ECONOMIC EFFECTS OF SOME MAJOR CHANGES IN THE FLOUR-MILLING INDUSTRY

By

HUEY JEFFERSON BATTLE

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University of Wisconsin

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THESIS APPROVED:

Peter Nelson
Head, Department of Agricultural Economics
Chairman, Advisory Committee

Raymond S. Thomas
Dean, Division of Commerce
Member, Advisory Committee

Roscoe L. Barnes
Professor of Agricultural Economics
Member, Advisory Committee

F. L. Underwood
Professor of Agricultural Economics
Member, Advisory Committee

Fred E. Pratt
Head, Department of Business Administration
Member, Advisory Committee

Robert MacVicar
Dean, Graduate School

337430

PREFACE

The processing industries directly associated with agriculture could be studied quite independently of the agricultural industry. An approach to the study in this narrower content would not provide the correct perspective of the true situation. It is also erroneous to conceive the economic development of the wheat-flour-milling industry to be independent of the other segments of the economic society which it so clearly exemplifies. A large wheat surplus with all the related problems causes consideration to be given to all the means for alleviating the basic problem of instability in the agricultural economy. A study of major changes that have taken place in the wheat-flour-milling industry provides a frame of reference for formulating governmental policies and alleviating the problems of wheat surpluses. This represents the content of this study.

The nature of this study is both historical and analytical. A review of the changes that have taken place in the wheat-flour-milling industry is made, and the effects of the changes on the industry are analyzed. Few publications on the wheat-flour-milling industry are found since the 1930's, except for regular publications of the millers' organization (Millers' National Federation). Included in this thesis is information ranging from accounts of the primitive era through the first half of the twentieth century. The review since 1900 is restricted primarily to the United States.

The objective of this thesis is to submit in an organized manner a rather complete review of the wheat flour milling industry, pointing out major changes that have taken place in the industry and the economic effects of such changes. One aim is to provide additional information on the operations and progress made by the industry in order that policy makers may direct their attention to factors affecting these operations and thereby formulate policies in the best interest of the economy.

I wish to express special gratitude to Professor Adlowe L. Larson, my thesis advisor, for his critical appraisals and most helpful suggestions in the preparation of this manuscript. I am indebted to Professor Peter Nelson, Head of the Department of Agricultural Economics and Chairman of the Advisory Committee, for his patience and liberal encouragements. I am sincerely grateful to Professor F. L. Underwood, member of the Advisory Committee, for his invaluable suggestions and to other members of the Agricultural Economics staff for their assistance in the preparation of this manuscript. To Professor Raymond D. Thomas, Dean of the Division of Commerce and member of the Advisory Committee, my appreciation is extended for his useful criticisms and suggestions relevant to this study. I am also grateful to Professor F. E. Jewett, Head of the Department of Business Administration and member of the Advisory Committee, for his valuable suggestions on certain areas of inquiry, and to other members of the economics staff for their assistance in making this study.

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CHAPTER I

MAJOR CHANGES IN THE PRIMITIVE ERA

Wheat milling as an industry is relatively young when compared with the milling of wheat. The term "wheat milling industry" is meaningful only when associated with the production of flour and by-products of wheat after the industrial organization of wheat processing plants which did not come into vogue until the beginning of the "power age" discussed later in this section. Grinding or milling of wheat, however, dates back to prehistoric days.

A change occurred in the meaning of the words "mill" and "miller" as a result of the change in the operation performed by them. Formerly the term "mill" was associated with a place or apparatus where grain was ground. Recently the word "mill" has carried a much broader connotation including buildings other than those in which the grinding of grains takes place, e.g., sawmills, steel mills, powder mills, etc. The term "mill" is generic as used today. Originally the term "miller" was used to designate both the master and the miller. Later, as milling became a business in modern terminology, the masters or owners performed the management of the business, and the millers were assigned the role of operating the mechanical or production end.

Origin of Milling

The origin of wheat-milling was evidenced soon after the arrival of man. The use of stones as a device for the cracking of grains for human consumption originated because of the inability of man to execute the

process with his teeth. The time of such origin dates back to the early days of the Egyptian nation, about 6000 years ago.[1]

However, the earliest grinding of wild grains, not wheat necessarily, began about 75,000 years ago during the Aurignacian times. Some of the stones used then were described as roundish, about one and one-fourth inches thick with a flat surface about three and one-half inches across.[2] One was held in the palm of the hand and worked against the other in one of the following three ways: (1) up-and-down, (2) back-and-forth, or (3) a round-about motion. These stones were tri-purpose tools and very crude apparently, since they served as hammer-stones, chopping blocks or anvils, and rubbing stones.

Man's reliance on grain

The pre-eminence of the primitive mode of manufacturing grain-food became increasingly apparent as man's reliance on grain increased. This increase in man's dependence on grain-food resulted from a diminution in quantity of edible meats available to him. This transition took place about 25,000 years ago. Evidence of such transition is found in the Magdalenian times. The hollowed stones and evidence of rickets revealed by their skeletons support the contention that man's dependence on food had been shifted from meat to grain-food.[3]

A similar change in man's dependence on plant food appears to have taken place in Europe and later in America. The occurrence of such transition may be regarded as administering great impetus to the origin of wheat-milling.

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[1]P. A. Amos, Processes of Flour Manufacture (London, 1925), p. 5.

[2]John Storck and Walter D. Teague, Flour for Man's Bread (Minneapolis, 1952), p. 17.

[3]Ibid., p. 17.

The change in the use of grinding tools appears to have taken place in an effort to keep pace with agricultural production, an industry much more recent. The development of domestic milling seemed to have advanced faster in America than it did in Greece. This was due mainly to the large quantities of cereals found in America after Columbus' expedition. The finding of those vast quantities of wheat, barley, and other cereals encouraged the development of skillful tools to process them and provide an abundance of desirable grain-food.

In the Old World (Greece), unlike the United States, where abundance of cereals prevailed, efforts were made to increase productivity in the grinding process in order that the time and energy necessary for the grinding of wheat might be minimized. Efforts were made also to reduce the amount of waste occurring in the milling operation.

Origin of the mortar-pestle

In an effort to attain this objective the process of grinding was changed from the handstone method to that of the mortar-pestle combination.[4] This method of grinding grains appears to have been introduced about 4000 B. C.[5]

To increase the quantity of wheat and other cereals the cultivation of grains was found productive. Agriculture was born as the cultivation of grains was introduced, some eight or nine thousand years ago. Agriculture may be regarded as the parent of civilization. This was apparent to the Egyptians as they revealed their story of Osiris and

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[4]In the handstone method of cracking grain a rather flat stone with a slight depression in the center was used in conjunction with a small flat stone. The mortar-pestle combination consisted of two crude tools used in cracking grain. The mortar was a round hollow stone and the pestle was blunt on one end but small enough on the other to be held with one hand. For description see Ibid., pp. 44-46.

[5]P. A. Ames, op. cit., p. 7.

Isis. Osiris taught the people of his time how to till the soil and manage the fruits of the earth. Isis had discovered the way to make bread from wheat that had grown voluntarily, but its use was unknown. According to the Greek agricultural myth this happened in Nysa and indicates that Nysa was the birthplace of agriculture.

Nysa, according to Pliny, is Scythopolis, located just south of the Sea of Galilee. Wild wheat and barley were found there as late as 1906 by Aaronsohn.[6]

Milling Tools in the Early Age

The change to the grinding of wheat-grain by the use of mortars and pestles was aimed at increasing the efficiency of the operation--to reduce waste and attain the desired degree of fineness through a much more controlled operation. Mortars and pestles took on many shapes and sizes during this transitional period in an effort to enhance their proficiency.

As pointed out earlier, the cracking of grain was done in one of three ways.[7] Tools adapted to different motions apparently took on different shapes; viz., for up-and-down pounding a tall cylinder-type mortar was most productive; for back-and-fourth motion the saddlestone-metate was employed; for round-about motion a shallow mortar was devised. An additional motion was used which has not been mentioned heretofore. It was employed by many people for a long period of time and may be viewed as a conglomeration of those named above--the indiscriminate motion using a "pounder-rubber" combination as its adopted implement.

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[6]Storck and Teague, op. cit., p. 27.

[7]Cf. p. 2.

It was, nonetheless, crude in the grinding process. The operation of these crude tools was manifested in a period ranging from 4000 to 2000 B. C.[8]

Origin of the saddlestone-metate

The development of saddlestone-metate, which was found in Egypt about 3000 B. C., was not alone in improving the means of processing wheat.[9] It was accompanied by other improvements. For better grinding and reducing perishability, preliminary treatments of wheat were sought and used. Romans began to sun-dry their wheat; Egyptians dried their wheat by a slow fire and in some instances parched the wheat before grinding it. Moistening of wheat before grinding did not go unnoticed by the Old World. Conditioning or tempering, a principle that is presently retained, was initially witnessed here.

The mediums used in the wheat-grinding process were quite crude when compared with our present milling equipment. They may now be described as inefficient, small-scale milling tools. The milling of wheat and other cereals up to this period was, almost without exception, a household chore carried on by each family unit that could acquire the crude tools and grains for grinding. A saddlestone in its earliest stage was used all day to produce sufficient flour to feed a family of eight.

It is obvious that many changes have occurred in the technique of wheat grinding as we move from the earliest handstones to the saddlestone-

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[8]P. A. Amos, op. cit., p. 7.

[9]The saddlestone-metate consisted of two stones used in combination for crushing grain. The base of the saddlestone was flat with a slight depression in the top. The metate was usually oblong to be used by both hands in cracking the grain. See Ibid., p. 50.

metate era. A vast array of crude grinding tools has been improvised during this time span (75000 B.C. to 3000 B.C.).

A short comparison between the mortar-pestle combination and the saddlestone-metate combination reveals an explanation as to the long use of each with or without modifications. The sizes and shapes of the former varied considerably; the latter remained in the proximity of fifteen inches long and ten inches wide. The potential improvements that could be made of the former were almost nil when compared with that of the latter because of the principle upon which it operated. In consequence, the mortar-pestle combination has gone out of vogue, but the principles of modern milling of wheat may be regarded as principally the same as that of the true saddlestone-metate combination. The severe pounding of grain, a mortar-pestle operation, resulted in the loss of nutrients contained therein and was undesirable.

Change in place of grinding

Community grinding of wheat, however, the first change from household grinding, has been accredited to the community mortar. Community wheat-grinding was more pronounced in American Indian locations than in Greece.[10]

The pounding of grains by the use of the monstrous mortar-pestle combination was a strenuous operation. Efforts to minimize this exertion of energy resulted in the development of the "Lazy Jim," which aided in the substitution of water for human energy as a source of power. This method of grinding proved cumbersome, awkward, and very unsatisfactory; yet the change from the dependence on human labor *per se* as the source of power to that of natural power was phenomenal.

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[10] P. A. Amos, *op. cit.*, p. 47.

It appears advantageous to point out here an innovation that gave acceleration to the development of a tool with which a better grade of flour might be produced. It was the introduction of bread, a leaven product. Although the date and place of its origin are not ascertainable, it is strongly believed that its introduction accelerated the improvement of flour that followed.

Introduction of sieves

The Romans' appreciation for fine quality flour effected considerably the improvement in the quality of wheat products. Romans and Egyptians employed what is known as "sieves" as early as 2500 B. C. according to Pliny as cited by Storck and Teague.[11] Some sieves were made from horse hair and others from flax.

The paintings on Egyptian tombs revealed the antiquity of what is now called by millers the "gradual reduction process"—obtaining the finished product by a process of successive grinding and intermittent sifting (about 2600 B. C.).[12] Sifting permitted the separation of flour from the offal. Bread made from ground wheat without the use of sieves is regarded as poor quality bread, but it sufficed to feed those who soon populated both Mesopotamia and Egypt. Their social patterns were built around their grain production. The inhabitants of these nations were completely dependent on the production of grain, and they knew little, if anything, about meat as a food.[13]

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[11] Storck and Teague, op. cit., p. 50, 67.

[12] Ibid., p. 64.

[13] Ibid., p. 55.

Beginning of Commercial Wheat-Flour Milling

Two major changes, occurring in the eastern Mediterranean area about 1000 B. C., were of such importance that they led to the beginning of commercial wheat-flour milling. These were the employment of "saddlestone-rubber" combinations and the application of a continuous rotary motion instead of the mortar-pestle and the reciprocating or indiscriminatory motion used heretofore.[14] The saddlestone-rubber combination underwent a series of modifications enlarging its size and increasing its output capacity. But the resulting device required masculine strength for operation. Nevertheless, with this new device one man was able to produce a surplus of food in addition to the needs of his family. Flour milling became a commercial business in consequence of the productivity of man in the manufacture of wheat flour. The efficiency of capital when so applied led to what was later regarded as the beginning of industrialism. Commerce and trade began to appear in what may be regarded as a profitable undertaking.

The latter innovation, the application of continuous rotary motion, enabled the full utilization of man-power and even animals, and caused a perceptible increase in wheat-flour output.

One must keep in mind, however, that the productive wheat-flour production mediums would have been of little consequence had wheat not been available for grinding. It appears reasonable, therefore, to assume that improved methods of production were concomitantly taking place as the rate of change in flour production was greatly accelerated, all of which led to the organization of civilized societies.

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[14]The "saddlestone-rubber" combination like the saddlestone-metate was used to crack grain, the rubber being much larger than the metate. The saddlestone was more nearly rectangular than the saddlestone used in combination with the metate. For description and picture see Ibid., p. 73.

The Greeks were the first to launch a program on the experimental level with a belief that nothing was final or finished, and that there was room for improvements that would be realized only through experimental research. This belief, coupled with concerted efforts, revolutionized milling. The advancement was characterized by many trials and errors, but the present status of wheat milling discloses its importance.

Improvements of saddlestones

Of the series of changes in saddlestones, the addition of handles to the rubbers and the grooving of meeting surfaces appear outstanding. The former permitted the use of larger stones. The understone or "base stone" became flatter and more rectangular than the originally concave saddlestones. The latter permitted a shearing action instead of direct pressure that was generally exercised by ancient saddlestones. Present use of corrugated rollers indicates the benefits of this principle. The provision of a hopper in the upperstone permitted two men's continuous feeding of the mill according to its capacity--one to feed the hopper while the other pushed the handles that were attached to the rubber. Other small changes were also made; e.g., the sloping of the base stone downward and away from the pusher permitted the use of gravity, and the regulation of the height of mills to the most comfortable position.

Origin of lever mill

It was soon discovered that if the height of the mill were raised to a position where the handles were waist high and one end of the handle were stationary, one could use his hands, arms, and weight on the other end to push the handle in a circular manner. This machine when built, became known as a "lever mill." It was large and had a

capacity sufficient to provide an avenue for profit-making by entrepreneurs. Milling of flour was now done in accordance with market demand, which was principally expressed by bakeries. For all practical purposes the enterprise may be characterized as a mill-bakery combination, since bakeries were the main sources through which flour could be sold.

The change in wheat-milling tools from saddlestones to lever mills may be described as a result of continuous improvements of the saddlestones. However, the principle of push and pull movement was not changed. Milling tools of this description were saddlestones, slab mills, and push mills. Engineering developments were introduced to change the grinding of grain from a push and pull motion, which was last exercised by the "push mill" to the circular motion, which was introduced with the "lever mill" about 500 B. C.[15]

Change from lever mills to millstones

The change from "lever mills" to "millstones" may be characterized as a series of changes that retained the principle of rotary movements. Mills of this description were: hourglass mills, Delian mills, quern mills, and millstones.

The huge cumbersome hourglass, introduced by the Greeks, clearly marked the use of slaves and animals as a source of power in operating the mill.[16] It was by no means a machine of perfection, but its faults were overshadowed by its virtues. Its development was recognized as early as 500 B. C. The popularity of hourglass mills remained high because their power sources, slaves and animals, were plentiful and the output of these monstrous mills was relatively large.

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[15] Ibid., p. 74.

[16] The hourglass differed from the lever mill in that it was larger and included a cylindrical hopper.

Notwithstanding the fact that hourglass mills had contributed immensely to popularizing industrial milling, there was little change in the place of grinding bread-grain for home consumption. Advantages of rotary motion milling were kept in mind by family millers, although such a small-scale plant would not accommodate a huge mill such as the hourglass mill.

Resulting from efforts to employ this advantageous rotary motion using the minimum amount of labor was the introduction of quern mills and the subsequent abolition of the huge hourglass.[17] The quern even surpassed the saddlestone in domestic use except in some isolated areas. It was much more efficient and could be easily adapted to family-size production needs. It remained, therefore, in vogue as long as domestic grinding was carried on. Military groups could carry portable querns along to grind their food-grain, which was very important during this era since perishable flour could not be taken. A quern was capable of grinding a bushel of wheat in an eight-hour day. It was nearly twelve times as productive as the saddlestone. The quern was about one third as productive as the hourglass per unit of time but exceeded the hourglass in productivity per unit of effort.

Power Age: 600 A.D. —

The change from the quern to the millstone represented numerous small improvements accruing from efforts to perfect milling equipment. Empowering of milling equipment by water, wind, steam, and later by electricity is indicative of the engineering ability of millwrights, who became known as "engineers." Production efficiency no longer

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[17]The quern used the same principles as the lever mill and hourglass, but was much smaller than either.

rested on the physical power of man but was extended to the availability of natural power. This era can easily be regarded as the "power age," the origin of which dates back approximately 2000 years.

Mention was made of the existence of water mills by the Roman architect, Vitruvius, as early as 19 B.C.,[18] by Ausonius in the third century A.D., and in England in 762.[19] Arabian travelers found windmills in operation on the banks of the Helmand in what is now eastern Iran about 1000 A.D., approximately a thousand years after the first record of the water mill.[20]

In the search for natural power the steam engine was invented in 1769. Since the flour milling industry was an important user of power, the steam mills were introduced shortly thereafter, about 1784.[21] Although the steam mill was a technological advancement, it created problems in the sanitation of both the flour and the facilities.

About 100 years later electricity as a source of power in flour milling was introduced. The first all-electric flour mill was erected at Laramie, Wyoming, in 1887. Perhaps the primary advantage of electric mills over steam mills at that time was the improved sanitation which resulted in higher quality flour. Electric milling continued to replace steam milling until, by 1940, the ratio of electric milling to steam milling was four to one.[22]

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[18] Ibid., p. 94.

[19] Ibid., p. 99.

[20] Ibid., p. 116.

[21] P. A. Amos, op. cit., p. 6.

[22] Starck and Teague, op. cit., p. 194.

The transition to the employment of power mills lagged behind in some areas for three reasons: (1) power milling was very slightly related to the attitudes and social patterns prevailing at the time, (2) labor was cheap in many localities, and (3) initial cost of setting up power mills was relatively high. This transition, however, opened two avenues of improvement: first, the development of scientific and mechanical studies and, second, the employment of natural power instead of human power as a prime mover. With these two coupled together, complemented by machine parts to exercise them, man's productive capacity was much less limited.

Water mills

The prerequisite for water mills was a strategic location on or near a body of water. With this type of mill in operation, a city located at a distance from a body of water was at an economic disadvantage. Water mills, with their milling capacities, caused the development of many cities along or near bodies of water; e.g., Rochester, New York, sprang up around the great falls of the Genesee River, and Minneapolis around St. Anthony Falls.[23]

Windmills

The windmill originated from efforts to innovate a prime mover that did not require the strategic location that water mills required. The importance of natural power was not realized in some areas until after the fall of the Roman Empire and the evolution of freedom, greatly reducing slave labor. Cities not located near bodies of water felt that this innovation was indispensable if they were to compete with cities

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[23] Ibid., p. 102.

adjacent to water. The importance of milling suggests that it was one of the dominating enterprises governing economic prosperity in many areas during this time. Production by windmills depended entirely on the sensitiveness of the mill to the wind. Reliance could not be placed on incessant wind for continuous grinding of grain. However, this source of power could be more widely used than water. More reliable sources of power were sought later for the grinding of grains, since the enterprise was economically profitable only when in continuous operation. The ceaseless demand for flour and the inability to preserve its original quality necessitated continuous production. The intermittence of wind power prevented millers from satisfying the demand.

Steam mills

A shift to the steam mill was witnessed but not before windmills had been erected in great numbers in many parts of the world, including both the New and the Old World. Many windmills are still found in operation but are not so massive in construction as those of the 16th and 17th centuries. They are now used primarily for pumping water into storage tanks and charging storage batteries. But, as wheat-milling changed from a community to a large-scale industry, windmills soon lost their prominence. Popularity of the steam mill was hampered somewhat by the large amount of fixed cost involved in the establishment but its large productive capacity caused the milling industry to change from wind-milling to steam-milling. Moreover, the possibility of continuous grinding by steam mills played no small part in facilitating this transition.

Electric mills

Electric mills were adopted with the aim of improving sanitary conditions in the flour mills. They soon proved superior to steam mills

and were adopted at an increasing rate. The electric mill permitted a better control of operations in the flour production process than did water, wind, or steam mills. Also less space was required to set up electric machinery because of its compactness. Although electric machinery reduced the size of physical plants necessary to grind a given quantity of flour, fixed costs were higher. But production per mill increased. Also the number of workers could be reduced by using electric milling machinery, which lowered the labor cost for a given flour output.[24]

Analysis and Conclusions

The wheat milling industry has undergone several major changes in organization since its birth, which occurred when flour milling became a commercial enterprise. Prior to this time wheat-milling was first a household chore and later a community enterprise.

Displeased with the crude system of wheat grinding, millers and technicians put forth untiring efforts and exercised ingenuity in a search for a more reliable source of power and productive machinery. The use of electricity, replacing steam and water in many instances, and the employment of rollerstones, replacing mortar-pestle combinations, seem to have satisfied the immediate search. These two major changes ultimately led to what is now regarded as the modern milling industry.

The air current purifier of 1873 and the automatic roller mill of 1874, which resulted from many previous improvements, both major and

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[24]For other mechanical and operational advantages of electric mills over steam mills, see Leslie Smith, Flour Milling Technology (Liverpool, England, 1944), p. 368.

minor, revolutionized the milling industry.[25] Changes to more productive machinery and the increasing application of electricity soon resulted in discarding the old grist mill that had been grinding grains for tolls or exchanging processed products for unprocessed grains with consumers.

These changes in machinery resulted in a milling industry that could manufacture more than enough flour to meet the domestic demand. The introduction of electric mills improved the quality of flour supplied to consumers. The increase in milling productivity encouraged the growing of additional wheat, but the effects could not have been fully realized without improvements in transportation. These changes, therefore, have aided millers in producing flour on a commercial basis.

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[25] A. C. Hoffman, Large-Scale Organization in the Food Industries (Washington, 1940), p. 38.

CHAPTER II

EXTENT OF MAJOR CHANGES IN THE MILLING INDUSTRY

After the introduction of productive milling machinery it was necessary to make additional changes to better utilize the increased capacity. These were changes in locations of milling centers, public privileges granted to the flour milling industry, changes in organization within and among firms in the milling industry, changes in exports of flour, mergers and consolidations, and changes in purchase and sale practices in the industry. The extent to which these changes have taken place and their effects on flour-millers' operations make up the content of this chapter.

Location of Flour-Milling Centers

Prior to the 20th century major flour-milling centers shifted with wheat production. Transportation appears to have been one of the dominant factors. Other factors were (1) location of consumers in relation to wheat growing centers, (2) sources of milling powers, and (3) milling-in-transit privileges.[1]

From 1650 to 1899

During the latter half of the 17th century New Amsterdam, now New York City, was the largest flour production center in America. It retained this position until the middle of the 18th century when Philadelphia gained first place.

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[1]Cf. p. 72.

New York City's position as the leading flour-milling center was due mainly to a monopoly law that had been enacted in 1678 prohibiting the milling of flour anywhere else in the province.[2] This law resulted in a big conflict in the state of New York and in consequence was abolished in 1694.[3] Flour-milling in New York City then decreased.

It was not until about 1750, however, that Philadelphia gained the first place as a flour-producing center. Baltimore, Wilmington, Delaware, and Richmond, Virginia, were at that time making a considerable proportion of the total flour produced in America. Pennsylvania was exporting about 40 percent more wheat, flour, and biscuits than New York, and these two ports accounted for almost all of the exports.[4]

Near the beginning of the 19th century Philadelphia lost its position to Baltimore, which retained it until 1830.[5] Grain and flour were being transported down rivers by boats and over land by wagons. Soon railroad lines were laid, and the sources of wheat supply extended westward beyond the Alleghenies where soil adapted to wheat production was cultivated. In consequence, Baltimore's flour production rose as high as 800,000 barrels a year.[6]

By this time, notwithstanding the fact that Baltimore's production of flour had risen considerably, New York, a city located nearer the western grain-producing section had surpassed Baltimore and had become for the second time the largest flour-producing city in America. The

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[2]Storck and Teague, op. cit., p. 149.

[3]Ibid.

[4]Ibid., p. 152.

[5]Ibid.

[6]Ibid., p. 153.

state of New York then became the leading flour-producing state and maintained this rank until 1890 when Minnesota took the lead.

After the introduction of mass production machinery, economics of flour milling became primarily a function of transportation and power costs. The Falls of St. Anthony in Minnesota provided supply of power for flour milling on a large-scale basis. Moreover, it was located closer to the wheat production areas. Incorporated just west of the Falls was Minneapolis, Minnesota, in 1858.[7] The economic effect of improved flour-milling machinery and the large source of power furnished by the Falls is indicated by V. S. Clark in the following statement:

> As early as 1878 a solid train of cars carrying 2,500 barrels of flour reached New York after an unbroken trip from Minneapolis, to make connection with a steamer which would deliver the consignment in London sixteen days from the time it left the Falls of St. Anthony. In 1881 Minneapolis manufactured 3,125,000 barrels of flour. Three years later its annual output was 5,100,000 barrels, and by 1890 it manufactured flour-mill-products to a value of nearly $31,000,000.[8]

By 1884 Minneapolis not only had surpassed New York City but had become the largest milling center of the World.[9] Minneapolis mills rose from an average daily capacity of 25 barrels in 1860 to 1,867 barrels in 1890. The increase points to the strategic importance of a location which provided efficient power and an adequate grain supply, located between the wheat-producing areas and centers of population. The importance of location cannot be overemphasized during the early 19th century, for modern means of transportation were yet lacking.

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[7] Ibid., p. 210.

[8] V. S. Clark, History of Manufactures in the United States, Vol. II (New York, 1929), p. 504.

[9] Storck and Teague, op. cit., p. 210.

The development of improved means of transportation encouraged millers throughout the country to expand their milling capacity and improve their milling techniques. They were then able to purchase wheat in distant markets and transport flour to consumers located long distances from the mill.

From 1900 to 1952

Improvements were made in transportation facilities in the last decade of the 19th century. These, coupled with milling-in-transit privileges, enabled millers to expand their markets. Because of lower relative cost millers regarded transportation as of lesser importance than they did during the 17th century.

Table 1 indicates three cities producing the largest quantity of flour in the United States during the 20th century.[10]

Table 1. Production of Wheat Flour by Selected Cities, Specified Years—1902-1952.
(In millions of barrels)

Year	Buffalo	Kansas City	Minneapolis
1902	1.0	1.3	16.3
1905	2.5	2.1	14.4
1910	3.8	2.2	15.4
1915	6.6	2.9	18.1
1920	5.2	3.6	15.0
1925	9.5	5.4	12.0
1930	12.3	7.8	10.8
1935	9.6	6.0	6.6
1940	9.8	6.2	5.3
1945	13.4	7.8	8.4
1950	12.8	7.9	6.8
1952	12.2	7.7	7.4

Source: 1902-30 from Malott and Martin, Agricultural Industries, 1939, p. 245; 1935-52 from the Northwestern Miller (Almanack Number), 1953, Vol. 249, p. 30. Note: Figures for years 1945-52 have been converted from hundredweight sacks by the equation $Y = \frac{X}{1.96}$ where Y = Number of barrels, 1.96 is based on 196 lbs. of flour per barrel, X = Number of 100-lbs. sacks.

[10] For regions see Appendix, Table VII.

The data in Table 1 reveal the changes that occurred in the three largest wheat-flour producing centers in the United States from 1902 to 1952. Minneapolis stood well ahead of both Kansas City and Buffalo during the first two decades of the 20th century. About 1930 Buffalo began producing more wheat-flour than Minneapolis. Buffalo's increase in production was attributed to the milling-in-bond provision adopted in the 1920's. Kansas City, Kansas, has surpassed Minneapolis only three times: first in 1940, second in 1950, and third in 1952. Although Buffalo remained ahead of Minneapolis after 1930, it has not for one time exceeded the record set by Minneapolis in 1915 when its flour production rose to 18.1 million barrels. Buffalo's highest record was set in 1945 when its flour production rose to 13.4 million barrels. Thus Buffalo, Kansas City, and Minneapolis ranked first, second, and third respectively in 1952. But flour production of the states in which these cities are located has not followed a similar pattern.

It is necessary to consider the production of the six largest wheat-flour-producing states in order to determine whether a relationship existed between the largest flour-producing cities and the largest flour-producing states.

From 1904 through 1929 Minnesota led all states in flour production just as its principal producing city Minneapolis led all cities in flour production during the same period (Table 2). By 1935 Minnesota had been surpassed not only by New York, as Buffalo had surpassed Minneapolis, but also by Kansas, a state whose main producing city, Kansas City, did not surpass Minneapolis until about 1940. Kansas, taking the lead about 1935, remained well ahead of Minnesota and New York, which tended to alternate for second position according to the years included in the table.

Table 2. Flour Production by Six Leading States in United States, Specified Years—1904-1952.
(In millions of barrels)

Year	Kansas	Minnesota	New York	Missouri	Illinois	Texas
1904	17.0	23.9	5.7	6.2	6.0	3.2
1909	10.9	23.7	6.7	5.7	6.4	3.3
1914	12.8	27.1	8.5	5.4	6.6	4.1
1919	16.2	28.5	9.1	7.1	7.2	4.6
1925	15.9	23.7	9.0	7.5	5.5	4.0
1929	15.1	19.7	12.0	8.9	5.4	4.3
1935	13.6	12.0	12.4	7.7	5.2	6.2
1937	15.3	11.2	12.7	9.0	5.2	6.8
1941	16.3	11.2	13.6	9.6	5.7	6.5
1945	20.6	18.6	16.3	11.6	7.5	9.5
1949	18.9	14.7	14.9	11.2	6.2	7.5
1952	17.9	14.8	14.2	10.1	7.0	6.3

Source: (1904-1941) Biennial Census of Manufactures; (1941-1952) The Northwestern Miller, Almanac Number, Vol. 249, April, 1953. Note: Figures for years 1945-1952 have been converted from hundred weight sacks by equation $Y = \frac{X}{1.96}$, where X = Number of sacks, Y = Number of barrels, 1.96 is based on 196 lbs. per barrel.

Missouri and Illinois produced more flour than New York in 1904. Texas did not exceed either of the "Big Three" producing states. Texas exceeded Illinois in flour production about the same year that Kansas and New York exceeded Minnesota, but yielded to Illinois again in 1952. Missouri, however, maintained fourth position from 1935 through 1952.

In the more recent years Kansas led all other states in flour production, yet the largest flour-producing city of the state ranked third up to 1935 when compared with Buffalo and Minneapolis, indicating that flour milling was not concentrated in Kansas as in New York and Minnesota. Since Kansas did not have as cheap sources of power and transportation as did Minnesota and New York, centralization of flour milling did not occur.

Where wheat production is well distributed over the state, cost of transporting wheat to mills may be minimized if mills are located at or near these production sections. On the other hand, cost of manufacturing flour may be minimized if mills are located at points where milling power is least expensive. In states where flour is produced either wheat or milling power may not be present in adequate supplies. Therefore, comparisons must be made between the increase in cost if wheat were transported from wheat fields to mills located where ample milling power is available and the increase in cost of production if mills were located at or near wheat production sections and the product then transported to consuming areas.

In Kansas, a wheat-producing state, flour mills are scattered over the state near the wheat fields. In states where relatively small volumes of wheat are grown but ample milling capacities are available, mills are generally located near sources of milling power or whatever advantageous positions may be available. This, along with water transportation outlets and the milling-in-bond provision, accounts for the relatively large amount of milling done in Buffalo as compared with Kansas City, whereas the state of Kansas exceeds the state of New York in flour production.[11] Transportation, therefore, is one of the location-determining factors even though its relative importance has declined since the development of economical means of overland transportation.

Railroad Transportation of Wheat

Fifty percent of carload terminations of wheat was located in three states - Minnesota, Kansas, and Texas. The states of Oklahoma,

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[11]For explanation on milling-in-bond see page 31.

Missouri, Wisconsin, Washington, and Illinois accounted for an additional 25 percent of the 1949 terminations. The remainder was distributed over other states.[12] The mere fact that New York was not one of the eight states that accounted for 75 percent of carload terminations, though ranking third in flour production, is indicative of the small proportion of the total amount of wheat coming into New York by rail. New York's largest flour-producing center is Buffalo, which receives most of its wheat by boat.

The railroad movement of wheat in the United States is quite complex.[13] The intrastate and interstate movements of wheat reveal to some extent the location of mills within and outside of wheat-producing states. Arrivals at Minneapolis and Buffalo are largely interstate movements, whereas Kansas City's arrivals are primarily intrastate movements, in spite of a substantial volume received from Oklahoma. Terminals in Minnesota are primarily supplied by the Dakotas and Montana with small volumes entering from Nebraska. In 1949 approximately three-fifths of the carload terminations of wheat in the United States were interstate, and two-fifths were intrastate shipments.[14]

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[12]W. J. Hudson, A Study of Conditions Affecting the Transportation of Grains by Railroad (Washington, D. C., June 1953), p. 9.

[13]The complexity of railroad movements of wheat stems from the fact that wheat shipments by rail have their own distinctive traffic flow dictated by the factors of production, the location of consumer markets, and the end use of the product. Moreover, the multiplicity of routings available coupled with the in-transit privilege make railroad movement of wheat even more complex.

[14]For detailed description of intrastate and interstate movement of wheat see W. J. Hudson, op. cit., pp. 9-12.

Motortruck Transportation of Wheat

Prior to 1930 railroad companies were not competing much with motortrucks in the transportation of wheat. Motortrucks were used primarily in hauling wheat from the farm to country assembly points located along railroad lines. Wheat was then loaded into boxcars and transported to central or terminal markets for milling. The portion not milled at this terminal market was eventually moved by rail to other mills or to ocean ports for export.

Wheat farmers were faced with a rapid decline in wheat prices during the depression years of the 1930's. The downward adjustments in railroad rates were slower than the rapid decline in wheat prices. As a result, transportation of wheat by motortrucks was extended beyond country assembly points to terminal markets in an effort to reduce cost of transportation.

The increased use of motortrucks for transporting wheat was temporarily interrupted during World War II because of gasoline rationing and shortage of motortrucks available for transporting grain. Since the war, motortruck movement of wheat regained and even surpassed its previous status. A study of the Southwest indicated that more than three-fourths of the 117 business operators interviewed used motortrucks to handle grain or its products (Table 3).[15] All of the flour mills indicated that they were using trucks in transporting wheat and flour. It should be noted that fewer country and terminal elevators used motortrucks than did flour and feed mills.

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[15] W. J. Hudson and E. K. Henchen, The Transportation and Handling of Grain by Motortruck in the Southwest (Washington, D. C., May, 1952).

Table 3. Business Operators Interviewed, with Replies on Truck Use Distributed According to Functional Classification

Functional Classification	Operator Interviewed		Using Trucks		Using Trucks to — Ship and Receive		Ship Only		Receive Only		Using Rail Only	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Country elevator	77	100.0	55	71.4	*		55	71.4	*		22	28.6
Terminal elevator	13	100.0	9	69.2	6	46.1	2	15.4	1	7.7	4	30.8
Flour mill	15	100.0	15	100.0	13	86.7	2	13.3	-	-	-	-
Feed mill	12	100.0	11	91.7	8	66.7	3	25.0	-	-	1	8.3
Total or Average	117	100.0	90	76.9	27	23.1	62	53.0	1	0.8	27	23.1

*Truck receipts of grain at country elevators omitted since this survey was not concerned with the truck movement of grain from the farm to the primary market.

Source: Hudson, W. J. and Henschen, E. K., The Transportation and Handling of Grain by Motor truck in the Southwest, U.S.D.A., P.M.A., Washington, D. C., May, 1952, p. 6.

No flour-mill operators indicated the use of railroads exclusively. According to the report 23 percent of all the concerns interviewed used trucks to ship and receive grain, whereas approximately 53 percent used trucks only to ship and less than 1 percent reported the use of trucks only to receive.

Motortrucks used in transporting grain were operated by three types of operators, namely, merchant truckers, for-hire or specialized commodity carriers, and company-operated carriers.[16] Merchant truckers are primarily engaged in purchasing wheat directly from farmers and transporting it to terminal elevators and mills. They pay the farmers cash and deliver the wheat to that terminal elevator from which they can receive the greatest profit above cost of wheat and transportation.

Specialized for-hire carriers are generally employed by country or terminal elevators. This type of organization operates one or more trucks on a for-hire basis.[17] They often take other transport jobs after wheat harvesting seasons in order to keep their trucks and drivers employed during most of the year. Unlike the merchant trucker, bona fide specialized for-hire carriers do not take title to the grain they haul. They merely hire out to render a transportation service for a fee agreed upon.

Company-operated truck carriers generally consist of truck equipment and drivers that are owned and employed by country and terminal elevators and by mills that employ trucks for the distribution of mill products. The distance of haul ranges from 200 to 600 miles.

Flour and feed mills were reportedly the largest users of

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[16] Ibid., p. 10.

[17] Ibid., p. 12.

company-operated trucks.[18] The probable advantages to flour and feed mills in using their own trucks for transporting mill products were (1) more complete utilization of mill's equipment; (2) lower cost of transporting grain inventories between mills by trucks than by rail; (3) complete control of grain by mills while in route; (4) assured and better service; and (5) conservation of boxcar space for mill-product shipments.[19]

The number of company-operated trucks owned by terminal elevators varied according to their size and location. Terminal elevators operating line elevators were the largest users of trucks. Trucks were used by terminal elevators: "(1) when their line elevators were plugged, (2) when they could not get boxcar delivery to country points when they wanted it, (3) when the distance involved meant trucking costs equaling the rail rate, and (4) when there was competition for the crop during short crop years."[20]

The diversion in the transportation of grain from railroads to motortrucks was due to (1) lower rates, (2) better services, (3) boxcar shortages during harvesting peaks, (4) lower handling costs, and (5) the increase in the volume of business elevators and mills could handle.[21]

Of the 117 firms interviewed, 34 expressed objections to trucking grains. Of the terminal elevators, 46 percent gave objections to trucking grain, which was more than for any other type of business interviewed. Fewer feed mills expressed objections than any other

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[18] Ibid., p. 12.

[19] Ibid.

[20] Ibid.

[21] Ibid., pp. 24-52.

classification of firms. The objections appearing most frequently by all classifications were in the following order: (1) unethical business practices, (2) disruption of existing marketing channels, and (3) lack of transit privilege.[22]

Concessions Made to Flour Milling Industry

The flour milling industry has not reached its present status in the economy on the basis of efficient operations *per se*. It has also received concessions or been granted privileges that have benefited it appreciably. The two major concessions have been milling in transit and milling in bond.

Milling in Transit

Competition between railroad companies to serve the flour milling industry in the transportation of its grain and flour has resulted in the granting of milling-in-transit privileges. Transit privileges were granted to grain shippers as early as 1870 in Nashville, Tennessee.[23]

The milling-in-transit privilege permits wheat to be shipped from the point of origin (field or grain market) to a milling point, ground into flour, and shipped on to the destination point, the railroad company charging a through rate from origin to destination plus a small fee for expenses incurred at transit points.[24]

The purpose of the milling-in-transit privilege was to equalize transportation costs between industrial locations under existing general

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[22] *Ibid.*, pp. 54-56.

[23] Millers' National Federation, *Almanac Number* (Minneapolis, April 28, 1953), p. 4.

[24] D. P. Locklin, *Economics of Transportation*, 3rd Ed., (Chicago, 1947), pp. 53-54.

rate structures. Prior to the granting of transit privileges mills located in the Middle West, at or near wheat-producing areas, enjoyed the advantage of lower transportation rates over mills located in the East, a long distance from wheat-producing areas. Although wheat processors in both locations were supplying the same consumer areas (mainly the East), those located in the West were able to send flour into the East at a through local rate, but Eastern mills were obliged to pay a local rate of transportation on wheat from the wheat market to the milling point and a local rate on flour from this point to the consumer market. Since freight rates increase in proportion to the number of steps, the sum of two local rates was higher than a through rate for equal distance.[25] The transportation cost of processors located in the East was higher for equivalent transportation service than that of processors located in the Middle West under such a transportation-cost-structure.

Under the milling-in-transit privilege, in some cases, the through charge was the local rate on the raw material, or wheat, and in other cases the rate applied was the local rate of the finished product, or flour in the case of wheat, the latter generally being the higher. The benefit of the milling-in-transit privilege to flour manufacturers was conditioned by the differentials in rates on wheat and flour, being greatest when transportation rates were equal for both products. Transit privileges, in addition to their pecuniary benefits to processors located near consumer areas but far from wheat-producing areas, involved a problem of disposing of by-products.

The theory underlying transit privileges is that movements in and

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[25] Russell E. Westmeyer, Economics of Transportation (New York, 1952), pp. 340-341.

out of transit or processing points are, in effect, a part of one continuous transaction, suspended only temporarily during processing.[26]

It is not mandatory that railroad companies grant transit privileges to processors. It is left to the discretion of the carrier. However, carriers can not according to law discriminate between milling companies in granting the privilege.

Transit privileges have been extended to cover products other than wheat and services other than milling. Soybeans, cottonseed, lumber, steel, coffee, and cattle (for dipping) are some of the commodities for which transit privileges have been granted.[27]

Milling in Bond

The flour-milling industry has been permitted to import wheat to be milled in bond and to export the flour to other countries. This is regarded as a concession granted to millers engaged in such flour milling because a large proportion of this import has been free of duty, permitting the entry of large volumes of wheat to be ground in bond into flour and exported to deficit wheat-producing countries. In the absence of such a provision Buffalo mills probably would not have reached their relatively large capacities, or the millers of that city would have had to offer prices sufficiently high to attract a volume of wheat appropriate to their capacities.

The provision for milling in bond was the Tariff Act of 1922, which authorized the importation of wheat, duty-free, to be milled in bond and

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[26]Millers' National Federation, Almanack Number, p. 4.

[27]Russell E. Westmeyer, op. cit., p. 340.

the flour to be exported to a foreign market.[28] Prior to the adoption of this act volumes of wheat imported annually bore positive relationships to annual domestic wheat-crop yields, for the imported wheat was used domestically.

Technological improvements made in the United States enabled millers to manufacture flour of higher quality than that of other countries.

Our ability to import Canadian wheat and export the flour in competition with Canadian flour demonstrates the superior manufacturing efficiency of our large milling organizations over that of the smaller mills in Canada.[29] Cuba, reporting a preference for United States milled flour, became one of the chief markets for milled-in-bond flour for United States millers. Canada supplied the wheat to be milled in bond into flour to be exported to Cuba.

The strategic location of Buffalo, New York, served as an intermediary point between the exporter, Canada, and the importer, Cuba. For economic consideration the milling-in-bond provision served as a milling-in-transit privilege for Buffalo. As a result, Buffalo millers milled all of the Canadian wheat exported to Cuba under such provision until 1930, except for small quantities milled in Galveston, Texas.

Southwestern flour millers, in an effort to compete with the Buffalo flour-millers for the Cuban trade, were able to get a tariff adopted to reduce this relative advantage that the Buffalo millers had enjoyed over

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[28]Food Research Institute, Wheat Studies, Vol. 12, (California, 1936), p. 127.

[29]For a comparison of flour manufacture in Canada and United States, see Wheat Studies, Vol. 1, No. 4, pp. 129-131.

then. This act was known as the United States Tariff Act of June 18, 1930.[30] Under this act wheat imported to be milled in bond into flour and exported to Cuba was made subject to a duty equal to a preferential rate accorded by Cuba to the United States plus a consumption tax.[31]

Changes in Cuban preference for American milled flour led to corresponding changes in rates of duty applied to wheat imported from Canada via the United States to be milled in bond. Under the reciprocal trade agreement of 1934 a preference clause was inserted for American-milled flour by Cuba. This preference was a differential in duties on imported flour, which was abolished in 1936. The United States, consequently, discontinued its duty on wheat imported from Canada to be milled in bond into flour and exported to Cuba. The preferential rate no longer existed on which the United States had been basing its duty on imported Canadian wheat as heretofore.[32]

In addition to the volumes of wheat milled in bond and exported to Cuba, large volumes came into Buffalo to be milled under similar arrangements and exported to other countries. Since Cuba was the only one to accord a preference for American-milled flour, the United States did not place an import duty on wheat imported from Canada to be milled in bond into flour and exported to other countries. The annual volumes and

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[30] Wheat Studies, Vol. XIII, pp. 179-180.

[31] If Cuban duty and consumption tax on flour milled in countries other than the United States were 50 cents per hundredweight, while duty and consumption tax on American-milled flour were only 35 cents per hundredweight (because of a reciprocal trade agreement between the United States and Cuba), the United States would impose a duty of 15 cents per hundredweight of flour ground from imported wheat to be milled in bond and exported to Cuba. For Summary of U. S. Tariff Act, 1930, see Almanack Number, 1953, op. cit., p. 41.

[32] Wheat Studies, Vol. 12, pp. 127-128.

values of wheat milled in bond into flour for export to Cuba and other countries are shown in Table 4.

Table 4. Volume and Value of Wheat Milled in Bond in United States (1928-1953)

Year	Free[a]	Dutiable[b]	Total	Value of Wheat
	Bushels	Bushels	Bushels	Dollars
1928	19,767	—	19,767	$22,908
1929	13,735	—	13,735	15,311
1930	19,939	—	19,939	18,534
1931	14,948	699	15,647	10,013
1932	7,431	2,596	10,027	5,362
1933	7,554	2,733	10,287	5,745
1934	7,360	3,446	10,806	7,605
1935	7,518	3,913	11,431	9,290
1936	9,216	4,095	13,311	11,922
1937	5,751	3,281	9,032	9,834
1938	2,942	839	3,781	2,503
1939	7,933	2,598	10,531	5,938
1940	6,196	2,457	8,653	5,871
1941	8,405	1,813	10,216	6,230
1942	5,043	3,321	8,364	6,051
1943	6,188	3,160	9,348	9,061
1944	9,928	837	10,765	13,278
1945	11,411	11	11,422	14,978
1946	6,094	341	6,435	9,312
1947	110	107	217	335
1948	N.A.	N.A.	N.A.	—
1949	5,718	1,873	7,591	14,951
1950	8,253	2,416	10,669	21,061
1951	3,507	769	4,276	9,643
1952	6,868	625	7,493	16,600
1953[c]	2,715	7	2,722	6,418

[a]Milled in bond and exported to other countries, except Cuba.
[b]Milled in bond and exported to Cuba.
N.A.: Not Available.
[c]For six months (January-June).

Source: 1928-46, U. S. Department of Commerce, Foreign Commerce and Navigation in U. S. (Washington).

Wheat classified as free was wheat milled in bond into flour and exported to other countries and not subject to duty. All wheat milled

in bond into flour and exported to other countries was free of duty until 1930 including that exported to Cuba. Wheat milled in bond under the classification of "Free" represented the major portion of wheat milled in bond in the United States.

Dutiable wheat represents wheat milled in bond into flour and subject to a duty.[33] Since 1931 part of the wheat milled in bond has been subject to an import duty. Although the United States abolished its import duty on Canadian wheat imported for grinding in bond into flour and exported to Cuba in 1936, Canada remained faced with an import duty payable to Cuba.

The total volume of wheat milled is of importance to the flour millers rather than the volumes classified as free or dutiable. The total volume ground under the milled-in-bond provisions was largest in 1930 and least in 1947, among the years for which data were available.

The value shown reflected changes in wheat prices, and so was related to the general price level. It further showed no relationship between total volume ground under the milled-in-bond provisions and the value of the wheat. The total volume ground appeared to have been a function of the reciprocal trade agreements and International Wheat Agreements, whereas the value was a function of the price level, crop yields, cost of production in conjunction with government support prices for wheat, and the effective demand.

Intrafirm Organization

The firms of the flour-milling industry are composed of plants that have retained the same primary principles of grinding and sifting in

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[33] Ibid., p. 126.

manufacturing flour as their prototypes of some time ago but are modified to cope with the potential capacity of the innovations now available. However, as a result of these modifications, firms of today cannot be regarded as mere replicas of those existing some 150 years ago.

In general, the modern firm can be divided into four major sections: reception and storage, cleaning and tempering, grinding and sifting, packing and shipping.

First, wheat is received in storage elevators by power-driven conveyers or bucket elevators operated by one man. It remains in mill elevators until needed for grinding.[34]

Second, separators, scourers, and entoleter-aspirator combinations are used in cleaning and tempering of wheat. These machines remove foreign matter and leave clean wheat to be milled into flour. Tempering is usually done in bins. It is the application of water, heat, and air to wheat to facilitate the separation of the bran from the endosperm.[35]

Third, gradual reduction and purifying machines are found in the grinding and sifting section. Gradual reduction consists of corrugated rollers set apart by certain distances, the gap becoming smaller and smaller as the grinding process approaches the finishing stage. Purifying machines are used in the separation of flour from offal. These machines are run by individual motors. The number of reduction and purifying machines used by a firm depends on the size of the firm.

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[34]Since millers do not practice purchasing wheat before there is a demand for flour, wheat is held in storage generally for only a short time.

[35]J. H. Scott, Flour Milling Processes (London, 1951), p. 152.

Finally, tanks are located in the milling building where separate grades of flour are kept. They are controlled so that desired blends can be obtained from any combination of grades, which are then packed and conveyed to some central station to be transported to purchasers.[36]

Firm Management

The managerial factor plays a significant role in the modern firm, which was not an important factor prior to commercial milling. The modern complex firm must be well organized, and the duties of each manager must be clearly delegated. Firms composed of plants embodying machines with many intricate parts require close observation in order that all machines may function according to order. Harnessed with the responsibility of mass production by the use of many complex machines, managers assign duties to foremen employed in the production process. Because of the precision by which these machines operate, further break-downs of responsibilities have been made to assistants and still further to some of the advanced trainees. The firm must be organized in such a way that careful supervision is exercised by a specified foreman at each level of operation.

The responsibility of management is positively correlated with the size of the firm, ceteris paribus, but not by any given coefficient. At best, it can only be said that the responsibility of management becomes progressively greater as the size of the flour mill increases. A hypothetical example proposed by J. F. Lockwood tends to support the inference that the rate of increase in the size of firms may be less than the corresponding rate of increase in the number of foremen assigned to the various levels of operation.

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[36]For details on major operations performed at milling plants see Starck and Teague, op. cit., pp. 319-321; J. H. Scott, op. cit., pp. 207-523.

> A 30-sack mill, for instance, might have one foreman for the whole plant, a 50-sack mill one extra foreman for the warehouse, and a 100-sack mill four foremen, one for intake and mile, one for the screen room, one for the mill, and one for the warehouse, as well as an assistant mill manager to co-ordinate the work of these four; in the last case there would be separate foremen for each 8-hour shift in the mill itself, making a total of six foremen.[37]

Management responsibility begins with intake of raw materials and extends through the dispatching of processed products. Apparent today is the vast change in importance placed on management when compared with that of two centuries ago.

Decision-taking

As firms grew larger in size, managerial decisions become more numerous and complex. The fact that decisions must be made in business firms indicates that alternative courses of actions are available. It is the entrepreneur's responsibility to choose the most profitable course of action from the available alternatives.

Alternatives faced by entrepreneur's of flour mills result from variations in consumers' demand, variation in quality of wheat grown annually, various methods of milling and blending to obtain desired grades of flours, and various contracts under which wheat can be purchased and flour can be sold.

Bakeries and household flour consumers are two major sources of demand. Decisions must be made as to whether flour will be milled for both sources and in what proportions. Since the qualities of flour demanded by the two sources differ, it becomes difficult to make this decision because of the variation in costs of producing the two qualities of flour and the probable variation in prices of the two.

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[37] J. F. Lockwood, Flour Milling (London, 1945), p. 157. Also see J. F. Lockwood, Provender Milling (London, 1945), pp. 346-348.

Variations in the quality of the wheat affect the quality of the flour. Since it is impossible to determine long beforehand the quality of wheat that will be produced, it is difficult to make commitments long in advance. Although the decision as to what commitments to make is complex, it has been simplified somewhat by making short term (approximately 60-day) contracts with flour buyers.

Methods of milling differ in manufacturing the various grades of flour. Blending, in order to obtain a desired grade, differs according to the quality of wheat milled. The relative prices of various wheats that may be milled in obtaining a desired grade of flour influence the decision as to what combination of flours to blend.

The futures market is a medium whereby a certain amount of risk is shifted in contracting wheat for milling. It serves as a hedging device for millers. Hedging enables millers to operate on smaller margins, accept flour contracts for forward delivery, secure more liberal credit terms, and operate nearer full capacity with less fixed investment in warehouse facilities. Although participation in futures trading is a decision to be made, it eliminates some decisions that would otherwise be necessary.

The flour milling industry is characterized by a large proportion of fixed capital. Decisions are needed in accord with future conditions during the life span of the fixed investment. Because of the durability of flour milling machinery and warehouse facilities, it is difficult to make immediate adjustments. It is necessary, therefore, that long term decisions be made by giving careful consideration to all factors affecting profit.

Additional long range factors further complicate decisions to be made by entrepreneurs of flour-milling firms. Changes in consumer taste

and preference, income flow, milling technology, and foreign affairs are some of the long-range factors that must be considered. In a progressive economy, changes in these factors often occur rapidly and thus increase the difficulty of decision.

Intrafirm organization does not terminate in the production process, per se. Where commercialism prevails, records of inventories, costs, receipts, and profits must be kept if the entrepreneur is to ascertain the maximum profitability of the firm. Such records when properly kept provide one with knowledge necessary for proper allocation of resources.

Interfirm Organization

The above discussion on organization in the wheat milling industry has been limited to organization within the firm. This has been influenced by the industry's response to technology, demand, and competition. Organization among firms has also changed in the last forty or fifty years. Most alterations generally concern the number and size of mills and the pooling of resources for research and advertising. Where sufficient cooperation is found in an industry, it is not necessary that the firms carry on independent research that may be conducted by a representative of the industry. Millers' National Federation serves as an advertising source as well as an information bureau for companies in the flour milling industry. Hence, it is not necessary that individual companies maintain as large advertising staffs as otherwise would be necessary. Likewise, industry-wide cooperation reduces the amount of research that would be necessary by individual companies.

Number of Firms

Because of the introduction of air-current purifiers and automatic all-roller mills, which were economically employed by increasing use of

electricity, the milling of wheat flour became a relatively productive business. Freedom of entry, relatively low fixed cost, and simplicity of plant operations resulted in an increase in the number of firms until 1909. Afterward, as the amount of fixed cost of the average mill rose and the operation of the firm became more complex, the number of firms decreased.

The Bureau of the Census in its report on manufactures divides flour mills into two classes, (1) merchant flour mills, which purchase grain and then sell the products after grinding, and (2) custom or neighborhood mills, which grind their customers' grain for a fixed charge, which may be paid in cash or in kind. This study is concerned primarily with the former, for they make 98 percent or more of the total flour produced in the United States.[38] Commercial mills are included in the classification of Merchant Mills. Not all merchant mills are necessarily engaged in wheat-flour production, but the number of merchant mills not thus engaged is so small that their inclusion does not alter appreciably the average character of wheat flour mills.

The number of merchant mills has declined since 1909, but the average production per mill has increased along with technological inventions (Figure 1).

The number of merchant mills in the United States continued to increase from 9,476 in 1899 to an all-time high of 11,691 in 1909. The number decreased from 1909 through 1951 except for slight increases in 1933, 1946, and 1947 following sharp drops. The number reached an all-time low in 1951, the latest year for which data were available.

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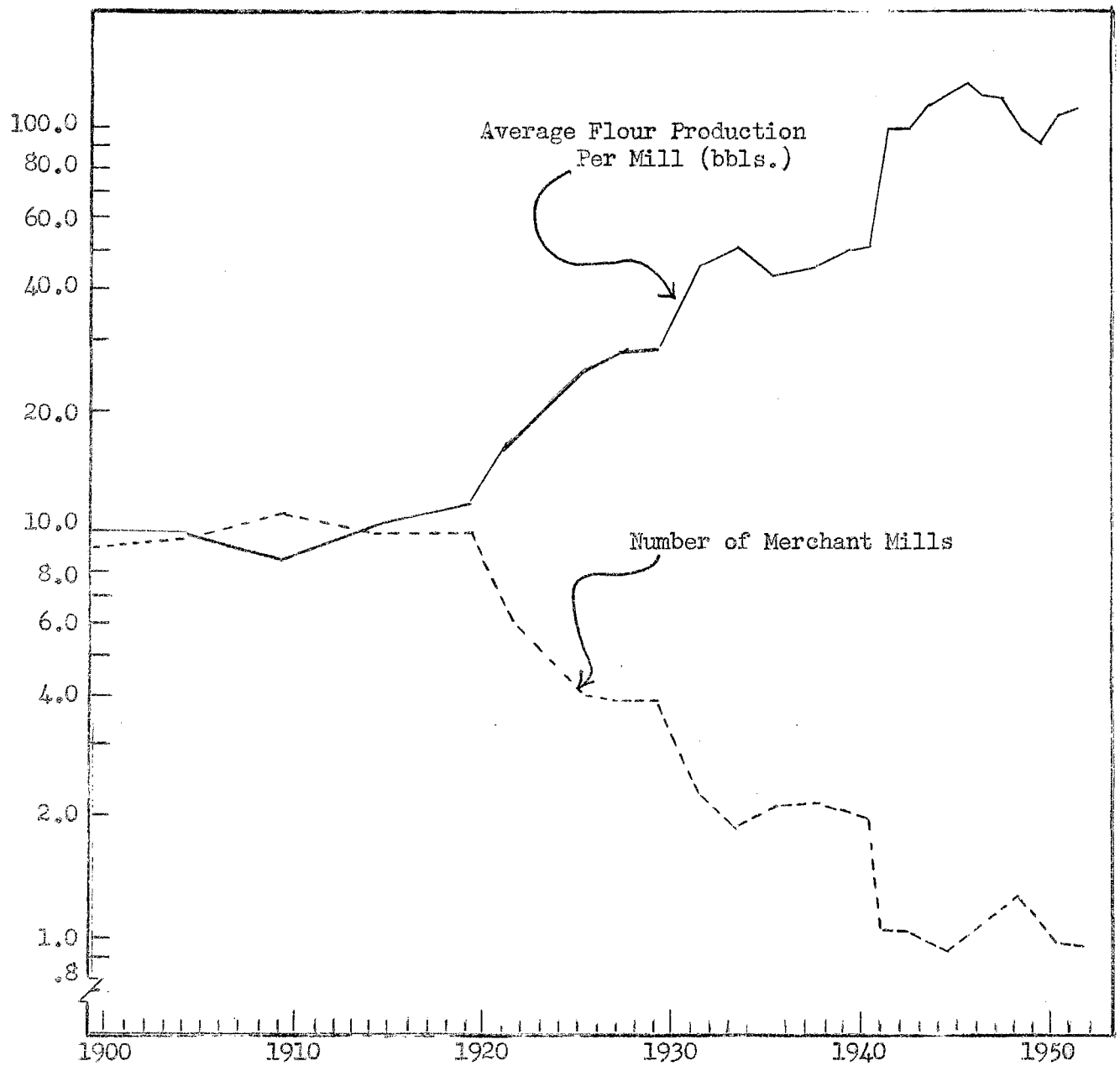
[38] Federal Trade Commission, Competitive Conditions in Flour-Milling Industry (Washington, 1928), p. 3.

Figure 1. Number of Merchant Mills and Average Flour Production per Mill, 1899-1951*



SOURCE: Appendix, Table I.

The average annual decline in number of merchant mills by 10-year periods was as follows: 1909-19, 98.3; 1919-29, 686.6; 1929-39, 187.9; and for 1939-49, 89.0 per year. The increase of 23 percent in number of mills between 1899 and 1909 was followed by a decrease of 10,663 mills, or 91 percent, between 1909 to 1950.[39] The most rapid decrease came in the 1920's wherein 64 percent of the total 40-year decrease occurred.

Size of Mills

The size of mills as used in this study was measured by physical output.[40] Generally, the size varied inversely with the number. However, output deviated from this generalization during World War II and parts of the 1930's when the depression was most pronounced. While the number of mills was reduced by 89 percent between 1899 and 1951, total United States flour-production increased 17 percent. Although the number of mills had been reduced about 89 percent by that date, total production reached an all-time high in 1947, at about 43 percent above that in 1899.[41] The average production per mill reached an all-time high in 1945 of approximately 133,000 barrels, an increase of 1,164 percent over the average production in 1899. After 1909 the average output per mill approximately doubled in each successive ten-year period (Appendix, Tables I and II).[42]

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[39]For figures corresponding to chart 1, see Appendix, Table I.

[40]Other measures of sizes are outlays and number of persons employed.

[41]See Appendix, Table I, for figures on total production by years.

[42]Rates may be measured by the slope of the curve of average flour production and that of the number of merchant mills respectively.

Relationship Between Total Production and Total Exports

A positive relationship was found between total United States flour production and exports (Figure 2). This was apparent since total domestic consumption remained relatively unchanged. Per capita consumption declined from 224 pounds in 1902 to 133 pounds in 1952.[43] The decrease in per capita consumption was offset by the increase in population from about 76,000,000 in 1902 to 156,000,000 in 1952.[44]

The period was divided into three sections: 5-, 2-, and 1-year intervals. In section 1 both the peak of production and the peak of exports occurred in 1919. In section 2, from 1921-1939, figures of 2-year intervals, the peak of production occurred in 1929, but exports were greatest in 1921, following the 1919 peak. Their respective troughs were found in 1933 and 1935, when total production reached a low of 100,899,000 barrels and exports 3,877,551 barrels. The third section, figures of 1-year intervals, showed a peak in both production and exports in 1947. The trough of production occurred in 1940 and the trough of exports in 1942, at the end of the declines which began in postwar year 1919 and at the beginning of the upsurge in activity associated with World War II.[45]

Relationship Between Changes in Total Production and Total Exports

Flour production and exports have changed annually. A least-squares regression line indicates that for a change of 1.0 million

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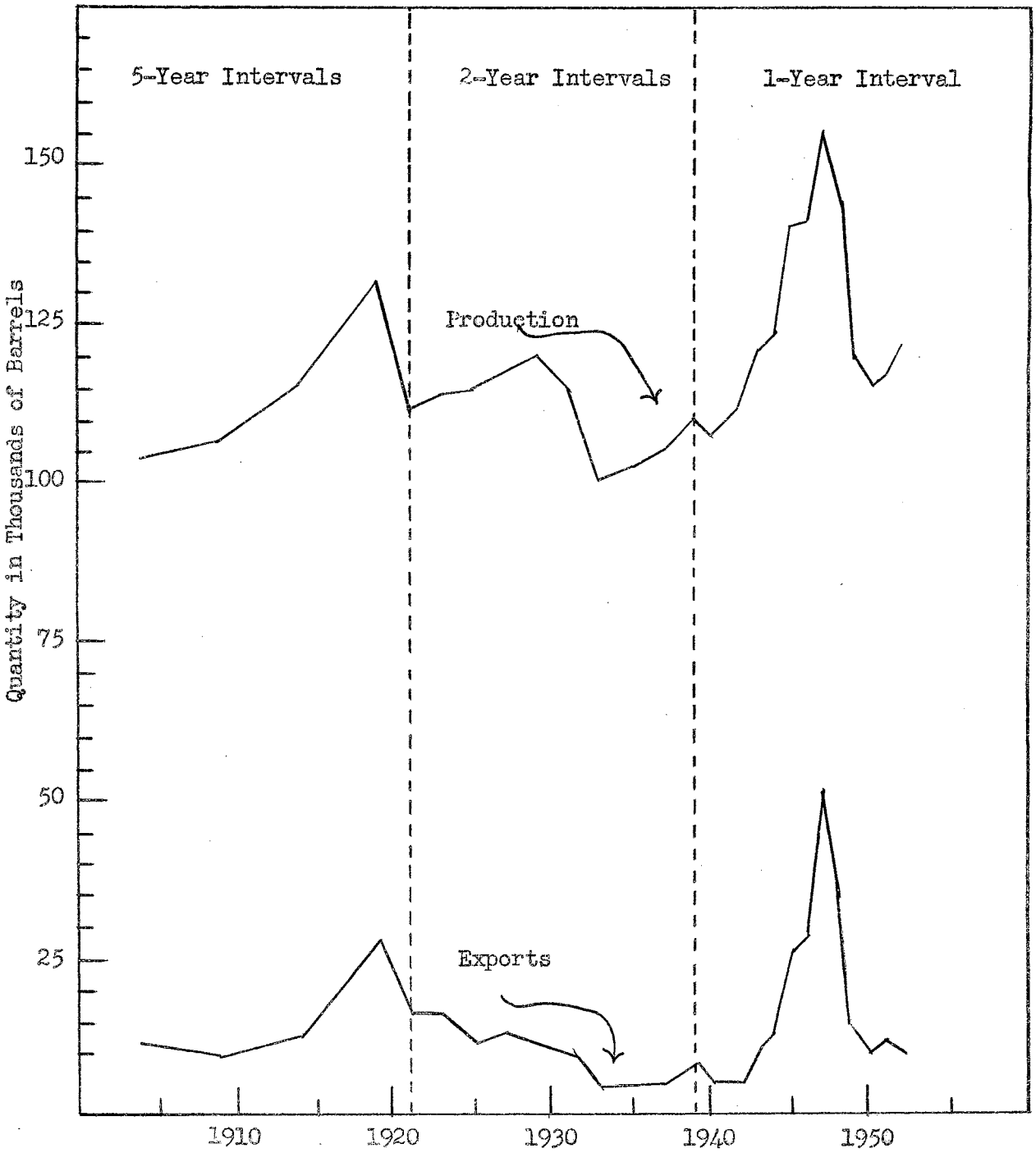
[43] Millers' National Federation, Golden Anniversary, The Southwestern Millers (Missouri, May 6, 1952), p. 12-A. Cf., Table 11, p. 112.

[44] Ibid.

[45] Figures for exports are found in Appendix, Table III.

Figure 2. Total Production and Total Exports of Flour in the United States by Years, 1904-1952



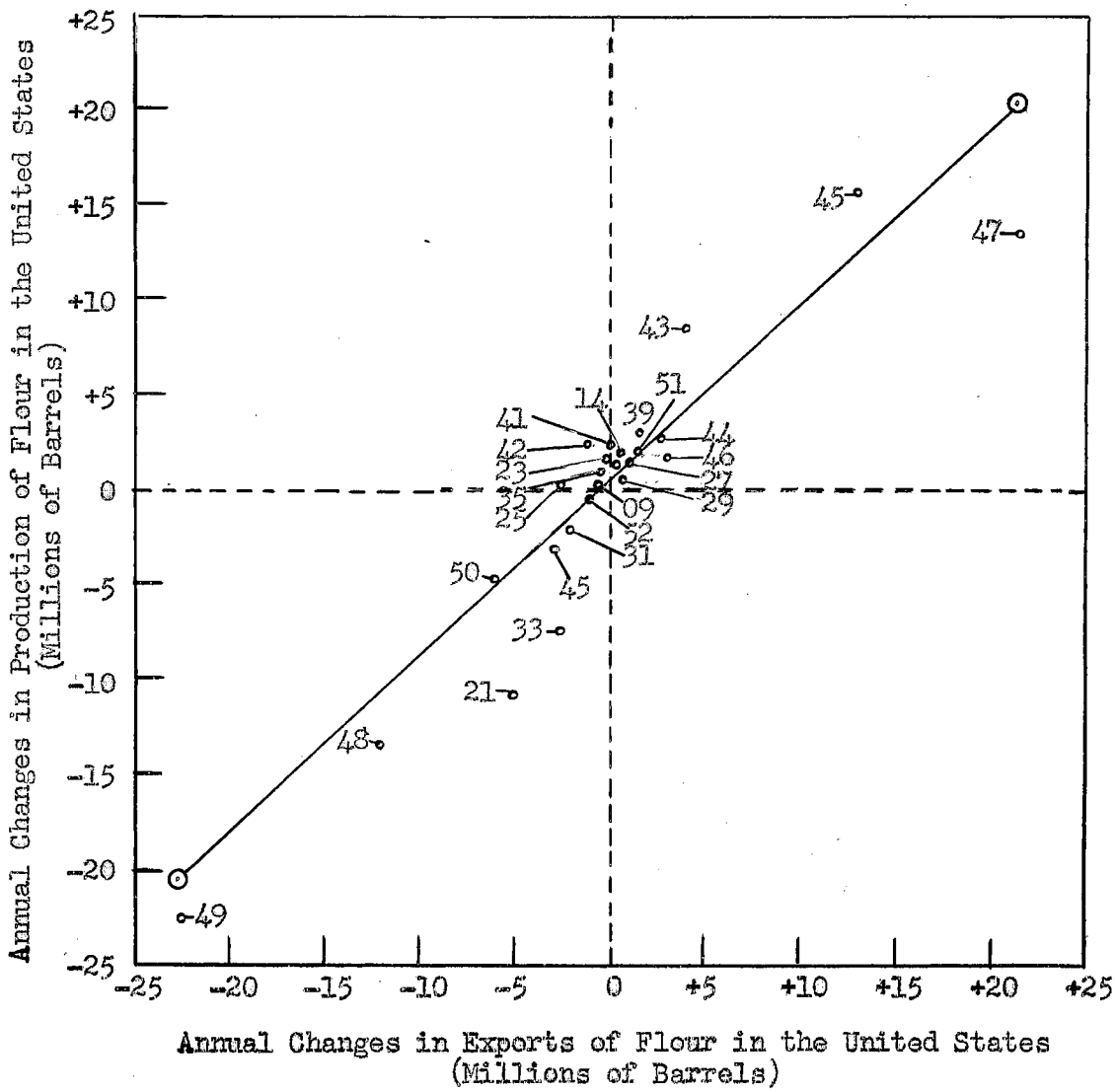
SOURCE: Appendix. Table III.

barrels in flour exports, flour production changed .95 million barrels in the same direction (Figure 3). This suggests that, given the change in amount of exports, one may estimate the change in the amount of production for that year. However, the flour-milling industry has faced many exogenous factors affecting the production of flour that were not subject to management by the firms of the industry. This statistical relation may be expected to hold only for future conditions none too different from those of the past 42 years.

The most drastic decline in the number of mills in any two-year period was witnessed in 1919-21, a decline of 4,223 mills, or 39 percent. The declines in exports were 10,880,612 barrels and in production 21,619,327 barrels for the same period. However, the greatest annual decline in both exports and production of flour occurred in 1949. The greatest annual increases occurred in 1947. The loss in export markets for flour at the end of World War I had considerable influence on the contraction in number of mills, on total exports, and on production of flour in the United States. The depression of the 1930's also had a marked influence on these three factors. Changes in both production and exports were negative in 1931 and 1933 (Figure 3). In no year included in this analysis was a positive change in total exports accompanied by a negative change in production.

When exports and production were expressed as percentages of the last previous year reported, instead of absolute increase or decrease in number of barrels of flour, similar conclusions were warranted (Figure 4). The percentages were plotted against each other for the years reported, 1909 to 1952, and a freehand curve was drawn in to represent the general relationship between changes of exports and changes of production in the United States. Again, no year occurred in which exports

Figure 3. Relationship Between Changes in Exports and Production of Flour in the United States, 1909-1951



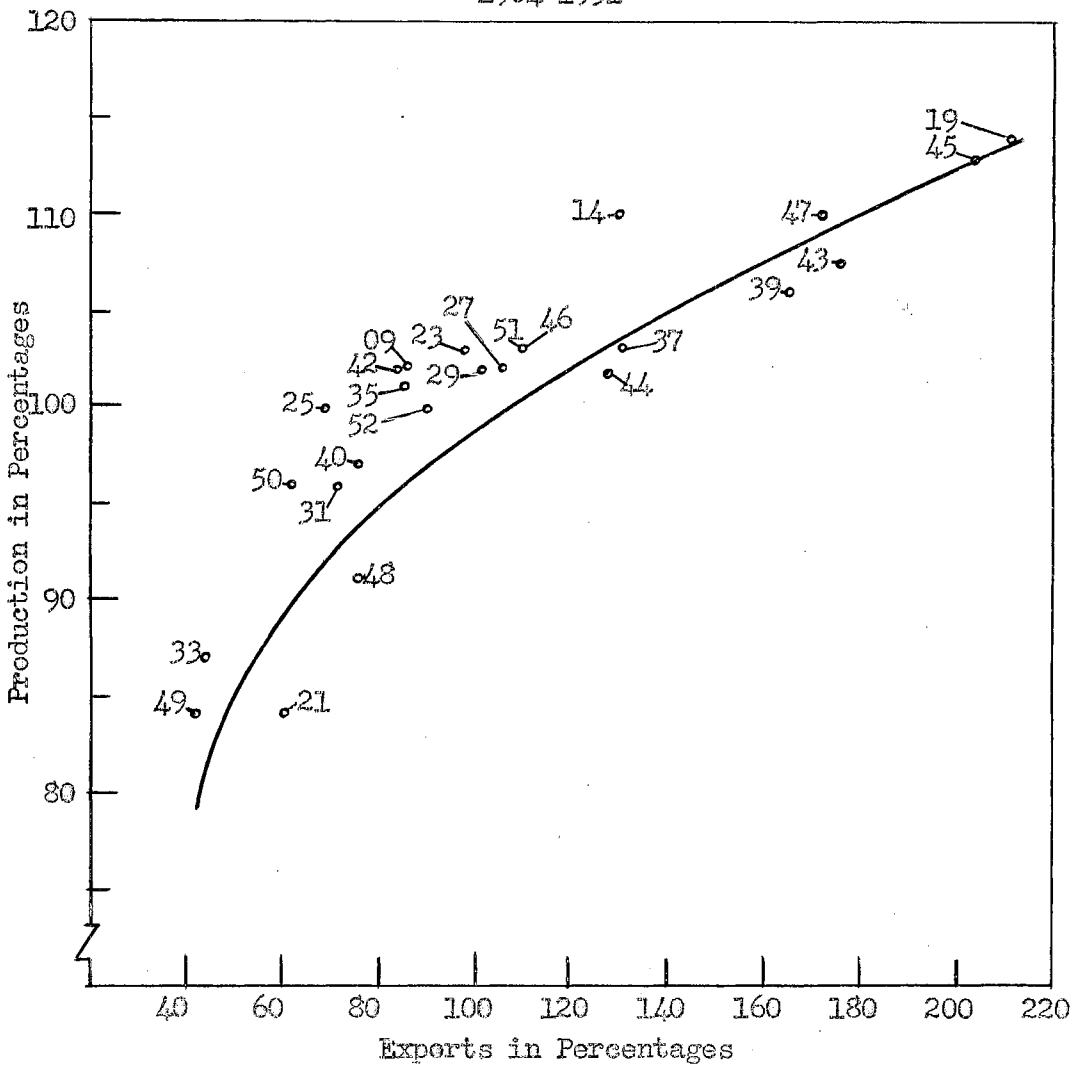
increased while production decreased. The slope of the curve indicates that whereas exports increased with less-than-proportional increases in production, export decreases were accompanied by progressively declining production.

The above comparisons of flour production with exports, in addition to relating the changes in size of the flour industry to changes in exports, indicate that very little change occurred in the volume of flour stored in the United States and that aggregate domestic consumption of flour remained relatively unchanged because flour was consumed either at home or abroad. To follow this to its logical conclusion would indicate that changes in flour exports may generally be expected to show up in changes in production, *ceteris paribus*. Exceptions were found during war periods and during chaotic market conditions, both foreign and domestic.

Millfeed Outputs by Flour Mills

In addition to the production of flour, the industry manufactures millfeeds, which consist largely of that portion of ground wheat that is not suited for flour. The output of millfeed followed a similar pattern to that of flour when percentages of extraction were unchanged.

Figure 4. United States Exports and Production of Flour As Percentage of Last Previous Year Reported, 1904-1951[1]



[1]1904-1919, time interval of 5 years;
1919-1939, time interval of 2 years; and
1939-1952, time interval of 1 year.

SOURCE: Appendix, Table IV.

Millfeed Output in United States by Calendar Years, 1924-52*

(In Thousands of Tons)

1924 - 4,409	1938 - 4,190
1925 - 4,491	1939 - 4,247
1926 - 4,340	1940 - 4,075
1927 - 4,333	1941 - 4,166
1928 - 4,553	1942 - 4,271
1929 - 4,612	1943 - 4,538
1930 - 4,679	1944 - 4,722
1931 - 4,399	1945 - 5,510
1932 - 4,031	1946 - 4,793
1933 - 3,911	1947 - 5,913
1934 - 3,956	1948 - 5,337
1935 - 3,926	1949 - 4,651
1936 - 4,251	1950 - 4,524
1937 - 4,185	1951 - 4,617
	1952 - 4,605

*Compiled from: Millers' National Federation, The Northwestern Miller (Almanack Number), (Minnesota, April 24, 1953), p. 26.

The total output of millfeeds by the flour-milling industry during this 29-year period was least in 1933 and highest in 1947, the same as flour production. A small variation was observed for 1927, when millfeed output was less than that of 1925, whereas flour output in 1927 was greater than in 1925. This deviation may be explained by the change that took place in flour extractions in 1927. The flour-milling industry has produced at a rate of approximately 75 percent extraction; i.e., three fourths of wheat grain was ground into flour and one fourth into millfeeds. Fluctuations in percentage of extraction can easily cause a variance in the normal relationship of millfeed to flour. Such changes are likely to be made during war periods when the government intervenes to stimulate an increase in the supply of flour from a given supply of wheat. During World War II the extraction rate was pushed beyond 80 percent in an effort to meet wartime exigencies. The close relationship between millfeed and flour production is indicative of relative constancy of the percentage of extraction.

Mergers and Consolidations in the Wheat-Milling Industry

Historically the wheat-milling industry was characterized by a large number of individual mills until 1920 when mergers and consolidations began. A few (12-16) large flour-milling corporations were operating at the close of World War I, but the production facilities, in most cases, were individually owned.[46]

Mergers and Consolidations

Mergers took place among large companies, but consolidations were mainly the acquisition of many small companies which later were combined into a much larger company. Such mergers and consolidations of great importance took place in the 1920's and 1930's. Mergers of importance included General Mills, Inc., Pillsbury, Inc., Commander-Larabee Co., Russell-Miller Milling Co., International Milling Co., and Colorado Milling and Elevator Co.

General Mills, Inc.

General Mills, the largest organization in the flour-milling industry in 1952, was incorporated in Delaware in 1928 for the purpose of consolidating five existing companies: Washburn-Crosby Co., Royal Milling Co., Kalispell Flour Mill Co., Red Star Milling Co., and Royal Mountain Elevator Co. These five companies, Washburn-Crosby being the largest, owned several subsidiaries.[47] This merger provided the organization, General Mills, Inc., with an aggregate milling

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[46] U. S. Federal Trade Commission, The Concentration of Productive Facilities (Washington 1947), pp. 58-60. Also A. C. Hoffman, op. cit., p. 39.

[47] A. C. Hoffman, op. cit., p. 42.

capacity of 63,575 hundredweight per day and an aggregate grain storage capacity of 18,467,000 bushels.[48] The flour mills owned by these companies were geographically scattered in Minnesota, Missouri, Kansas, Montana, Utah, and Washington. The aggregate capital value was estimated at near 27 million dollars.[49]

General Mills continued to increase its size and control by the acquisition of two additional companies in 1929, the Sperry Flour company and the Larrowe Milling Company. The former owned flour mills in Washington, Oregon, Utah, and California. The latter was primarily engaged in the sale of millfeeds at Rossford, Ohio.[50]

The scope of mergers and consolidations that took place during the incorporation of General Mills was indicated in the following statement by A. C. Hoffman:

> By 1936 General Mills had acquired the entire capital stock of 25 operating subsidiaries. The subsidiary companies were manufacturers and distributors of flour, cereal products, and commercial livestock feeds. The corporation maintains distributive offices for its products in 72 cities in the United States and foreign countries. It operates mills and storage elevators in 22 cities. The combined capacity of all its mills is more than 30,000 barrels of flour per day, which is about one-fourth of the total capacity of all commercial flour mills in the country.[51]

Pillsbury Mills, Inc.

Pillsbury Mills, second only to General Mills, was incorporated in Delaware in 1935 under the name "Pillsbury Flour Mills Co." for the

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[48] U. S. Federal Trade Commission, Growth and Concentration in the Flour Milling Industry (Washington 1947), pp. 2-3.

[49] Ibid., p. 3.

[50] Ibid., p. 16.

[51] A. C. Hoffman, op. cit., p. 42.

purpose of consolidating two existing companies, Pillsbury Flour Mills Company, located in Minnesota, and Pillsbury Flour Mills, located in Delaware. Pillsbury Mills organization of 1952 was the result of several acquisitions of small companies including the Church Cartage Co., a trucking business; a grain elevator and warehouse; a paper mill; assets and business of Globe Grain & Milling Co.; commercial feed mills; a soybean processing plant; and several other concerns.[52]

Data on estimated capital were available for this study only for Globe Grain & Milling Co. This estimate was approximately 6.2 million dollars, for which Pillsbury Mills paid 3.6 million in cash. This transaction was estimated to have augmented the total capital value of Pillsbury Mills, Inc., about nine percent.[53] The total value of capital controlled by Pillsbury Mills, Inc., including both owned and leased properties, was estimated at about 12.7 million dollars in 1915 in contrast to 32.7 million dollars in 1945.[54] Not all of this increase could be accredited to acquisitions, as Pillsbury Mills, Inc., paid almost the book valuation for some of its purchases.

Commander-Larabee Milling Co.

Third in size with respect to flour production was the Commander-Larabee Milling Co., which was organized in 1926. This organization was the result of the merger of Commander Milling Co. with its subsidiaries and the Larabee Flour Mills Co. with its subsidiaries. In addition, several small concerns were consolidated immediately following the merger of this "Big Two."

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[52] U. S. Federal Trade Commission, Growth and Concentration in the Flour Milling Industry, pp. 22-23.

[53] Ibid., p. 5.

[54] Ibid., p. 5.

Commander Milling Company had four affiliated corporations (Big Diamond Mills Co., Rapere Milling Co., Commander Elevator Co., and Minneapolis Milling Co.) operating mills and elevators in Minnesota.[55] Larabee Flour Mills Company operated mills in Kansas and Missouri and owned the J. C. Lysle Milling Company in North Kansas City.[56]

The consolidation of the two companies brought together an aggregate daily milling capacity of 29,600 barrels.[57] Commander-Larabee Corporation purchased in September 1928 the Thornton & Chester Flour Mills, Inc., Buffalo, New York, and in June 1932 the properties of C. R. R. Smith Milling Co., Sherman, Texas.[58]

All assets subject to current liabilities, plus the estimated value of goodwill, business, trade names and brands, together with certain cash resulting from sale of its securities were transferred to the two above-named operating subsidiaries by the corporation.[59]

In 1930 Commander-Larabee Corporation met with financial hardship, which resulted in the transfer of ownership of its assets and control to Archer-Daniels Midland Co. This company owned stocks and assets of many concerns engaged in various occupations, of which Commander-Larabee was the only one engaged in flour-production.[60]

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[55] U. S. Federal Trade Commission, Agricultural Income Inquiry, Pt. 1 (Washington, 1938), p. 290.

[56] Ibid., p. 291.

[57] Ibid., p. 290.

[58] Ibid., p. 290.

[59] Ibid., p. 291.

[60] A. C. Hoffman, op. cit., p. 43.

Mergers and consolidations of other organizations listed on the preceding page were of less significance.[61] They were attempts to take advantage of the economies of large-scale production and were occasioned by financial crisis experienced by some companies. They brought about a concentration in flour milling capacity within six large companies (Table 5).

Table 5. Daily Rated Capacity and Percentage of Total Capacity of the Six Largest Companies, 1945

Companies	Daily rated Capacity	Percent of total capacity of the Industry*
	Hundredweight	Percent
General Mills, Inc.	130,300	9.65
Pillsbury Mills, Inc.	82,700	6.13
Commander-Larabee Milling Co.	44,760	3.32
International Milling Co.	39,000	2.89
Russell-Miller Milling Co.	37,000	2.79
Colorado Milling & Elevator Co.	31,690	2.35
Total	366,150	27.13
Next largest 30 Cos. with capacities from 5,000-26,000 Cwt.	314,426	23.30
Total	680,576	50.43

*Percentages are based on a total capacity of 1,349,749 hundredweights.

Source: U. S. Federal Trade Commission, Growth and Concentration in the Flour Milling Industry (Washington, 1947), p. 11.

The flour milling industry had an aggregate total daily rated capacity of about 1,349,749 hundredweight in 1945.[62] General Mills alone

[61]These organizations are included in Table 5 on the six largest companies with their daily rated capacity and percentage of total capacity. For detailed description of mergers and consolidations of companies see Growth and Concentration in the Flour Milling Industry, pp. 13-36.

[62]Ibid., p. 11.

had a daily rated capacity of 9.65 percent of the aggregate flour-milling capacity in the industry, followed by Pillsbury Mills with 6.13 percent. The six largest companies combined had a daily capacity of more than one-fourth (27.13 percent) of the entire flour-milling industry. The next largest thirty companies combined had a daily capacity of 314,426 hundredweight, or only 23.3 percent of the total. Slightly more than 50 percent of the total flour-milling daily capacity was controlled by the largest 36 companies.

Purchases of Wheat by Flour-Milling Industry

Purchases of wheat by millers from their various sources of supply are indicated to some extent by the location and size of plants. Those of small capacity located near wheat production areas are likely to purchase their wheat for flour milling directly from farmers. But as milling becomes a large-scale business, it becomes economical to set up agencies for purchasing wheat from near and distant markets. Generally, the flour-milling industry was composed of numerous plants prior to 1920, usually located near wheat-producing centers or along water outlets that extended near wheat-producing centers.

Prior to Flour-Milling Industrialism: 1600-1880

Before the application of new techniques and the introduction of large-scale production machinery, milling was carried on by custom or grist mills. They engaged in grinding customers' grains for a fixed charge or payment in kind. Their customers were usually producers. There was no incentive to solicit wheat from distant markets because millers were kept busy grinding local wheat. Moreover, adequate transportation facilities were not available for transfer of wheat or ground

products to distant markets. Thus little or no competition existed between localities. Differences in quality of flour were due mainly to differences in skill and quality of wheat.

After Flour-Milling Industrialism: 1880-1952

Soon after technological changes were introduced flour-milling became industrialized and appeared profitable with large-scale equipment. Shifts in organization and location of plants exploited these innovations. Among the changes in organization was the establishment of purchasing and selling agencies common in most commercial establishments of 1952. The change from direct purchase to a more complex system was obvious from the latter 19th century into the early 20th century. Purchases by 13 milling companies in 1935 are illustrative of the more modern manner (Table 6). Similar data were not available for other years. The aggregate production of wheat in the United States for the year 1935 was 496,496,000 bushels.[63] Of this crop, these thirteen companies purchased 231,542,291 bushels, or 43.6 percent. This was 65.2 percent of total United States commercial production.[64] The high percentage of purchases reflects the relative importance of these thirteen companies.

Of the total purchases by these companies, 37.5 percent was from country sources, but less than one percent was directly from farmers. The largest percentage of country purchases was from company-owned or company-controlled elevators, followed by other line elevators which included purchases from farmers' cooperative country elevators.

Terminal market sources accounted for 62.5 percent of all purchases. Among these, terminal market elevators ranked first with 26.37 percent

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[63] U. S. Federal Trade Commission, Agricultural Income Inquiry, Part 1, p. 279.

[64] Ibid.

of all purchases, or about two-fifths of the terminal market purchases. Second to terminal market elevators were terminal market commission houses with 19.06 percent of all wheat purchases.

Table 6. Wheat Purchases of 13 Flour Milling Companies,* by Sources of Supply, Fiscal Year 1935

Source of Supply	Wheat Purchases	
	Bushels	Percent of Total
Country Purchases:		
Direct from farmers	1,441,513	0.62
Country elevators (owned or controlled by reporting companies)	37,635,330	16.25
Other line or Country elevators (not owned or controlled by reporting companies)	34,350,066	14.84
Country Dealers and Shippers	6,657,077	2.74
Interior brokers	4,617,462	1.99
All other country sources	176,375	.08
Total Country Purchases	86,878,698	37.52
Terminal Market Purchases:		
Terminal market elevators	61,059,134	26.37
Terminal market commission houses	44,135,072	19.06
Terminal market grain merchants and shippers	18,407,798	7.95
Terminal market brokers	9,875,673	4.27
All other terminal market sources	11,110,506	4.83
Total terminal market purchases	144,663,583	62.48
Total Country and terminal market purchases	231,542,281	100.00

*Includes the following companies and their domestic subsidiaries: General Mills, Inc., Pillsbury Flour Mills, Co., Commander-Larabee Corporation, Standard Milling Co., Flour Mills of America, Inc., Tex-O-Kan Flour Mills Co., International Milling Co., The Colorado Milling & Elevator Co., Russell Miller Milling Co., Centennial Flouring Mills Co., Fisher Flouring Mills Co., Globe Grain & Milling Co., and King Midas Mill Co.

Source: U. S. Federal Trade Commission, Agricultural Income Inquiry, Part 3 (Washington 1938), p. 1065.

General Mills, the largest wheat-flour milling company, purchased 23.30 percent of all wheat purchased for flour milling during the crop year 1934-35; Pillsbury Mills purchased 9.77 percent; Colorado Milling &

Elevator Company purchased 5.31 percent; and Commander-Larabee Corporation purchased 5.12 percent of United States commercial wheat production of 302,844,000 bushels.[65]

These four companies purchased slightly more than 43 percent of total commercial production of wheat in the United States for the crop year 1934-35. This again points to the relative importance of the largest companies. Approximately 57 percent of commercial wheat purchases was scattered among the remaining companies of the United States.

Sales of Flour by Channels of Distribution

The sales of flour by millers through their various channels of distribution indicate to some extent the growth of the milling industry. The mere fact that several channels of distribution have been set up is indicative of the increased capacity. As the number of distributive agencies increased, flour-millers were able to supply all classes of consumers in various locations with flour and by-products and thus provided additional incentive to expand capacity. Mergers and consolidations were evidence of this incentive in the second and third decades of the 20th century.[66]

Prior to Flour-Milling Industrialism: 1600-1880

Flour sales by millers prior to flour-milling industrialism were almost nil. Mills were composed of small units that were unable to produce more than their customers required for their own needs. The small production units were engaged full time in grinding wheat for a fixed charge or payment in kind. Moreover, inadequate transportation

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[65] Ibid., pp. 280-281.

[66] Cf. p. 49.

facilities prohibited sales of flour in distant markets even if millers had been capable of producing surpluses.

After improvements were made in production machinery, markets for flour were sought outside of the immediate vicinities. Wheat and flour were transported down navigable streams to market places. The lack of navigable streams in some areas to connect flour-milling centers with consumer markets kept sales relatively small.

The chief market for flour was provided by local grocery stores near milling centers, which supplied the inhabitants in the cities, small towns, and villages.[67] No incentives for establishing distribution agencies prevailed because of inadequate transportation facilities, the relative inefficiency of milling machinery, and lack of flour markets.

After Flour-Milling Industrialism: 1880-1952

Means of transportation were improved in the last two decades of the 19th century. Wheat was transported wherever the demand prevailed. Flour millers were then in position to purchase wheat from distant areas and to mill and transport flour to distant markets. Consequently, sales agencies were set up, and several channels of distribution were provided. Typical of these channels were the sales by thirteen flour milling companies for the fiscal year 1935 (Table 7). These companies sold 45,698,123 barrels of flour in 1935. This was 47 percent of the aggregate volume of 96,613,151 barrels of flour made by all companies producing 5,000 or more barrels annually.[68]

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[67] U. S. Federal Trade Commission, Wheat Flour Milling Industry (Washington, 1924), p. 73.

[68] United States Department of Commerce, Bureau of Census, Wheat Ground and Wheat Milling Products (Washington, 1935), p. 2.

Table 7. Flour Sales of 13 Flour Milling Companies,* by Channels of Distribution, Fiscal Year 1955

	Flour Sales	
	Barrels	Percent of Total
Brokers	342,170	0.75
Mill agents	804,534	1.69
Wholesale grocers	4,654,746	10.19
Wholesale flour merchants and jobbers	6,504,900	14.24
Independent retail grocers	1,005,855	2.20
Cooperative or voluntary chains	1,161,376	2.54
Chain grocery stores (excluding their bakeries)	3,820,607	8.36
Biscuit and cracker companies	742,936	1.63
Bakeries operated by chain store grocers	2,373,947	5.19
Retail bread bakers	3,580,193	7.83
Wholesale bread baking companies	10,729,537	23.48
Other bakers and manufacturers	3,307,700	7.24
Exported	3,401,669	7.44
All other consumers and distributors	3,207,962	7.02
TOTAL FLOUR SALES	45,698,129	100.00

*Includes flour sales of the 13 flour milling companies listed in footnote of Table 6.

Source: U. S. Federal Trade Commission, Agricultural Income Inquiry, Part I (Washington, 1938), p. 1086.

The largest percentage of the flour of these thirteen companies was sold to wholesale bread-baking companies. The second largest percentage was sold to wholesale flour merchants and jobbers. The third largest percentage was sold to wholesale grocers. These three channels accounted for 47.9 percent of the sales made by the companies in question.

A grouping of sales according to types of purchasing agencies reveals the following: (1) 45 percent of flour was sold directly to baking companies, (2) 27 percent was sold through wholesale channels, (3) 13 percent was sold through retail channels, (4) and approximately 7 percent was sold as exports. Only 7.02 percent of the flour produced was sold to all other consumers. Included in this channel of distribution

were sales made directly to household consumers and flour exchanged for wheat by wheat growers. The proportion of sales to bakeries, as compared with retail sales, appeared to be in vast contrast to what would likely be found if similar data were available prior to industrialization of flour milling or even prior to mergers and consolidations in the industry.

Analysis and Conclusions

Locations of flour mills changed to the extent that in 1932 they were concentrated in three cities, namely, Buffalo, Kansas City, and Minneapolis. Privileges of milling in transit and milling in bond affected the location and size of flour centers. The privilege of milling in transit permitted a firm to ship in and mill the wheat and to ship out the flour at one through rate for transportation from initial origin to final destination rather than the sum of local rates which might be applicable. Discontinuation of this privilege at Minneapolis in 1926, under pressure exerted by Southwestern millers, caused a decline in its flour production.[69] The milling-in-bond privilege aided in developing the industry at Buffalo. Located in a direct line between the Canadian wheat region and its export market, Buffalo was able to receive Canadian wheat, mill it in bond, and export it to designated importing countries without additional import duty. Another factor was its source of cheap power. Buffalo's power costs were estimated at two-thirds of those for Minneapolis.[70] The development

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[69] D. M. Malott and B. R. Martin, The Agricultural Industries (New York, 1939), p. 246.

[70] Ibid.

of a milling industry at Kansas City was due to the proximity of wheat-producing areas and the lower cost of winter wheat as compared with spring wheat.

Concentrations of flour-milling centers occurred because of monopolistic factors, inherited or granted. For example, Minneapolis exceeded all other cities in flour production until the milling-in-transit privilege was discontinued at that point. Buffalo's concentration came from its milling-in-bond advantage. Both privileges were monopolistic advantages granted by the government and by the railroad companies. Buffalo's cheap power was an inherited monopolistic advantage. Likewise, the strategic location of Kansas City near a wheat-growing region was an inherited monopolistic advantage.

Milling-in-transit and milling-in-bond privileges tended to have a decreasing cost effect on flour production for particular firms, ceteris paribus. The effect was a function of that portion of total cost attributable to transportation but reflected in the fixed cost per unit of output. Both privileges enabled firms to locate at strategic positions with respect to other advantages, particularly operating costs such as power.

Assuming that flour-milling firms possess a large amount of excess capacity and that an increase in output will not affect the price of goods, then, an increase in output results in a shift of the marginal and average revenue curves to the right. At this larger output there is a decrease in average cost of production. Since flour mills are characterized by heavy fixed costs, such an increase in output results in increased net returns. Thus it appears that milling-in-bond privileges permitted a more nearly full utilization of fixed capital in the Buffalo mills, which increased the net returns per unit of flour milled. The

net effect of these concessions was an increase in demand for wheat by particular firms. A firm is interested in maximizing total profit. A decrease in cost is, in effect, an increase in profit, *ceteris paribus*. As long as a firm may increase profit by increasing output, it will continue to increase production.

Organization within flour-milling firms underwent marked changes after commercialization. Improved milling machinery improved qualities of flour, which resulted in an increase in demand. Flour mills required trained personnel for operation. The number of flour mills declined--especially the number of small mills--but average production per mill increased. These changes indicated that a large amount of excess capacity was present and that flour was more economically produced in large-scale plants. Production on a commercial basis required that records be kept on all operations in order that adjustments might be made to increase the profit of the firm. The progress made in modern flour mills resulted from careful organization and supervision.

Organization among flour milling firms began when the industry became commercialized. The Millers' National Federation served as a coordinating and advertising agency and as a bureau of information for four-milling firms in the United States. This provided a decrease in cost to individual firms for services rendered. Industry-wide research reduced repetition that might be carried on by individual firms so that the entire economy could benefit.

The principle of equating the supply of flour with the demand was recognized in the data relating production to exports. If domestic demand remains relatively unchanged, changes in export demand for flour would be reflected in changes in production. The marked decline in number of mills during parts of the 1920's and 1930's, therefore, was

inferred to be the effect of a decline in foreign demand of American milled flour.

Mergers and consolidations were the effects of loss of markets and relatively high fixed costs in milling firms. Through mergers and consolidations, a control over the supply was expected which would enable the firms to exact a higher price for the flour. Also, advantages of the economies of large-scale production would be possible. The overall effects of mergers and consolidations were the concentration of milling capital under control of a few and the increased bargaining power of millers in purchasing wheat and selling flour.

A marked change was made in flour millers' buying and selling habits. Prior to commercial flour-milling wheat purchases for milling purposes were made directly from farmers, and mills were located near the wheat growers.

Technological improvements enabled flour to be made on a large-scale basis and milling became industrialized. The introduction of mass-production machinery, which was soon followed by improved transportation facilities, also stimulated large-scale flour production. Wheat purchases at country points were not sufficient to sustain mass production. Terminal markets were set up to accommodate large-scale production units. Wheat purchases were shifted from country points to terminal markets because of the large supplies of various grades of wheat kept in storage. Flour millers were then able to fill orders upon short notice. This reduced the uncertainty of price changes in wheat between the date of negotiation and the date of delivery. The net effect of the change in purchase practice and technological improvements both in the milling machinery and in the transportation facilities was a decrease in cost, which was shared by wheat-growers, millers, and flour-consumers.

Prior to industrialism flour was milled for a payment in kind. Later most sales were made to retail stores. Following the introduction of mass production milling machinery and improved transportation facilities, agencies for distributing flour were established. Retail stores were unable to store the large quantities milled, and wholesale companies were organized. As bread bakery techniques were improved, sales of flour to wholesale bread-baking companies exceeded sales to wholesale merchants and jobbers. On the one hand, the establishment of the various channels of distribution of flour enabled millers to efficiently operate their large-scale machinery, but, on the other hand, the bargaining power of millers might have been reduced by selling to an organization of concentrated bargaining power such as the baking industry.

CHAPTER III

NATURE OF COMPETITION IN THE FLOUR-MILLING INDUSTRY

Commercialization of the flour-milling industry, resulting from capacity developed by the use of improved power machinery and from mobility of raw material and products brought about by improved transportation facilities, enabled individual firms to reach considerable distances for both supplies and markets and therefore enter into competition with each other. The nature of that competition, its relation to marketing practices and financial returns, and efforts employed to restrict it were analyzed and the results reported in this chapter. It was felt that such analyses were important to the protection of a free-enterprise economy.

The flour-milling industry has been characterized by a relatively large number of small firms dominated by a few large-capacity firms, all making a product essentially homogeneous. Flour sold to bakeries has been quite homogeneous, but that sold to retail stores for resale to individual consumers has varied somewhat, especially in the minds of consumers.

The Federal Food, Drug, and Cosmetic Act required that certain elements in given proportions be included in flour produced for human consumption. However, millers have added optional ingredients in addition to the standards set by the Act and sold what is termed "enriched flour" and "self-rising flour." Provisions were made for the enrichment of flour under the Federal Food and Drug Act of 1906, under

the Federal Food, Drug, and Cosmetic Act of 1938, and under the several amendments thereto.[1] For practical purposes, differences in flours have been determined partly by the effectiveness of advertisements. Hence from an economic point of view firms in the industry are regarded as producers of homogeneous products. With these conditions prevailing, the flour-milling industry may be regarded as oligopolistic in nature.

The nature of competition existing in the flour-milling industry was further shown by inquiry into the investment-profit ratios, sale and purchase practices, and concessions granted in the industry. These factors, when considered over time, provided knowledge of the changes in degree of competition.

Investments and Profits

Flour-milling companies invested capital in production with the aim of receiving returns on their investments. Data on investments, profits, and returns on investments were computed for flour companies representing fifty-two percent of the aggregate milling capacity in the United States in 1953 (Table 8). The figures represented the entire business of the companies included. Although these companies were engaged in other business activities, they were primarily engaged in the manufacture of wheat flour.

The total amount invested by those companies reached a high of nearly 430 million dollars in 1952. Returns on investment for the same year were lowest except for the years 1936 and 1938. Profits, after taxes, were highest in 1947 when they increased by almost 100 percent

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[1] Millers' National Federation, The Northwestern Miller (Almanack Number), April, 1953, p. 15.

Table 8. Investment, Profit, and Return on Investment, 1928-1953

Year	Investment (total)	Profit (after taxes)	Return on Investment
1928	55,620,669	4,084,584	.073
1929	124,440,850	8,755,824	.070
1930	126,183,497	8,624,296	.068
1931	116,122,908	7,316,572	.063
1932	132,915,592	6,603,798	.050
1933	142,587,110	7,288,874	.051
1934	143,082,809	8,187,422	.057
1935	146,928,132	8,095,377	.055
1936	154,288,284	5,446,583	.035
1937	143,555,176	6,478,718	.045
1938	136,863,841	4,241,847	.031
1939	142,774,858	6,289,745	.049
1940	148,706,815	8,257,741	.055
1941	146,729,606	8,147,648	.055
1942	180,885,168	8,915,652	.049
1943	226,019,740	10,530,377	.047
1944	243,388,978	11,384,543	.047
1945	247,014,291	12,765,235	.052
1946	247,200,130	15,497,764	.063
1947	286,388,487	29,679,114	.104
1948	327,439,191	28,019,999	.086
1949	316,176,693	19,233,672	.061
1950	325,641,008	19,613,957	.060
1951	419,221,670	19,899,932	.047
1952	429,121,700	17,640,126	.041

Source: Moody's Industrial Manuals and Standard and Poor's Industry Surveys. Companies included: General Mills, Inc., Pillsbury Mills, Inc., Flour Mills of America, Inc., International Milling Co., Russel-Miller Milling Co., and Colorado Milling and Elevator Co.

over the previous year. The returns on capital reached a record high of 10 percent in 1947.

The return on investment, computed from the investment and profit schedule, showed a gradual decline. Insofar as the degree of competition was measured by the rate of return over time, flour-milling companies were becoming more and more competitive. Large excess capacities tend to support the inference. However, such inference excluded the World-War-II period in which price-controls were employed, and profits

during this period did not reflect the normal marketing behavior of the companies.

Sale and Purchase Practices

The demand for so-called "family-flour" changed as a result of the decline in home baking. Per capita consumption declined from 177.1 in 1928 to 147.9 pounds of flour consumed annually in 1944. The so-called "family-flour" purchases for domestic purposes represented about 34 percent of total wheat flour purchases in 1944. The estimated per capita consumption for 1952 was 133.0.[2]

The aggregate demand for flour was divided into two broad classifications, viz., household demand and industrial demand. Of 58 flour-milling companies studied by the Federal Trade Commission, 57 reported that they produced household flour, and 34 also produced industrial flours.[3]

Flour millers were producers and sellers not only of flour. Sales of household and industrial flour represented varying proportions of total sales, depending largely on the extent that the companies participated in the production and sale of complementary products and others that were not necessarily related to flour-milling. Both related and unrelated businesses in which flour-millers were engaged appeared to bear a positive relationship to the size of the companies. Large companies were engaged in larger and perhaps more side-line investments than smaller companies.

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[2]Millers' National Federation, The Southwestern Millers, (Golden Anniversary) Vol. 31 (Kansas City, Mo., May 6, 1952). p. 12-1.

[3]U. S. Federal Trade Commission, Distribution Methods and Costs, Part 1 (Washington, 1944), p. 70.

Purchases made by flour-milling companies were not limited to the purchase of wheat. Of the 58 companies reporting, 55 percent indicated that they purchases for resale, without reprocessing, several commodities, e.g., dog food, doughnut mixes, salt, grits, rice, gasoline, rye flour, corn meal, and other products.[4]

The methods or practices by which flour-millers made their sales underwent no appreciable changes after the early 1930's. Improvements and alterations were made; but the main principles remained relatively unchanged. Flour-millers in most instances maintained their own salesmen to take orders for manufactured products. Flour sales were made through brokers or manufacturers' agents, wholesale customers, retail salesmen, and retail stores. Some flour companies found it economical to employ a combination of sales media, whereas others made sales only through retail stores and wholesale customers.

Flour-milling companies generally divided their salesmen according to territories or regions, types of products sold, or the classes of consumers supplied. The economies of such organization of sale forces depended in part on the number and quantity of products offered for sale. For example, large companies selling multiple products to many classes of consumers probably maintained a low selling cost by organizing their sales forces according to territories or regions. Small companies, on the other hand, selling only one or a few products and in small quantities, were likely to find it economical to employ salesmen trained in selling certain types of products. However, a company too small to economically employ this type of sale practice might have found it economical to make sales only at the mill door. In such

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[4]Ibid., p. 71.

case the production personnel were also the sale agents. Alternatively, one may have been employed to make house-to-house calls to consummate sales. Seven of the 58 companies reporting indicated to the Federal Trade Commission that they employed a salesman to make house-to-house calls.[5] Large companies generally supplied bakeries with wheat because bakeries usually made large orders for a specific flour-grade.

Sales were negotiated on one of two bases, (1) on-track basis or (2) to-arrive basis. The latter was subdivided in the flour milling industry, viz., (1) sales made on a basis of delivered price at a designated agency in the customer's city or (2) sales made on a basis of price delivered at customer's door. Large flour companies made sales on both bases.[6]

Flour sold by the milling industry was generally identified by brand names. The brands consisted of the milling company's name, customer's private name, or a combination of the two. A small percentage of flour was sold without brand names. The number of brands and grades of flour sold varied between companies. A substantial reduction in brands and grades of flour has been made in recent years according to a report by the Federal Trade Commission.[7]

A large number of sizes of packages were used by millers before federal regulations were passed affecting the sizes of flour containers.[8]

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[5] Ibid., p. 71.

[6] Ibid., pp. 70-76.

[7] Ibid., p. 74.

[8] The War Production Board's Conservation Order No. M-221, Jan., 1943, designated the size of containers that would be used hereafter in the Flour Milling Industry, Viz., 5, 10, 25, 50, 100 pounds, and over. For details see Northwestern Miller, Vol. 213, No. 13 (March 31, 1943), p. 16.

State laws affecting flour-packaging varied widely, and many sizes of package were found on the market and thus increased the cost of production. Cost of packaging averaged 40 cents per barrel for the years 1919-1922 and constituted the second largest cost of production item.[9] Data were not available for recent cost of packaging, but the Millers' National Federation reported a reduction in cost of packaging.[10]

The additional expense brought about by World War II led the United States government to emphasize the reduction in cost of production wherever possible. In compliance, the War Production Board issued an order in January, 1943, effective April 1, 1943, prohibiting the packaging of flour and feed in any textile or paper bag other than of the following net weight capacities: 2, 5, 10, 25, 50, and 100 pounds or over.[11]

Efforts to Restrict Competition

Competition among flour-millers became so keen following World War I that efforts were made by them to reduce what they referred to as "undue" competition. Flour-millers began to face what appeared to them to be chaotic marketing conditions. It can not be said that flour-millers have completely abandoned such efforts. Major efforts to restrict competition are discussed below.

Curtailment of Production

As early as 1923 flour-millers began to visualize the aggregate demand for flour as inelastic. They also felt that they were operating their plants at an output beyond the point of equalization of marginal

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[9] U. S. Federal Trade Commission, Wheat Flour Milling Industry, 1924, p. 52.

[10] Millers' National Federation, (Golden Anniversary) 1952, p. 6-A.

[11] U. S. Federal Trade Commission, Distribution Methods and Costs, p. 75.

cost of production and marginal receipts.[12] Notwithstanding the fact that there was visible excess capacity, flour-millers cooperatively emphasized the point that they should reduce flour-production which would reduce cost and increase prices per unit of flour sold. Such curtailment in production was believed to occasion an increase in profit for firms presently earning a profit and reduce losses for those firms presently not covering cost.

Additional capacities built up during World War I had resulted, according to the Millers' National Federation, in "a milling capacity greatly in excess of our domestic needs."[13] The need for curtailment of production was discussed at several meetings held in 1923 and 1924. Flour-millers advocated a slogan: "Make no surplus flour and you will have no trouble."[14]

Millers witnessed a decline in flour exports about the time that concerted efforts were emphasized to curtail production. The average annual quantity exported during the five-year period 1919-23 was more than 18 million barrels, but the average annual quantity exported during the following five-year period (1924-28) was 13 million barrels.[15]

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[12]Theoretically, total profit is maximized at that output at which marginal cost equals marginal revenue (marginal receipts). Beyond that point cost of producing an additional unit adds more to total cost than the additional unit of production adds to total revenue. Conversely, for any output short of the point where marginal cost equals marginal revenue, producing an additional unit adds less to total cost than the additional unit of production adds to total revenue.

[13]U. S. Federal Trade Commission, Agricultural Income Inquiry, p. 292.

[14]Ibid., p. 292.

[15]Food Research Institute, Wheat Studies, Vol. II (California, 1935), pp. 45-49.

The emphasis on curtailment of production did not exceed the discussion stage. No concerted efforts to curtail production were subsequently witnessed. The curtailment of production would have had to come about by reducing production of the existing firms. Because of the large number of firms with a vast range in size, it is not surprising that flour-millers did not agree on a policy of curtailment of production as a cure for unfavorable flour prices.

Blacklist of Customers

In 1924 Southwestern millers continued to restrict what was termed "undue" competition among flour-millers by circulating among all of the members a "blacklist" of customers. The list was composed of customers whom different flour-millers had found to be bad credit risks or unduly hard to satisfy with orders in the past. Secretary C. V. Topping of the Southwestern Millers' organization, Southwestern Millers' League, secured names of such customers from the Millers' Exchange records and sent them out to all flour-milling companies who were members of the organization. Correspondence relevant to this matter was indicative of the importance flour-millers placed on this practice. It appeared that the list was used rather extensively.

The nature of the correspondence suggested that lack of agreement existed between member mills as to the names submitted by some of the millers for the blacklist. The general sales manager and vice-president, W. R. Duerr, of Kansas Flour Mills Co., Kansas City, Missouri, wrote a letter to C. V. Topping expressing his dissatisfaction pertaining to the list. It was an example of the many letters written by millers expressing their dissatisfaction. Mr. W. R. Duerr's letter of February, 1924, stated in part as follows:

> I think we [Member Millers] should carefully go over the list of customers that we have listed, since I feel reasonably sure that some of the names that now appear would again be satisfactory for the mills to sell.
>
> ...in looking through the book here and there, there are some good customers that appear in this book that possibly were not at all at fault as to being listed. It might have been [that] it was the mill's fault and I think some of these are good concerns...[16]

Names of undesirable customers submitted by member mills were accepted by the organization for circulation without accompanying reasons. It appears that some flour-milling companies submitted names for the "blacklist" because of personal conflicts between them and the customers which might not have been a problem of common interest to other millers. No record as to the extent to which self motives influenced the submitters' list of undesirable customers is available.

Agreements, Understandings, and Cooperation

On several occasions flour-milling companies met to reach an agreement on some of their major profit-affecting factors. Discussions on rates of profit, exchange of information on selling prices, and fixing elements of prices appear to have been of paramount importance to flour-milling companies during the 1920's.

Rate of Profit.--With intentions of reaching agreements, understandings, and obtaining effective cooperation among them, flour-millers devoted considerable attention to the question of profit. They appeared convinced that a certain margin above cost of production was necessary to assure a fair rate of profit. Their interest in establishing agreements and understandings on a rate of profit was evidenced by their correspondence

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[16] U. S. Federal Trade Commission, Competition and Profits in Bread and Flour (Washington, 1938), pp. 352-353.

and discussions at federation meetings. Some flour-millers indicated that a minimum profit of $1 per barrel or $.51 per hundredweight should be made on each lot of flour sold. Others, however, did not indicate any such fixed rate of profit but considered it a question that should be decided by individual companies.[17]

The Millers' National Federation in its annual meeting of 1923 explicitly expressed its disapproval of millers' selling flour at a price equal to cost or below. Several millers admitted that they were guilty of such negotiations in attempts to minimize losses but added that they were willing and ready to abide by the consensus of the group. No set margin, such as the $1 margin proposed by some, was agreed upon at the meeting. It was left to the individual companies, but it was urged that millers sell above cost of production.[18]

Following the adjournment of the federation meeting, letters were sent by several millers to the office of the federation expressing their views on the profit issue. It appears to have been the consensus that the setting of profit was, in effect, the establishing of prices. In order to make such practice effective, millers appear to have chosen the exchange of price information as the next step.[19]

Exchange of Information on Selling Prices.--Little was accomplished in reaching agreements and understandings and receiving proper cooperation among flour millers on the exchange of information on selling prices. Attention had been called to representatives of flour-milling companies

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[17] Agricultural Income Inquiry, p. 292.

[18] Competition and Profits in Bread and Flour, pp. 353-354; 292-293.

[19] For letters written concerning profit-fixing see Competition and Profits in Bread and Flour, pp. 352-362.

during the federation meeting of October, 1923, concerning the establishment of a system to exchange price information. The organization appeared convinced that the economic conditions of flour-milling companies would be rapidly improved if the group could reach an agreement and if millers could exhibit proper cooperation in executing agreed plans. The remedy for the chaotic marketing conditions of flour, particularly prices, was viewed by the representatives attending the meeting as strongly dependent on the cooperation of flour-millers in exchanging price quotations.

The exchange of correct price information among members of the organization was intended to prevent flour-millers from price-cutting, and accordingly raise prices for all mills. The level of prices varied in different locations, and it was very difficult to establish a single price. If prices received by flour-producers varied by more than cost of transportation, an exchange of information on flour prices would provide alternative markets for producers located in the lower price regions. It does appear that such an agreement would have been in the interest of the flour-producers of the organization. Millers could sell their flour in markets that would give them the greatest net return per unit of sale. But the group was confronted with an obstacle, which appeared to be distrust and dishonesty.[20]

The reliability of price quotations appeared questionable to the millers themselves. Moreover, member companies were not sure that their colleagues would cooperate as promised. Such suspicion arose out of the feeling that millers were going to sell flour even if prices fell below what was considered acceptable prices by the organization. While doing so, they would not quote the price received but a price that was acceptable by the organization.

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[20] Ibid., pp. 364-365.

This distrust was not alleviated by buyers of flour; on the contrary, they seemed to have aggravated it. Buyers of one region often told jobbers of that and other regions that flour was being offered for sale at some price less than that which millers of that region had quoted to their salesmen. The spread of such propaganda seems to have been far-reaching. Flour companies, when informed of the reportedly low price sellers, reported this information to the organization. In several cases flour-producers that were maintaining high price quotations wrote companies that had been reported as selling below what had been regarded as a normal price. The secretary of the organization was designated to investigate the reliability of the rumor that certain companies were selling flour at too low a price. In all cases except one this charge was denied by the company investigated.[21]

Exchange of price information among Southwestern flour millers had been carried on before the Northwestern Millers' Organization launched this program at their meeting in 1923.[22]

Growing out of this promotion of "exchanging information on prices" was the publication of price quotations in various states. Such publication continued monthly, weekly, or daily, depending on the organization.

Attempts to organize prices for which millers were willing to sell gained publicity to the extent that the Federal Trade Commission was called upon to investigate the legitimacy of such action.

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[21] Pillsbury Mills, Incorporated, sold flour at $1 less than the price Omaha Flour Mills was receiving at the same location and time. The price demanded by Omaha Flour Mills had been considered acceptable by the organization. When Pillsbury was questioned, it admitted selling flour at such low price and indicated it was of no other company's concern. For details see Ibid., p. 362.

[22] Ibid., p. 366.

Replies to the Federal Trade Commission investigation revealed two types of answers: (1) Some companies stated that they exchanged price information with other flour-milling companies to prevent any vast contrast in prices in different localities. (2) Other companies stated that they had turned in price information to their organization for publication but had never indulged in collusion with other companies. In no case was it admitted by companies interviewed nor the flour millers' organization that prices had been fixed by any one concerned or by the organization. Moreover, companies made voluntary reports of prices received for flour. The reason given by companies investigated was to keep their members informed on prices received in various locations. It was left to the individual company to set its price according to the replies.[23]

Fixing Price Elements.--Price-fixing on the part of flour-millers appears to have been based on what may be termed "cost-and-profit" bases. These bases were not attained on purely competitive grounds; i.e., efficiency of a firm was not necessarily the sole determinant of selling prices. In other words, the forces of free competition in price determination seemed to be held in check by agreements as to the prices for which flour should be sold and by soliciting the cooperation of all member millers in carrying out the agreement.

A break-down of cost as used by the Northwestern Miller Organization in an attempt to fix the elements of price included the following: cost of wheat, operating expense or cost of conversion, credit allowed for by-product, and package cost.[24]

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[23] Ibid., pp. 378-383.

[24] Ibid., p. 382. The bases upon which profit was determined were discussed in detail in a preceding section. Cf. p. 78.

The first attempt by the Northwestern millers to become engaged in fixing the elements of cost began in a meeting September 1, 1924.[25] Organized at this meeting was the Livingston Economic Service.[26] The Service purported to render to the members of the Northwestern millers' organization a cross section report on wheat cost per barrel and the flour market situation. The report was to be based on information gathered from conferences held with wheat buyers and sellers in regard to wheat prices, and conferences were held with sales managers in regard to flour prices.

It appeared that this report entitled "Market Bulletin" would, in effect, inform members of the wheat and flour prices and the operating expense throughout the area in which their members made purchases and sales of wheat and flour respectively. The report provided data for each member to use as a yardstick. Yet, conflicting with this interpretation was the fact that the bulletin showed cost data based on market prices on the date of publication according to the following:

> The wheat price used on the cost card should be the market price of the /wheat/ mixture of the date of the cost card, not what you bought it for. Your competitors probably have to sell on to-day's market.[27]

Such a policy, if carried out, suggested one of two conditions. The data were gathered either from a few firms on the date of publication or from many firms some time previously and adjusted on some basis to fit the prices quoted on date of publication. In either case, the prices published would not necessarily be in line with the cross-section of realized prices.

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[25] Agricultural Income Inquiry, p. 382.

[26] Competition and Profits in Bread and Flour, p. 387.

[27] Ibid., p. 388.

Operating expense or conversion cost was arbitrarily set at $1 per barrel. No evidence of attempts to adjust operating expense to the size of the firms was found. The multiplicity of sizes and capacities operated likely accounted for this omission.

As to the credit given to by-products or offals, prices were set slightly below the market price in order to allow for safety. This "safety-hedge" was intended to offset deviations in food-prices. When buying wheat, the millers considered the price of by-products. The price of feed encountered by millers when ready to sell varied from the price of that feed on the purchasing date of wheat. This margin, or "safety-hedge," protected the miller from losses in case of price declines in feed or increased their anticipated receipts if prices of feed should rise. The margin also served as a partial hedge against decline in flour prices. The margin set varied from $2 to $4 per ton, depending on the variation in feed and flour prices.[28]

Package cost was an item also considered in fixing the elements of the selling price of flour. Below is a sample of the Market Bulletin issued by the Livingston Economic Service, dated January 31, 1925.[29]

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[28] Ibid., pp. 388-389.

[29] Ibid., p. 388.

Condensed Market Cost Card

	Market basis for shipments in:		
	60 days	90 days	120 days
Wheat basis (May) $1.96½ plus premium and carrying charge	$ 2.04½	$ 2.07	$ 2.09½
Wheat mixture cost for 4 bushels (35 pounds)	9.37	9.49	9.60
Operating expense	1.00	1.00	1.00
	10.37	10.49	10.60
By-product credits, regular extractions			
Second clear....barrels...$5.05	1.16	1.16	1.16
Low grade.....tons.....34.75	1.16	1.16	1.16
Bran.....do. 22.75	1.16	1.16	1.16
Shorts.....do. 25.25	1.16	1.16	1.16
Cost of 191 pounds patent flour (bulk)	9.21	9.33	9.44
Cost of 200 pounds patent flour (bulk)	9.64	9.77	9.89
Package cost (98's cotton)	.32	.32	.32
Total cost, 200 pounds 95 per cent patent flour	$ 9.96	$10.09	$10.21

In conjunction with the condensed market cost card an appeal was issued to flour-millers to refrain from dumping their feeds. If millers would merchandise their feeds just as their flour, it was believed that the price of feed would rise.

As to the probable behavior of feed prices one must consider the supply of substitutes for wheat by-products in relation to the demand for the products. For example, if the quantity of a given quality of corn to be marketed should increase and the quantity of such quality of wheat remain unchanged, the price of corn would decline. Since by-products of wheat were competing with other products for the consumers' dollar, the quantity and demand for competing products had to be considered in predicting price behavior of wheat by-products. Millers since have seemed to consider this relationship in pricing their products.

The specification costs of the Livingston Economic Service were obviously inflated. The "safety hedge" and the arbitrary fixation of $1 for operating expense embodied in the Market Bulletin added to the inflated costs. Mr. Livingston, the reporter, admitted to such charge when he stated: "Prices quoted to-day are noticeably out of line with cost figures. This may be due to one of several reasons...whatever the reason, we stick by our figures."[30]

The members of the Southwestern Minnesota Mills also reported to their organization. Their cost figures ranged from eight to fifty cents per barrel below those of the Livingston Economic Service.[31]

It appeared, therefore, that cost figures reported in the Market Bulletin were inflated or that figures reported by the Southwestern Minnesota Mills were underestimated. The latter probability was hardly true, however, since cost figures published by the Southwestern Minnesota Mills were reportedly based on actual or realized costs.

The Southwestern millers appeared to have been engaged in the publication of cost data as early as 1922, evidenced by a letter which was written by one company to the Nebraska Millers' Association, which read in part as follows:

> We did not intend to convey the idea that we favored the control of prices by mills in Nebraska...but in order to save our properties, we did think it time to observe and maintain certain costs entering into the manufacture of flour and other wheat products, to give us back [our costs?] only and to wire our daily minimum price to you the moment we consummated any sale...which in turn would be given to members by wire from this office. Such members would act according to their own judgment.[32]

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[30] Ibid., p. 390.

[31] Ibid., p. 390.

[32] Ibid., p. 391.

The records of flour sales reported to the Southwestern Millers' Association were broken down into three classes: A, B, and C.

> Class "A" sales pertained to all sales representing a sound milling profit based on cost of wheat, normal operating expense, and actual selling.
>
> Class "B" sales pertained to the volume of business associated with apparent profit but booked mainly to ensure operation. The probability of profit was more doubtful than sales made in class "A."
>
> Class "C" sales pertained to sales in which there were apparent losses but booked only to insure operation.[33]

Reported sales of this nature seem to have permitted mills of various conversion costs or operating efficiencies to make adjustments as to what they regarded as good or "A" sales in regard to their various costs. Companies selling the same product to the same source at the same time might list their sales differently depending on their various costs. Also having influence on the class under which the producer would list his sales were the relative uncertainties and risks encountered in each undertaking.

Code of Ethics and Business Practices.—In an attempt to activate efforts to restrict competition as described above, the Millers' National Federation adopted at an annual meeting in Chicago, Illinois, April 16, 1925, a "Code of Ethics and Business Practices."[34] The code was an attempt to bind together the members in such a way that any disloyal action on the part of any member firm would appear inexcusable. In effect, it was the pledging of allegiance to this document by all member firms. It was believed to be in the common interest of all members.

The code of ethics and business practices was too long for

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[33] Competitive Conditions in Flour-Milling Industry, p. 61.

[34] Agricultural Income Inquiry, p. 244.

reproduction here, but generally it embodied the following features: (1) prevention of competition in terms of sales and deliveries; (2) setting of arbitrary and uniform minimum selling prices for the companies; and (3) provision of methods for enforcing the two above named features.[35]

The so-called "ethical" and "unethical" practices as set up in the code of ethics by the executive committee were attained through prolonged discussions, comments, and criticisms by 75 representative firms throughout the United States.[36]

The code of ethics reportedly purported to promote equality of competition and facilitate the interpretation of competition, to eliminate unsound and unethical practices, and to promote the highest standard of business ethics.[37]

If all member firms should have adhered to the code of ethics through its entirety, the question might be raised as to the basis on which firms were free to compete. It seemed that freedom to compete had been removed by reason of the mere fact that all or many firms abided by rules set up by 75 firms, or only 1.7 percent of the millers in the United States. Of course the rules were not compulsory as reported by the Millers' National Federation but they appeared highly suggestive. Firms not abiding by these rules were not to receive the organization's publications on costs, prices received, and other pertinent information.

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[35] For a complete copy of the code of ethics and business practices, see Federal Trade Commission, Competitive Conditions in the Flour Milling Industry, Senate Document 97 (Washington, 1928), pp. 75-80, and Exhibit V, pp. 129-136.

[36] Competition and Profits in Bread and Flour, p. 415.

[37] Ibid., p. 419.

The quantity of flour produced and the selling prices of various grades were relatively fixed in the code of ethics, leaving quality as the major basis for competition. Since improvements in quality were quite limited at the time the code of ethics was adopted, the range for competition was rather narrow. From an economic viewpoint the code of ethics seemed to have reduced competition to a minimum. The only other freedom left to an individual member firm seems to have been freedom to exist. A decline in number of firms of approximately 19 percent was witnessed during the years 1923-25.[38]

Many of the practices defined as "ethical" and "unethical" by the federation were not free from criticism by an unbiased investigator. This inference seemed to have been supported by the Federal Trade Commission inquiries into some of the policies and tactics of the flour-milling industry.

The Federal Trade Commission had been called upon by the Senate to investigate some of the policies and tactics of the flour-milling industry. As a result of these inquiries the commission filed three charges against certain members of the flour-milling industry as operating in violation of the Sherman Antitrust Acts, Clayton Act, or the Federal Trade Commission Act.[39]

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[38]Cf. Appendix, Table I.

[39]The Sherman Antitrust Act was an act approved by Congress July 2, 1890, "to protect trade and commerce against unlawful restraint and monopolies." An amendment to the act was approved February 12, 1913. For details see Federal Trade Commission, Annual Report (Washington, 1931), p. 131.

The Clayton Act was an act approved by Congress October 15, 1914, to supplement the Sherman Antitrust Act. It was opposed to any corporation engaged in interstate commerce acquiring or holding any part of the capital stock of a competing corporation "where the effect of such acquisition was to substantially lessen competition between the corporation whose stock was so acquired and the...corporation making the

(1) Complaint No. 40.—Federal Trade Commission vs The Colorado Milling and Elevator Co. Charged: Attempting to eliminate competition by fixing resale prices and by refusing to sell to those who will not agree to maintain such prices. Status: Ante, Complaint No. 25. Disposition: Dismissed.[40]

(2) Complaint No. 585.—Federal Trade Commission vs Larabee Flour Mills Corporation. Charged: Using unfair methods of competition by offering to give and giving to any grocer, dealer, or merchant who purchased 25 barrels of respondent's flour, known as Larabee's Best Flour, a 10-year guaranteed gold-filled watch and continuing to give such a watch for additional purchases of 25 barrels of said flour until everyone in the store had received one of such watches. Disposition: After hearing, the complaint herein was dismissed without prejudice.[41]

(3) In seven cases, orders to cease and desist were issued against a total of 17 individuals and two corporations doing business under one or more of the following names: Royal Milling Co., Richland Milling Co., Empire Milling Co., Tennessee Grain Co., and Tennessee Milling Co., and others. Charged: Misdescription of business. Disposition: Cease and desist in the course of interstate commerce from using the term "Milling," or "Mills" or any word of like import.[42]

Whether the two former cases were dismissed because of innocence of the accused or because of lack of evidence is not known. The serving of subpoenas to the officers of the Millers' National Federation and the Washburn-Crosby Company in 1926 in order to obtain from their files

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acquisition...." The act mainly clarified portions of the antitrust act, particularly the term "restraint of trade." See U. S. Temporary National Economic Committee, "Large-Scale Organization in the Food Industry," Monograph No. 35, Washington, Government Printing Office, 1940, pp. 145-146.

The Federal Trade Commission Act was an act passed by Congress September 26, 1914, to supplement the antitrust act. It commanded business to refrain from unfair methods of competition by which free competition was endangered. No authority was invested in the commission to impose penalties. Its object was to protect the public, not to punish the offender. See Federal Trade Commission, Annual Report (Washington, 1931), pp. 8-14; 133-138.

[40] Federal Trade Commission, Annual Report (Washington, 1922), p. 111.

[41] Ibid., p. 146.

[42] Ibid., p. 112.

certain records indicated that some unfair activities probably existed in the flour-milling industry.[43]

Analysis and Conclusions

The flour-milling industry has consisted of a large number of small firms dominated by a few large firms, all producing a homogeneous product for bakeries and close substitutes for consumers. It therefore has been characterized as an oligopolistic industry.

Investments in the industry gradually increased between 1928 and 1952, but returns on investments gradually declined during the same period. If rates of return determine the degree of competition, it appears that flour-milling companies became more and more competitive. Available information indicated that the decline in returns on investments occurred because the increase in investment was not accompanied by a proportionate increase in profit. This decrease in returns on investments was one important factor influencing the decline in number of flour-milling companies.

An inquire into sale and purchase practices provided further information that influenced returns on investments. Flour sales were made to household and industrial users on "to-arrive" basis or "on-track" basis. Prior to 1943 a large number of sizes of flour packages were used by flour-millers. Labor, time, and cost of equipment were higher for packaging this large number of various size packages than for packaging a smaller number. This reduction in cost affected the return on investment.

Large numbers of brand names were used by millers in selling flour.

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[43]U. S. Federal Trade Commission, Annual Report (Washington, 1926), p. 62.

Although the quality of flour might have differed slightly before the passage of the Food, Drug, and Cosmetic Act of 1938, the numerous brand names were used in an attempt to differentiate the product of individual firms. If these attempts had been successful, returns on investments under monopolistic conditions might have been greater than those found in this study. From the available data the effects of advertising cannot be ascertained, but the decline in returns on investment indicated that advertising was not sufficiently effective to raise returns much above a rate of 6 percent for any appreciable length of time.

Flour millers, in an effort to increase returns on investment, engaged in the production and sale of products other than flour. It appeared that such engagements were generally carried on only by large-scale mills. Small-scale mills usually had only limited funds for operating their plants. Probably business operations other than the milling of flour, as well as economies of scale, enabled the larger mills to remain in operation during depressionary periods when small-scale mills were forced to leave the industry.

Since the end of World War I the flour milling industry has been plagued with excess capacity. The loss of export markets following the war left millers with such large amounts of excess capacities that they began to compete among each other for the domestic demand for flour. Competition reached the level that was referred to as "undue competition" by flour millers. In attempts to restrict competition, efforts were made by flour-milling companies to curtail production, to circulate a "blacklist" of customers among millers, and to seek agreements, understandings, and cooperation in the industry. The efforts had little effect on the flour-millers. Attempts to curtail production did not exceed the discussion stage. The blacklist of customers was often found

to be unreliable. Some customers' names were submitted to appear on the "blacklist" for personal reasons not important to other millers. Thus millers soon refused to recognize the "blacklist." Efforts to seek agreements, understandings, and cooperation were of little consequence. Although a rate of profit on each unit of sale was agreed upon, it appeared that flour-millers did not keep their operations within the agreements. It appeared that sales of flour by millers at prices below those agreed upon resulted from efforts to keep their mills in operation and to recover a portion of their fixed costs. However, efforts to achieve an agreement, understanding, or cooperation became so pronounced that investigations were made by the Federal Trade Commission on possible violation of the Antitrust Act of 1890, on the basis that the attainment of such an objective would restrict competition among firms. Although these efforts had little effect on flour-milling companies in operation at that time, it appeared that the national organization (Millers' National Federation) representing the industry became stronger, because companies interested in agreement, understanding, and cooperation became members of the organization. Since proposals for carrying out such efforts were made by the large flour companies, it appeared that small flour companies soon might have been liquidated had they followed the proposals.

CHAPTER IV

EFFECTS OF GOVERNMENT WHEAT POLICIES ON WHEAT FARMERS AND FLOUR-MILLERS

Government policies pertaining to wheat and wheat flour were instituted during and immediately following World War I. Several such policies were introduced during the 1930's and persisted afterward as important factors influencing the operations of wheat farmers and flour-millers. These government policies were generally characterized as mechanisms to bring about a balance between the supply and demand for wheat at the parity price levels.[1] They were focused on expanding domestic and foreign markets for wheat. Such policies are here discussed as prewar, wartime, and postwar policies in order to determine their effects on the flour-milling industry.

Prewar Government Wheat Policies

Wheat is exported principally as wheat and wheat flour. Foreign demand for wheat began to decline in 1921. The volume exported in 1921 was 86.7 million bushels less than that of 1920.[2] Total exports of

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[1]Parity price may be defined as "a price that would enable the seller of a unit of commodity to purchase as large a quantity of other goods and services as he was able to purchase with a unit of the commodity in a given base period." Warren C. White and Harry C. Trelogan, Agricultural Market Prices, 2nd Edition (New York, 1951), p. 29. See Robert L. Tontz, The Evolution of "Agricultural Parity" (Unpublished Ph.D. thesis, Agricultural Economics Department, Oklahoma A. and M. College, 1952), pp. 117-118.

[2]Millers' National Federation, (Golden Anniversary) Vol. 31 (Missouri, May 6, 1952), p. 20-A.

flour declined by 10.9 million barrels between 1919 and 1921.[3] This was only the beginning of a downward trend in the volume of exported wheat and wheat flour which continued until the late 1930's. The decline in the export market for wheat and wheat flour was in line with the decline in export markets for other American products. The decline was the result of increased production in foreign countries brought about through their policies to encourage production at home.[4] Import tariffs were increased in an effort to insulate the various countries from competition abroad. Purchasing powers of countries began to decline. Flour exports were 13.4 million barrels in 1927 as compared with 28.2 million barrels in 1919.[5] Wheat production was geared at a high level during World War I, and supplies were in excess of quantities demanded during the 1920's. Thus wheat prices were low and considered out of line with nonfarm commodities.

In an effort to raise the domestic price of wheat the federal government launched its first major wheat program after World War I in 1929. It was the Agricultural Marketing Act of 1929, which was to be administered by the Federal Farm Board. The objective was to stabilize market prices of farm products through loans or direct purchases out of a $500 million revolving fund.[6] Price pegging of wheat was attempted by encouraging cooperative organizations to store surplus wheat. Cost of this operation was financed out of the revolving fund. The effect expected would have

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[3]See Appendix, Table III.

[4]W. W. Wilcox and W. W. Cochrane, Economics of American Agriculture (New York, 1951), p. 516.

[5]See Appendix, Table III.

[6]W. W. Wilcox and W. W. Cochrane, op. cit., p. 539.

been an orderly marketing of wheat had sufficient funds been available to implement this policy. A grave omission by the policy-makers in devising the policy was their failure to consider production-controls. Acreage controls alone have been of doubtful effect in controlling total wheat production. To obtain a given price for a commodity one must consider the factors affecting both the supply and demand for the commodity. Although wheat growers benefited temporarily by the Act, the benefit to society was questioned.[7]

The flour-milling industry was affected similarly following World War I. The decline in export market for wheat flour resulted in an excess milling capacity in the flour-milling industry. Total flour-production was 132.5 million barrels in 1919 and 118.1 million in 1927, a decline of eighteen percent. The percentage of capacity utilized was 39.1 in 1919 and 29.2 in 1920, but rose to fifty-four percent by 1927 for reasons to be explained subsequently.[8]

The loss of a market sufficient to support the existing flour-milling capacity resulted in a marked decline in number of mills.[9] With exceedingly large percentages of milling capacities not being utilized, competition appeared to be relatively keen. Mergers and consolidations of plants resulted in an effort to attain a balance between total milling capacity and demand for flour. The result was believed to end what was termed "undue competition."

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[7]A. L. Larson, Agricultural Marketing (New York, 1951), p. 492.

[8]The Northwestern Millers (Golden Anniversary), p. 16-A.

[9]According to the Bureau of Census report there were 10,708 merchant mills in 1919 and 4,635 in 1927. Flour milling capacities were 654,836,000 hundredweight and 385,054,715 hundredweight, respectively. See Appendix, Table I, and The Northwestern Millers (Golden Anniversary), p. 16-A.

In 1933 the revolving fund set up in the Agricultural Marketing Act of 1929 was exhausted by withholdings of surplus wheat from the commercial market. Efforts to control production were then undertaken. The first was the passage of the Agricultural Adjustment Act of 1933. Attempts to control wheat production were included in this Act by making acreage allotments. Such allotments were expected to adjust wheat production to demand. Acreage was reduced, but total production remained approximately the same.[10] The effects of the Agricultural Adjustment Act of 1933 on reducing production have thus been debatable.

The Agricultural Adjustment Acts of 1933, 1936, and 1938 all aimed at bringing about a balance between the supply and demand for wheat. Compensatory payments were made to conformers. Benefit payments proclaimed in the Agricultural Adjustment Act of 1933 were financed through a processing tax that resulted in an increase in wheat prices. Wheat processors shifted most of the tax in increased wheat prices to consumers. The price of bread rose five cents a pound.[11] Benefit payments to United States wheat growers for the three years that processing taxes were legal were as follows:[12]

1933...$ 98.6 million
1934... 101.6 million
1935... 115.6 million

In addition about $6.5 millions were spent in export subsidies and in disposal of surpluses for each of the three years.[13]

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[10] A. L. Larson, op. cit., p. 493.

[11] Wilfred Malenbaum, The World Wheat Economy, 1885 to 1939 (Cambridge, Massachusetts, 1953), p. 17.

[12] Ibid., p. 16.

[13] Ibid.

The processing tax on wheat was declared unconstitutional by the Supreme Court in January, 1936, and was immediately terminated.[14] The Soil Conservation and Domestic Allotment Act of 1936 was enacted to replace the 1933 Act. A year later the Agricultural Marketing Act of 1937 was enacted, and in 1938 a revised Agricultural Adjustment Act was passed.[15]

The Agricultural Adjustment Acts of 1933, 1936, and 1938 had in common the objective of reducing production of surplus farm commodities, whereas the Agricultural Marketing Act of 1937 aimed at the orderly marketing of such commodities, including wheat.

Payments to wheat growers did not end with the termination of the Agricultural Adjustment Act of 1936. Only the source of finance was transferred from processing taxes to government expenditures. Soil Conservation payments to wheat growers amounted to $50.5 millions in 1938; parity payments were $34.0 millions; wheat loans by the Commodity Credit Corporation amounted to $16.0 millions (excluding administrative costs); and export subsidies for 1938 cost $26.0 millions.[16]

The effects of acreage allotments, nonrecourse loans, marketing quotas, price support programs, and foreign aid programs were indeterminate. Admittedly, the price of wheat began rising in 1935. How much of the rise was attributable to agricultural policies cannot be specified. The reduction of wheat acreage coupled with the droughts of 1934 and 1936

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[14]Harold G. Halcrow, Agricultural Policy of the United States (New York, 1953), p. 291.

[15]For a detailed discussion of each Act, see O. B. Jesness, Readings in Agricultural Policy (Philadelphia, 1949), pp. 234-236.

[16]United States Department of Agriculture, The Wheat Situation (Washington, September, 1939), p. 18.

resulted in an appreciable decline in the supply of wheat, influencing a rise in wheat prices.[17]

The Reconstruction Finance Corporation subsidized flour exports to China, Japan, the Phillipines, and other Far Eastern markets in 1933-1934. The Reconstruction Finance Corporation loaned to China $50 million in 1934. Of this sum $4 million were earmarked for purchases of flour and $16 million for purchases of wheat.[18] In 1936 subsidies were paid for flour exported to the Phillipines only. Payments were made from customs revenue funds under the Amendments of the 1935 Agricultural Adjustment Act. An export subsidy of thirty cents per barrel was announced September, 1938, by the Federal Surplus Commodity Corporation, which was later raised to sixty cents per barrel. As a result sales of exported wheat and wheat flour reached a total of 109 million bushels from July 1, 1938, to May 1, 1939. Of this total 77 million bushels were subsidized.[19] An average of 70 million bushels of wheat and wheat flour were exported through the Economic Cooperation Association during 1937-1939.[20]

The school-lunch program, Food-Stamp Plan, American Red Cross, and Federal Emergency Relief Administration Program were policies used to Stimulate demand (domestic and foreign) for wheat. Nonrecourse loans,

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[17] No. 2 Hard Winter Wheat sold at Kansas City for $.981 per bushel in 1934, for $1.051 in 1935, for $1.214 in 1936, for $1.108 in 1937, and for $.695 in 1938. See FAO, Grain (Commodity Series), Bul. No. 13, (Washington, May, 1950), Appendix Table C-3, p. 105.

[18] Food Research Institute, Wheat Studies, Vol. 10 (California, 1934), p. 392.

[19] B. Malott, op. cit., pp. 266-267.

[20] Frank R. Galay, "The International Wheat Agreement of 1949," Quarterly Journal of Economics, Vol. 64 (August, 1950), p. 461.

acreage adjustment payments, surplus purchases, parity price payments, and diversion payments were financed by the federal government and aimed at raising domestic wheat prices by restricting the quantity going on the commercial market.[21]

Wheat and Wheat Flour Policies
During World War II

World wheat prices were low in the crop year 1938-39. Competitive subsidiaations by principal wheat export countries (The United States, Canada, Australia, and Argentina) plus large wheat crops appear to have had a depressionary influence on world wheat prices at the beginning of World War II. The assumption that wheat prices in importing countries were unaffected by a wheat subsidy program in the United States led to the conclusion that wheat growers in the United States benefited by $57 million from the price-raising effect of price support programs on domestic wheat prices. The cost of subsidy for 1938-1939 was approximately $26 million. British wheat prices dropped ten cents per bushel as a result of the subsidy program. United States wheat growers received an increase of seven or eight cents instead of the anticipated increase of seventeen cents per bushel. The aggregate increase to wheat growers was approximately $26 million. The United States government paid out $42 million in 1938-1939 for the subsidy and wheat loans. The effect was a loss of approximately $16 million.[22]

Other wheat and wheat flour expenses incurred by the United States government in 1938-1939 were: $5.3 million for indemnities paid on flour

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[21] O. B. Jesness, op. cit., pp. 55-89.

[22] Food Research Institute, Wheat Studies, Vol. 17 (California, 1940), pp. 84-87.

exports and $20.7 million paid on export sales of wheat and wheat flour by the Federal Surplus Commodity Corporation, the difference between purchase and sale prices.[23]

The promulgation of wheat support prices and ceiling prices on flour during World War II placed millers of wheat flour in a "squeezed" position. They could no longer pass on to the consumers the increased cost of wheat purchases. In order that flour might be sold at ceiling prices, subsidies were paid to flour-millers.[24]

Flour sales immediately increased when the flour subsidy became effective on December 1, 1943. The cost of the subsidy was expected to range from $8 to $10 million monthly. But flour-millers reduced their sales for fear the subsidy would be discontinued. As a result, subsidy payments to flour-millers totaled only $4,356,000 through March 26, 1944.[25]

The extraction rate for flour as announced by the War Food Administration ranged from 75 to 85 percent during World War II. The announced extraction rate prohibited millers from converting large proportions of the wheat they purchases into feedstuffs. If millers had been free to extract flour at a lower rate (say 60 percent), a larger portion of the wheat could have been sold as feed, which appeared more profitable. To counteract such an inducement ceiling prices were placed on feedstuffs. The Commodity Credit Corporation announced a support price on millfeed at $1.50 a ton below the OPA ceiling price on December 30, 1943.[26]

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[23] Ibid., p. 66.

[24] A. L. Larson, op. cit., p. 494. Such subsidy programs tended to contribute to inflationary pressure which was later exemplified upon the removal of price controls.

[25] Food Research Institute, Wheat Studies, Vol. 20 (California, 1943), pp. 99-110.

[26] Food Research Institute, Wheat Studies, Vol. 19 (California, 1942), p. 127.

Flour exports were also subsidized during World War II. The subsidy payments were the difference between export prices of flour and domestic prices. Export flour subsidies were financed through the Reconstruction Finance Corporation. Lend-Lease exports of flour reached a high of approximately six million sacks in 1943, and the United Nations Relief and Rehabilitation Administration exports reached its maximum of 9.4 million sacks in 1946, all of which were subsidized by the federal government.[27]

The War Food Administration made subsidy payments as high as $2.64 per barrel in 1943 to fulfill a commitment that had been made to Cuba.[28] Southwestern millers supplied more than one-half of this commitment.

Postwar Wheat and Wheat Flour Policies

Governmental wheat policies were continued for two years after World War II.[29] Wheat support prices remained in effect at 90 percent of parity, and loan rates at that level remained in effect after 1944.[30] Also, acreage allotments for wheat remained in effect or in a standby position after World War II. The objectives of allotments and support prices were the same as those of the prewar and wartime periods, viz., attaining a balance between wheat production and demand for wheat.

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[27] Northwestern Millers (Almanack Number), Vol. 247 (Missouri, April 22, 1952), p. 30

[28] The Department of State and Board of Economic Welfare agreed to send 700,000 barrels of flour to Cuba in 1943 at $6.90 per 200 pounds in an effort to stabilize the price of flour landed in Cuba. In return Cuba was to send sugar to the United States at a more favorable price and lower the tonnage on this principal staple. Ibid.

[29] The cessation of hostilities of World War II was proclaimed officially December 31, 1946.—Federal Register, Vol. 12, No. 1, p. 1.

[30] United States Department of Agriculture, The Wheat Situation, February, 1954, p. 19. Loan rates by Calendar years were: 1947 - $1.83; 1948 - $2.00; 1949 - $1.95; 1950 - $1.99; 1951 - $2.18; 1952 - $2.20; 1953 - $2.21. See United States Department of Agriculture, The Wheat Situation, June, 1953, p. 2.

Wheat and wheat flour were disposed of through the following means: (1) shipments to Pakistan under a Special Act of Congress, (2) President's Emergency Aid Program, (3) East German Feeding Program, (4) International Wheat Agreement, (5) Commodity Credit Corporation, and (6) Mutual Security Act.[31]

The United States and three other major wheat-exporting countries (Canada, Australia, and France) signed an agreement which was believed to circumvent an anticipated decline in world wheat prices. The agreement was referred to as the International Wheat Agreement. This first started in 1933 but was terminated within a year because agreed export quotas failed to reverse the trend of declining wheat prices.

Immediately following World War II a bilateral wheat agreement was formed between Canada and the United Kingdom. This agreement seemed to give impetus to the organization of a multilateral agreement. In 1949 a four-year (1949-53) International Wheat Agreement was formed by five wheat-exporting countries and thirty-seven wheat-importing countries. By the end of the four-year period the number of importing countries had increased to forty-two. Specific imports and exports were assigned to individual countries. The exporters agreed to sell their quotas at a set maximum price, and importers agreed to buy their quotas at a set minimum price. Exporters and importers were not obligated to make negotiations when the world wheat price ranged between the set maximum and minimum prices.[32]

Inasmuch as a decline in world wheat prices was generally anticipated, it was agreed that the minimum price per bushel of wheat would decline by

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[31] The Wheat Situation, February 26, 1954, pp. 12-13.

[32] W. Malenbaum, op. cit., p. 192.

ten cents each year for the four-year period. The maximum agreed price remained unchanged for the period. The Agreement of 1953-56 changed the set prices, however (Table 9).

Table 9. Negotiable Wheat Prices Under International Wheat Agreements, 1949-56*

Crop Year	Maximum	Minimum	World Price**
1949-50	$1.80	$1.50	$2.34
1950-51	1.80	1.40	2.48
1951-52	1.80	1.30	2.30
1952-53	1.80	1.20	2.20
1953-56	2.05	1.55	----

*Prices are expressed in terms of Canadian currency per bushel for No. 1 Manitoba Northern Wheat in store at Port William, Port Arthur.
**World Wheat prices taken from W. Malenbaum, The World Wheat Economy, p. 193.

Source: U. S. Commission on Foreign Economic Policy, Staff Paper (Washington, February, 1954), p. 202.

The objectives of the International Wheat Agreements were (1) to assure supplies of wheat to importing countries and (2) to provide a market for wheat to exporting countries at an equitable and stable price.[33]

The International Wheat Agreements were likely not effective in raising or maintaining high world wheat prices, for world wheat prices remained above the maximum prices set in the agreement. Associated with the Agreements have been relatively large volumes of wheat and flour exports when compared with the drastic decline of wheat exported

[33]Harry G. Johnson, "The De-stabilizing Effect of International Commodity Agreement on the Prices of Primary Products," The Economic Journal, Vol. 60 (September, 1950), p. 626.

following World War I. Although the volume of wheat and wheat flour exported declined in the fiscal year 1949-50, an increase occurred during crop years 1950-51 and 1951-52 (Table 10).

Table 10. Exports of Wheat and Wheat Flour by United States, 1939-53*

Year	Wheat (1,000 bus.)	Flour** (1,000 bus.)	Total (1,000 bus.)
1939-43	21,832	21,308	43,140
1944-48	208,657	133,972	342,629
1948-49	375,420	128,576	503,996
1949-50	258,712***	40,398	299,119
1950-51	321,835	44,310	366,145
1951-52	430,981	42,845	473,826
1952-53****	N.A.	N.A.	317,176

*Figures for years 1939-43 and 1944-48 are annual averages.
**Flour is expressed in wheat equivalent.
***Excludes 6 million bushels exported to Canada for storage.
****Computed from Monthly Bulletin of Agricultural Economics and Statistics, by FAO, Vol. 3, No. 1, (January, 1954), p. 17.
N.A. - Not Available.

Source: BAE, The Wheat Situation, October-November-December, 1952, p. 29.

The average annual export of wheat and wheat flour was least during 1939-43. Exports were generally above wartime exports and considerably above the prewar (1939-43) average. In the first year of the International Wheat Agreement (1949-50), United States exports declined but began increasing during the second year. A decline in the total exports of wheat and wheat flour occurred in the last year of the 1949 Agreement.

Of the total exports of wheat and wheat flour from the United States approximately 54.5 percent moved under the Agreement in 1949-50 and 62.5 percent in 1950-51.[34] The United States' share of the export market

[34]Food and Agriculture Organization, A Reconstruction of The Economics of the International Wheat Agreement (Commodity Policy Studies No. 1) September, 1952, p. 30.

under the Agreement for 1949-50 and 1950-51 was 46.4 and 48.8 percent respectively.[35] The aggregate volumes of wheat guaranteed and the aggregate volumes shipped under the Agreement were as follows:

Exports (million bushels)	1949-50	1950-51	1951-52 (Preliminary)	1952-53 (Estimated)
Guaranteed under IWA	432	581	581	581
Total (Australia, Canada, U.S.)	642	730	910	810
Total World	815	920	1010	830

Source: Wilfred Malenbaum, The World Wheat Economy, p. 193.

Since world wheat prices remained above maximum prices set in the Agreement and since nearly 50 percent of world wheat exports moved under the International Wheat Agreement at the maximum price set, the United States Government subsidized wheat-exporters by the difference between the maximum price of the Agreement and the support price level.

Price support programs of the United States held domestic prices above the International Agreement maximum price and world market prices. As a result large subsidies were made to wheat and wheat-flour exporters. The United States exported a gross total of 1,456 million bushels of wheat and wheat-flour during the four-year period 1949-53.[36] Of this total 918 million bushels moved under Agreement. A total of $562 million or approximately 61.2 cents per bushel was paid to exporters by the United States Government.[37]

By the maximum price of $2.05 set in the 1953-56 International Wheat Agreement it has hoped to reduce subsidy payments. The effect

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[35] Ibid., p. 37.

[36] Cf. Table 6.

[37] Staff Papers, p. 204. Export subsidy rates for years 1949-53 were 55, 68, 63, and 58.8 cents respectively. See FAO, Commodity Report (January, 1953), p. 9.

depends on world market prices, support price levels, and volumes exported during this period.[38]

Member wheat importers received wheat at lower than world market prices. Since world market prices generally have been above maximum agreed prices, member wheat exporters have not received a higher than world market price for their wheat. Whether the Agreements have effectively reduced fluctuations in world market prices is problematical. By implication it appeared that the setting of maximum and minimum prices in the agreement resulted in a greater fluctuation in world market prices. If world market prices rose above the agreement maximum price, member importers received, in effect, a subsidy giving them additional purchasing power to buy additional wheat on the world market or to buy other things. Such additional purchasing power would otherwise not have been present. Similarly, if world wheat prices fell below the agreement minimum price, member importers would pay, in effect, a tax to member exporters and thus restrict their purchases on the world wheat market because of lack of funds. Hence the world market wheat price seemed to fluctuate even more under an agreement of this nature.[39]

Analysis and Conclusions

During World War I wheat production was at a higher level than was needed to meet the domestic demand. Large volumes were exported

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[38] With importing countries reaching their prewar wheat production levels, an increase in wheat exports is unlikely. For an indication of wheat policy trend, see "New Program Recommendations" in The Wheat Situation, February 26, 1954, p. 9.

[39] For a detailed exposition of the "de-stabilizing" effect of price agreements, see Harry G. Johnson, "The De-Stabilizing Effect of International Commodity Agreement on the Prices of Primary Products," The Economic Journal, Vol. 60 (September, 1950), pp. 626-629.

to foreign countries engaged in wartime operations. Following World War I wheat production in foreign countries increased, and the export demand for American wheat declined. A downward trend in wheat exports continued until the late 1930's. The excess supply of wheat, resulting from a marked decline in exports, was placed on the domestic market and resulted in a rapid decline in American wheat prices. In an effort to raise wheat prices the federal government launched storage and production-control programs. However, with technological improvements available to wheat-growers a storage program could be of little effect without a rigid production-control program. The ineffectiveness of a loan program without such controls was exemplified by the experience of the Federal Farm Board.

Acreage control programs were instituted by the federal government in an effort to control production. Although wheat acreage was decreased, acreage control programs did not decrease total production. Production per acre was increased because wheat growers selected the best land and employed improved production techniques. The drought during the 1930's was the most effective factor in bringing about a curtailment of production.

The rapid decline in wheat prices which resulted from the additional quantity placed on the market after World War I indicated the relative inelasticity of demand for wheat flour; i.e., a small change in quantity of flour offered could be sold only at a greater than proportionate inverse change in flour prices. The federal government could raise and maintain flour prices at a particular level with an inelastic demand for flour either by limiting supply or by standing ready to purchase all production which could not be sold at a certain price. The federal government provided support prices to wheat-growers while also providing

measures to limit supply, to stimulate demand for wheat and wheat products by consumer subsidy programs, and to enter the market directly through storage and purchase programs.

During World War II support prices on wheat were continued. The export demand for wheat increased, for foreign countries were again engaged in wartime operations. Since wheat was exported as wheat and wheat-flour, flour-millers enjoyed an expanded export market for flour. Flour-millers received monetary gains through the government's attempts to dispose of the wheat surplus as flour. However, price controls in the domestic market restricted margins of wheat-processors until the government provided subsidy payments to flour-millers in order that flour might be sold at ceiling prices.

Foreign aid and price support programs were the dominating factors influencing wheat prices. The maintenance of high wheat prices through price supports limited the expansion of flour production, which, in turn, encouraged flour-millers to engage in the manufacture of products other than wheat in order to increase their profit positions. Flour-millers not able to engage in the manufacture of products other than wheat found themselves squeezed between support prices for wheat and ceiling prices on flour.

The Korean Conflict of 1950 prevented a marked decline in world wheat and wheat flour prices similar to that which occurred following World War I. Although International Wheat Agreements were signed between some of the exporters and importers of wheat in attempts to stabilize world wheat prices, world wheat prices were influenced mostly by the "cold" war, which prevented countries participating from bringing their wheat production back in line with prewar levels. A review of the American flour export trend revealed a decline in wheat-flour exports

in 1949 followed by an increase in 1950.[40] Flour-millers were able to continue their exports because of the war. In the absence of the Korean Conflict and government export subsidy programs an additional decline in milling capacity likely would have occurred.

Large-scale flour companies apparently benefited more from government export subsidy programs than did the small-scale flour companies. Government commitments were usually of a specified quality and for large volumes, which were difficult for small-scale plants to supply. Moreover, fulfilling some government contracts necessitated forward pricing of flour, and large-scale companies were generally in a better position to reduce risks on forward pricing through hedging in future markets than were the small-scale companies.[41]

The protectionist measures instituted by the government stimulated the growing of wheat in many areas, which may not have been the most efficient use of the land. If protectionist measures were successful in raising the domestic price of wheat, competing commodities would likely take over portions of the markets that were once considered wheat markets.[42] Therefore protectionist policies were apparently associated with stockpiling of surpluses and losses of markets. Stockpiling of surpluses could be temporarily delayed by strict production controls; but market outlets likely shrink because good substitutes become available in time.

The net effects of government wheat policies on the flour-milling industry appeared to be the engagement of large-scale companies in the

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[40]See Appendix, Table III.

[41]For a detailed explanation on futures trading, see A. L. Larson, op. cit., pp. 413-447.

[42]For a comprehensive evaluation of protectionist measures, see W. Malenbaum, op. cit., pp. 154-170.

manufacture of products other than wheat, the liquidation of many small-scale milling companies, and the introduction of technological improvements largely by large-scale companies in an effort to expand market sales of flour and flour products. However, adjustments of milling capacity to the demand for flour apparently were delayed as a result of temporary benefits from governmental policies, particularly in war time.

CHAPTER V

PROSPECT FOR FUTURE CHANGES IN THE FLOUR-MILLING INDUSTRY

A consideration of the trends of operations that flour-millers followed during the last half century provides a basis for considering the prospect for some future changes of major importance, i.e., some *ex ante* changes that are likely to occur having significant influence on flour-milling operations. It is this task that is approached with a degree of trepidation.

Future changes discussed below were deduced from *ex post* changes and current trends in flour-milling operations. Whether or not such changes will be realized depends almost entirely on the interpretations of three important factors: (1) the influence of increase in population and changes in consumers' taste on flour milling operations, (2) the international trade agreements between the United States and countries now serving as a source of demand for American-ground flour, and (3) the changes in technology affecting flour-milling operations.

Interpretation of these comprehensive factors, as they affect the flour-milling industry, can be true only for a limited period of time. Consequently it is necessary to set up a time period within which prognostications of future changes seem plausible.[1]

Any time period selected for interpreting the prospect for future changes in the flour-milling industry is somewhat arbitrary. It should

[1] In a dynamic and progressive economy such a time period must be short as contrasted to one which is not so dynamic or progressive.

be long enough to permit the causal factors to operate but short enough to restrict the entry of major unforeseeable factors. The relative influence of known factors should not change significantly. With this in mind the period selected was 25 years. Future changes are likely to be refinements and extentions of previous changes.

Number and Size of Mills

The number of flour mills in operation is determined primarily by the ease of entry into the flour-milling industry and the relative profitability of this alternative source of employing factors of production.

A decline in the number of mills has occurred since 1909.[2] It resulted from the reduction in returns on investment, the relative increase in fixed cost, and the introduction of mass production machinery that requires fewer firms to produce enough flour to meet the demand. Per capita consumption of flour has declined in the United States, but the domestic demand has not declined pari passu because of the increase in population. The increase in population has little more than offset the decline in per capita consumption (Table 11).

Of importance in determining the number and size of mills is the aggregate demand for flour, both domestic and foreign.[3] The factors that influence demand for flour are necessary, therefore, in order to anticipate the trend in the future. The decline in per capita consumption appears to have resulted from three major factors: "the larger variety

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[2]See Appendix, Table 1.

[3]Foreign demand is considered in the next section of this chapter.

Table 11. Per Capita Consumption of Flour and Population of the United States 1902-1953

Years	Flour (lbs.)	Population (1000)	Years	Flour (lbs.)	Population (1000)*
1902	224	79,160	1928	177.1	120,501
1903	222	80,632	1929	172.6	121,770
1904	221	82,165	1930	168.9	123,077
1905	219	83,820	1931	159.9	124,040
1906	217	85,437	1932	157.4	124,840
1907	215	87,000	1933	152.6	125,579
1908	213	88,709	1934	153.3	126,374
1909	211	90,492	1935	156.9	127,250
1910	209	92,407	1936	162.2	128,053
1911	206	93,868	1937	157.6	128,825
1912	212.3	95,331	1938	158.7	129,825
1913	206.4	97,227	1939	157.2	130,880
1914	207.0	99,118	1940	154.0	132,122
1915	199.8	100,549	1941	154.5	133,402
1916	204.9	101,966	1942	155.6	134,860
1917	198.2	103,203	1943	162.1	136,739
1918	164.1	103,266	1944	147.9	138,397
1919	196.0	104,512	1945	159.8	139,928
1920	182.3	106,466	1946	155.6	141,389
1921	177.5	108,541	1947	138.3	144,126
1922	181.2	110,055	1948	136.8	146,631
1923	176.1	111,950	1949	134.9	149,188
1924	174.8	114,113	1950	134.6	151,677
1925	176.7	115,832	1951	133.0	154,360
1926	177.5	117,399	1952	130.0	156,901
1927	173.3	119,038	1953	127.0	N.A.

*Estimates of Population of Continental United States as of July 1 of each year.

Source: Per Capita Consumption, Years 1902-1951, Millers' National Federation, The Southwestern Millers, Golden Anniversary, Vol. 31, (Missouri, May 6, 1952), p. 12-a; Years 1952-1953, Millers' National Federation, The Northwestern Millers, Vol. 251, (Minnesota, February 16, 1954), p. 12. Population of United States: USDA., Statistical Abstract of the United States, (Washington, 1953), p. 13. N. A., not available.

of food available, the increased average purchasing power of consumers, and a reduction in total food needs."[4] Basic data do not provide a framework from which logical deductions can be made in regard to the future trend of the average purchasing power of consumers. But, if improvements in technology are attained an increase in average purchasing-power might be expected, which, according to previous consumption trends, will contribute to a decline in per capita consumption.

An increase in a variety of foods will very likely occur if agencies who are not engaged in introducing new food products for human consumption continue at their rapid pace. With a continued increase in a variety of foods from which to choose, it appears only likely that a decline in per capita consumption of flour will persist, ceteris paribus.

If industrial research laboratories of the United States continue their technological innovations in the future as they have in the past, additional power machinery will reduce the amount of energy required and bring about a reduction in the quantity of food needed. Flour is no exception, and continued decline in per capita consumption is likely.[5]

Reducing the rate at which per capita consumption has declined, however, are the introduction of new products made from flour and the improvement in quality. The effects of these two factors will be conditioned by the influence of similar factors on competing products.

The number of consumers times per capita consumption determines the aggregate domestic consumption. In the year 1952 this was

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[4]The Northwestern Miller (Golden Anniversary), p. 12-A.

[5]It should be noted, however, that there is a minimum amount of energy, which has not yet been determined, that is necessary to maintain a healthy body even in a "push-button" society.

approximately 202 million hundredweight based on a per capita consumption of 130 pounds annually.[6]

Twenty-three years ago per capita consumption was 172.6 pounds. Since then per capita consumption has declined by 42.6 pounds. It would be necessary for per capita consumption to decline only 19.7 pounds in the next 23 years to maintain the 1952 aggregate domestic consumption of flour.[7] If total population reaches 175 million in 1975 as predicted by the Bureau of Census, total consumption of flour will remain the same as that of 1952 if per capita consumption declines to 110.3.[8]

Foreign Demand for United States Flour

The flour-milling industry exported 14 percent of its aggregate flour production for the five-year period 1948-52. For the last three years of the period annual exports were nine percent of production.[9] The difference of five percent is indicative of a downward trend in the export of flour.

Conditioning the export trend in the future will be the volume of wheat grown in the United States, cost of milling and transportation, and foreign demand trade agreements between the United States and importing countries of American flour. In effect this may be reduced

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[6] $\frac{155,911,000 \times 130}{100} = 202,675,300$. See Table 11.

[7] Percentagewise, the decline in per capita consumption of flour in the ex post period (1929-52) was 25 percent. The anticipated decline in the ex ante period (1952-75) required a decline of only 23 percent.

[8] For estimate of United States population in 1952 see The Northwestern Miller (Golden Anniversary), p. 12-A. 20,207,530,000 ÷ 175,000,000 = 110.3.

[9] See Appendix Table 3.

to the supply-demand relationship of flour in the United States and importing countries, i.e., the quantity of flour available and the quantity of flour demanded. Moreover, such factors can be expected to have their full influence only when ill-feeling and non-economic considerations are absent between negotiating countries. Following are four major propositions affecting international trade agreements and thereby influencing the volume of American-manufactured products exported.

1. During periods of economic recovery restrictions *might* well be placed on the import of manufactured products as security to manufacturing concerns within the country and as a means of accelerating recovery.

2. If the objectives of the Point-IV program are reached, appreciation for additional manufactured goods *might* be developed, resulting in an increase in demand for American-manufactured products.

3. If prices of American-manufactured products should rise relative to prices in foreign countries, the quantity of American goods exported would decrease, and the balance of payments would be disturbed, *ceteris paribus*.

4. If production efficiency of countries with which the United States competes for export markets should increase to the extent that they are in position to supply the same quality products at a lower cost than that of the United States, a decline in demand for American-manufactured products is to be expected.

These propositions point up the complexity of forecasting future trends of export markets. The free play of economic forces in establishing a general equilibrium between wheat and wheat flour exports and demand for imported flour was greatly disturbed by World War II and the Korean Conflict. It appears only feasible that the import demand for flour will decline as importing countries regain their former levels of wheat and flour production. Also, competitive subsidization between exporting countries tends to increase their production, which increases competition for export markets by adding more wheat available for export.

The effects of competitive subsidization on flour exports of the United States will be influenced by relevant international policies. Policies instituted since 1947 do not appear to have increased the quantity of flour exported.[10]

With an anticipated decline in the aggregate demand for flour, adjustments will be made to meet the contracted demand. Such adjustments will be characterized by a decline in number of firms and a contraction in sizes of existing firms. Any improvements in milling technology may cause a further decline in the number of mills.

Location of Production

The locations of flour-milling centers are not likely to undergo any marked changes in the next 25 years if means of transportation continue to improve and rates on the transportation of wheat and flour remain proportionally the same. However, a concentration of wheat production is likely if support prices are lowered or discontinued.[11]

On the other hand, if support prices are maintained, those engaged in wheat storage are likely to find it a prosperous operation, unless a policy is formulated to restrict wheat production. The needs for additional storage facilities for grains are expressed by the granting of fast write-offs on storage facilities licensed under the Federal

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[10] Cf. Appendix, Table 2.

[11] It appears feasible to expect wheat to be produced in those areas that are naturally adapted to wheat-growing. Production trends in the past suggests that such states as Oklahoma, Kansas, Dakotas, and Minnesota will be the primary sources of wheat production. Such states as Illinois, Texas, Missouri, Oregon, etc. are likely to find it to their advantage to engage in other lines of production for which they are more suited.

Warehouse Act.[12] Other ways by which the federal government encourages grain storage building are (1) making farm-storage facility loans, (2) making storage equipment loans, and (3) guaranteeing occupancy of new storage facilities.[13] If farmers agree on a cooperative program to effectively bring about an "equitable" price for their wheat, storage facilities may be needed even in the absence of government support prices.[14]

Also influencing the location of wheat-growing centers will be the demand for the various classes of wheat. Since hard winter wheat is probably considered superior for bakery purposes, it is likely that wheat-growers located in the Southwest, where this class of wheat is primarily grown, will receive a higher price for their wheat than those located in other areas, where spring wheat is grown. A comparison of domestic consumption of flour between family flour and bakery flour indicates that bakeries are purchasing a larger proportion of flour sold within the United States.

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[12]Under section 124 B of the Internal Revenue Code Federal income tax payers may elect to amortize over a period of 60-months the depreciable cost of grain storage facilities licensed under the United States Warehouse Act, providing such facilities were built after December 31, 1952, and on or before December 31, 1956, 39 Stat. 486 as amended. See Internal Revenue Bulletin, No. 5, February 1, 1954, Treasury Department Internal Revenue Service; Public Law 207, 83d Congress, Section 206, Signed by the President August 15, 1953; and Internal Revenue Code of 1954, 83d Congress, 2nd Session, H. R. 8300, Section 169, pp. 44-46.

[13]For details see Agricultural Marketing Service, The Agricultural Situation (Washington, D. C., March, 1954), Vol. 38, No. 3, pp. 11-12.

[14]Enid, Oklahoma, may be cited as a place where the need for additional storage facilities in the future is expressed. Total grain storage capacity at Enid is 43,399,500 bushels. Expecting to be completed by the harvest season of 1954 is the construction of an additional 12 million bushels storage elevator, making a total of 55,399,500 bushels. Enid will then rank third in the nation as a storage center. For further explanation on grain storage elevators See Union Equity Cooperative Exchange, "Equity News," Enid, Oklahoma, December, 1953, and February, 1954, issues.

Consumption	1953 Cwt.	1940 Cwt.
Family flour	45,000,000	64,600,000
Home mix, cakes	6,000,000	3,000,000
Total home	51,000,000	67,000,000
Bakery flour	142,900,000	130,000,000
Semolina	10,700,000	8,400,000
Total all flour	204,600,000	206,000,000
Family flour/total all flour	22%	31%
Bakery flour/total all flour	69%	63%

Source: Millers' National Federation, Southwestern Millers (Kansas City, Mo., April 13, 1954), p. 34. Note: Statistical corrections are made in total of original data for year 1953.

If the change in the percentage of bakery flour consumed continues at the same rate, its use will be approximately 77 percent of total flour consumed by 1975. Likewise, if the percentage of family flour consumed continues to decline at the same rate, family flour consumed will be approximately 11 percent of the total flour consumed by 1975. It appears that the downward trend in flour consumed by families is likely to continue but not at such a rapid rate as in the past. The rates will be influenced by the quality of flour produced for the various uses by income changes and preference changes, which will in turn affect per capita flour use.[15] Previous studies indicate that the quantity of flour consumed declines as income increases.[16]

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[15] A comparison of per capita flour use according to a report of the Millers' National Federation is as follows:

	1953	1940
Family flour	33.1 lbs.	38.9 lbs.
Semolina	6.8 lbs.	5.9 lbs.
Biscuit, crackers	13.4 lbs.	9.9 lbs.
Restaurant, Institutions	6.3 lbs.	6.1 lbs.
Bakery Industry	71.0 lbs.	75.7 lbs.

Source: Millers' National Federation, Southwestern Millers (Kansas City, Mo., April 13, 1954), p. 34.

[16] Although previous studies indicate that quantity of flour consumed varies inversely with changes in income (within limits), income-quantity elasticity for food is two-tenths while the elasticity of income-expenditure on food is four-tenths. For complete analysis of study on income-food expenditure see G. S. Shepherd, Marketing Farm Products (Ames, Iowa, 1946), pp. 20-26.

Future Changes in Milling Technology

Flour-milling has been characterized as an industry that has lagged in technological progress. Accounting for such lag is a combination of durable equipment, relatively high fixed cost, and excess milling capacity. There has been little incentive to adopt new machinery when that on hand was not being fully utilized. Consequently productivity trends of the flour-milling industry have declined since 1939 (Table 12).

Output per worker and per man-hour have declined since 1939; yet production and number of workers have increased for reasons explained above. Although the indexes include other grain mills, it is assumed that the data fairly represent flour-milling statistics.

Table 12. Indexes of Production, Production Workers, Man-Hours, Productivity, and Unit Labor Requirements: Flour and Other Grain-Mill Products Industry, 1939-51
(1939 = 100)

Year	Production	Production Workers	Man-hours	Output Per- Production Worker	Output Per- Man-hour	Unit Labor Requirements Production Workers Per Unit	Unit Labor Requirements Man-hours Per Unit
1939	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1940	96.8	97.2	95.1	99.6	101.8	100.4	98.2
1941	98.2	95.6	96.7	102.7	101.6	97.4	98.5
1942	100.1	97.0	103.2	103.2	97.0	96.9	103.1
1943	114.3	110.9	127.9	103.1	89.4	97.0	111.9
1944	117.6	116.2	137.8	99.5	85.3	100.5	117.2
1945	128.8	121.7	142.4	105.8	90.4	94.5	110.6
1946	119.7	119.6	136.8	100.1	87.5	99.9	114.3
1947	134.0	126.6	146.7	105.8	91.3	94.5	109.5
1948	122.1	123.7	135.4	98.7	90.2	101.3	110.9
1949	103.7	118.3	125.0	87.7	83.0	114.1	120.5
1950	99.9	111.7	116.5	89.4	85.8	111.8	116.6
1951	102.2	114.6	123.3	89.2	82.9	112.1	120.6

Source: Bureau of Labor Statistics, "Flour and Other Grain-Mill Products Industry, 1939-1951," Productivity Trends (Washington, 1952), p. 9.

Based on the assumptions that the aggregate demand for flour is expected to decline in the near future and that the industry will attempt to adjust production (and milling capacity) to demand, a change in productivity trends in the future seems most likely.

Because of an anticipated decline in demand for flour, millers will in all probability attempt to reduce cost of flour production by reducing the size of their milling capacity. The attempts are likely to be characterized by reducing the number of workers along with milling capacity. It does not appear likely that such millers will employ new machinery where a decline in demand for flour is visualized unless they are encouraged by the granting of concessions that will reduce the cost involved in the exchange of machinery.

The federal government has instituted plans which tend to encourage the replacement of less productive equipment with more productive equipment. The amortization of emergency facilities is a case in point.[17] Flour-millers' interest in adopting modern machinery and improved techniques is exemplified by their visits to Europe to study and evaluate modern equipment established there since World War II.[18]

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[17] Under the Amortization of Emergency Plan "every person is entitled to a deduction with respect to the amortization of the adjusted basis of any emergency facilities based on a period of 60-months." Emergency facilities are defined as "any facility, land, building machinery or equipment or any part thereof constructed after December 31, 1949 for which a certificate has been made." For details see Internal Revenue Service, Internal Revenue Code of 1954, 83d Congress 2d Session, H. R. 8300, Sec. 168, pp. 41-44.

[18] The Association of Operative Millers at a conference held in Chicago, Illinois, discussed "European Mills and Milling as seen by an American Miller." For details see Millers' National Federation, Southwestern Millers (Missouri, April 13, 1954), p. 26.

Other indications of future use of technological improvements are (1) the building of new bulk material hauling units which enables quick dumping of flour,[19] (2) the building of refrigerated plants to produce frozen dough for such products as frozen cakes, biscuits, and cookies and pies,[20] and (3) the building of a "Quick-Freeze Bread Plant" in Port Chester, New York.[21]

The introduction of these new techniques and equipment seems to aid in reducing the cost of operations and expanding the demand for products of flour. These are two factors to which millers will continue to give consideration in planning their operations. The implementation of such innovations may be seen in the near future.

Analysis and Conclusions

The flour-milling industry is characterized by excess capacity. On the basis of this excess capacity and of interpretations of past trends in supply, demand, and technology, a further decline in the number of flour mills appears likely. However, in the short run, all firms will operate so long as they are covering variable costs and getting some return on their large fixed investment. Only a decline in aggregate demand for flour, a large technological improvement in production, or a change in demand for a type of flour which present milling equipment cannot produce will force many mills out of the

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[19] Southwestern Millers, April 27, 1954, p. 13.

[20] For a detailed description of a refrigerated plant built by Burrus Mills, Inc., see Southwestern Millers, April 6, 1954, p. 13.

[21] In this plant bread is placed in a freezing unit for quick-freeze which seals the flavor within. "Quick-Freeze" bread can be transported in a radius of 400 miles. For details see Ibid., p. 60.

industry. In the long run, the more inefficient mills will not be maintained because not all costs are covered; hence they will cease operations as the physical plants are depleted. As those mills go out of the industry, the expected long-run adjustment is that the remaining firms can be operated more nearly at optimum capacity to make them more efficient.

The past trend in flour exports indicates a continued downward trend in the future. In an effort to develop a live-at-home program, it appears feasible to expect that importing countries will increase their domestic production. To what extent the future export markets for flour will decline is difficult to determine from available data. If new export markets for flour arise in some of the undeveloped areas, they would tend to prevent a marked decline such as was witnessed following World War I. However favorable the probability of developing new markets may appear, it is doubtful that the increase in exports to undeveloped areas in the near future will be sufficient to completely offset the anticipated decline of exports to other markets.

It would be idle speculation to attempt to incorporate into this study an estimate of the variety of new foods that will likely be placed on the domestic market or the change in consumers' preference in the future. Historically, the variety of foods has continued to increase, and consumers have substituted other foods for flour products. Also per capita incomes have increased, which has permitted the substitution away from flour and wheat products. With a downward trend in per capita consumption of flour as in the past, total domestic consumption of flour can remain the same only if total population increases to 175,000,000 by 1975.

Locations of milling centers are determined by locations of wheat-growing areas in relation to locations of consumer areas, conditioned by operating costs and transportation rates. Cheap sources of power have caused diversions in location. The establishment of industrial plants in Southern states appears very likely, which in all probability will attract flour-millers and consumers, but not enough to stimulate a marked change in densely populated areas in the near future.

The primary users of flour are bakeries and family consumers. The growing use of flour by bakeries as contrasted with the declining use by family consumers indicates that flour-millers will need to make changes in their flour blending toward that required by bakeries. The increasing number of bakery products coming on the market will likely augment this trend.

Data are not available to indicate the extent to which technological improvements will be adopted in the future. Historically, the flour-milling industry has lagged behind in the adoption of modern machinery. High fixed cost and excess milling capacity seem to account for the lag. Hence, the productivity of labor has gradually declined relative to the total economy. If the number of flour-milling firms continues to decline as anticipated, the excess milling capacity will also decline. Thus the productivity of labor in the flour-milling industry is most likely to rise as compared to that of the early 1950's.

The overall effects of changes that are likely to occur in the future are a reduction in number of firms, a loss in export markets, a continued increase in bakery use of flour as compared with a decrease in family consumption, and an increase in productivity of labor in the flour-milling industry.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Wheat-milling as an industry was antedated by the grinding of wheat and other grains in prehistoric days on a relatively small scale. From the evidence, the earliest grinding of grains dates back to approximately 75,000 years ago. Evidence of the use of the "crude" tools used for the cracking of grain during that time has been found in prehistoric caves. Such tools were of various shapes and dimensions.

Man's reliance on grain gave rise to agriculture, especially to the growing of wheat. The increase in production and man's increasing reliance on grain encouraged the adoption of a more productive grinding tool. Too little time was left to cultivate the grain after most of the day was spent at the family mill grinding enough for the household's daily needs.

Household grinding was replaced about 2000 B.C. by community grinding. The mortar-pestle and saddlestone-metate combinations were replaced with the lever mill and later with millstones. The change necessitated the use of more power, but the increase in productivity more than offset the additional power required. The transition encouraged the search for natural power. Water, wind, steam, and electric mills were the results of searches for sources of power to replace men. The period of discovery (about 600 A.D.) was considered as the "power age." It was during the "power age" that commercial milling was born.

Following the arrival of the pilgrims at Plymouth Rock, Massachusetts, power grinding machinery was introduced into the United States. Locations near navigable streams were considered strategic because they provided cheap water power and were convenient for transporting wheat and wheat-flour to consuming areas. The replacement of water mills by wind mills and finally by electric mills reduced the relative advantage of locations near bodies of water.

The adoption of milling tools during the primitive era provided a foundation upon which flour-milling was later based. Mass production machinery enabled millers to grind more wheat than was needed for their immediate consumption. Flour-milling became a commercial enterprise. Increased milling capacity and demand for flour increased the demand for wheat. The net effects of improvements in milling equipment were an increase in supply of flour and an increase in demand for the improved quality flour.

The development of grain transportation by means other than water also encouraged millers to set up plants in places away from water routes. Nevertheless, Buffalo, New York, developed as a milling center because of its cheap source of milling power and its location in a direct line between a wheat-exporting country (Canada) and a flour-importing country (Cuba). Determinants of milling locations were wheat-producing areas, cost of processing and transportation, and location of consumers' areas. When flour-milling was done by small-scale units and means of transporting wheat for long distances were not available, milling was primarily limited to wheat-producing areas and some wheat was grown in most inhabited localities. After the latter half of the 17th century flour-milling centers were generally located near consumers. Differential

freight rates on wheat and flour accounted for the concentration of flour-milling in these centers.

Other changes that took place in the flour-milling industry included the organization of personnel within firms as well as organization among firms. The introduction of the air current purifier of 1873 and the automatic roller-mill of 1874 completely revolutionized the flour-milling industry. These innovations resulted in large-scale plants, which brought about an increase in labor productivity within each firm. A manager was designated, and specific duties were delegated to individual members of the productive force. The personnel were organized to bring about a greater production at the least cost. Interfirm organizations were established that served in the interest of the industry. The industry consisted of a large number of small firms dominated by the "Big Six." The size of the firms tended to increase, but the number of mills continued to decline. Decision-making on the part of managers of individual firms became more complex. More productive equipment made possible the production of flour in excess of domestic consumption. An export market was sought.

The volume of flour exported showed a positive relationship to the total volume of flour milled, indicating that aggregate domestic demand for flour did not change perceptibly. The relatively fixed volume of flour consumed domestically was the result of increases in population since per capita consumption declined.

The export markets for American flour shrank considerably immediately following World War I. Flour-milling capacity far exceeded needs. To combat the loss of markets and reduced prices for their products, the firms entered into mergers and consolidations in the 1920's. The largest

mergers were General Mills, Inc., Pillsbury Mills, Inc., Commander-Larabee Co., Russell-Miller Milling Co., International Milling Co., and Colorado Milling and Elevator Company. These took place between 1926 and 1936. By 1945 these six companies occupied 87 percent of the total daily rated milling capacity in the United States. The Federal Trade Commission on several occasions investigated the legality of certain transactions in the industry.

Even as mill locations changed to milling centers, locations of flour-milling centers also have changed. In 1952, the three largest flour-producing cities were Buffalo, Kansas City, and Minneapolis. Buffalo took the lead over Minneapolis in 1930 and retained it through 1952. Kansas City remained in third place. A review of location of milling centers by states reveals a different pattern. Minnesota led through 1949, after which Kansas held the leading position through 1952. New York remained in third position as a flour milling state. Accounting for production in Buffalo were its location along water routes, abundance of power, nearness to concentrated population centers, and its intermediary position between Canada and importing countries. Minnesota's location farther northward, nearer wheat-growing centers and its cheap power sources, contributed to its growth as a milling center. Kansas City's position as a flour-milling center was attributable to its location in the midst of a wheat-growing belt. Milling-in-bond and milling-in-transit privileges also contributed to the concentration of flour milling centers. Purchases of wheat by flour-millers changed to fit the trends in the industry. The importance of country sources declined until in 1939 the thirteen largest milling companies obtained 63 percent of their wheat from terminal markets and only 37 percent from the country.

Sales practices also changed from a predominance of small sales direct to individual consumers to a large sales organization seeking outlets through baking companies, wholesale channels, retail channels, and exports. The largest percentage was sold through baking companies.

The adoption of mass production milling machinery resulted in concentrated locations of flour-milling centers. Intrafirm and interfirm organization resulted from efforts to sell flour commercially, which tended to have the effect of decreasing costs. Because of the high cost of improved milling equipment small firms not able to secure this equipment were forced to liquidate. The loss of the export market influenced the decline in number of mills, for the modern productive machinery had provided millers with excess capacities. Mergers and consolidations took place in efforts to control the supply of wheat flour.

The nature of competition under which the flour-milling industry operated was less than that of "pure" competition. Dominated by a few large firms, it was oligopolistic in nature. Advertisement played a large role in cost of operations by the industry. The amount spent for acquainting consumers with the products and the amount spent on sheer propaganda were indistinguishable. The quality of flour milled for human consumption was essentially homogeneous inasmuch as the Federal Food, Drug, and Cosmetic Act of 1938 set up standards which such products must meet. The returns on investment in the industry were less than those of some other processing industries because of the relatively large excess milling capacity.

Excess milling capacity resulted in what millers referred to as "cutthroat competition" following World War I. Consequently, efforts to

restrict competition took on the following activities: curtailment of production, circulation of a blacklist of customers, and the formation of agreements, understanding, and connection. The objective of each was to aid in bringing about a greater return on millers' investments. Little benefit resulted from these efforts.

The flour-milling industry enjoyed concessions made through privileges of milling in transit and milling in bond. The former permitted wheat to be shipped from the point of origin to a milling point, ground into flour, and shipped on to the point of destination at a through rate plus a small fee for expenses incurred at the intermediary point. It was important to millers located at a distance from wheat-growing centers. The privilege of milling in bond permitted the import of wheat to be milled in the United States under bonded facilities and exported to other countries. Portions of wheat milled under such privileges were free of import duties in the United States. That portion going to a country which indicated a preference for American-milled flour was subject to a duty equal to the differential in its import duties. Cuba was the only country indicating this preference. It was abolished in 1934.

Government policies were instituted which affected wheat-growers and flour-millers. Following World War I when the export market for wheat drastically declined, the federal government began to work out programs that would aid in preventing a drastic decline in wheat prices. The first major program of such nature began in the setting up of the Agricultural Marketing Act of 1929 under the supervision of the Federal Farm Board. The objective was to regulate the quantity of wheat going on the market in the hope of regulating domestic wheat prices. The $500 million revolving fund was not sufficient to stave the surpluses

of wheat that were produced. Consequently the program failed to attain its objective through trade. The Agricultural Adjustment Acts of the 1930's were, among other things, further efforts on the part of the federal government to bring about a "fair" price for American-grown wheat. The droughts of the 1930's probably had more influence on bringing about a balance between the supply and demand for wheat and hence a higher price than did the programs in effect. Heavy import duties placed on wheat during the 1930's served as a protectionist measure for American wheat growers. Millers had to pay a higher price for their wheat than would have been necessary had wheat been permitted to freely enter the United States. Such measures did not appear economically sound in the long run.

Wheat disposal included sales of wheat as such and sales of manufactured products, mainly flour and millfeeds. Flour-millers received pecuniary returns through efforts of the federal government to export some of the surplus wheat. Export flour subsidies were paid through the Reconstruction Finance Corporation as early as 1933-1934. The Federal Surplus Commodity Corporation announced subsidy payments on flour in 1938. In addition, exports of wheat and wheat-flour were made through the Economic Cooperation Administration during 1937-1939. As a result of subsidy programs exports increased.

Domestically, the School-Lunch Program, Food-Stamp Plan, American Red Cross Program, and Federal Emergency Relief Administration Programs were instituted to stimulate the demand for wheat and wheat-flour.

During World War II subsidization of wheat and wheat-flour became more pronounced. With support prices on wheat and ceiling prices on flour, millers were placed in a precarious position. Moreover, the

extraction rate on wheat was fixed by the federal government. The federal government provided a subsidy for millers in order that flour would be milled and sold at ceiling prices. The cost to the federal government for this subsidy was little more than $4 million from December 1, 1943 through March 26, 1944.

Export prices and export subsidies on wheat continued after World War II. Exports of both wheat and wheat-flour increased, reaching a record high in 1947. In an effort to circumvent a drastic decline in world wheat prices, as witnessed following World War I, an International Wheat Agreement was formed in 1949 consisting of five major wheat-exporting countries and thirty-seven wheat-importing countries. The number of importing member countries increased to forty-two before the end of the four-year agreement. The Agreement was renewed in 1953. It provided quotas for member exporters and importers under agreed minimum and maximum prices. If world wheat prices should rise above the maximum price set in the agreement, exporters were obliged to offer to importers their respective quotas at the maximum price set in the agreement. If world wheat prices should fall to or below the minimum set in the agreement, importers must offer to purchase their respective quotas at the minimum price set in the agreement. The objectives were to stabilize or at least prevent a drastic decline in world wheat prices. The effects were questionable inasmuch as world wheat prices remained above the maximums set in the agreements. Moreover, nearly fifty percent of the export sales of wheat and flour were made outside of the agreement.

The prospects for future changes in the next quarter century appeared very likely to be refinements and continuations of previous changes. Attempts to adjust milling capacity to the demand for flour

would probably reduce the number of mills. The largest mills would be expected to reduce their capacity allocated to the milling of wheat-flour. A decline in demand for flour was explained by the facts that consumers had a large variety of foods from which to choose and that the widespread employment of labor-saving machinery had reduced the amount of food necessary for human consumption. Per capita consumption of flour is likely to continue downward. Counteracting this expected trend would be the introduction of new products from wheat flour. Historically, there appeared to be an inverse relationship between per capita consumption of flour and average purchasing power of consumers, ceterus paribus. When war-torn countries regain their former or desired levels of wheat production, a decline in export demand is to be expected.

Continued support prices on wheat would probably place those engaged in the operation of storage facilities in a more prosperous position, unless programs were instituted concurrently to further restrict wheat production.

Although lags occurred in making technological changes in the flour-milling industry, provisions have been made by the federal government to induce the adoption of new equipment, which may result in an increase in flour-milling productivity. The Amortization of Emergency Plan is an example of such inducement. The plan permits fast write-offs on emergency facilities based on a period of 60 months. With the reduction in excess milling-capacity and some adoption of more productive machinery, an increase in milling productivity may be anticipated. The net effects of anticipated changes in the flour-milling industry are likely to be a continued decline in the number of mills, which would enable prevailing mills to operate nearer to their optimum capacity.

Outside developments having marked effect upon the industry included improved transportation by rail and water, growth of cities, development of power resources, and expansion of commercial wheat areas. These factors combined with the air current purifier and automatic roller mill, developed within the industry, produced the outstanding effect of creating a highly competitive commercialized mass-production milling industry whose large firms were highly integrated internally, with specialized selling and wide industrial organization. This situation, in the face of stable domestic demand and declining per capita consumption of flour produced troublesome effects in the form of excess plant capacity, overcapitalization, and wheat surpluses. The effect of complaints was to bring government efforts to aid both the milling industry and the wheat growers. Mass production improved the quality of flour, and added services brought the wheat products closer to the consumers, whose expanded incomes in recent years have been sufficient to cover the cost. Future effects may include integration of the milling, baking, and freezing industries near large wheat storage centers.

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TABLE II

Indexes: Number of Mills, Total Production and Average Production in the United States, 1899-1951

(1899 = 100)

Year	Number of Mills	Total Production	Average Production Per Mill
1899	100	100	100
1904	106	104	98
1909	123	106	86
1914	114	117	102
1919	113	133	118
1921	68	111	162
1923	55	114	207
1925	46	115	253
1927	43	118	278
1929	42	120	284
1931	25	116	455
1933	20	101	496
1935	23	103	443
1937	24	106	447
1939	23	112	494
1940	22	109	495
1941	12	111	959
1942	11	113	988
1943	11	122	1135
1944	10	124	1187
1945	11	140	1264
1946	12	143	1217
1947	13	156	1191
1948	14	143	998
1949	13	120	906
1950	11	115	1060
1951	11	117	1109
1952	—	117	—

Source: Computations based on data in Table I.

APPENDIX

TABLE I

Number of Mills, Total Production and Average Production in the United States; 1899-1952

Year	Number of Merchant Mills	Total Production (in bbls.)	Average Volume Per Mill (in bbls.)
1899	9,467	99,763,777	10,528
1904	10,051	104,013,278	10,349
1909	11,691	105,756,625	9,046
1914	10,788	116,403,770	10,790
1919	10,708	132,465,604	12,371
1921	6,485	110,846,277	17,092
1923	5,232	114,438,544	21,873
1925	4,314	114,689,930	26,585
1927	4,035	118,132,027	29,277
1929	4,022	120,094,451	29,859
1931	2,412	115,419,060	47,852
1933	1,932	100,899,000	52,225
1935	2,193	102,327,239	46,661
1937	2,238	105,273,951	47,039
1939	2,143	111,368,727	51,969
1940	2,082	108,520,408	52,123
1941	1,096	110,612,245	100,924
1942	1,085	112,806,122	103,969
1943	1,016	121,377,551	119,466
1944	994	124,183,673	124,933
1945	1,052	140,000,000	133,080
1946	1,110	142,295,918	128,195
1947	1,243	155,866,836	125,396
1948	1,355	142,414,795	105,103
1949	1,253	119,566,836	95,424
1950	1,028	114,744,387	111,619
1951	1,000	116,734,696	116,735
1952	—	116,398,469	—

Source: Years 1899-1935, A. C. Hoffman, Large-scale Organization in the Food Industries, Temporary National Economic Committee, Monograph 35, (except for 1923 and 1933) Page 39; year 1923 taken from Federal Trade Commission Report on Competitive Conditions in Flour-Milling Industry, 1928, page 4; year 1933, Statistical Abstract of U. S., 1934; number of mills, years 1937, 1939 taken from U. S. Census of Manufacture; years 1940-44 and 1951, Southwestern Millers (Golden Anniversary), Vol. 31, May 6, 1952; years 1945-52, U. S. Department of Commerce, Bureau of Census in Facts for Industry, Series: M16A.
Note: Production after 1943 was originally in 100 lb. sacks. Such data have been changed to barrels by equation $y = \frac{x}{1.96}$, where y = number of barrels, x = number of 100 lb. sacks, 1.96 is based on 196 lbs. per barrel.

TABLE III

Annual Changes in Exports and Production of Flour
in the United States, 1904-1952

Year	Total Exports	Change in Exports	Total Production	Changes in Production
	(In barrels)			
1904	11,854,388	—	104,013,278	—
1909	10,153,877	- 1,700,511	105,756,625	+ 1,743,347
1914	13,201,633	+ 3,047,756	116,403,770	+ 10,647,145
1919	28,199,265	+ 14,997,632	132,465,604	+ 16,061,834
1924	17,317,653	- 10,880,612	110,846,277	- 21,619,327
1929	16,916,837	- 398,816	114,438,544	+ 3,592,267
1935	11,694,859	- 5,221,978	114,689,930	+ 251,386
1937	13,414,227	+ 1,719,368	116,132,027	+ 2,442,097
1939	14,283,143	+ 867,857	120,084,451	+ 1,952,424
1941	10,246,469	- 4,036,674	115,419,060	- 4,675,391
1943	4,597,653	- 5,650,816	100,899,000	- 14,520,060
1945	3,977,551	- 620,102	102,327,239	+ 1,428,239
1947	5,188,847	+ 1,211,296	105,273,951	+ 2,946,712
1949	6,400,510	+ 2,311,224	111,368,727	+ 6,094,776
1950	4,895,918	- 1,504,592	108,520,408	- 4,848,319
1951	4,989,796	+ 93,878	110,612,245	+ 2,091,837
1952	3,996,959	- 992,837	112,808,122	+ 2,195,877
1953	8,912,245	+ 4,315,306	121,377,551	+ 8,571,429
1954	10,714,796	+ 2,802,551	124,183,673	+ 2,806,122
1955	25,926,571	+ 12,210,775	140,000,000	+ 15,801,327
1956	29,759,755	+ 3,833,184	142,295,918	+ 2,295,918
1957	51,329,081	+ 21,569,326	155,866,836	+ 13,570,918
1958	39,131,639	- 12,197,442	142,414,795	- 13,452,041
1959	16,437,755	- 22,693,878	119,966,836	- 22,447,959
1960	10,153,061	- 6,284,694	114,744,387	- 4,822,449
1961	11,713,265	+ 1,560,204	116,734,696	+ 1,990,307
1962	10,586,733	- 1,126,532	116,398,469	- 336,227

Source: Export, Millers' National Federation, The Southwestern Miller (Golden Anniversary) Vol. 31 (Kansas City, Missouri, May 6, 1952), p. 19-A; Production taken from table I.

TABLE IV

UNITED STATES EXPORTS AND PRODUCTION OF FLOUR AS PERCENTAGE OF LAST PREVIOUS YEAR REPORTED, 1904-1951*

Year	Production	Exports
1904		
1909	102	86
1914	110	130
1919	114	212
1921	84	61
1923	103	98
1925	100	69
1927	103	115
1929	102	106
1931	96	72
1933	87	44
1935	101	85
1937	103	131
1939	106	165
1940	97	77
1941	102	101
1942	102	85
1943	108	177
1944	102	128
1945	113	204
1946	102	115
1947	110	172
1948	91	76
1949	84	42
1950	96	62
1951	102	115
1952	100	90

*Computed from data in Table III.

TABLE V

NUMBER OF MILLS BY SIZE GROUPS, CENSUS YEARS 1899-1933
(Size in bbls.)

Number of Mills Reporting

Year	Size in barrels: Under 1,000	1,000-4,999	5,000-19,999	20,000-99,000	100,000- and over	Total
	Number of Mills Reporting					
1899	5,525	4,310	2,580	634	135	13,188
1904	5,150	3,843	2,123	622	166	11,904
1909	4,720	3,313	1,733	550	193	10,509
1914	4,420	2,996	1,377	540	218	9,551
1919	4,330	2,900	1,185	494	274	9,183
1921	3,700	2,256	930	420	239	7,545
1923	3,200	1,880	769	386	247	6,482
1925	2,850	1,600	667	351	247	5,715
1927	2,650	1,450	642	352	255	5,349
1929	2,500	1,290	592	288	267	4,937
1931	2,400	1,200	544	299	251	4,694
1933	2,300	1,120	500	261	228	4,409

Source: Food Research Institute, Wheat Studies, Vol. XII, (Stanford, California, 1936), p. 283.

TABLE VI

NUMBER OF MILLS BY DAILY CAPACITY SIZE GROUPS IN CWT., 1945-53

Year	Size in hundredweights: 400 and over	401-800	801-1200	1201-2400	2401-4000	4001-6000	6001-8000	8000- and over	Total Number of Mills
	(Number of Mills)								
1945	623	115	76	101	79	25	18	15	1052
1946	684	110	77	101	78	26	19	15	1110
1947	671	107	74	103	78	25	20	15	1093
1948	929	110	71	101	79	27	21	17	1355
1949	867	97	63	87	71	29	21	18	1253
1950	651	97	57	88	68	30	22	15	1028
1951	645	84	49	35	66	32	24	15	1000
1952	N.A.[1]	69	49	82	62	35	20	18	N.A.[1]
1953	N.A.	70	42	75	60	37	18	18	N.A.

[1]N.A. = not available

Source: Compiled from data in U. S. Department of Commerce, Facts for Industry, Series M16A-02, (Washington, May 26, 1953), p. 3 for years 1945-52. Years 1953, Millers National Federation, The Northwestern Millers, Vol. 251:18, (Minnesota, May 4, 1954), p. 27.

TABLE VII

FLOUR MILLED IN SOUTHWEST, NORTHWEST, AND NEW YORK STATE
1899-1930

Year	Southwest	Northwest	New York State
		(In Millions of Barrels)	
1899	8.7	27.2	5.4
1904	12.3	30.2	5.7
1909	17.8	31.7*	6.7
1914	20.3	30.9*	8.5
1919	27.8	31.8*	9.0
1921	24.1*	28.7*	8.4
1923	27.1*	28.0*	8.9
1925	29.0*	26.7*	12.5
1927	32.7*	26.6*	12.3
1928	29.4*	24.1*	12.5
1929	32.2*	21.9*	13.2
1930	31.1*	20.9*	13.3
1937	50.1	27.3	24.6
1938	48.0	30.8	25.2
1939	49.0	30.2	24.9
1940	47.7	29.2	24.8
1941	51.8	30.6	26.6
1942	53.9	32.9	26.3
1943	60.9	37.8	28.0
1944	60.6	40.4	29.9
1945	67.2	47.7	32.0
1946	67.1	46.3	33.5
1947	78.4	52.2	32.5
1948	77.5	41.9	30.2
1949	64.3	37.5	29.2
1950	63.0	37.7	27.0
1951	64.9	38.9	26.3
1952	63.6	37.5	27.9

*Year beginning July 1. Areas are explained in Chapter 2 of thesis.

Source: Years 1899-1930, Dean W. Malott and Boyce F. Martin, The Agricultural Industries, (New York, 1939), p. 244; Years 1937-52, Almanack Number, op. cit., 1953.

TABLE VIII

DAILY RATED MILLING CAPACITIES IN THE SOUTHWEST AND NORTHWEST AND PERCENTAGES UTILIZED, 1937-1952

(In 100-lb. Sacks)

	Northwest			Southwest		
Year	No. of Mills	Daily Rated Milling Capacity	Per cent Utilized	No. of Mills	Daily Rated Milling Capacity	Per cent Utilized
1937	190	222,627	48.2	312	373,027	73.7
1938	161	206,363	53.4	290	372,576	73.5
1939	149	177,129	62.6	276	368,219	73.1
1940	145	177,169	64.8	255	364,397	77.1
1941	142	179,751	62.5	239	361,747	76.3
1942	139	179,242	67.1	231	354,642	76.6
1943	132	174,850	82.4	213	352,300	82.0
1944	123	174,497	88.3	199	350,144	88.3
1945	113	179,348	96.9	191	354,901	92.2
1946	104	178,777	96.1	185	399,226	97.1
1947	97	187,686	107.8	180	377,625	111.1
1948	85	181,201	94.0	168	388,560	108.8
1949	75	181,181	80.0	166	398,887	93.8
1950	65	173,085	81.9	138	383,609	78.5
1951	71	165,950	84.4	137	384,141	80.0
1952	69	165,940	87.9	137	388,741	74.8

Source: Compiled from Millers' National Federation, Almanack Numbers of each year.

VITA

Huey Jefferson Battle
candidate for the degree of
Doctor of Philosophy

Thesis: ECONOMIC EFFECTS OF SOME MAJOR CHANGES IN THE FLOUR-MILLING INDUSTRY

Major: Agricultural Economics
Minor: Economics

Biographical and Other Items:

Born: October 31, 1918, at Rusk, Texas.

Undergraduate Study: Langston University, 1940-1942; 1946-1947.

Graduate Study: University of Wisconsin, 1950-1952; O.A.M.C., 1952-1954.

Experiences: U. S. Air Corps, 29th Aviation Squadron, 1942-1945; taught 3½ years at Douglass High School, Wewoka, Oklahoma; Research Assistant in the Department of Agricultural Economics, O.A.M.C., 1953-1954.

Member of Alpha Phi Alpha, Pi Gamma Mu, The American Economic Association.

Date of Final Examination: July, 1954.

THESIS TITLE: ECONOMIC EFFECTS OF SOME MAJOR CHANGES IN THE FLOUR-MILLING INDUSTRY

AUTHOR: HUEY JEFFERSON BATTLE

THESIS ADVISER: ADLOWE L. LARSON

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TYPISTS: MR. AND MRS. GORDON F. CULVER