since 1961. The vast majority of North Dakota durum wheat is shipped to durum mills within the state or shipped east for milling.

Per capita consumption of macaroni products increased from 5.2 pounds in 1939 to 6.3 pounds in 1967. An all-time high for production and sales of macaroni products was attained in 1969, indicating an increase in per capita consumption.

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\*Excluding flow patterns of semolina and durum flour.

Consumption of macaroni products is highest in the Northeastern Region of the United States. This coincides with the geographical location of the highest concentration of macaroni plants.

Prior to 1960, exports of durum wheat were negligible, whereas in 1967 and 1968 exports accounted for 47 percent of the total United States durum production. Algeria, Belgium, France, and the Netherlands are the most consistent importers of durum wheat with Italy becoming the most promising importer of durum wheat.

ANALYSIS OF  
PRODUCTION PROCESSING CONSUMPTION  
MARKETS FOR DURUM WHEAT

By

Donald W. Berger and Donald E. Anderson

INTRODUCTION

Cash receipts in North Dakota from the marketing of crops during the year 1968 were approximately \$453 million.<sup>1</sup> This represents 52 percent of the total income received by North Dakota producers.

Wheat was the major source of farm income. It accounted for 31 percent of total farm income, or approximately \$269 million in 1968.<sup>2</sup> The total value of production for all wheat was \$295 million; durum wheat accounted for \$124 million or 42 percent of the total value of all wheat. It is apparent, therefore, that durum wheat contributes significantly to North Dakota farm income.

The Problem

The domestic flow pattern of durum wheat, durum products, and the structural organization of the durum wheat industry has not been researched to any great extent. Recent studies have centered around the export market and the potential demand for durum wheat. Since North Dakota has continuously produced 80 to 85 percent of all durum wheat in the United States, it is important that the North Dakota producer understand the complex market structure of the durum wheat industry. Understanding the complete spectrum of marketing activities will enable the producer to understand and react to changes in price and demand factors in the market.

Objectives

This study was undertaken to gain insights into the market organization of the durum wheat industry and the flow patterns of durum wheat and durum products.

The specific objectives of this study are:

1. To identify and analyze the structural organization of the durum milling industry.

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<sup>1</sup>Price, J. R. and F. R. Taylor, North Dakota Crop and Livestock Statistics, 1969, Agricultural Statistics No. 21, Statistical Reporting Service, United States Department of Agriculture and Department of Agricultural Economics, North Dakota State University, Fargo, North Dakota, May, 1970, p. 77.

<sup>2</sup>Ibid., p. 78.



2. To identify and analyze the structural organization of the macaroni processing industry.
3. To trace the geographic flow of durum wheat and durum products.

#### Methodology and Sources of Data

This study was designed to estimate main elements of the market structure in both the durum and macaroni industries. The main elements of market structure were gathered through secondary sources. Actual flow patterns of durum wheat were gathered through personal interviews.

### STRUCTURE OF DURUM WHEAT INDUSTRY

#### Durum Production in the United States

Durum wheat has been grown in the United States since 1900. Durum, however, has never accounted for more than 10 percent of the total wheat acreage.<sup>3</sup> Over four-fifths of the durum crop in the United States has been produced in North Dakota over the past eight-year period (Table 1) with lesser quantities being produced in South Dakota, Minnesota, Montana, and California (Figure 1).

#### Durum Milling Industry

Durum milling is unique in the flour milling industry in that semolina is the main durum product and not bread flour. Semolina is defined as purified middlings obtained from the grinding of durum wheat.

The processing of durum wheat into durum products consists of the following basic procedures:

1. Cleaning,
2. Tempering,
3. Milling, and
4. Purifying (shaking).

The object of cleaning is to remove all the foreign matter from the wheat prior to conditioning (tempering) for the milling process. Foreign matter may be classified generally as seeds from other than durum wheat--rubble, light impurities

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<sup>3</sup>United States Department of Agriculture, Wheat Situation, Economic Research Service, November, 1968, pp. 23 and 24.

TABLE 1. UNITED STATES DURUM PRODUCTION BY STATES, 1961-1969

State	Year									
	1969	1968	1967	1966	1965	1964	1963	1962	1961	
	(1,000 bushels)									
Minnesota	2,552 ( 2.4) <sup>a</sup>	3,128 ( 3.2)	2,205 ( 3.3)	1,512 ( 2.4)	2,883 ( 4.1)	2,156 ( 3.3)	1,450 ( 2.8)	1,683 ( 2.3)	616 ( 3.0)	
North Dakota	91,773 ( 86.3)	83,420 ( 83.4)	54,888 ( 82.6)	55,120 ( 87.1)	61,411 ( 87.9)	56,985 ( 86.8)	43,752 ( 85.4)	59,582 ( 83.0)	16,800 ( 79.3)	
South Dakota	4,914 ( 4.6)	4,833 ( 5.0)	4,424 ( 6.6)	2,556 ( 4.0)	2,266 ( 3.2)	1,680 ( 2.6)	1,526 ( 3.0)	2,880 ( 4.0)	1,829 ( 8.6)	
Montana	6,900 ( 6.5)	7,665 ( 7.8)	4,560 ( 6.9)	3,760 ( 6.0)	3,021 ( 4.3)	4,512 ( 6.7)	3,848 ( 7.5)	6,960 ( 9.7)	1,428 ( 6.7)	
California	180 ( 0.2)	455 ( 0.6)	366 ( 0.6)	300 ( 0.5)	285 ( 0.5)	385 ( 0.6)	671 ( 1.3)	704 ( 1.0)	512 ( 2.4)	
Total Production	106,319 (100.0)	99,501 (100.0)	66,443 (100.0)	63,248 (100.0)	65,886 (100.0)	65,718 (100.0)	51,247 (100.0)	71,809 (100.0)	21,185 (100.0)	

<sup>a</sup>The values in parentheses represent the state's percentage of the total production for that particular year.

Source: United States Department of Agriculture, Crop Production, 1961-1969 Annual Summaries, Crop Reporting Board, Agricultural Marketing Board, Washington, D.C., December of every year.

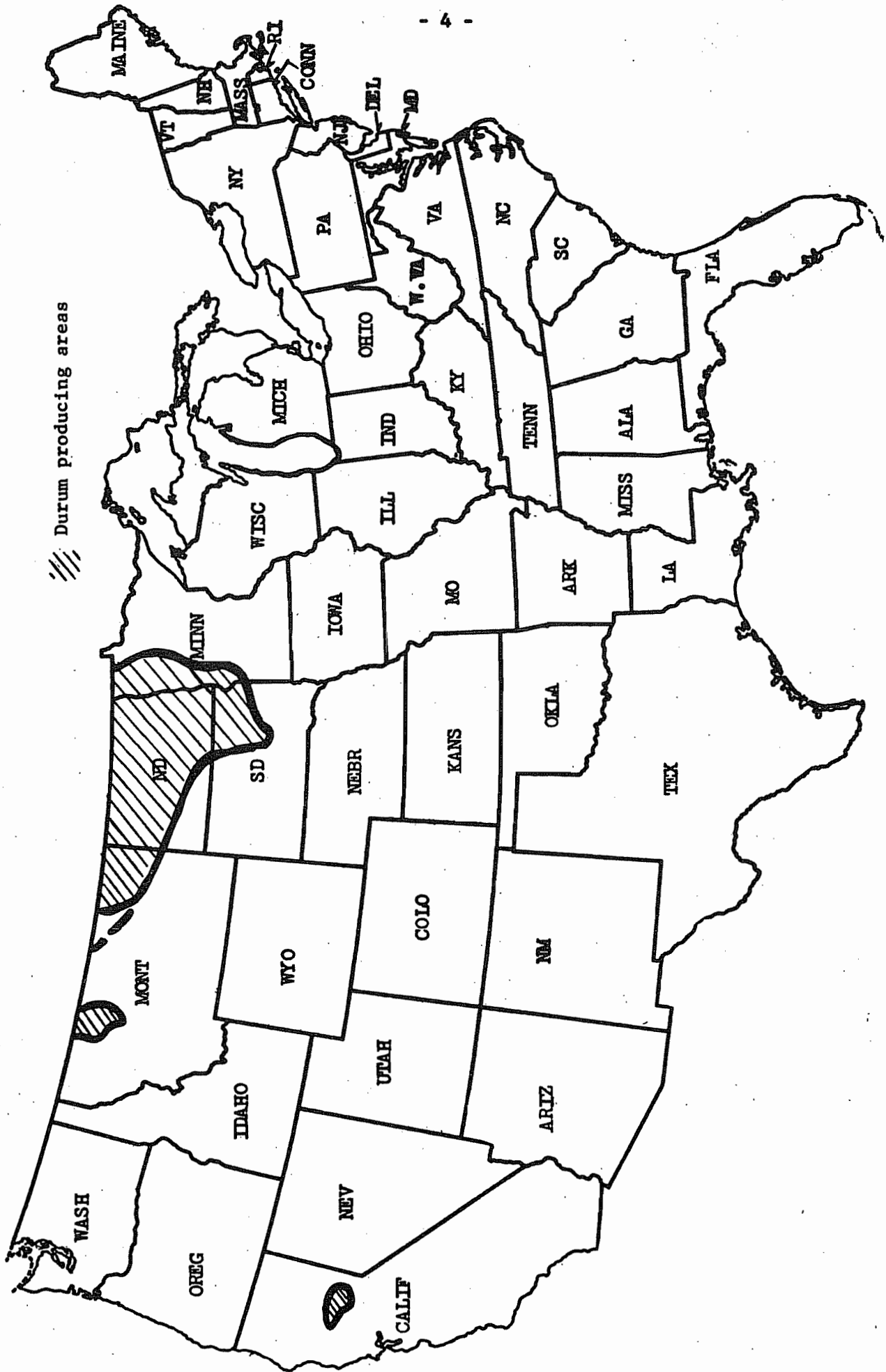


Figure 1. Durum Producing Areas in the United States, 1970

such as chaff, dust and dirt, pieces of metal, and other foreign objects.<sup>4</sup> Due to the size, specific gravity, shape, etc., of the foreign matter, machines manufactured to clean durum use one or more techniques to separate the impurities.

The principle aim of the tempering (conditioning) operation is to treat the wheat to obtain an efficient separation of the bran and endosperm and to induce the right degree of mellowness into the interior of the kernel.<sup>5</sup> The proper treatment will result in a good quantity of large-sized bran with a minimum amount of bran powder.<sup>6</sup>

The process of durum milling is a complex repetition of grinding and purifying (sieving) operations.<sup>7</sup> The conditioned or tempered wheat kernels are passed through a series of breakrollers (minimum of three rollers to a maximum of nine rollers). The purpose of the breakrolls is to open and scrape the wheat grains to release the endosperm material from the skin of the wheat kernel (bran).<sup>8</sup> The breaking down system aids maximum release of endosperm particles in the form of purifiable semolina with low production of bran powder.

In a sense the durum milling process is an attempt to produce purified semolina (efficient separation of the bran from the endosperm). The semolina stocks are passed over a vibrating sieve through which currents of air are drawn. This purifying process produces the most efficient separation of bran and semolina.

A second system of rollers called the reduction rolls is used for the grinding of middlings or semolina on numerous stages of smooth rolls. Normally, semolina is the end result of the durum milling process unless a customer specifies durum flour.

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<sup>4</sup>Fenshawe, S. R. D., "Screenroom Machinery and Processes," (Volume I in Practice of Flour Milling), National Joint Industrial Council for the Flour Milling Industry, Northern Publishing Co., Ltd., Liverpool, England, 1966, Chapter 4.

<sup>5</sup>Bain, E., "Conditioning and Drying," (Volume I in Practice of Flour Milling), National Joint Industrial Council for the Flour Milling Industry, Northern Publishing Co., Ltd., Liverpool, England, 1966, Chapter 5.

<sup>6</sup>Ibid., Chapter 5.

<sup>7</sup>Scott, J. H., "The Flour Milling Process," (Volume I in Practice of Flour Milling), National Joint Industrial Council for the Flour Milling Industry, Northern Publishing Co., Ltd., Liverpool, England, 1966, Chapter 10.

<sup>8</sup>Ibid., Chapter 10.

## Industrial Concentration

### Number and Size of Plants

The overall trend in the flour milling industry is one of declining numbers.<sup>9</sup> According to the Northwestern Miller's "List of Durum Product Mills," the number of durum mills has remained relatively stable over the past 24 years (Table 2).

The total number of durum milling plants remained stable since 1945, but the size (capacity) of the mills has changed. Since 1945, the small mills (0-2,000 cwt./day) declined from 27 percent of the total mills to 8 percent in 1969 (Table 2). The number of large durum mills (3,000-10,000 cwt./day), which were nonexistent in 1945, comprised 16 percent of total mill numbers in 1969.<sup>10</sup>

### Number and Size of Companies

The durum milling industry is composed of a small number of companies (Table 3), with the number of companies remaining quite stable over the past 25 years. When evaluated by proportion of total industry capacity operated by the largest firms, the durum milling industry may be considered a highly concentrated industry. Since 1945, the two largest firms have held from 36 percent of the industry capacity to a high of 54 percent in 1969 (Table 3). The trend since 1950 has been toward increased concentration of production and market share in the larger firms.

### Geographic Description of the Industry

In 1945, the center for durum milling was concentrated in the Upper Midwest near the resource (Figure 2). Since 1945, the industry has become more market oriented in that most new mill capacity has been built closer to their markets (Figure 3). The Upper Midwest is still considered the center of durum milling and maintains 68 percent of the milling capacity in the United States.

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<sup>9</sup>National Commission on Food Marketing, Organization and Competition in the Milling and Baking Industries, Technical Study No. 5, Washington, D.C., June, 1966, p. 11.

<sup>10</sup>Other mills may grind durum occasionally, but these mills are not set up strictly for durum milling as are the ones that are included in Table 2 and in the preceding analysis of the durum milling industry.

TABLE 2. THE PERCENTAGE DISTRIBUTION OF DURUM MILLS BY CAPACITY OF PLANTS, UNITED STATES, 1945, 1951, 1961, 1965, AND 1969

Mill Size (Capacities in Cwt.)	1945		1951		1961		1965		1969	
	Number of Mills	Percent of Mills	Number of Mills	Percent of Mills	Number of Mills	Percent of Mills	Number of Mills	Percent of Mills	Number of Mills	Percent of Mills
1-2,000	3	27.3	5	38.4	3	27.3	3	27.3	1	8.3
2,001-4,000	5	45.4	4	30.8	4	36.3	4	36.3	6	50.0
4,001-6,000	2	18.2	3	23.1	3	27.3	2	18.2	3	25.0
6,001-8,000	1	9.1	1	7.7			1	9.1		
8,001-10,000					1	9.1	1	9.1	2	16.7
Total	11	100.0	13	100.0	11	100.0	11	100.0	12	100.0

Source: "List of Flour Mills," Northwestern Miller, The Miller Publishing Company, Minneapolis, Minnesota, 1945, 1951, 1961, 1965, and 1969.



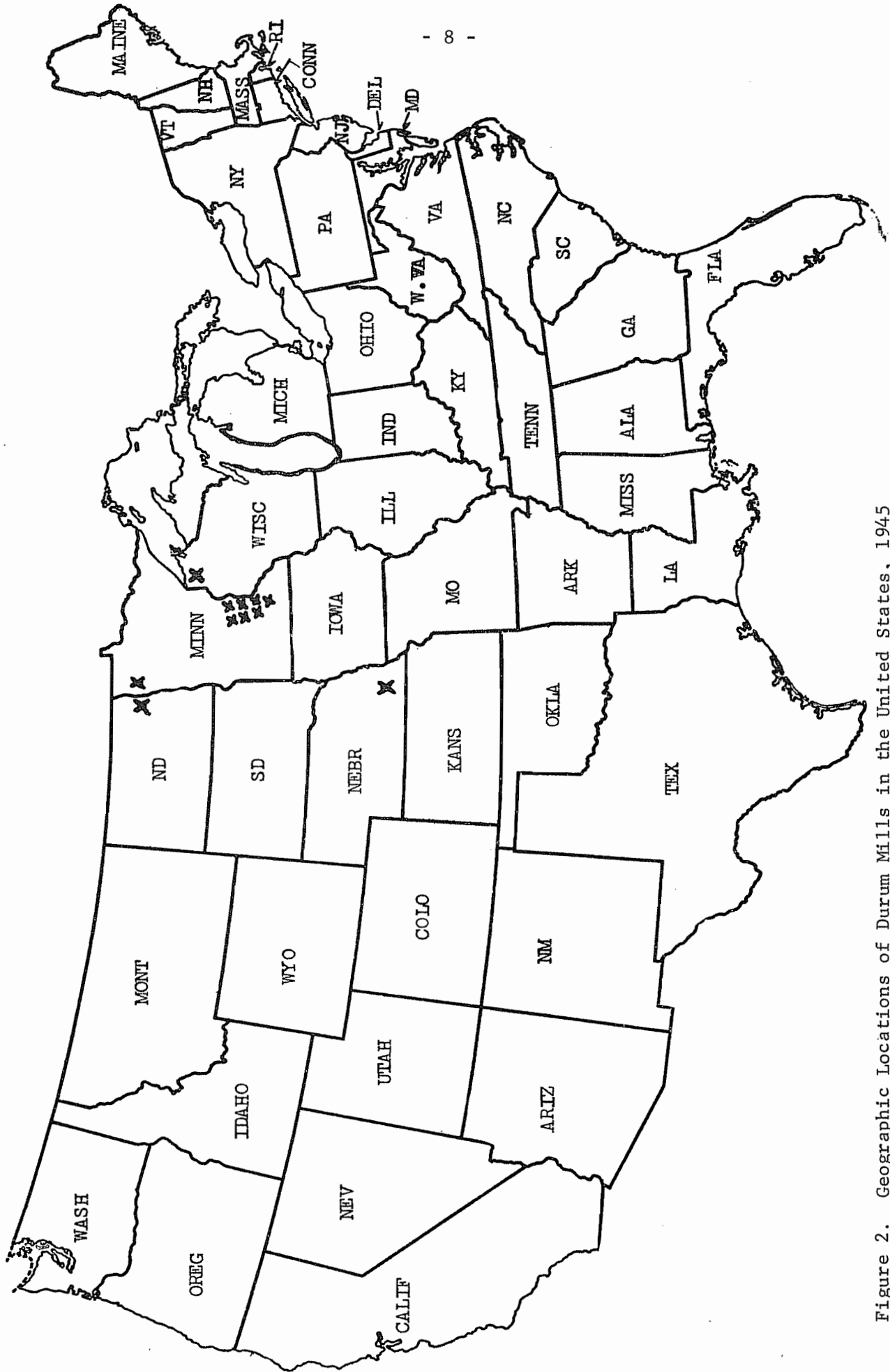


Figure 2. Geographic Locations of Durum Mills in the United States, 1945

Source: "A List of Flour Mills in the United States and Canada," The Northwestern Miller, 1945.

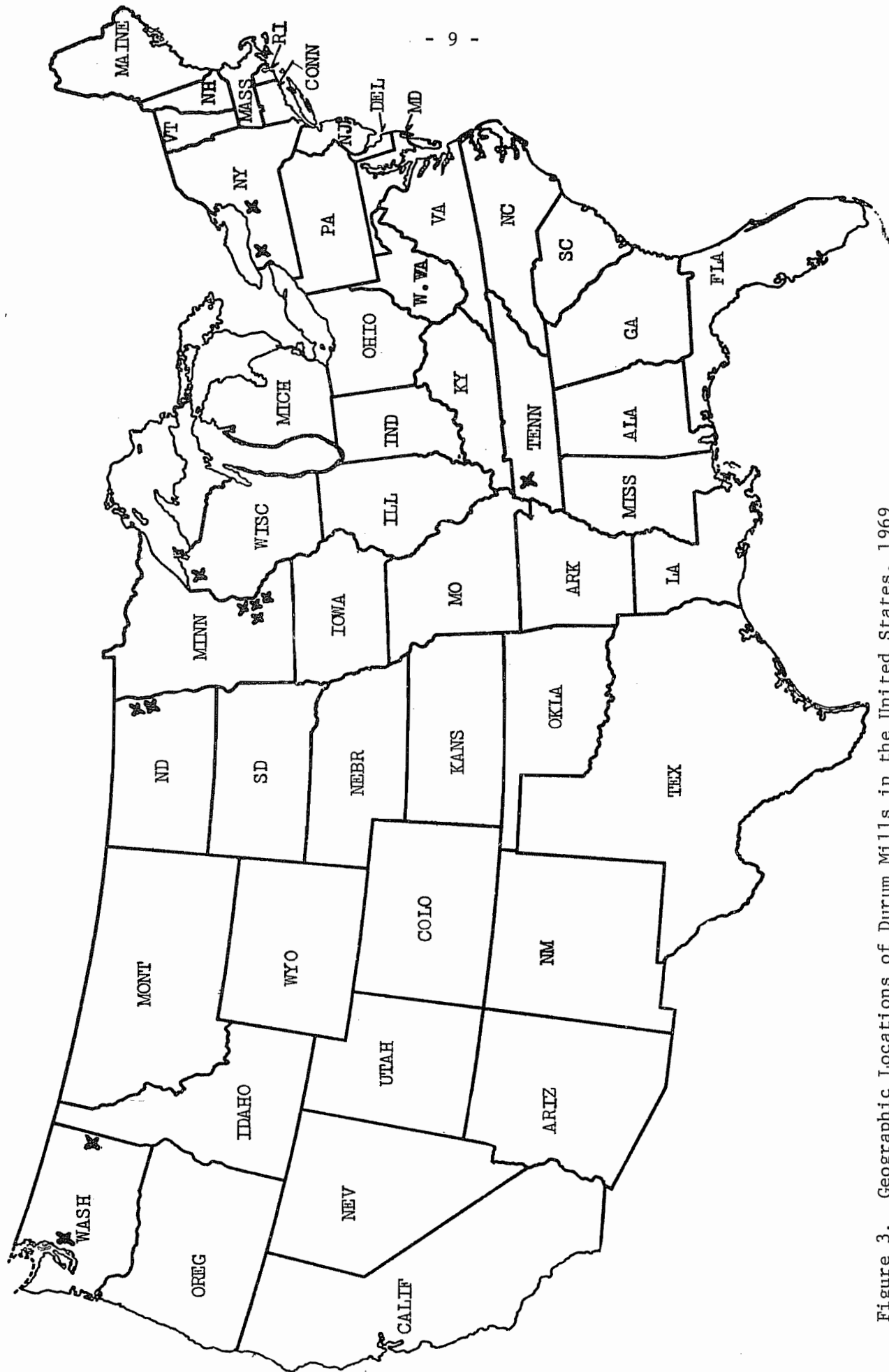


Figure 3. Geographic Locations of Durum Mills in the United States, 1969

Source: "List of Mills in the United States and Canada," The Northwestern Miller, September, 1969.

TABLE 3. NUMBER, CAPACITY, AND CONCENTRATION RATIOS OF THE DURUM MILLING INDUSTRY IN THE UNITED STATES, 1945, 1951, 1961, 1965, AND 1969

Year	Number of Companies	Capacity (cwt./day)	Percent of Total Daily Industry Capacity and Amount in Cwt. Produced by:		
			2	4	6
			Largest Companies	Largest Companies	Largest Companies
1945	10	35,340	14,500 41%	22,300 63%	28,240 80%
1951	11	39,825	14,500 36%	24,800 62%	30,800 77%
1961	9	36,536	18,100 49%	26,450 72%	32,450 89%
1965	10	41,290	18,200 44%	29,200 71%	35,900 87%
1969	8	51,678	27,800 54%	40,800 80%	48,128 93%

#### Product Differentiation

"Product differentiation is an important influence on the character of the competitive relationships of the established member sellers of an industry."<sup>11</sup> If a product is differentiated, consumers or buyers will be willing to pay more for that product than for a substitute.

The three sources of product differentiation are:

1. The differences in quality of design among competing outputs,
2. The ignorance of buyers, and
3. The buyer's preference for certain products that are developed by sales promotion and advertising.<sup>12</sup>

<sup>11</sup>Bain, op. cit., p. 210.

<sup>12</sup>Ibid., p. 214.

The output (semolina and durum flour) of the durum milling industry can be considered homogenous. It is difficult to differentiate between the output of two different mills provided the same quality of durum wheat and the proper technical know-how is applied in the milling process. Whatever product differentiation exists in the durum milling industry is founded on the buyer's lack of knowledge or information and the seller's influence (sales promotion and advertising) on the buyer.

The product differentiation of durum products (semolina and durum flour) apparently results from sales promotion and advertising of the seller's brand names and price. Advertising in the durum milling industry is carried out through one basic media, trade magazines.

#### Entry of New Firms into the Industry

Entry into the durum milling industry appears to be relatively easy. Any established wheat milling operation could convert to a durum milling operation rather easily.<sup>13</sup> If the market demanded more semolina and durum flour, the probability of a wheat milling operation converting to a durum milling operation appears to be high.

Factors of production and technological know-how do not seem to hinder entry, nor do any type of legal restrictions.

#### Price

The average price (United States) for semolina and durum flour (measured by value of shipments divided by total pounds produced) has increased over the past 20 years (Table 4). The miller's price per pound for semolina and durum flour rose from 5.6 cents per pound in 1947 to 6.7 cents per pound in 1967, or an increase of approximately 19 percent. During this same period, the price of durum wheat decreased (Minneapolis-St. Paul Market) from an average of \$2.89 per bushel in 1947 to \$2.10 per bushel in 1966, a 27 percent decrease.<sup>14</sup>

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<sup>13</sup>This statement was based on correspondence and interviews held with various people within and outside the industry. Reliable conversion costs were not obtained.

<sup>14</sup>United States Department of Agriculture, Agricultural Statistics, 1950, 1958, and 1968, United States Government Printing Office, Washington, D.C.

TABLE 4. AVERAGE PRICE PER POUND OF SEMOLINA AND DURUM FLOUR, UNITED STATES, 1947, 1954, 1958, 1963, AND 1967

Year	Pounds of Semolina and Durum Flour (1,000 pounds)	Value of Shipment (\$1,000)	Average Price Per Pound (cents)
1947	916,400	50,928	5.6
1954	756,000	53,236	7.0
1958	828,600	47,049	5.7
1963	1,093,600	62,500	5.7
1967	1,262,200	84,600	6.7

Source: U. S. Bureau of the Census, Census of Manufacturers, 1967, 1963, 1958, 1954, and 1947 Preliminary Reports, Grain and Mill Products, U. S. Department of Commerce, Washington, D.C.

#### Macaroni Manufacturing Industry

The term macaroni is applied to a variety of products. Macaroni products refer to macaroni, spaghetti, noodles, and specialty goods. Spaghetti is referred to as a "long good" and macaroni and noodles as "short goods."

The processing of semolina or durum flour<sup>15</sup> into macaroni products is relatively simple and consists of four basic steps:

1. Blending,
2. Mixing and kneading,
3. Extruding, and
4. Drying.

Blending different grades of semolina, farina,<sup>16</sup> and durum flour is often necessary to meet the requirements of macaroni manufacturers. Blending normally occurs at the place of processing, not at the milling location.

The exact proportion of semolina and water used during the mixing process depends upon the quality of the semolina, the type of macaroni products to be

<sup>15</sup>Durum flour is used in the manufacturing of noodles.

<sup>16</sup>Farina is the purified middlings obtained from the grinding of hard wheats other than durum wheats.

produced and the manufacturing equipment available.<sup>17</sup> The most important point is to use a mixer in which the semolina and water do not have a tendency to ball up.<sup>18</sup> If an even distribution of the water into the semolina cannot be attained, the dough has to be kneaded. Kneading requires heavy machines which are expensive to run. It also tends to weaken the gluten and should be reduced to a minimum.<sup>19</sup>

Extrusion is simply the forcing of the dough through various sized and shaped dies to get the desired product.

Drying of macaroni products is one of the most delicate drying processes in the food industry, being more than simple dehydration as in the case of many other alimentary products.<sup>20</sup> The first predrying is necessary to make the handling of the macaroni products possible. The air for this predrying operation is, as a rule, delivered by a fan built into the frame of the extrusion press. The final drying process is different in terms of machinery required for the various types of macaroni products (short and long goods). The prevailing ideas on how macaroni products should be dried (final drying) are as follows:

"At first the macaroni products are dried in a warm, moist atmosphere, with heating on and the fresh air inlet valve partly closed. After a certain time the heat is reduced and the air valve completely shut--this is the sweating period. During this period water which is in the core of the macaroni product is travelling to the surface, and the surface which had started to develop a crust in the predrying period begins to get soft. After this sweating period a second drying period starts, during which drying proceeds with air a little cooler and drier than in the first period. As drying proceeds, the air is set cooler and drier, until drying is practically completed. The air valves are now completely opened, and the macaroni products exposed to a draught of ambient air. The cycle is generally completed in about twenty-four hours. Using a little more heat at the beginning makes it possible to cut down the time required, whereas if only little heat is used drying time may go up to thirty-six hours. Drying too quickly was not considered an advantage to the quality of the macaroni products, as the flavour is not fully developed and resistance to excessive cooking is reduced. On the other hand, if drying proceeds too slowly, especially at the beginning, too much acidity will develop and the goods will easily turn sour."<sup>21</sup>

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<sup>17</sup>Hummel, Charles, Macaroni Products, Food Trade Press, Ltd., London, England, p. 24.

<sup>18</sup>Ibid., p. 25.

<sup>19</sup>Ibid., p. 26.

<sup>20</sup>Ibid., p. 125.

<sup>21</sup>Ibid., p. 142.



## Concentration of the Macaroni Industry<sup>22</sup>

### Number and Size of Plants

The number of macaroni plants in the United States has declined from 226 plants in 1947 to 205 in 1967 (Table 5). The minor fluctuations in number of plants over the past 20 years indicate no definite trend.

The total number of plants has remained stable since World War II. The size distribution of these plants, however, has changed. For example, since 1954 extremely small plants with 1-9 employees (measurement of plant size) declined from 56.8 percent to 53.8 percent of total plants in 1963. During this same period, large plants (100 or more employees) increased from 8.6 percent to 11.8 percent of total plants. This indicates that the industry is making a slow transition towards larger plant size.

Large plants have also increased their share of industry sales, while the share held by small plants declined (Table 6). For example, plants with 250 or more employees increased their share from 15.4 percent to 22.3 percent of industry sales from 1954 to 1963. At the same time, small plants (1-9 employees) saw their share decline from 7.4 percent to 3.9 percent of industry sales.

### Number and Size of Companies

The macaroni industry is composed of over 200 companies (Table 7). By at least one measure, the macaroni industry may be considered a concentrated industry. Kaysen and Turner classify an industry as concentrated (Type II oligopoly) if the eight largest companies account for 33 percent or more of industry shipments and the 20 largest companies account for 75 percent or more.<sup>23</sup> Since 1947 the eight largest macaroni companies have held more than one-third of industry sales (Table 7).

Pearson conducted a newspaper survey of consumer purchases of macaroni products from four large macaroni manufacturing companies in selected metropolitan areas.<sup>24</sup> The results of the survey indicate even stronger oligopolistic characteristics (Table 8). Pearson concluded that the large regional firms tend to dominate markets in most sections of the country. Producers in each area are composed of a concentrated core of a few dominant companies plus a fringe of smaller firms.

In summary, the industry is a concentrated oligopoly at the national level with large regional firms being dominant in most market areas.

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<sup>22</sup>This section relies heavily on Pearson, W. E., Structural Trends and Economies of Scale in the Macaroni Industry, unpublished Master's Thesis, University of Nebraska, Lincoln, Nebraska, November, 1966, pp. 15-37.

<sup>23</sup>Kaysen, Carl and Donald F. Turner, Antitrust Policy: An Economic and Legal Analysis, Harvard University Press, Cambridge, Massachusetts, 1959, p. 30.

<sup>24</sup>Pearson, op. cit., p. 21.

TABLE 5. THE PERCENTAGE DISTRIBUTION OF MACARONI MANUFACTURING PLANTS BY NUMBER OF EMPLOYEES, UNITED STATES, 1947, 1954, 1958, 1963, AND 1967

Plant Size (Employees)	1947		1954		1958		1963		1967 <sup>a</sup>	
	Number of Plants	Percent of Plants	Number of Plants	Percent of Plants	Number of Plants	Percent of Plants	Number of Plants	Percent of Plants	Number of Plants	Percent of Plants
1 - 4	67	29.6	86	39.6	78	36.4	75	33.9	--	--
5 - 9	41	18.1	40	17.2	35	16.4	44	19.9	--	--
10 - 19	27	12.0	23	9.9	25	11.7	32	14.5	--	--
20 - 49	39	17.3	41	17.6	35	16.4	26	11.8	--	--
50 - 99	30	13.3	23	9.9	20	9.3	18	8.1	--	--
100 - 249	20	8.9	17	7.3	18	8.4	22	10.0	--	--
250 - 499	1	.4	3	1.3	3	1.4	4	1.8	--	--
500 - 999	1	.4	--	--	--	--	--	--	--	--
Total	226	100.0	233	100.0	214	100.0	221	100.0	205	--

<sup>a</sup>The 1967 preliminary report did not break down the 205 plants by plant size (employees).

Source: U. S. Bureau of the Census, Census of Manufacturers, Macaroni Products, 1947, 1954, 1958, 1963, and 1967 Preliminary Reports, U. S. Department of Commerce, Washington, D.C.

TABLE 6. DISTRIBUTION OF MACARONI PLANTS BY AVERAGE VALUE OF SHIPMENTS PER PLANT, MACARONI INDUSTRY, UNITED STATES, 1947, 1954, 1958, AND 1963<sup>a</sup>

Year	Number of Employees							
	1-9		10-49		50-249		250 or More	
	Percent of Industry Value of Shipments	Average Value of Shipments Per Plant	Percent of Industry Value of Shipments	Average Value of Shipments Per Plant	Percent of Industry Value of Shipments	Average Value of Shipments Per Plant	Percent of Industry Value of Shipments	Average Value of Shipments Per Plant
1947	NA <sup>b</sup>	NA	NA	NA	NA	NA	NA	NA
1954	7.4	87,900	18.2	424,590	57.1	2,135,500	15.4	7,663,600
1958	7.5	111,000	16.7	501,900	60.0	2,829,000	16.1	9,665,000
1963	3.9	72,824	14.6	562,914	59.2	3,300,025	22.3	12,407,750

<sup>a</sup>Value of shipments is an indicator of sales as it includes net selling values.

<sup>b</sup>Not available.

Source: U. S. Bureau of the Census, Census of Manufacturers, Macaroni Products, 1947, 1954, 1958, and 1963, U. S. Department of Commerce, Washington, D.C.

TABLE 7. CONCENTRATION RATIO OF THE MACARONI AND SPAGHETTI INDUSTRY, 1947, 1954, 1958, AND 1963

Year	Companies (Number)	Value of Shipments (\$1,000)	Percent of Value of Shipments Accounted for by:						Indexes
			Largest Companies		Largest Companies		Largest Companies	Primary Product Specialization <sup>a</sup>	
			4	8	20	50			
1947	219	112,094	23	35	56	--	1.00	.98	
1954	226	149,656	26	37	58	--	1.00	.97	
1958	205	167,510	25	41	64	87	.99	.99	
1963	207	222,947	31	47	71	91	.96	.94	

<sup>a</sup>The "primary product specialization ratio" measures the extent to which plants classified in the industry specialize in making products regarded as primary to the industry; that is, value of shipments of primary products of plants in the industry is expressed as a ratio of the total shipments of all products made by these establishments (excluding miscellaneous receipts, such as receipts for contract and commission work on materials owned by others, scrap and salable refuse, repair, etc.). The 1954 and 1947 ratios for some industries reflect minor revisions of previously unpublished census data.

<sup>b</sup>The "coverage ratio" measures the extent to which all shipments of primary products of an industry are made by plants classified in the industry, as distinguished from secondary producers elsewhere; that is, value of shipments of the primary products made by plants classified in the industry is expressed as a ratio of the total shipments of primary products made by all producers, both in and out of the specified industry. The 1954 and 1947 ratios for some industries reflect minor revisions of previously published census data.

Source: Concentration Ratios in Manufacturing Industry, report prepared by the U. S. Bureau of the Census for the Subcommittee on Antitrust and Monopoly of the committee on the Judiciary United States Senate, (United States Government Printing Office, Washington, D.C., 1966), p. 15.

TABLE 8. MARKET SHARES OF FOUR LARGEST MACARONI MANUFACTURING COMPANIES IN SELECTED METROPOLITAN MARKET AREAS

City Market Area	Year	First Brand	% of Market	Second Brand	% of Market	Third Brand	% of Market
Providence	1964	Prince	36.6	LaRosa	35.8	Moellers	15.8
Washington, D.C.	1964	Moellers	82.0	Ann Page	5.0	San Giorgio	5.0
Charlotte	1963	Moellers	39.6	Skinner	25.0	Ann Page	16.4
Pensacola	1964	Ronco	51.5	Moellers	21.2	Ouaker	7.2
Cincinnati	1963	Moellers	45.2	Faulds	17.8	Delmonico	13.7
Indianapolis	1964	Red Cross	36.7	Faulds	15.1	Delmonico	11.5
Minneapolis	1963	Creamette	42.4	Mother's	26.6	Jenny Lee	23.3
Omaha	1964	Skinner	43.0	Gooch	36.0	Am. Beauty	6.0
Houston	1965	Skinner	55.7	Am. Beauty	11.7	Kraft	9.2
Phoenix	1964	Gold Medal	37.0	Am. Beauty	29.0	Gooch	11.0

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TABLE 8. MARKET SHARES OF FOUR LARGEST MACARONI MANUFACTURING COMPANIES IN SELECTED METROPOLITAN MARKET AREAS (CONTINUED)

City Market Area	Year	Fourth Brand	% of Market	Share of Market by Four Largest Companies	Share of Market by Other Companies
Providence	1964	Ann Page	3.0	91.2	8.8
Washington, D.C.	1964	Delmonico	2.0	94.0	6.0
Charlotte	1963	Kraft	4.1	85.1	14.9
Pensacola	1964	Ann Page	7.1	87.0	13.0
Cincinnati	1963	Kraft	6.2	82.9	17.1
Indianapolis	1964	Kroger	8.4	71.7	28.3
Minneapolis	1963	Flavorite	.7	93.0	7.0
Omaha	1964	Food Club	3.0	88.0	12.0
Houston	1965	Ronco	7.0	83.6	16.4
Phoenix	1964	Globe A-1	4.0	81.0	19.0

Source: Pearson, W. E., Structural Trends and Economies of Scale in the Macaroni Industry, unpublished Master's Thesis, University of Nebraska, Lincoln, Nebraska, November, 1966.



Geographic Description of the Industry

The macaroni industry currently tends to be located near areas of population concentration. Location of a large share of the plant capacity is situated in or near heavily populated centers (Figure 4). Some small plant locations are not shown in Figure 4 because state data were not available on small plants.

The Middle Atlantic Region of the United States has by far the greatest number of plants and the highest percentage of total value of shipments (Table 9). This can be partially attributed to the ethnic groups whose native dietary habits include the consumption of relatively large amounts of pasta products.

TABLE 9. GEOGRAPHIC DISTRIBUTION OF MACARONI PLANTS AND VALUE OF SHIPMENTS IN THE UNITED STATES, 1967

Geographic Areas	Number of Plants	Value of Shipments	Percent of Total
New England	19	19,700	7.4
Middle Atlantic	53	104,600	39.5
East North Central	35	43,700	16.5
West North Central	16	37,300	14.1
South	21	18,100	6.8
West <sup>a</sup>	51	41,500	15.7

<sup>a</sup>Excluding Hawaii.

Source: U. S. Bureau of the Census, Census of Manufacturers, 1967 Preliminary Report, U. S. Department of Commerce, Washington, D.C.

Product Differentiation

The macaroni industry regards macaroni, spaghetti, noodles, and related specialty items as homogenous products. The output of one firm is substitutable for the output of another provided the proper quality ingredients and know-how are used in production. The product differentiation that exists in the macaroni industry is created on the basis of the consumer's lack of information and firm's promotional activities.

Other factors which contribute to product differentiation are attractiveness and convenience of display, including the size, location, and height of the display above the floor. Package size or weight and wrapping material (attractiveness of packaging) also contribute to product differentiation.

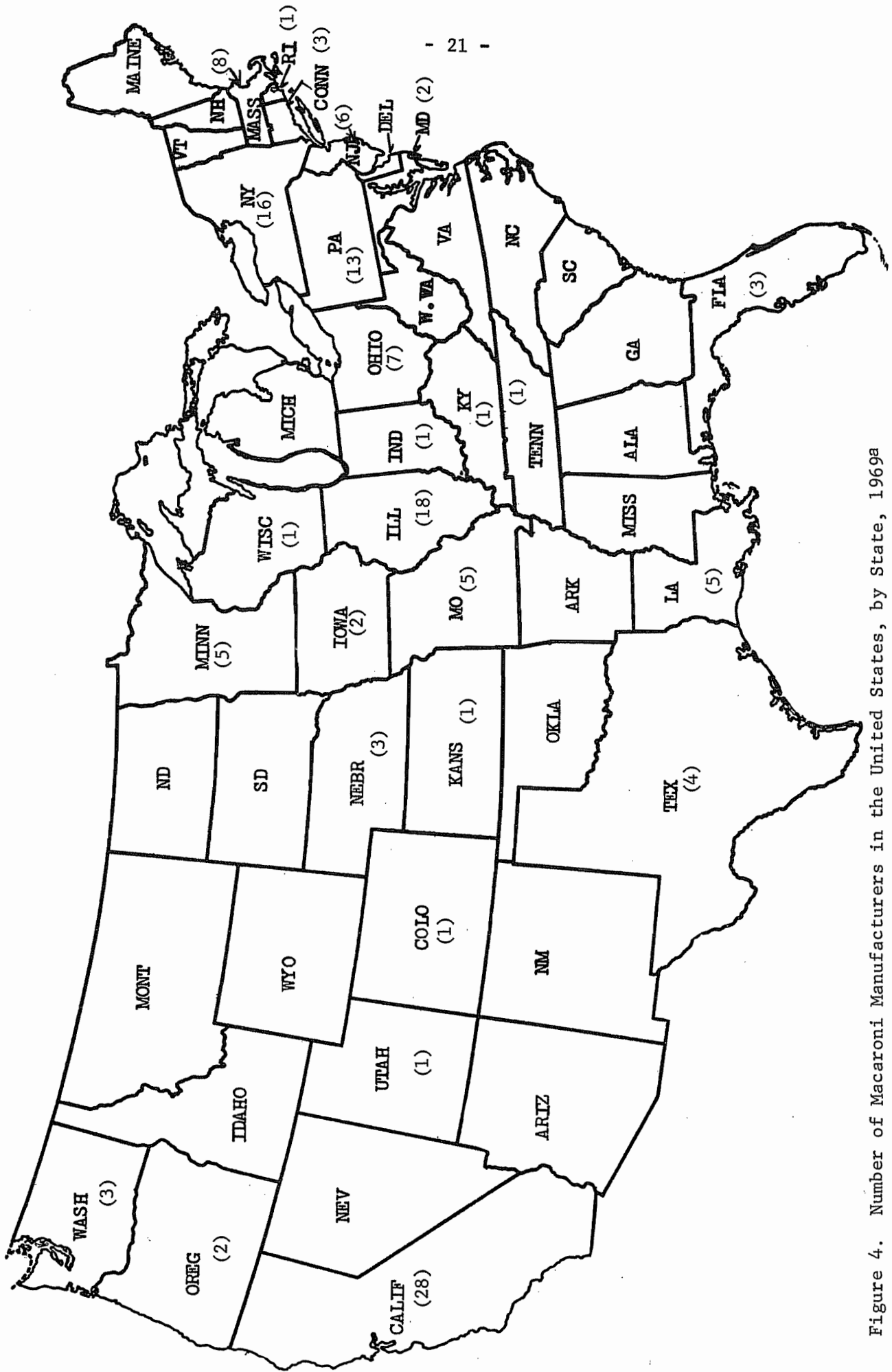


Figure 4. Number of Macaroni Manufacturers in the United States, by State, 1969a

<sup>a</sup>Several plants were not included because published data were not available on a state basis.

### Entry of New Firms into the Industry<sup>24</sup>

Factors of production and knowledge necessary to use these factors are readily available for new entrants into the macaroni industry. Furthermore, no outright legal restrictions prohibit entry. Indications are that new entrants have difficulty in obtaining desirable shelf space for their products. Consumer product preferences also appear to be a deterrent to new firms entering the industry. These preferences, where strong, are difficult for new entrants to overcome.

The macaroni industry is characterized by a large number of small processing facilities. Economies of size have not been attained by firms in this industry and, therefore, average industry production costs will be higher than optimum. There is overcapacity in the industry.<sup>25</sup> However, a large portion of this may be due to the many small, inefficient, technologically obsolete firms that will continue to operate as long as variable costs are covered. Continued market growth and the phasing out of obsolete plants will undoubtedly alleviate the overcapacity problem.

### Prices--Wholesale and Retail<sup>26</sup>

The macaroni manufacturer's average price per pound (measured by value of shipments divided by total pounds produced) has been steadily increasing since 1947 (Table 10). The price per pound for macaroni and spaghetti increased from 12.38 cents in 1947 to 19.15 cents in 1967; an increase of 54.6 percent. At the same time, the price per pound for noodles increased from 19.21 cents to 26.40 cents, or an increase of 37.4 percent.

Retail prices indicate that pricing practices may not actually reflect costs of producing macaroni products. For example, as shown in Table 11, macaroni prices in Minneapolis, Minnesota, (27 cents) were 4.3 cents per pound higher than macaroni prices in New York City, New York, in 1964. Considering transportation costs and the cost of the raw material, retail prices in Minneapolis should theoretically be lower than in New York, assuming the same production costs. Therefore, some pricing policies may actually be artificial.

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<sup>24</sup>This section relies heavily on Pearson, W. E., Structural Trends and Economies of Scale in the Macaroni Industry, unpublished Master's Thesis, University of Nebraska, Lincoln, Nebraska, November, 1966, p. 25.

<sup>25</sup>Pearson, op. cit., p. 99.

<sup>26</sup>Pearson, op. cit., p. 26.

TABLE 10. AVERAGE WHOLESALÉ PRICE PER POUND OF MACARONI, SPAGHETTI, AND NOODLES, UNITED STATES, 1947, 1954, 1958, 1963, AND 1967<sup>a</sup>

Year	Pounds of Macaroni & Spaghetti (1,000)	Value of Shipments (\$1,000)	Average		Pounds of Noodles (1,000)	Value of Shipments (\$1,000)	Average Price Per Pound (cents)
			Price Per Pound (cents)	Price Per Pound (cents)			
1947	692,891	85,805	12.38	125,484	24,108	19.21	
1954	733,219	113,792	15.52	141,727	32,205	22.72	
1958	796,208	125,254	15.73	142,879	30,521	21.36	
1963	994,488	167,700	16.86	164,583	39,534	24.02	
1967	1,034,600	198,100	19.15	126,500	33,400	26.40	

<sup>a</sup>Shipments include interplant transfers, but do not include canned products.

Source: U. S. Bureau of the Census, Census of Manufacturers, Macaroni Products, 1947, 1954, 1958, and 1963, U. S. Department of Commerce, Washington, D.C.

TABLE 11. AVERAGE RETAIL PRICE OF MACARONI PER POUND, UNITED STATES, FEBRUARY, 1964

City	Price Per Pound (Cents)
Atlanta	25.0
Baltimore	25.0
Boston	24.4
Chicago	26.0
Cincinnati	24.2
Cleveland	25.1
Detroit	25.0
Houston	28.4
Kansas City	26.1
Los Angeles	24.3
Minneapolis	27.0
New York	22.7
Philadelphia	24.0
Pittsburg	24.5
Portland	26.8
St. Louis	26.8
San Francisco	29.1
Scranton, Pa.	24.1
Seattle	27.8
Washington, D.C.	23.1

Source: U. S. Department of Labor, Retail Food Prices by Cities, B.L.S., February, 1964, pp. 4 and 6.

## CONSUMPTION AND DISTRIBUTION OF DURUM WHEAT AND MACARONI PRODUCTS

### Domestic Consumption and Flows

Domestic consumption of durum wheat was assumed to be directly related to the domestic consumption of macaroni products. Therefore, only domestic consumption of macaroni products will be considered in this section.

### Flow Patterns of Durum Wheat

Data were not accumulated on the shipping directions of durum wheat. It was assumed that the durum wheat grown in North Dakota, South Dakota, and Minnesota was shipped either within the state of North Dakota and Minnesota or east for milling (Figure 5). The durum grown in Montana was assumed to be shipped west and California durum was assumed to be milled within the state. As previously noted, the Upper Midwest is the durum milling center of the United States. Consequently, it is reasonable to expect that most of the durum wheat raised in the region is milled locally.

### Flow Patterns of Semolina and Durum Flour

Data were collected from durum milling firms regarding shipments of semolina, durum flour, and other durum milling products. These data were used as a basis to indicate the major flows of durum mill products into pasta processing market channels throughout the United States. The data reflect approximately 50 percent of the annual industry processing. Because of incomplete data, the ratio of semolina to durum flour may not be typical of the industry processing patterns. The data in Table 12 indicate that semolina and granular products move principally into eastern markets, with the populous Middle Atlantic and North Central states absorbing the bulk of the shipments. Durum flour shipments to processing markets went mainly to the West Coast and Middle Atlantic Coast areas. The by-product markets were located primarily in the North Central and Middle Atlantic states. These data tend to substantiate the large movement of durum wheat from North Dakota to eastern markets. By aggregating total durum mill products, it was found that 39 percent moved to the Middle Atlantic States for processing, while 17 percent of total shipments went to both the West Coast and east North Central regions (Figure 6).

### Consumption of Macaroni Products

Unlike many of the products made from wheat, macaroni, spaghetti, and noodles have not experienced a decline in per capita consumption (Table 13).<sup>27</sup>

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<sup>27</sup>United States Department of Agriculture, Food Consumption, Prices, and Expenditures-Supplement to 1968, Economic Research Service, AER #138, U. S. Government Printing Office, Washington, D.C., p. 25. Per capita consumption of white and whole wheat decreased from 113 pounds to 106 pounds from 1960 to 1967.



Indicates shipping direction of durum wheat for milling purposes

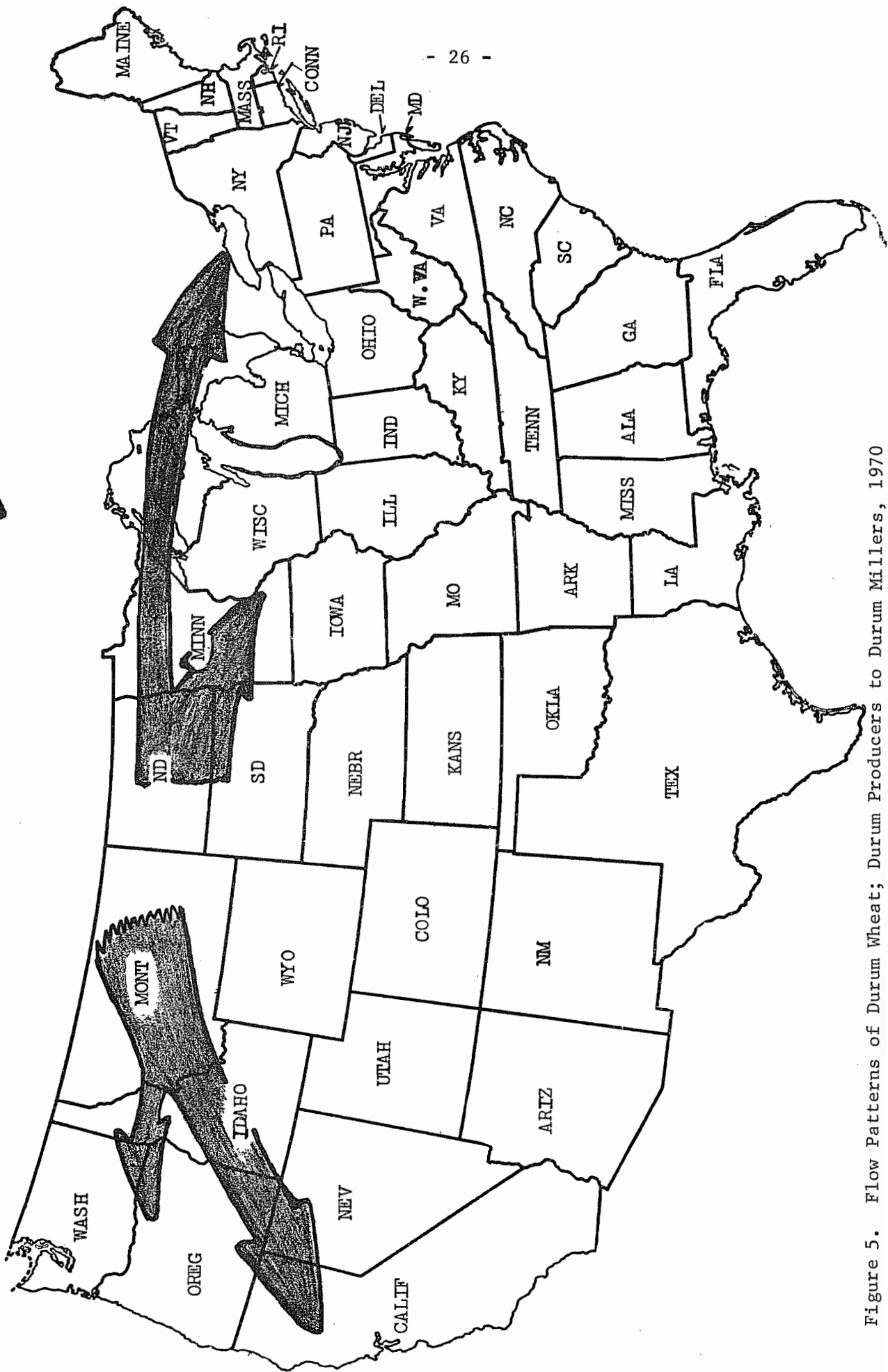


Figure 5. Flow Patterns of Durum Wheat; Durum Producers to Durum Millers, 1970

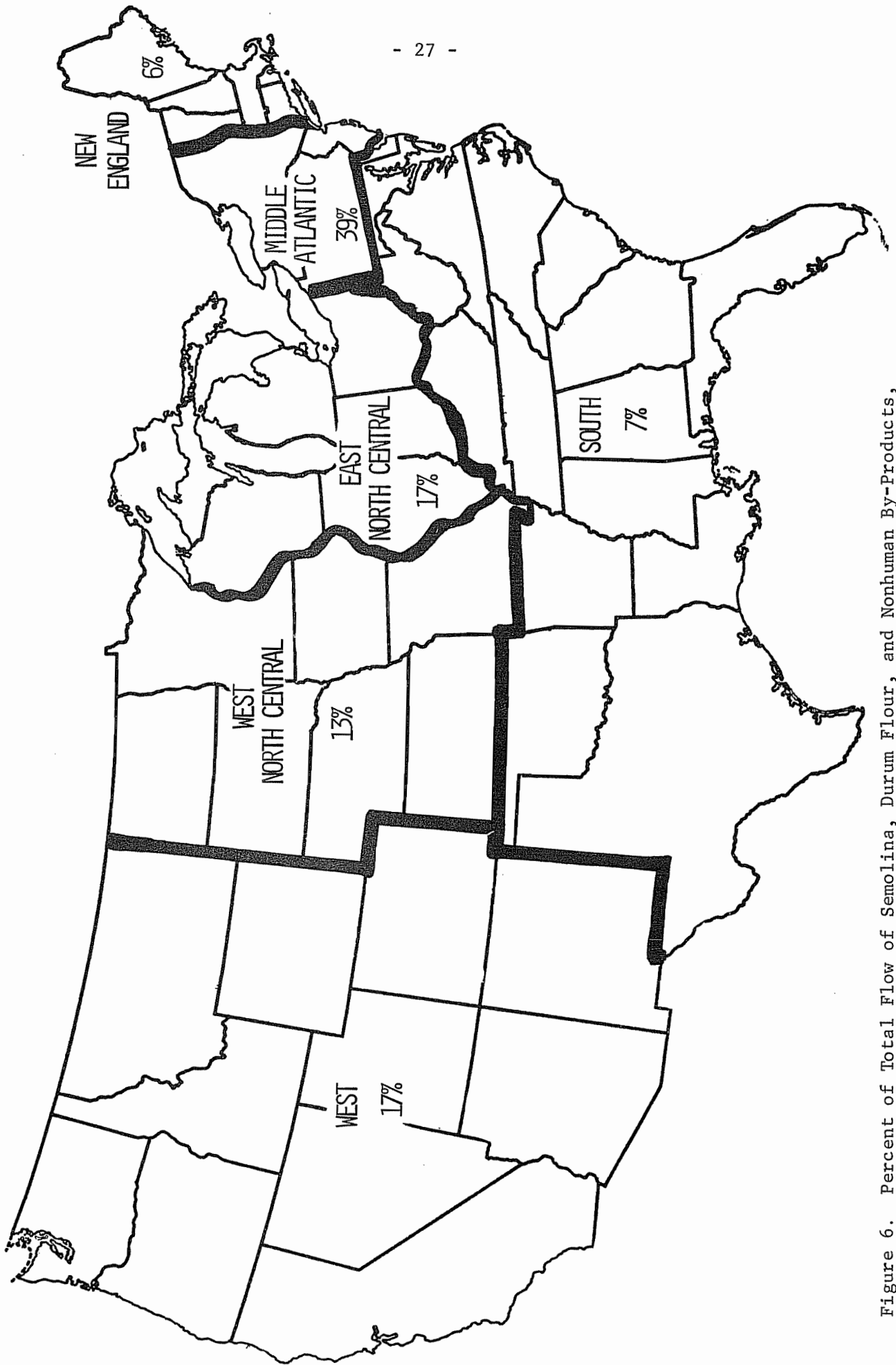


Figure 6. Percent of Total Flow of Semolina, Durum Flour, and Nonhuman By-Products, by Region, 1969

TABLE 12. SHIPMENTS OF DURUM PRODUCTS BY REGIONS, 1969<sup>a</sup>

Regions	Semolina and Granular	Durum Flour (cwt.)	Nonhuman By-Products	Total
New England	338,600	49,520	23,680	411,800
Middle Atlantic	2,298,300	316,660	130,240	2,745,200
South	402,500	85,140	22,560	510,200
East North Central	876,700	188,500	137,300	1,202,500
West North Central	731,100	127,040	69,660	927,800
West	309,465	873,467	6,800	1,189,732
TOTAL	4,956,665	1,640,327	390,240	6,987,232

<sup>a</sup>Based on data collected from processing firms representing approximately 50 percent of the total industry capacity.

TABLE 13. PER CAPITA CONSUMPTION OF MACARONI PRODUCTS, 1939 TO 1967

Year	Macaroni, Spaghetti, and Noodle Production (1,000 lbs.)	Per Capita Consumption <sup>a</sup>
1939	684,300	5.2
1947	818,375	5.7
1954	874,946	5.4
1958	996,207	5.7
1963	1,207,490	6.4
1967	1,245,100	6.3

<sup>a</sup>Assuming that inventories are constant from year to year.

Source: U. S. Bureau of the Census, Census of Manufacturers, 1967, 1958, and 1947 Preliminary Reports, U. S. Department of Commerce, Washington, D.C., and U. S. Bureau of the Census, Population Estimates, Series P-25, No. 368, U. S. Department of Commerce, Washington, D.C.

Per capita consumption of macaroni products has been above five pounds for a number of years and was up to over six pounds in both 1963 and 1967. The Macaroni Journal stated that in 1969 an all time high was achieved for production and sales of macaroni products in the United States, indicating that per capita consumption may be continuing the increasing trend.<sup>28</sup>

#### Geographic Pattern of Macaroni Product Consumption

The geographic distribution of macaroni products is not surprising when considering the location of macaroni plants (Figure 4). The Northeastern Region of the United States leads the way in the consumption of macaroni products with .62 pounds of macaroni products consumed per household per week (Figure 7). The North Central and Western regions follow with .42 pounds of macaroni products consumed per household per week. The high per household consumption of macaroni products in the Northeastern Section can be attributed to ethnic groups which have maintained many of their native dietary habits.

#### United States Export Markets for Durum Wheat

Prior to 1960, exports of durum wheat were negligible. Since 1960, however, durum exports have increased from five million bushels to a record high in 1968 of 46 million bushels (Table 14). The five million bushels of durum wheat exported in 1960 represented 15 percent of the total United States durum wheat production. In 1968 the 46 million bushels of durum wheat exported accounted for 47 percent of the total United States durum wheat production. The importance of export markets appears to be a continuing phenomenon, with nearly 39 million bushels exported in the 1970-71 marketing year.

#### Geographic Distribution

A majority of durum wheat exported from the United States is shipped via the Great Lakes ports (Table 15). Durum wheat shipped from Canadian ports has typically originated at Great Lakes ports for transshipment from Canadian ports.

The most consistent buyers of United States durum wheat are Algeria, Belgium, France, and the Netherlands (Table 16 and Figure 8). Over the 10-year period, (1960-1969), France has purchased 18 percent of the total durum wheat inspected for exports.

Italy is a relatively new and promising importer of United States durum wheat. This could be attributed to the fact that Italian macaroni manufacturers must, by law, utilize 100 percent durum wheat in the manufacture of macaroni products.

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<sup>28</sup>The National Macaroni Manufacturers Association, "Macaroni Trends," Macaroni Journal, Palatine, Illinois, February, 1970, p. 4.

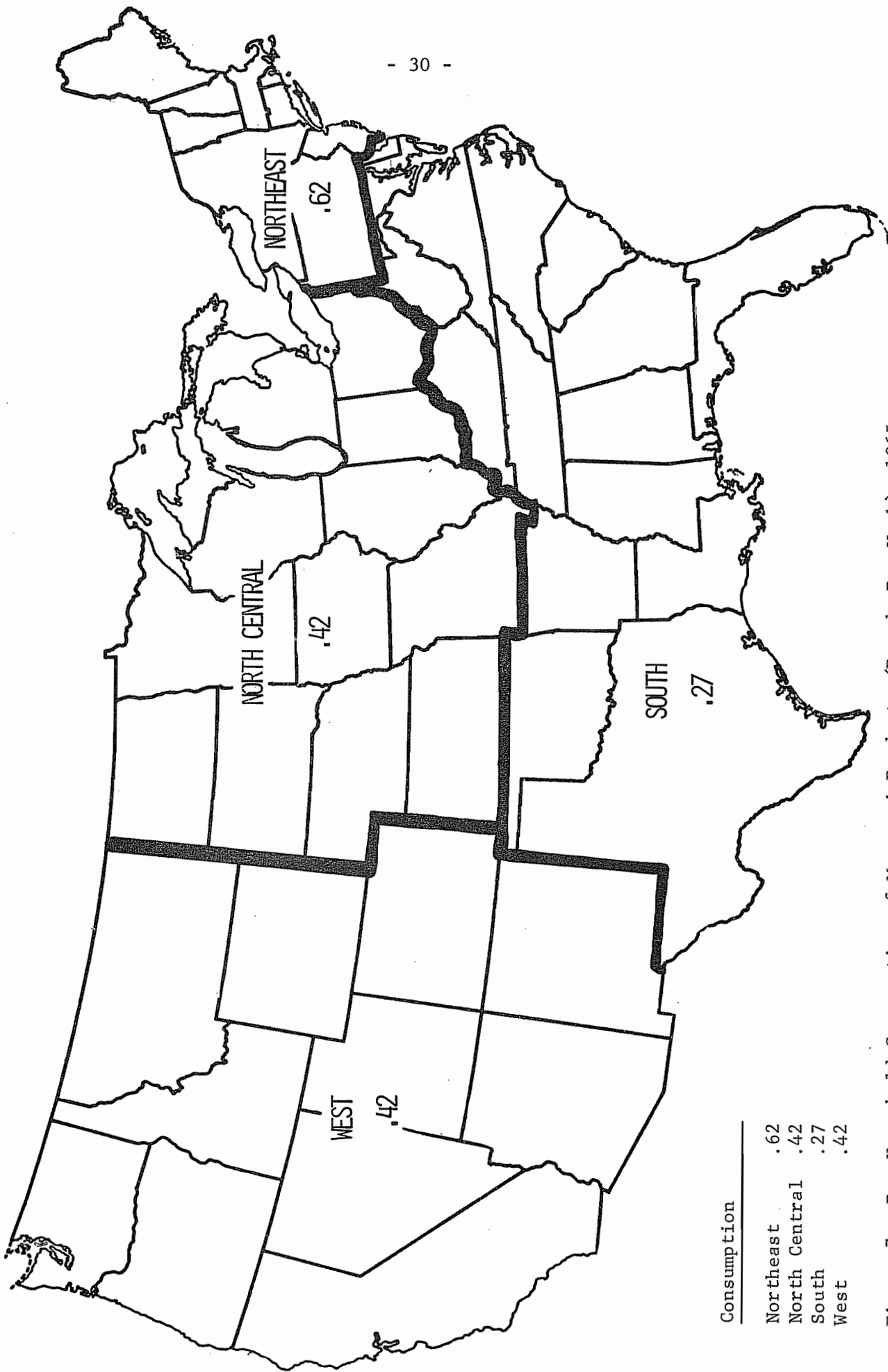


Figure 7. Per Household Consumption of Macaroni Products (Pounds Per Week), 1965

TABLE 14. UNITED STATES EXPORTS OF DURUM WHEAT, WITH PERCENTAGES OF TOTAL UNITED STATES DURUM PRODUCTION, 1960-1969

Year	Durum Wheat Exports (1,000 bushels)	Percentage of Total Production
1960	5,256	15
1961	15,878	75
1962	3,314	5
1963	27,871	54
1964	7,715	12
1965	33,852	48
1966	47,144	75
1967	31,103	47
1968	46,402	47
1969	34,244	32

Source: United States Department of Agriculture, Grain Market News, Grain Division, Agricultural Marketing Service, Vol. 8, #28; Vol. 9, #28; Vol. 10, #28; Vol. 11, #28; Vol. 12, #29; Vol. 13, #29; Vol. 14, #29; Vol. 15, #29; Vol. 16, #29; Vol. 17, #29; Vol. 18, #30; Washington, D.C.

TABLE 15. INSPECTIONS FOR EXPORTS OF DURUM WHEAT BY COASTAL AREA WITH COMPARISONS, 1960-1969

Coastal Port Area	Year																			
	1960		1961		1962		1963		1964		1965		1966		1967		1968		1969	
	Bushels (1,000)	% Total	Bushels (1,000)	% Total	Bushels (1,000)	% Total	Bushels (1,000)	% Total	Bushels (1,000)	% Total	Bushels (1,000)	% Total	Bushels (1,000)	% Total	Bushels (1,000)	% Total	Bushels (1,000)	% Total	Bushels (1,000)	% Total
Canadian	--	--	--	--	--	--	--	--	1,442	18	2,222	6	10,416	22	4,494	14	11,715	25	16,311	48
Great Lakes	3,886	74	14,438	91	3,067	93	7,894	28	1,847	24	8,815	26	17,074	36	14,501	47	11,956	26	6,247	18
Atlantic	985	19	242	1	--	--	19,702	68	3,182	41	14,650	43	11,136	23	8,935	29	18,479	40	5,977	17
Gulf	385	7	767	5	33	1	905	4	1,216	16	8,007	24	7,989	17	2,295	7	3,620	8	3,950	12
Pacific	--	--	431	3	214	6	--	--	28	1	158	1	529	1	878	3	632	1	1,759	5
TOTAL	5,256	100	15,878	100	3,314	100	27,871	100	7,715	100	33,852	100	47,144	100	31,103	100	46,402	100	34,244	100

Source: United States Department of Agriculture, Grain Market News, Grain Division, Agricultural Marketing Service, Vol. 8, #28; Vol. 10, #28; Vol. 11, #28; Vol. 12, #29; Vol. 13, #29; Vol. 14, #29; Vol. 15, #29; Vol. 16, #29; Vol. 17, #29; Vol. 18, #30; Vol. 19, #30; Washington, D.C.

TABLE 16. INSPECTIONS OF EXPORTS OF DURUM WHEAT BY COUNTRY OF DESTINATION, 1960-1969<sup>a</sup>

Country	Year										Total
	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	
	(1,000 bushels)										
Algeria		3,586 (23)				3,191 (09)	11,665 (25)	8,692 (28)	8,117 (18)	5,860 (17)	41,111 (16)
Angola								50 (12)			50 (N)
Arabia								37 (11)			37 (N)
Argentina						2 (N)					2 (N)
Austria				116 (.4)							116 (N)
Belgium		923 (06)		699 (02)	187 (02)	1,477 (04)	2,041 (05)	2,816 (09)	2,387 (05)	2,510 (07)	13,040 (05)
Canada	2,849 (54)	5,878 (37)		1,660 (06)							10,388 (04)
Canal Zone								6 (N)	40 (.1)	34 (N)	80 (N)
Chile							424 (.8)		2 (N)		426 (.2)
Columbia								41 (.1)			41 (N)
Costa Rica								67 (.2)	57 (.1)	199 (.1)	323 (.1)
Dom. Repub.						140 (.4)	225 (.4)	282 (.8)	379 (.7)	376 (01)	1,402 (.6)
Ecuador									1 (N)		
France	576 (11)	2,135 (13)	1,495 (45)	1,817 (08)	3,839 (50)	10,102 (30)	7,630 (16)	4,848 (16)	9,367 (20)	3,703 (11)	45,512 (18)
Germany W.	74 (01)			35 (.1)	114 (01)	267 (.8)	411 (.8)	615 (02)	918 (02)	157 (.4)	2,591 (01)
Guatemala					3 (N)			46 (.1)	118 (.2)	223 (.6)	390 (.2)
India						1,054 (03)	1,510 (03)				2,564 (01)
Ireland				4 (N)			1,018 (02)	44 (.1)			1,066 (.4)
Italy						3,938 (12)	4,109 (09)	3,228 (11)	13,774 (30)	7,154 (21)	32,203 (13)
Japan					48 (N)	158 (.5)	529 (01)	771 (02)	464 (01)	1,437 (04)	3,407 (01)
Lebanon					562 (07)	3,075 (09)	853 (02)				4,490 (02)
Libya									290 (.6)		290 (.1)
Morocco							1,504 (03)	661 (02)			2,165 (.9)
Mozambique			14 (01)								14 (N)
Netherlands	332 (07)	2,778 (17)		2,810 (10)	2,071 (27)	6,433 (19)	6,145 (13)	3,670 (12)	6,600 (14)	6,014 (18)	36,853 (15)
Norway						74 (.3)	657 (01)			147 (.1)	878 (.3)
Panama								47 (.1)	60 (.1)	183 (.4)	290 (.1)
Philippines								20 (N)	39 (.1)	20 (N)	79 (N)

- continued -



TABLE 16. INSPECTIONS OF EXPORTS OF DURUM WHEAT BY COUNTRY OF DESTINATION, 1960-1969<sup>a</sup> (CONTINUED)

Country	Year									Total	
	1960	1961	1962	1963	1964	1965	1966	1967	1968		1969
	(1,000 bushels)										
Poland								854 (03)			854 (.3)
Portugal	794 (15)			456 (01)		739 (02)	1,280 (03)	466 (01)	916 (02)	1,040 (03)	5,691 (02)
Soviet Union				20,085 (72)	1,677 (23)						21,762 (09)
Spain					458 (06)	592 (02)					1,050 (.4)
Switzerland			32 (01)								32 (N)
Tunisia								2,516 (08)	1,491 (03)	2,973 (09)	6,980 (03)
United Kingdom				18 (N)	103 (01)	1,684 (05)	6,270 (13)	101 (.3)	56 (.1)	318 (.9)	8,550 (03)
Venezuela	52 (01)			171 (.5)	238 (03)	926 (03)	873 (02)	1,225 (04)	1,326 (03)	1,854 (6)	6,665 (03)
Other	579 (11)	578 (04)	1,773 (53)							42 (N)	2,972 (01)
Reduction of U.S. Stocks in Canada					-1,585 (-20)						-1,585 (-6)
TOTAL	5,256 (100)	15,878 (100)	3,314 (100)	27,871 (100)	7,715 (100)	33,852 (100)	47,144 (100)	31,103 (100)	46,403 (100)	34,244 (100)	252,779 (100)

<sup>a</sup>Values in parentheses represent the percentage of the total (N = negligible amount).

Source: United States Department of Agriculture, Grain Market News, Grain Division, Agricultural Marketing Service, Vol. 8, #28; Vol. 9, #28; Vol. 10, #28; Vol. 11, #28; Vol. 12, #29; Vol. 13, #29; Vol. 14, #29; Vol. 15, #29; Vol. 16, #29; Vol. 17, #29; Vol. 18, #30; Washington, D.C.

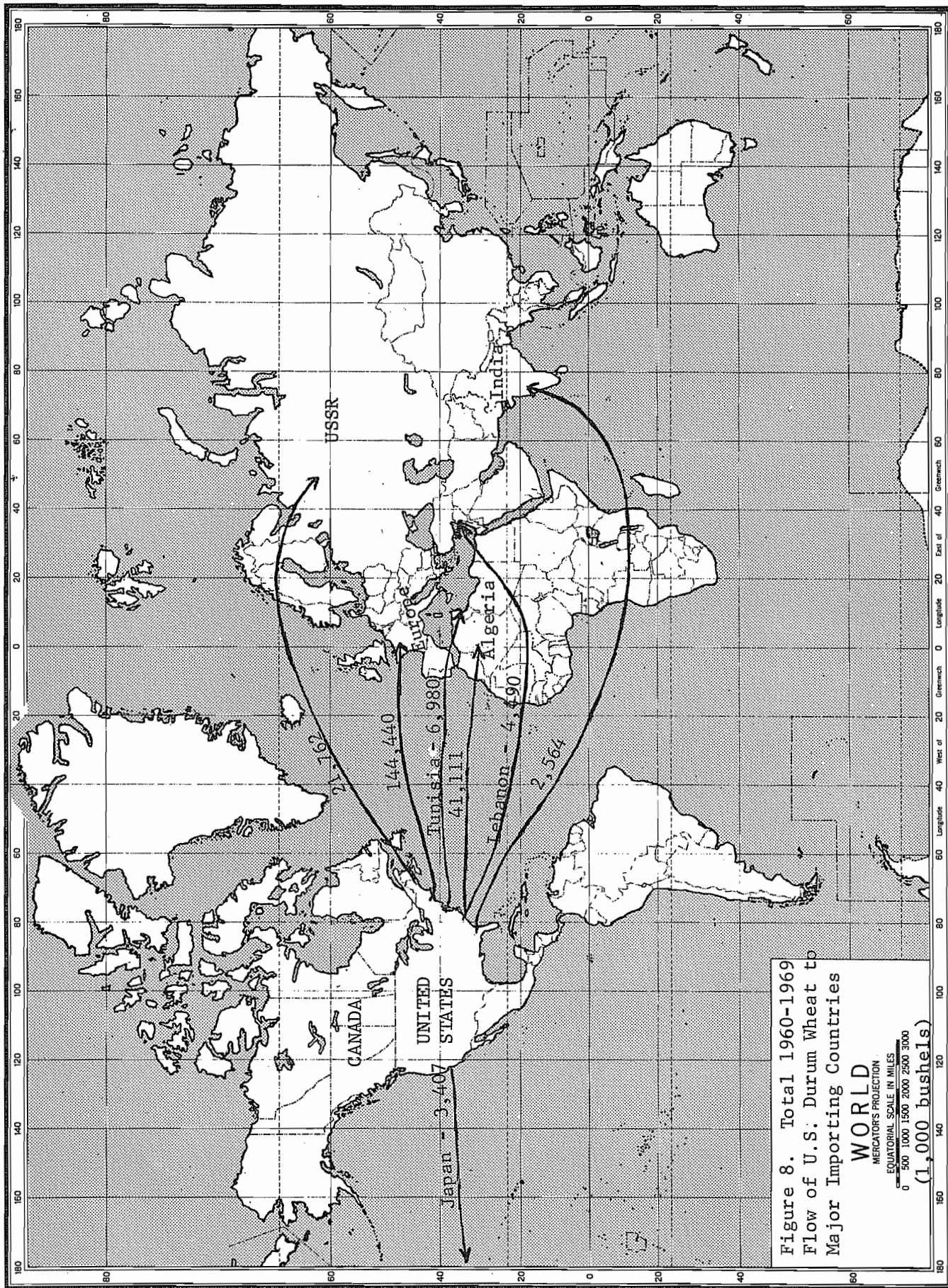


Figure 8. Total 1960-1969  
Flow of U.S. Durum Wheat to  
Major Importing Countries