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The Guaranteed Minimum Price and Price Stabilization in the Wheat Market

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THE GUARANTEED MINIMUM PRICE AND
PRICE STABILIZATION IN THE WHEAT MARKET

by

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B.A. May 1984, University of Michigan

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ABSTRACT

THE GUARANTEED MINIMUM PRICE AND PRICE STABILIZATION IN THE WHEAT MARKET

Therese L. Soullier
Old Dominion University, 1990

The government of the United States offers a guaranteed minimum price per bushel to farmers in return for a reduction in acreage planted. Through this program, the government attempts to control the supply of wheat and stabilize the price of wheat. There is growing debate in the United States as to the effectiveness and prudence of the current program.

This thesis will examine the effectiveness of the guaranteed minimum price program, using the two-stage least squares procedure to examine a demand and supply model. The study will look at the relative stability of the price of wheat and how and to what degree the guaranteed minimum price affects the supply and price of wheat. It is expected that the analysis will demonstrate that the guaranteed minimum price program is ineffective in providing a stable market price and should be reexamined.
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CHAPTER 1
Introduction

The farm program operated by the United States' government includes a subsidy program for wheat farmers. The multifaceted wheat program has many goals, one of which is the stabilization of the market price of wheat. In order to accomplish this goal, the government offers to purchase a farmer's crop at a guaranteed minimum price in exchange for the farmer idling a certain percentage of his fields. In this manner, the government seeks to control the supply of wheat and stabilize the market price. This thesis will examine the effectiveness of using the guaranteed minimum price to achieve the government's goal of a stable market price for wheat.

The government of the United States has been operating a wheat program for U.S. farmers since the middle of the nineteenth century, when the government transferred public land to private ownership for use as farmland. Although the form of aid to wheat farmers has changed over the years, some type of aid has been offered for over one hundred years. As a result of this, the market price of wheat has been directly or indirectly affected by government intervention for over one hundred years, thereby making a comparison study between the stability of market prices in the presence and absence of the guaranteed minimum price impossible. This study will instead focus on the effects
which the guaranteed minimum price has on the supply of wheat and indirectly on the market price. The purpose of the program, from the government's standpoint, is to stabilize the market price by controlling the supply of wheat. In theory, if one of the purposes of the guaranteed minimum price is the stabilization of the market price of wheat, then changes in the guaranteed minimum price should have consistently predictable effects on the supply of wheat and should also influence the market price.

Before beginning any analysis, it is necessary to provide an overview of the wheat market in the United States. As a beginning, it is a premise of this study that demand for wheat is stable. Consumers use more or less wheat based on its price. The demand curve for wheat does not shift dramatically within or between time periods. The change in price is determined by supply. As the supply curve shifts, the price of wheat changes and wheat consumers adjust their purchasing along the same demand curve, based on the new supply curve.

Within the wheat market, individual farmers have no ability to set the selling price. The large number of wheat farmers provides for a competitive market in which all farmers who sell at a particular time receive the same price for their wheat. No individual farmer can affect the price of wheat by adding or withholding product from the market. For the purposes of this study therefore, the U.S. wheat
market will be considered purely competitive. In reality, the product is not homogeneous, however the assumption of a homogeneous product will not adversely affect the outcome of this study. The data used in this study is the average yearly price and production figures for all types of wheat, so individual farmers still can not influence the price.

It is within this competitive market that individual farmers operate. Like all businessmen, a wheat farmer incurs expenses in the production of the product. Initially, there are capital expenses in land, buildings and machinery. In addition to capital outlays, which can be viewed as investments for which the farmer has collateral, the farmer must also buy seed and fertilizer, hire labor and provide for his own living expenses. In order for a farmer to remain in business, the price a farmer receives at harvest time for his wheat must cover all his expenses. In addition, the price must be high enough so that the farmer can make payments on any loans which he undertook to make capital investments.

When the individual farmer plants, he has no way of knowing what the market price will be at harvest time. If the collective harvest is good, then abundant wheat supply will force the price down. In years of abundant supply, it is quite possible that the cost of producing the wheat is greater than the price which is received for the wheat. The farmer can not cover his expenses nor make any loan.
payments. The reverse occurs when the harvest is poor. Under these uncertain price conditions, the farmer plants as many acres as are available to him in order to increase his odds of making a profit. Planting on only a portion of the available acreage reduces variable expenses, however the majority of expenses are fixed. Planting on only a portion of the available acreage only slightly reduces total expenses but greatly reduces potential income. When the majority of wheat farmers follow this logical strategy, too much wheat is produced and the resulting market prices are too low to cover all the farmers' expenses.  

In an attempt to stabilize the market price of wheat at a level which allows farmers to make an ordinary profit, the United States government operates a wheat subsidy program. There are several types of aid offered to farmers under this program, however this thesis will examine only one, the guaranteed minimum price. Under this portion of the wheat program, the U.S. government agrees to pay participating farmers a set price for each bushel of wheat produced. The price is known at the time of planting and allows the farmer to plan more accurately since he is dealing with a set price as opposed to an expected price. In exchange for obtaining the guaranteed minimum price, the farmers must idle a certain percentage of their fields, thereby reducing total output.

Participation in the program is voluntary and the
number of participants fluctuates from year to year. When the expected price for wheat is high, the number of participants decreases and vice versa. Unfortunately, this tendency can work against the efforts of the government and the best interests of the farmers. When the expected price is relatively high, farmers do not participate in the program because they do not want to idle any fields. Additionally, farmers will spend more money on fertilizer to increase the yield per acre, attempting to harvest as much wheat as possible and profit from the high expected price. This strategy on the part of all farmers increases supply and lowers the price. Analogously, when the expected price is relatively low, more farmers opt to participate in the government program, idling fields and decreasing supply, thereby raising the price. The government does not have the power to control participation; it can only attempt to control participation through the strategic setting of the guaranteed minimum price.

In evaluating the success of the government's program, this thesis will examine two aspects relating to the guaranteed minimum price. First, since the government seeks to stabilize the price of wheat through the use of the guaranteed minimum price, in order for the program to be deemed successful, the price of wheat must be judged to be stable during the 36 years of the study. It's important to note that the concept of stability is relative and that this
determination is subjective. For the purpose of this study, the market price of wheat will be defined to be stable if the price, beginning with a base year, is within a range of ten percent after accounting for inflation. The rate of inflation which will be used is the rate for all food products for each year. This rate has been chosen over the rate of inflation for prices of grain products due to the existence of government intervention in the price. A range of ten percent has been chosen somewhat arbitrarily, but with a logical basis. A ten percent range is lenient in comparison to the normal price fluctuations for other food products. A restrictive definition of stable is not necessary for the purposes of this study and would only serve to bias the study in favor of a negative finding. The definition of stable, when combined with the other criteria, will allow for an adequate determination of the success of the government program. The average market price for wheat for each year will be examined using the above parameters and an overall trend will be established.

The second aspect of the guaranteed minimum price which will be examined is the effect which use of the guaranteed minimum price has on the supply and price of wheat. It is a premise of this study that price fluctuations are the result of changes in supply. Additionally, the actions undertaken by the government are aimed at altering supply. Therefore, a regression model will be used to determine
effects which the government action has on the amount of wheat supplied to market each year and how that affects the market price. A two-equation regression model will be employed using two-stage least squares. The model will estimate demand and supply functions in an effort to determine the effects of the guaranteed minimum price on supply and the market price of wheat. The demand equation will use total demand as the dependent variable. The independent variables will be taken from two independent regression equations. The first equation will be the amount of wheat exported as a function of the exchange rate, the market price of wheat and the world supply of wheat. The second independent equation will be the amount of wheat purchased domestically as a function of the market price of wheat, the population of the United States and income. The inventory of wheat at the end of the year will also be included as an identity.

The supply equation will use total supply as the dependent variable. The independent variables will be taken from an independent regression equation in which the amount of wheat harvested is the dependent variable and the futures' price, the market price of wheat, the cost of production and the guaranteed minimum price are the independent variables. The beginning inventory of wheat will be included as an identity.

The independent variables from the independent
regression equations will be used as independent variables in the demand and supply equations used for the two-stage least squares regression model. This will provide an analysis of the relationship between price and supply and demand. The relationship of the independent variables to supply and demand, and indirectly to price, will also be investigated.

This analysis will be used to demonstrate whether there is a link between the government's actions and the amount of wheat harvested in any given year. The guaranteed minimum price can work to help or hinder the government's goal. If the guaranteed minimum price is set too high, farmers will see the opportunity for profit and plant more wheat. If the price is set at or very near to the actual market price of wheat, then farmers will base their planting decisions on their cost of production versus the market price. The model should demonstrate whether or not there is a relationship between the guaranteed minimum price and the amount of wheat harvested each year and indirectly, the market price of wheat.

This study will attempt to establish a quantitative link between the government's guaranteed minimum price and the market price of wheat. If the market price of wheat is a function of the amount of wheat harvested and the amount of wheat harvested is a function of the government's actions, then the government program can be viewed as
effective in altering the price of wheat. Additionally, if the market price of wheat is a function of the government's actions, then the government program can again be seen as effective in altering the price of wheat. It must be noted however, that in order for the program to be considered successful in the attainment of its goal, the guaranteed minimum price must not only affect the supply and the market price but must affect them in such a manner so as to achieve the government's goal of a stable price.

By combining the results of the regression analysis with the results from the examination of the relative stability of the market price of wheat, a determination can be made as to whether or not the government's program has produced a stable market price for wheat. There are several possible results. The price of wheat could be shown to be stable and a function of the government's actions under the wheat program. A second possible result is that the market price of wheat will be stable and not a function of the government's actions. Additionally, the price of wheat could be shown to be unstable and a function of variables other than those included in the model. It is also possible that results other than those discussed above could be obtained. In order for the U.S. guaranteed minimum price program to be found successful in the attainment of its goal, the market price of wheat must be stable as a result of the guaranteed minimum price program.
Notes


3. Douglass, 170.


7. Gardner, 62

CHAPTER 2
Review of the Literature

There are three categories of previous research which are potentially important to the hypothesis being investigated in this study. The first category deals with the possible benefits of price stabilization programs, the second category presents the reasoning behind interventionist farm programs and the third category examines the effects which macroeconomic policy can have on the farm sector. Results of the key articles within each category will be presented in this chapter in order to provide a basic framework within which this study is conducted.

Before examining the government's effectiveness in achieving a stable market price for wheat, it is important to address the issue of the desirability of a stable market price for wheat. An examination of this issue was undertaken by Brorsen, Chavas, Grant and Schnake in 1985. The objective of the study was to investigate the influence of price uncertainty on the price margin in a marketing channel using empirical evidence from the wheat market. Using the theories of perfect contestability and perfect competition, the flour milling industry and retail grocery firms were defined as price takers, acting under uncertain price conditions. The study used regressions of two linear
price margin equations, one for the farm mill and one for the mill retail margin, in determining how mill and retail firms act under uncertain prices. A price risk variable was calculated by using a weighted, moving average of price changes over the preceding twelve months. The risk variable was included in both price margin equations. The study demonstrated that as price uncertainty increased, flour mills and retail stores increased the marketing margin (the difference between the firm's buying and selling price). Most of the increased margin is passed on to consumers since wheat demand is price inelastic. The study suggests that price stabilization programs benefit not only producers, but marketing firms and consumers as well.

Several researchers have tried to estimate a consumer's willingness to bear the costs of a price stabilization program. Most studies of this type use the expected value of the consumer's surplus as a welfare measure. Helms disputed this method, arguing that the value of the expected consumer's surplus diverges significantly from the actual amount a consumer is willing to pay for implementation of a price stabilization policy. Helms used numerical simulations to demonstrate that any measurement of a consumer's willingness to pay to have a price stabilization policy implemented must incorporate expected consumer's surplus measures with consumer's risk preferences. Consumers become more risk adverse as price fluctuations
become wider and are thus willing to pay more, through taxes or other fees, for price stabilization. If price fluctuations are small, consumers are willing to take the risks associated with changes in the market. As the degree of price fluctuations increases, consumers prefer the costs of a price stabilization program to unpredictable, wide price fluctuations. The wider the price fluctuations, the more the consumer is willing to pay for price stabilization. This study demonstrates that for consumers, the welfare gains from a price stabilization program are measured by consumer's risk preferences as well as monetary gain.

The majority of studies examining the economic rationale for government intervention within the agricultural industry view a free market as the best welfare result and government intervention as a deadweight loss. Chavas and Leathers challenged this traditional approach in 1986.8 The two researchers argued that market imperfections negated a free market as the best welfare result and that government intervention should be judged by a comparison of its benefits and costs.9 The study developed a model of an indebted firm, then used that model to demonstrate the effects which various types of government policy produce. The study identified five main types of government intervention which could be used to aid indebted farmers. These were direct income transfers, cost subsidies, loan subsidies, reductions in uncertainty and
price distributions, and making resources more mobile.\textsuperscript{10} The most important for the purpose of this thesis is reduction in uncertainty and price distributions. The benefits of a successful price stabilization program are that the probability of default is eliminated since farmers borrow money based on their cost of production versus the price of the product (as opposed to the expected price). In addition, as long as the price is held constant at its mean, potential entrants will only be attracted to farming if their potential profits are highest in farming.\textsuperscript{11} Farmers under this type of stabilization program will have to be efficient. In contrast, if the price stabilization program raises the price above the normal mean, then firms which would ordinarily not be able to make a profit by farming will enter the industry creating excess supply.\textsuperscript{12} The overall point being that price stabilization programs should not be used to raise the price above its normal mean.

As mentioned above, one of the key elements of a successful interventionist program is helping efficient farmers remain in business during times of "bad luck" (pest infestation, drought, etc.) without helping inefficient farmers to stay in business. A study by Heimlich in 1986 examined the effects of agricultural programs on the conversion of land from other uses to agricultural purposes from 1975 to 1981. In regards to the current use of a government set target price, the study concluded that
participation in the program would provide new entrants using highly erodible land (land which produces low yields) with a profit incentive for converting their land to cropland. Without the government program, it was not profitable to convert the land to cropland. As this study suggests, parameters which limit the type of farms eligible for government assistance are important to the success of any stabilization program.

There have been several studies dealing with the effects of inflation on the income of farmers. A 1985 study by Starleaf, Meyers and Womack investigated this topic using the traditional economic theory which states that an increase in the general rate of inflation benefits those whose money incomes are flexible and harms those whose money incomes are fixed. Since farmers have flexible money incomes, the theory suggests that they should benefit from unanticipated increases in the rate of inflation. By examining the prices paid by farmers for their product, the researchers were able to establish general trends. The most important of these trends being that the farming sector is subject to much greater short run output price flexibility than the nonfarm sector. In periods of unanticipated inflation, the prices received by farmers for their product increase faster than the prices which farmers have to pay for the products they purchase, since most of their purchases are from the nonfarm sector of the economy. The
study concludes that farmers benefit from unanticipated increases in the rate of inflation and are harmed by unanticipated decreases in the rate of inflation. This result has important implications for stabilization policies. A policy which allows the price to move with the general rate of inflation will subject farmers to the benefits and the hazards of unanticipated increases and decreases in the rate of inflation. Conversely, a stabilization policy which does not allow the price to move with the general rate of inflation will harm farmers during unanticipated increases and benefit farmers during unanticipated decreases in the rate of inflation. Only a policy which allowed for the systematic resetting of the price based on economic conditions could nullify these effects.

A study conducted by Frankel in 1986 further explains the effects which fluctuations in the nonfarm sector of the economy have on prices in the farm sector. Frankel examined the effects which fluctuations in the money supply have on commodity prices. The basic results were that commodity prices generally move in the same direction as the money supply, but disproportionately. Agricultural prices tend to be more flexible than prices in the nonfarm sector. If the money level increases, the real interest rate will fall, causing commodity prices to fall. Because commodity prices are more flexible, they fall below their long run
equilibrium. The opposite occurs when the money supply decreases. The implication for price stabilization policy is that macroeconomic policy can be as important a source of fluctuation in agricultural prices as microeconomic factors.

The preceding discussion outlines some of the rationale behind government intervention in the farm sector, pointing out the possible benefits of intervention along with potential problems. It is within this context of research that this thesis is written. By assuming, as the research indicates, that there are benefits to price stabilization, this thesis investigates only the effectiveness of the government program in bringing about stable prices. The costs of the stabilization program are borne by taxpayers. If wheat prices are not stable, then the taxpayers are paying for benefits which never accrue.
Notes


2. Brorsen, 526.


6. Helms, 98.


10. Leathers, 835.

11. Leathers, 836.

12. Leathers, 837.


15. Starleaf, 388.


The purpose of the study is to determine whether or not the United States government's use of the guaranteed minimum price has been effective in producing a stable market price for wheat. In order to do this, a time series study was conducted. Data from the years 1950 through 1985 was examined.

The analysis began with an examination of the stability of the market price of wheat. In order for the guaranteed minimum price to be considered successful, the market price must be judged to be stable. Even if the regression analysis indicates that the supply and market price of wheat are a function of the guaranteed minimum price, the price of wheat must be relatively stable since price stability is one of the program's main goals.

For this analysis, the market price of wheat for each year was adjusted for inflation, using the yearly rate for all food products. The adjusted prices were then compared and the percent change in price from year to year was calculated. This process enabled an analysis of yearly price fluctuations to determine if the deviations were within a range of ten percent as compared to the previous year. Price fluctuations were examined using the previous year as opposed to using the first year of the study as the base.
year, so as not to compound any errors or trends. The results were examined to determine the relative stability of the market price of wheat over the course of the study.

Following this, two simultaneous equations were specified which incorporated the variables expected to influence the demand and supply of wheat. The model is overidentified, an independent variable, market price, was used in both equations within the model. For this reason, the two-stage least squares procedure was used.

A two step process was used in order to construct the model. First, the identities for the demand and supply variables were specified. The demand identity was

\[ D_t = X + D_p + I_e \]

where \( D_t \) was the total amount of wheat demanded each year, \( X \) was the amount of wheat exported from the United States, \( D_p \) was the amount of wheat purchased domestically and \( I_e \) was the wheat inventory at the end of the year.

Two equations were derived from the demand equation in order to further define those variables which influence total demand. An independent regression was performed for each equation to determine the significance of the independent variables within the model. The first independent demand equation further defined exports in the following manner:

\[ X = f(R, P, W) \]

where \( R \) was the exchange rate, \( P \) was the market price for
wheat and \( W \) was the world supply of wheat minus U.S. wheat production.

The second independent demand equation further defined the amount of wheat purchased domestically in the following manner:

\[
D_p = f(P, N, Y)
\]

where \( P \) was the market price of wheat, \( N \) was the population of the United States and \( Y \) was income in the United States, as measured by GNP.

These regressions provided a basis for inclusion of the independent variables within the demand equation used for the two equation model. I.e., wheat inventory at the end of the year, was included only in the identity equation for demand.

This produced the following equation for total demand:

\[
D_t = f(R, W, P, N, Y)
\]

Demand as a function of the exchange rate, the world supply of wheat, market price, population and income. This equation incorporates the independent variables from the two independent demand equations for exports and domestic wheat purchases.

A basic premise of the study was that demand is relatively stable. The demand curve should not shift dramatically from year to year. The supply of wheat should determine the amount of wheat purchased as opposed to stored, thereby producing a stable demand curve.
The independent variables which help in determining the total amount of wheat demanded, those included in the model, do not shift dramatically from year to year. The amount purchased grew steadily over the course of the study, as did the world supply of wheat minus U.S. supply and U.S. exports. Since the coefficients within the demand equation interact with slowly changing independent variables, a stable demand curve results. The changes in price are the result of a shifting supply curve intersecting the demand curve at different points.

The total demand variable was expected to be negatively correlated to the dollar exchange rate. As the value of U.S. currency decreases in relationship to the value of foreign currency, the relative price of U.S. produced wheat will decrease, thereby increasing purchases by foreign countries (increasing exports) and increasing total demand. The world supply of wheat minus U.S. supply was expected to be negatively correlated as well. As foreign supply increases (holding foreign demand constant), U.S. exports will decrease, thereby decreasing total demand for U.S. produced wheat. The market price of wheat was expected to be negatively correlated to total demand. As the price decreases, the amount of wheat purchased will increase along the same demand curve. The population was expected to be positively correlated to total demand. As the population increases, more wheat will be needed to satisfy the new
demand. Income was expected to be positively correlated to total demand. As GNP rises, purchases of wheat, both for personal consumption and feed grains (due to an increase in the demand for meat), will increase thereby increasing demand.

The amount of wheat purchased, both domestically and in the form of exports, will determine the amount of wheat in storage at the end of the year. For this reason, the amount of wheat in inventory at the end of the year was included in the identity equation for demand only. There is a demand for wheat storage, however it was treated as exogenously determined. The demand for wheat storage was not treated, within the confines of this study, as influencing the total demand variable.

As a summary, the total demand equation was derived as follows:

\[ D_t = X + D_p + I_e \]

identity

\[ X = f(R, P, W) \]

independent equation

\[ D_p = f(P, N, Y) \]

independent equation

\[ D_t = f(R, W, P, N, Y) \]

demand equation

The total supply equation for the model was derived in the same manner as the demand equation. The supply identity was:

\[ S_t = H + I_b \]

where \( S_t \) is the total amount of wheat supplied in the United States, \( H \) is the amount of wheat harvested in the
United States and \( I_B \) is the amount of wheat in inventory at the beginning of the year.

One equation was derived from the supply identity to further define those variables which influence total supply. An independent regression was performed on the equation to determine the significance of the independent variables within the model. The equation further defined the amount of wheat harvested in the following manner:

\[
H = f(F, P, C, G)
\]

where \( F \) was the price of wheat in the futures market, \( P \) was the market price of wheat, \( C \) was the cost of production and \( G \) was the guaranteed minimum price offered by the United States government.

This regression provided a basis for inclusion of the independent variables within the supply equation used for the two equation model. \( I_B \), wheat inventory at the beginning of the year, was included in the identity equation for total supply.

This produced the following equation for total supply:

\[
S_t = f(F, P, C, G)
\]

Supply as a function of the futures price, market price, the cost of production and the guaranteed minimum price. The variables were taken from the independent harvest equation.

The futures price was expected to be positively correlated to total supply. An increase in the futures price will signal the possibility of higher profits for
farmers. Farmers will plant more wheat and work to increase their yield per acre in order to take advantage of the higher expected profits. This action will lead to an increase in the supply of wheat. The market price of wheat was expected to be positively correlated to total supply. As the market price increases (holding production costs constant), farmers will again plant more wheat and increase their yields in an effort to gain higher profits. This will increase total supply. The production cost of wheat was expected to be negatively correlated to total supply. As the cost decreases (holding prices constant), farmers will increase wheat production and total supply will increase.

The guaranteed minimum price was expected to be negatively correlated to total supply. A high guaranteed minimum price will result in more farmers participating in the government program and agreeing to reduce their acreage. This will decrease total supply, which is the government's goal.

The wheat inventory at the beginning of the year was only included as a variable in the identity equation for supply. The beginning inventory was viewed as exogenously determined and was not seen as a determinant of supply. Wheat not sold in the current year is merely stored for sale in the following year. Since the amount of wheat inventory from the previous year is known at the time of planting, beginning inventories were not viewed as a causal variable. The total supply variable is the sum of wheat harvested and
the beginning inventory, however the primary variables which influence supply are all included in the regression equation for wheat harvested.

As a summary, the supply equation was derived as follows:

\[ S_t = H + I_b \]  identity

\[ H = f(F, P, C, G) \]  independent equation

\[ S_t = f(F, P, C, G) \]  supply equation

The two-stage least squares procedure was used to determine the parameters of the resulting model:

\[ D_t = f(R, W, P, N, Y) \]  demand equation

\[ S_t = f(F, P, C, G) \]  supply equation

The model was calculated using the logarithmic transformation of each of the variables in order to remove the growth over time of the variance of the data which is normally found in a time series analysis.

As a final note, the data for the variables of income, population and cost were obtained from the Statistical Abstract of the United States. The data for the variables of the amount of wheat harvested, the beginning and ending inventories, the amount of wheat purchased, the amount of wheat exported, the total demand and supply of wheat, the world supply of wheat minus U.S. wheat supply and the market and guaranteed minimum prices were obtained from Agricultural Statistics. The data for the exchange rate was obtained from World Financial Markets and the data for
the futures price was obtained from the **Statistical Annual**
issued by the Minneapolis Grain Exchange.\(^4\)

The amount of wheat harvested, exported, purchased, in
the beginning inventory, the ending inventory and for world
supply minus U.S. supply were recorded in millions of
bushels. The amount of wheat harvested, exported and
purchased were comprised of, respectively, all types of
wheat grown, exported and purchased for personal consumption
or as feed grains within the United States. The beginning
and ending inventories were the amount of wheat unsold and
in storage at the start and end of the year. The world
supply was all types of wheat supplied worldwide minus U.S.
supply. The market price of wheat, the futures price and
the guaranteed minimum price were expressed as dollars per
bushel and were, respectively, the average yearly price
received by farmers during each year, the futures price one
year later as recorded in December of the current year and
the government guaranteed minimum price offered for each
year. The population of the United States was recorded in
millions and included the fifty states. The production cost
of wheat and the exchange rate were recorded as indexes and
comprised of, respectively, all variable costs associated
with the direct production of wheat and the value of the
U.S. dollar as measured against the currencies of fifteen
industrial countries. Income was measured by the real GNP
of the U.S. and was recorded in billions of dollars. The
exchange rate during the years 1950 through 1969 was a constant equal to the value of 1970; changes during this time period were relatively minor and this should not affect the outcome of the study.
Notes


CHAPTER 4

Results

The first issue examined in this study was that of stability. The price of wheat for each year was compared to the preceding and following year to determine the relative stability of the price of wheat, after accounting for inflation. The average price of wheat per bushel in 1950 was $2.00. By adjusting this price for inflation for each year of the study, the price of wheat per bushel in 1985 should have been $8.49. In reality, the price of wheat in 1985 was $3.16, which indicates that wheat prices did not keep pace with inflation over the course of the study. This fact does not accurately reflect the farmers' financial position in relation to prices received. As the technology for farming improved, the cost curves for producing wheat decreased. Therefore, it was not necessary for the price of wheat to keep pace with inflation in order for the farmer to maintain the same level of profit. Nonetheless, as wheat price increases lagged behind the rate of inflation, profits decreased and those farmers most heavily in debt were forced into bankruptcy. This was contrary to the government's goal.

The actual stability of the price of wheat over the course of the study was less than ideal. Prices varied widely for a variety of reasons. From 1950 through 1962 yearly changes in the price of wheat, after accounting for
inflation, fell within a range of ten percent, except for 1958. During these years, inflation was low, the U.S. wheat harvest experienced no major changes in volume from year to year and the government made no major changes in the guaranteed minimum price. The thirteen percent decrease in price from 1957 to 1958 was most likely the result of a dramatic increase in supply. The United States' wheat harvest grew from 962 million bushels in 1957 to 1,469 million bushels in 1958. This was nearly a fifty percent increase and it is likely that the increase in supply forced the price down.

Beginning in 1963, prices varied widely from year to year, the greatest increase occurring from 1972 to 1973, when the price of wheat accelerated from $1.76 to $3.95. The biggest decline in price was from 1975 to 1976, when the price decreased from $3.55 to $2.73. There was great fluctuation throughout the time period, with both large relative increases and decreases.

The price fluctuations could have been the result of many factors and most likely were the result of a combination of factors. Most importantly, the inflation rate grew steadily from 1963 until 1970, from 1.2% to 5.9% and then remained high and varied greatly until 1983. From 1972 to 1973, the rate of inflation nearly doubled and the price of wheat more than doubled. Although the prices were adjusted for inflation, the rapid growth of the inflation rate most
likely contributed to the dramatic increases and decreases in price.

The other factors which influenced price stability during this time period will be examined in the demand and supply model. The main point for the purpose of this study is that the price of wheat was not stable from year to year, but varied greatly. The government has not been successful in securing a stable price for farmers.

In determining which factors affect the price of wheat, the investigation began with the development of a demand equation. To determine which variables have a significant effect on demand, the export equation was examined first, with the following results:

\[
\text{Log } X = 0.77 - 0.98 \text{ Log } R + 0.01 \text{ Log } P + 1.04 \text{ Low } W
\]

\[
(1.33) \quad (0.01) \quad (5.57)
\]

\[R^2 = 0.67 \quad \text{ DW} = 1.021\]

The negative coefficient was expected for the exchange rate, in that as the value of the dollar decreases relative to foreign currency, the relative price of U.S. exports decreases and exports should increase. The insignificant t statistic for market price is most likely due to the fact that demand for wheat is price inelastic. As long as U.S. wheat is sold at the going world market price, the actual price does not affect the quantity exported. The world supply of wheat tested significant, with the positive value indicating that world supply and U.S. exports increased.
together. The positive value was unexpected, however it is probably due to the fact that world demand has grown faster than world supply, excluding U.S. supply. Therefore, U.S. exports continue to increase, filling the void between world demand and supply.

The examination continued with the independent equation defining domestic purchases:

\[
\log D_p = 6.82 - 0.25 \log P - 2.56 \log N + 0.67 \log Y
\]

\[
(4.67) \quad (5.67) \quad (7.92)
\]

\[R^2 = 0.85 \quad DW = 1.092\]

The negative correlation between price and the amount of wheat purchased was expected and is consistent with normal demand and price correlations; purchases increase along the same demand curve as prices decrease. The domestic population value tested significant but negative. This was unexpected, however is logically explained. A study by Gordon R. Stavig found that population increases tend to be associated with decreases in the growth rate of per capita gross national product and can have a negative correlation with demand. In relation to this thesis, although population increased, per capita consumption of wheat was decreasing at a rate sufficient enough to nullify any increases in the amount of wheat purchased due to increases in population. This produced the negative correlation between population and the amount of wheat purchased. The positive correlation between income and wheat purchased was
expected for the reasons discussed in chapter three relating income to total demand.

By taking the exchange rate and world supply from the export equation and the price, population and income variables from the wheat purchased equation, the total demand equation is formed:

\[ \log D_t = f(\log R, \log W, \log P, \log N, \log Y) \]

Development of the supply equation focused on those variables which affect the amount of wheat harvested. The independent equation produced the following results:

\[ \log H =.48+.22 \log F-.63 \log P+1.37 \log C-.30 \log G \]

\[(1.86) (5.11) (9.55) (2.30)\]

\[ R^2=.90 \quad DW=1.309 \]

The positive correlation between the futures price and the harvest was expected, although the correlation was not as high as expected. This fact is probably due to the nature of farming, as much as any other factor. Wheat farmers can add fertilizer to increase yield per acre, however the amount of land available to each farmer for planting each year remains relatively constant. Farmers can only increase their harvest by small percentages in order to capitalize on high futures prices. The negative correlation between the price of wheat and the harvest was unexpected, but was most likely the result of a combination of factors. First, the market price used in this study was for the current time period. Farmers can do little, short of failing to harvest
the wheat, when the market price is low to decrease their harvest. Second, prices have not increased as rapidly as cost over the course of the study. The negative correlation between price and harvest may merely reflect the fact that the price has not kept pace with inflation, even though the harvest continued to increase. The positive correlation between the cost of production and the harvest was unexpected. The positive value most likely reflects the fact that both costs and the amount of wheat harvested grew steadily over the course of the study. The negative correlation between the guaranteed minimum price and the harvest was expected; as the guaranteed minimum price rises, acreage reductions by participating farmers decrease the amount of wheat harvested.

The four independent variables from the harvest equation were used to form the equation for total supply:

\[ \log S_t = f(\log P, \log P, \log C, \log G) \]

The two-stage least squares procedure was performed on the following model, with the following results:

\[ D_t = E + D_p + I_e \]

\[ S_t = H + I_p \]

\[ \log D_t = -1.96 + 1.01 \log R - 0.44 \log W + 0.32 \log P + 1.99 \log N + 0.11 \log Y \]

\[ R^2 = 0.84 \]

\[ (2.68) \quad (2.10) \quad (2.06) \quad (1.86) \quad (0.49) \]

\[ \log S_t = -1.03 + 2.07 \log F - 3.65 \log P + 2.28 \log C \]

\[ (2.85) \quad (3.85) \quad (2.80) \]
The correlation between world supply minus U.S. supply and total demand was negative, which was in contrast to the correlation between world supply minus U.S. supply and exports. The negative correlation for the model was the result originally expected. U.S. exports increase to satisfy world demand as world supply decreases (this decrease may be an actual decrease in volume or a decrease of proportions, meaning world supply does not increase as quickly as world demand and U.S. exports fill the void). The correlation between the guaranteed minimum price and total supply was negative, as was expected.

The study indicates that the guaranteed minimum price has a small, insignificant effect on the supply of wheat, and that other factors are more important in determining supply. The market price of wheat, the futures' price and the cost of production proved to be more significant determinants of supply. The government program is aimed at stabilizing the market price of wheat by affecting supply, yet the results do not indicate that the government is meeting its goal.

Both the demand curve and the supply curve were negatively sloped, with the demand curve having a steeper vertical slope than that of the supply curve. This result verifies the government's premise, and that of this study,
that changes in price are largely the result of changes in supply. Although the government is sound in its judgement of why changes in price occur, it has not been able to effectively alter the price. The reason for the failure of the government program partly lies in the low participation rates in the government program. During the course of the study, participation rates averaged well below twenty-five percent of all farmers. This means that over seventy-five percent of all wheat farmers are basing their planting decisions on the expected price for wheat. With the majority of farmers reacting to changes in the market and not the government's price, it is difficult for the government's program to have a significant effect on the price of wheat from year to year. The government nearly finds itself in an impossible situation. The easiest way to raise participation rates is to set the guaranteed minimum price markedly higher than the market price. This strategy however, results in new entrants to the market and increases supply and in the long run would be self-defeating.
Notes


CHAPTER 5

Conclusions

The conclusions which can be drawn from this study are varied. First, and most important, further research should be conducted regarding the overall effectiveness of the government’s wheat program. This study showed that the goal of a stable market price for wheat has not been obtained through the use of the guaranteed minimum price. This however, does not mean that the guaranteed minimum price program is totally without merit. The guaranteed minimum price program is just one part of the government’s program to provide farmers with the means necessary to ensure that they can meet the country’s wheat requirements and be viable competitors in the international market.

Research is needed to determine the overall effectiveness of the U.S. program in meeting all its goals under the wheat program.

The U.S. wheat program, like most government programs, is funded through taxes. Tax funding for a program which does not work is a waste of money and resources which could be used for other purposes. It is not a suggestion of this study that the wheat farmer receive no assistance from the government. However it would be wise to devise a system of assistance which is effective. The low participation rates by farmers in regards to the guaranteed minimum price

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program should themselves be viewed as a signal to the government that assistance of this type is not needed.

Secondly, the government needs to examine the results of previous research more closely. Assuming that there are gains from a stabilization policy, the government needs to construct a program which does not allow inefficient farmers to remain in business, while at the same time, it must protect efficient farmers from the highs and lows associated with the farming business cycle. The program must also prevent land from being converted from other uses into wheat production for the purpose of capitalizing on benefits of the program. Whether or not a wheat program could be designed to accomplish these goals remains to be seen. There are a variety of factors which influence the wheat market on a daily basis. For one program to encompass and account for all these factors would be nearly impossible.

The most important question which needs to be answered in regards to the wheat program is whether or not the benefits outweigh the costs. In the case of the guaranteed minimum price, the program has not met its stated goals, and the program costs are not producing the desired results. It is time for the United States to examine other, potentially more efficient, methods for aiding the wheat farmer. A comprehensive review of the entire program is in order.
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Gardner, Bruce L. and Richardson, James W. Consensus and Conflict in U.S. Agriculture: Perspective from the National Farm Summit (College Station: Texas A&M University Press, 1979).


### APPENDIX 1

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## APPENDIX 2

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