AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Wheat - Marketing

1980

UNIVERSITY OF CALIFORNIA
DAVIS
SEP 25 1980
Agricultural Economics Library

The Effect of the Suspension of Wheat Sales to the USSR on U.S. Prices and Exports

by

Alan J. Webb and
Leo V. Blakley

* Paper submitted for consideration as a selected paper, Annual Meeting of the American Agricultural Economics Association, University of Illinois, July 28-30, 1980. The authors acknowledge the assistance of Ron Meekhof and Shnu-Eng Hwang Webb in completing this manuscript.

Abstract

"The Effect of the Suspension of Wheat Sales to the USSR on U.S. Prices and Exports." Alan J. Webb (IED, ESCS, USDA) and Leo V. Blakley (Oklahoma State University).

A world wheat trade forecasting model is used to compare a sales suspension of maximum effectiveness with a no suspension alternative. The model suggests that U.S. producer prices will decline $.26 per bushel and exports fall 1.5 million tons in 1980 under the suspension. Increased market stability results from diminished influence of Soviet supply variability.

The Effect of the Suspension of Wheat Sales to the USSR on U.S. Prices and Exports

Introduction

On January 4, 1980, President Carter suspended all shipments of American grain to the Soviet Union except those quantities contracted under the five year trade agreement with the USSR due to expire in September 1981. Initially, the embargo of grain caused considerable consternation among grain producers, merchants and futures traders. Actions by the Administration and continued strength in export demand allayed fears, at least temporarily, of a sharp drop in grain prices. Yet the full impact of the suspension on sales to the USSR on crop prices probably lays ahead in the 1980/81 crop year and beyond.

The suspension is likely to have a greater impact on the U.S. wheat sector relative to feedgrains since wheat has a lower price elasticity of demand. A world wheat trade forecasting model is used to assess the impacts of the suspension on exports and prices under alternative crops and export conditions. The results show that even though U.S. prices and exports will decrease in the long run, they will become more stable because of the diminished influence of frequent Soviet crop variations upon the U.S. market.

* Agricultural Economist, Economics, Statistics, and Cooperatives Service, U.S. Department of Agriculture, Washington, D.C. and Professor, Department of Agricultural Economics, Oklahoma State University. Research supporting this analysis was conducted at Oklahoma State University, Stillwater, Oklahoma. The views contained in this paper are those of the authors and do not necessarily reflect those of the U.S. Department of Agriculture.

Methodology

A two-step procedure was used to evaluate the impacts of the suspension on U.S. wheat prices and exports. The first step in this procedure, fully discussed in Webb (1980), develops estimates of the structural coefficients of U.S. wheat trade with the rest of the world. In the second step, the structural coefficients are used to make projections of import demand and export supply for the United States, individual countries, and regional aggregates.

Estimation of Structural Model

A simultaneous equation model was constructed to determine the interaction of U.S. prices and quantities with each other and with quantities and prices of the rest of the world. Equations are specified for U.S. production, food use, seed use, feed use, and carry-out stocks of which the last two are functions of the current U.S. average producer wheat price. Equations for the rest of the world's production, domestic utilization and carry-out stocks are specified with the latter two a function of an average wheat import price. Both production relations depend, in part, on the previous year's prices, thus forming the basic cobweb model structure.

The U.S. and foreign sectors of the model are linked by an identity requiring U.S. exports to equal foreign excess demand and by an equation which specifies the U.S. producer price as a function of the foreign import price. U.S. exports, producer prices, feed use, carry-out stocks as well as foreign imports prices, total utilization and carry-out stocks are endogenous in the model. A listing of the exogenous variables along with a more detailed discussion of the structure of the model can be found in Webb (1980, pp. 103-110).

Projections for 1980/81

A framework for analyzing the effect of the suspension is based on linking the trade model described above and 1980/81 supply and demand projections. Projections of U.S. excess supply are obtained by incorporating 1980 values for all the exogenous variables in the equations of the U.S. sector of the simultaneous system.

In the foreign sector, it was felt that the highly aggregated supply and demand functions precluded an accurate forecast of the foreign excess demand for U.S. wheat exports. Therefore, foreign excess demand was disaggregated into important wheat producing and consuming areas of the world. For each area, equations were estimated to project area harvested, yields, production, feed use, seed use and food use.[1/] The difference between production and utilization projections determine the excess demand (excess supply) in each of the major importing (exporting) areas of the world.

A partial breakdown of these areas and their projected 1980 excess demands (supplies) is shown in Table 1.[2/] The excess demand for U.S. wheat is obtained by summing the excess demands and excess supplies over all importing regions, adjusting for a net understatement of utilization, and multiplying the result by the U.S. share of the world wheat market during 1974-76. This amount, 28.4 million metric tons, was added to projected foreign production plus carry-in stocks at the 1974-76 average import price ($163/mt) to establish the level of total foreign wheat demand.

These equations are at projected 1980 levels but their solution results in only a short run equilibrium. Long run 1980 equilibrium equations (shown in Table 2) are generated by solving for equilibrium and adjusting the intercepts of the relevant equations so that the previous year's stocks and prices are equal to the current year's stocks and prices, respectively. The system

Table 1.--Projection of 1980 Availability By Major World Regions

Region[b]	Supply-Demand Balance[a]	
	Average 1974-76	Projected 1980
	(Million metric tons)	
Western Europe	2.7	4.3
France	7.9	9.6
Eastern Europe	-3.7	-3.0
USSR	-5.5	-7.6
Africa	-8.4	-10.3
Egypt	-3.6	-4.8
Asia	-15.6	-16.6
India	-2.7	-1.4
Japan	-4.9	-5.3
Latin America[c]	-6.3	-6.6
Brazil	-2.2	-1.1
Oceania[d]	-.1	-.1
Total Importing Countries	-36.9	-39.9
Total Adjusted Demand[e]	-48.9	-51.9
Demand for U.S. Exports[f]	-26.7	-28.4

a. A positive sign indicates excess supply; a negative sign indicates excess demand.
b. A detailed breakdown of supply and demand projections in the important wheat consuming and producing countries within these regions is given in Webb 1980.
c. Excludes Argentina.
d. Excludes Australia.
e. An accounting of world supply and demand totals indicated a consistent underestimation of utilization of about 12 mmt. Import demand is adjusted upward by this amount.
f. Based on a U.S. world market share of 55%. Canada, Australia and Argentina account for the remaining share. Supply-demand balances were computed for these three exporters but were not used to compute U.S. export demand.

Table 2.--Long Run Equilibruim Equations for U.S. Wheat Trade Model in 1980.

Dependent Variables	Intercept	U.S. Price of Wheat		Foreign Price of Wheat	
		Period t-1	Period t	Period t-1	Period t
	mmt.	($/bu)	($/bu)	($/mt)	($/mt)
		Coefficients			
United States Sector					
Supply	72.4	2.7			
Carry-in	21.5[a]				
Production	50.9	2.7			
Demand	60.5		-6.0		
Food use	16.4				
Seed use	2.6				
Feed use	12.6		-3.3		
Carry-out	28.9		-2.7		
Foreign Sector					
Supply	407.1			.062	
Carry-in	49.3[a]				
Production	357.8			.062	
Demand	483.7				-.234
Domestic Utilization	427.03				-.182
Carry-out	56.4				-.052
U.S. Exports (=Foreign Excess Demand)	76.6			-.062	-.234
U.S. Producer Price	.0456				.0199

a. Quantity dependent on previous year's carry-out.

is successively solved for equilibrium and intercepts adjusted until changes in prices and stocks are small.[3/]

The equations in Table 2 display the expected price and quantity relationships. The relative magnitude of the price coefficients indicate that supply and demand in U.S. and foreign markets are not very responsive to price changes.

Analytical Framework and Assumptions

Within the context of the two sector trade model, a suspension of wheat sales to the USSR can be viewed as a decrease in foreign excess demand for U.S. exports. This is illustrated in Figure 1 which shows that for the given set of hypothetical supply and demand functions, U.S. excess supply (ab) will equal foreign excess demand (mn) at equilibrium price, P. An embargo will force the Soviets to decrease their demand for wheat causing foreign aggregate demand to shift down to D_f'. At the initial price P, foreign excess demand is now less than U.S. excess supply. This results in a fall in prices until a new equilibrium is reached at which quantity ed will be exported by the Untied States (and quantity qr imported) at a price of P'.

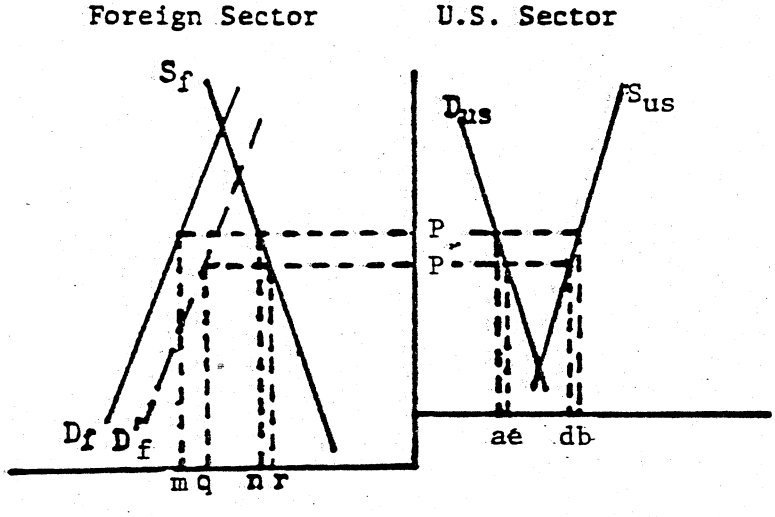

Figure 1. Impact of the sales suspension on foreign excess demand, U.S. excess supply and prices.

The effectiveness of the suspension can be measured by the reduction in total trade (a downward shift in the foreign excess demand curve). The suspension is not effective if the Soviets are able to buy wheat from other sources or circumvent enforcement measures. In this case, the export suspension redirects trade flows which results in small changes in exports and prices attributed, presumably, to a less efficient shipping pattern.

The suspension is effective if total trade is reduced by the amount of the suspension. Under these circumstances, the Soviets would have to use a policy option other than importing wheat to bring utilization in line with production.

For simplicity, three additional assumptions will be required. First, assume that, apart from the 1975 US-USSR grains agreement, no other policy measure (such as a gasohol program) is undertaken by the U.S. or by other major exporters to mitigate the impact of the suspension on domestic or world markets. Second, let the suspension of Russian grain shipments continue at least through the end of the 1980/81 crop year. Finally, assume that the sales suspension does not affect the price responsiveness of supply and demand functions for the United States and the world. Though none of these assumptions are essential to the analysis, their use permits the formulation of a framework in which the embargo can be evaluated without needless complications.

Results

Two alternatives are considered to evaluate the effect of the sales suspension on prices and exports using the trade model developed above. The first looks at the 1980/81 world wheat market without the suspension while the second assumes that the suspension has its maximum impact. The latter is quantified as a decrease in Soviet excess demand of 4.6 million metric tons--the difference between the 1980 projected Soviet excess demand of 7.6 million tons (Table 1) and the three million tons per year exempted under the 1975 US-USSR grain trade agreement. The actual effect of the sales suspension is

likely to fall somewhere between boundaries delineated by the two alternatives.

The following results show both direct and indirect effects of the sales suspension. The direct effects of the suspension are on the long-run level of prices and exports, whereas the indirect effects--which arise from the diminished role of the USSR in the world wheat market--influence market stability.

Direct Effects: Long-Run Equilibrium

The projections for the two alternatives are shown in the first and fourth columns of Table 3. A comparison of the two reveals a number of interesting results.

Prices. The suspension of wheat sales reduces U.S. producer prices by $.26 per bushel (from $2.78 to $2.52) and foreign import prices by $.35 per bushel (from $3.73 to $3.38).[4/] Though the sales suspension affects only about one percent of total foreign demand, prices declined by nine percent in both the U.S. and world markets. The impact of this relatively small shift in demand on the level of prices reflects the inherent unresponsiveness of world wheat supply and demand to changes in prices.

Supply. The suspension results in a decrease in wheat production of .7 million tons in the United States and a decrease of .8 million tons in the rest or the world. Total supply, however, remains nearly constant in both the US and foreign sectors due to offsetting increases in carry-in stocks.

Demand. Lower prices cause an increase in total quantity demanded of wheat in the U.S. of 1.6 million tons. Foreign demand declines by 1.5 million tons which is the difference between the 4.6 million decrease in Soviet demand and the 3.1 million ton increase foreign quantity demanded as a result of the lower prices.

Exports: A smaller volume of U.S. wheat is exported because of the embargo but the decline is only 1.4 million tons (from 36.0 to 34.6 mmt).

Table 3.--Projections of the Effect of the Export Sales Suspension on Wheat Prices, Quantities and Supply Variability in 1980/81.

	Units	Without Embargo			With Embargo		
		1980 Equilibrium	36 mmt. World Short Crop		1980 Equilibrium	8 mmt. World Short Crop	
			First Year	Second Year		First Year	Second Year
United States Sector							
Supply	mmt.	79.9	79.9	80.9	79.9	79.9	79.9
Carry-in	mmt.	21.5	21.5	16.1	22.2	22.2	21.0
Production	mmt.	58.4	58.4	63.8	57.7	57.7	58.9
Demand	mmt.	43.8	35.9	45.8	45.4	42.7	45.4
Food use	mmt.	16.4	16.4	16.4	16.4	16.4	16.4
Seed use	mmt.	2.6	2.6	2.6	2.6	2.6	2.6
Feed use	mmt.	3.6	.8[b]	4.5	4.2	2.7	4.3
Carry-out	mmt.	21.5	16.1	22.4	22.2	21.0	22.2
Exports[a]	mmt.	36.0	43.9	34.2	34.6	37.2	34.5
Producer Price	$/bu.	2.78	4.78	2.45	2.52	2.97	2.51
Foreign Sector							
Supply	mmt.	415.6	379.6	416.6	415.5	407.5	415.7
Carry-in	mmt.	49.3	49.3	44.1	50.0	50.0	48.8
Production	mmt.	366.3	330.3	372.5	365.5	457.5	366.9
Demand	mmt.	451.6	423.5	450.8	450.1	444.7	450.2
Domestic Utilization	mmt.	402.3	379.4	400.6	400.1	395.9	400.2
Carry-out	mmt.	49.3	44.1	50.1	50.1	48.8	50.0
Import Price	$/mt.	137.16	237.89	121.06	124.12	147.09	123.77
	($/bu.)	(3.73)	(6.47)	(3.30)	(3.38)	(4.00)	(3.37)

a. Equal to foreign excess demand.
b. Feed use is assumed to become price inelastic at 800 thousand metric tons for prices above $4.03/bu.

Indirect Effects: Market Stability

Much of the variability of wheat prices and exports over the past twenty years can be ascribed to fluctuations in production. The Soviet Union, as the world's largest wheat producer, has been the major contributor to world production variation. Variations in Soviet production may be a result of either poor or good crops. Each situation affects markets under the suspension differently.

The suspension of grain sales to the USSR by major exporters means that, in a year of a poor crop, the Soviets will be unable to make up the shortfall through purchases on the world market. In this case, world price stability is enhanced by the sales suspension because the Soviet supply situation has no effect on world prices or exports.

The effect of a large Soviet crop under the sales suspension on world market stability is less clear. The Soviets could either export their surpluses, as they have in the past, or they can build up inventories as a hedge against the uncertainty in the size of future harvests and the duration of the sales suspension.

Only the poor crop situation is analyzed because it can be easily quantified within the context of the current model. The sum of the residuals from the regional production equations which were used to generate the supply-demand balances in Table 1 provide an estimate of the magnitude of world crop variations. The largest reduction in world harvests occurred in 1975 when production was 36 million tons below the estimated level. The Soviet Union accounted for 28 million tons of that shortfall. Hence, the two short crop scenarios in Table 3 show the effect of a 36 million ton production shortfall without the embargo and a 8 million ton shortfall with the embargo.

An examination of these two world wheat supply shift scenarios indicates that they both exhibit the same basic pattern. There is an initial decrease in foreign production which results in an increase in current prices. Since supply is fixed in the short run, all first year adjustments occur in the demand components. In the second year, there are increases in production in response to the previous year's prices but these changes are, to a large extent, offset by a decrease carry-in stocks. The change in carry-in stocks stabilizes supply, dampens the cobweb type oscillations that would have occurred otherwise, and insures a rapid return to equilibrium.

A comparison of the impact of supply variations on U.S. and world markets without the embargo to markets with an embargo reveals substantial differences in the magnitude of stocks, prices and exports.

Stocks. Changes in stocks are of the utmost importance in stabilizing world wheat markets and American wheat inventories are particularly significant. United States' carry-out stocks are less than half that of the foreign sector but the changes in quantities in response to price movements are almost the same. U.S. wheat stocks are especially important for the 36 million ton shortfall. For prices in excess of $4.03 per bushel, U.S. feed use becomes perfectly inelastic. Therefore, at high prices, the only price responsive component of U.S. wheat demand is carry-out stocks.

Prices. Table 3 shows the variation in prices to be much smaller for the sales suspension situation. U.S. producer price fluctuations are reduced from a range of $2.33 to $.46 per bushel under the embargo. The range of variation in foreign import prices exhibit a similar decline.

Exports. Table 3 shows that the variation in U.S. wheat exports diminishes considerably in the sales suspension scenario. The maximum export demand decreases from 43.9 to 37.2 million tons. This is significant since extremely large export demand can put severe pressure on the physical capacity of the marketing system

causing delivery delays and prolonged market disequilibrium.

Conclusions

The effect of the suspension of wheat sales to the Soviet Union were analyzed using a two sector world trade forecasting model. Two alternative 1980 world wheat trade situations were condsidered. The first assumed no sales suspension while the second posited a suspension of 4.6 million tons of maximum effectiveness.

The findings suggested by the model used in this analysis indicate:

* The world and U.S. wheat markets are characterized by relatively price inelastic supply and demand functions. Small changes in quantities have a relatively large impact on prices.

* Changes in wheat stock play an important role in stabilizing world markets.

* Changes in U.S. stocks are extremely important in bringing a return to world market equilibrium. For a given price change, movements in U.S. stocks are almost as large as for stock movements of the rest of the world combined.

* The model indicates that the sales suspension will result in a maximum decline of the average U.S. producer wheat price of $.26 per bushel and a fall in U.S. exports of 1.5 million metric tons.

* The sales suspension will tend to increase stability in U.S. and world markets. The full effect will depend upon the Soviet policy response.

Footnotes

1. Inventory equations were not estimated because changes in stocks will have an average near zero for all but the major exporters.

2. Projections are based on 1972-76 average prices.

3. Though the aggregate supply and demand equations in both the U.S. and foreign sectors in Table 2 are not estimated directly in the simultaneous model, their structures are defined by the equations estimated for their component parts.

4. Prices are in real terms based on a 1972-76 average adjusted for long-run equilibrium conditions in the world market. The projected 1980 prices represent an increase of about 10% over estimated 1976 equilibrium prices. Using the target price as a rough indication of current nominal prices, this 10% applied to the 1980 target price of $3.63/bu. yields a current nominal equilibruim price of about $3.96.

References

Webb, Alan J., "The Impact of Projected World Wheat Production-Consumption Balances on U.S. Exports and Prices" Unpublished Ph.D dissertation, Dept. of Agricultural Economic, Oklahoma State University, Stillwater, 1980.